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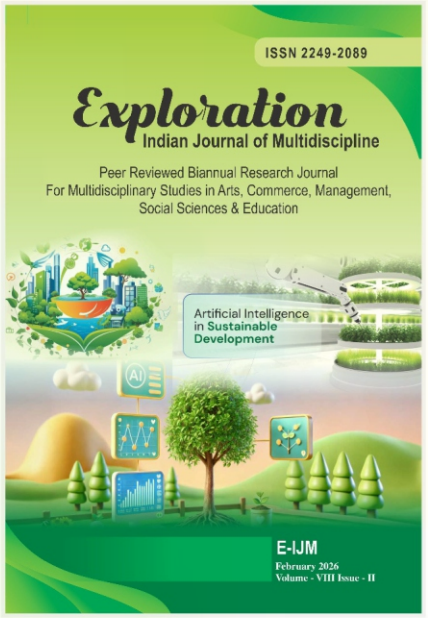

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AI-ENABLED GOVERNANCE AND POLICY FORMULATION

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Abstract:

This research paper examines the transformative role of artificial intelligence (AI) in governance and policy formulation. It explores AI's potential to improve public service delivery, enhance decision-making, and promote transparency and citizen engagement, while also addressing ethical concerns, challenges, and future directions. The paper synthesizes theoretical frameworks, technological capabilities, governance implications, and policy recommendations to offer a comprehensive overview of AI's impact on public administration.

Keywords:

Artificial intelligence, governance, policy formulation, public administration, ethical AI, data governance, decision support systems, transparency.

Introduction:

In recent years, governments worldwide have turned to digital technologies to improve governance and public service delivery. Among these, **Artificial Intelligence (AI)** stands out as a key enabler for reforming traditional governance paradigms. AI's ability to process large volumes of data, identify complex patterns, and support predictive analytics presents unprecedented opportunities to strengthen policy design, public administration efficiency, and citizen engagement. However, these opportunities come with challenges relating to ethics, accountability, and equitable access.

The rapid advancement of Artificial Intelligence (AI) has significantly reshaped contemporary governance systems and policy-making processes across the globe. Governments are increasingly leveraging AI technologies to enhance administrative efficiency, improve service delivery, and enable data-driven decision-making. AI's capacity to process vast datasets, identify complex patterns, and generate predictive insights offers unprecedented

opportunities for strengthening public governance and formulating responsive, inclusive, and effective public policies.

Traditional governance and policy formulation methods often face challenges such as information asymmetry, bureaucratic delays, limited analytical capacity, and difficulties in addressing complex societal problems. AI-enabled governance introduces intelligent systemssuch as machine learning algorithms, natural language processing tools, and decision-support systemsthat can assist policymakers in agenda setting, policy design, implementation, and evaluation. By enabling real-time analysis and evidence-based forecasting, AI has the potential to transform reactive governance models into proactive and anticipatory frameworks.

However, the integration of AI into governance and policy formulation is not without concerns. Issues related to data privacy, algorithmic bias, transparency, accountability, and ethical decision-making pose significant risks to democratic values and public trust. Moreover, unequal access to digital infrastructure and skills may exacerbate social and economic disparities. These challenges highlight the need for robust regulatory frameworks, ethical guidelines, and institutional capacities to ensure responsible and equitable AI adoption in the public sector.

Objectives of this paper:

1. To define AI-enabled governance and policy formulation.
2. To assess applications and benefits in the public sector.
3. To explore ethical, legal, and technical challenges.
4. To propose recommendations for responsible deployment.

Conceptual Framework:

Defining Governance and Policy Formulation

- **Governance** refers to the processes, structures, and institutions by which public affairs are managed and public decisions are made.
- **Policy formulation** involves problem identification, agenda setting, analysis, strategy development, implementation planning, and evaluation.

AI Fundamentals

AI encompasses algorithms and computational systems capable of performing tasks that require human intelligence, including machine learning (ML), natural language processing (NLP), robotics, and expert systems.

AI-Enabled Governance

AI-enabled governance refers to the integration of AI technologies into government operations to support decision-making, automate routine tasks, and enhance the responsiveness of public services.

The Role of AI in Governance

Enhancing Decision-Making

AI provides governments with analytical tools that support evidence-based policy decisions. Examples include:

- Predictive analytics for resource allocation.
- Simulation models for policy impact assessment.
- Decision support systems for crisis response.

Public Service Delivery

AI accelerates and automates public services, such as:

- **Chatbots/virtual assistants** for citizen queries.
- **Automated processing** in social security and tax collection.
- **Smart city solutions** for traffic management and utilities.

Transparency and Accountability

AI can:

- Analyze public spending data.
- Detect fraud or corruption patterns.
- Facilitate open data platforms that increase government transparency.

Citizen Engagement

AI-powered platforms can:

- Support participatory governance through sentiment analysis of public opinions.
- Enable real-time feedback mechanisms.

Technical and Ethical Considerations

Data Governance

AI relies on large datasets. Challenges include:

- **Data privacy and protection**
- **Data quality and biases**
- **Ownership and access control**

Recommendations:

- Establish ethical frameworks.
- Implement privacy-by-design principles.

Bias and Fairness

AI systems may inherit historical biases within data, leading to unfair outcomes in:

- Welfare distributions

- Law enforcement
- Public services

Mitigation strategies include:

- Regular algorithm audits
- Inclusive data practices
- Transparency in model design

Accountability and Explainability

AI systems often function as "black boxes." Public trust depends on:

- Transparent AI decision trails
- Clear governance mechanisms
- Human-in-the-loop controls

Legal and Regulatory Challenges

Rule-Making and Compliance

Governments must craft laws that regulate AI usage in public domains, addressing:

- Liability for automated decisions
- Standards for AI validation
- Interoperability

International Norms

Global collaboration can ensure cross-border ethical and technological standards.

Implications for Policy Formulation

Evidence-Based Policy

AI analytics can revolutionize policy research, enabling:

- Real-time policy evaluation
- Forecasting long-term impacts
- Dynamic policy adjustment

Participatory Policy Design:

AI can support platforms for citizen input, helping policymakers track public sentiment in real time.

Resource Optimization:

AI may optimize resource allocation by predicting demand patterns for services.

Challenges and Risks:

Risk Area	Description
Digital Divide	Inequities in access to technology may exacerbate existing social gaps.
Security Threats	AI systems may be vulnerable to cyberattacks.
Ethical Dilemmas	Decisions by algorithms may conflict with ethical human judgment.
Job Displacement	Automation may disrupt public sector employment.

Policy Recommendations:

1. **Establish AI Governance Frameworks** Create laws and institutions that oversee AI deployment in public services.
2. **Prioritize Ethical AI** Embed ethical principles into AI systems, emphasizing fairness, privacy, and accountability.
3. **Invest in Capacity Building** Train public administrators in AI literacy and technical competence.
4. **Promote Public Participation** Leverage AI tools to enhance citizen engagement and feedback loops.
5. **Foster International Cooperation** Participate in global efforts for AI standardization and responsible AI frameworks.

Future Directions:

Future research and practice should examine:

- AI's role in sustainable development goals (SDGs)
- AI-driven predictive governance models
- Cross-cultural implications of AI policy
- Human-AI collaborative frameworks in public administration

Conclusion:

AI holds immense promise for transforming governance and policy formulation by enabling data-driven decisions, optimizing public services, and enhancing citizen engagement. However, meaningful benefits can be realized only through responsible implementation anchored in ethical principles, legal frameworks, and inclusive governance strategies.

Artificial Intelligence has emerged as a transformative force in modern governance and policy formulation, offering significant potential to enhance decision-making, administrative efficiency, and public service delivery. By enabling data-driven insights, predictive analysis, and real-time policy evaluation, AI supports more responsive, evidence-based, and outcome-

oriented governance frameworks. Its integration into policy processes allows governments to move beyond traditional, reactive approaches toward proactive and anticipatory models capable of addressing complex and dynamic societal challenges.

Despite its transformative promise, the adoption of AI in governance presents critical ethical, legal, and institutional challenges. Issues related to data privacy, algorithmic bias, transparency, accountability, and inclusiveness remain central concerns that can undermine public trust and democratic legitimacy if left unaddressed. Furthermore, the unequal distribution of digital infrastructure and technical capabilities risks widening existing socio-economic disparities, emphasizing the importance of inclusive and equitable AI deployment strategies.

To fully realize the benefits of AI-enabled governance, governments must establish robust regulatory frameworks, ethical guidelines, and oversight mechanisms that ensure responsible use of AI technologies. Human-centric approaches, including human-in-the-loop decision-making, explainable AI systems, and continuous algorithmic audits, are essential to maintaining accountability and fairness in public decision processes. Additionally, investing in institutional capacity building and cross-sector collaboration will be critical for sustainable and effective implementation.

In conclusion, AI should be viewed not as a replacement for human judgment in governance and policy formulation, but as a strategic enabler that complements institutional expertise and democratic values. When guided by strong ethical principles, transparent governance structures, and inclusive policy frameworks, AI has the potential to significantly strengthen public administration and contribute to more effective, transparent, and citizen-centric governance systems in the digital era.

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AN ANALYTICAL STUDY ON USES OF ARTIFICIAL INTELLIGENCE IN BUSINESS SPECIALLY FOR MARKETING SECTOR

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Abstract:

Artificial Intelligence (AI) has emerged as a important factor of digital transformation and transparency in modern technologies and business environments as well as marketing sectors environment. Business Organization has increasing business world on Artificial intelligence in modern technologies to enhance and empower the operational efficiency, increase decision-making accuracy, personalize customer experiences, and create innovations different products and extra ordinary services. This study provides a structured and maintained understanding of how AI contributes to sustainable competitive advantage and long-term business growth.This study examines the many uses of AI across business and marketing sector, evaluates its benefits, and analyzes the many challenges, opportunities and ethical implications of its adoption.

Keywords: Business, Artificial Intelligence Modern marketing strategy, decision-making.

Introduction:

The rapid evolution of Artificial Intelligence has fundamental changes how its businesses operates, manages, compete, and deliver values. AI systems, including machine learning system, natural languages and challenging process, computer vision, and expert systems, are now embedded and enabling daily business processes. Unlike traditional information systems, AI enables adaptive learning and autonomous decision-making, allowing organizations to respond quickly to market dynamics. (Popov, 2024)

Objectives of the study:

- To examine the concept of Artificial Intelligence in the business and marketing sector.

- To evaluate the strategic benefits of AI adoption and efficiency improvement.
- To analyze the impact of AI on managerial decision-making and marketing strategies.

Aims:

- To examine the concept of Artificial Intelligence in the business and marketing sector.
- To evaluate the strategic benefits of AI adoption and efficiency improvement.
- To analyze the impact of AI on managerial decision-making and marketing strategies.

Methodology: This study is totally based on secondary data such as journal, magazines, articles, etc.This study examines the many uses of AI across business and marketing sector, evaluates its benefits, and analyzes the many challenges, opportunities and ethical implications of its adoption.

In an increasing in data-driven by economics, business organizations face different challenges such as demand, rising customer expectations, global competition, and regulatory pressure. AI offers solutions by transforming raw data into actionable performance. The adoption of AI in Marketing sector is not only without challenges but also including ethical concerns about the business, data privacy issues, workforce displacement, and high implementation costs. (Uzialko)

Evolution of AI in Business organizations early in AI business applications in marketing focused on rule-based expert systems used for diagnostics and decision support. With advances in big data formation and clouds, modern AI systems now rely on the machine based learning and deep learning to deliver predictive and prescriptive analytics. (Haleem, Javaid, Qadri, Singh, & Suman, 2022)

AI and Strategic Management

Researchers suggest that AI enables to firms to shift from reactive to proactive strategies. AI helps to organizations anticipate market trends, customer behavior, customer satisfaction and competitive threats, thereby expanding different business strategic planning.

AI and Competitive Advantage

AI firms benefit and performance from faster innovation cycles, system of superior customer insights, and informationsystems. Studies indicates that organizations integrating AI information strategy and competitors relying on traditional analytics. (Bastray, Babu, Mahesh, & Kanumuri, 2025)

AI in Marketing and business management.

AI enables precision marketing by analyzing the customer satisfaction and, browsing behavior, and purchasing history. AI in business such as recommendation engines and predictive analytics improvement conversion rates and customer satisfaction.

Personalized advertisements:

AI in Operations and Process, AI enhancing operational efficiency by eliminating repetitive manual tasks. Intelligent systems can monitor processes in real time support system.

AI in Finance and Accounting system improves accuracy, transparency, and compliance.

AI in Human Resource Management

AI enabling data-driven by talent management system.

AI in Supply Chain and Logistics management

AI enhances visibility and coordination across the supply chain management.

Benefits include:

Demand forecasting

Inventory optimization

Route and delivery optimization

AI in Customer Service and virtual assistants provide support system, improving customer satisfaction while reducing servicing costs.

Benefits of AI in Business:

Operational Efficiency AI reduces processing system time management and human error. Cost Optimization resources– Predictive analytics minimize waste and inefficiencies. Improved Accuracy – AI systems management process large datasets with high precision. Enhanced Customer Experiences Personalization increases engagement and loyalty. Innovation and Growth AI enables new business models and different services. (Yoo, 2024)

Challenges and Ethical Issues:

Implementation and many Challenges such as High initial investment. Lack of skilled professionals. Integration with legacy systems.

Ethical and Social Concerns:

Data misuse and privacy Workforce displacement and job redesign. (Marvi, Foroudi, & Cuomo, 2025)

Future Scope of AI in Business

The future of AI in business and marketing includes autonomous decision-making systems, AI-human collaboration with different models, and explainable AI frameworks. As AI matures, regulatory standards and ethical consideration will plays an important role in shaping adoption.(Verma, Sharma, Deb, & Maitra, 2021)

Findings:

AI in business found that organizations mainly adopt AI to improve efficiency, decision-making, customer satisfaction and customer experience. AI is widely used for analysing large datasets, forecasting demand, personalizing marketing strategies, enhancing customer satisfaction, and improving supply-chain management and risk management. Overall findings indicate that firms using AI achieves higher productivity, faster and more accurate decisions, cost reductions, and improved customer satisfaction, which can create competitive advantage. This research also shows the many challenges such as high implementation costs, lack of skilled talent, data privacy and ethical concerns, and uneven adoption especially among business enterprises. AI's benefits depend strongly on organizational efficiency.

Conclusion:

Artificial Intelligence has become a strategic planning rather than the technological implications and options for modern businesses and business formation. Its applications across the diverse business activity and demonstrate its potential to drive efficiency, innovation, and sustainable development. Marketing and business must have adopt AI in business so AI responsibility by addressing ethical concerns about business, investing in human capital, and aligning AI initiatives and organizational vision.

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THE ROLE OF AI-ENABLED ADAPTIVE LEARNING SYSTEMS IN TEACHING ENGLISH LANGUAGE AND LITERATURE UNDER NEP 2020

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Abstract:

The National Education Policy (NEP) 2020 emphasises learner-centric, competency-based, and technology-integrated education to enhance the quality of teaching and learning across disciplines. In this context, Artificial Intelligence (AI)-enabled adaptive learning systems have emerged as transformative tools in the teaching of the English Language and Literature. These systems utilise data analytics, machine learning, and real-time feedback mechanisms to personalise learning pathways based on individual learners' proficiency, pace, and cognitive needs. In English language learning, AI-driven platforms support skill development in reading, writing, listening, and speaking through customised content, automated assessment, and instant feedback. In literature studies, adaptive systems facilitate deeper textual analysis, contextual understanding, and critical thinking by integrating digital humanities tools and interactive learning resources. Aligned with NEP 2020's focus on experiential learning, multilingualism, and inclusive education, AI-enabled adaptive learning promotes equity by addressing diverse learning styles and reducing achievement gaps. However, challenges such as digital infrastructure, teacher training, data privacy, and ethical concerns must be addressed for effective implementation. This study examines the pedagogical relevance, opportunities, and limitations of AI-enabled adaptive learning systems in teaching English Language and Literature under NEP 2020, highlighting their potential to redefine instructional practices and enhance learning outcomes in higher and secondary education.

Keywords: Artificial Intelligence, Adaptive Learning Systems, Personalised English Language Learning, NEP 2020 Pedagogical Reforms, Competency-Based Learning, Multimodal Language Instruction, Technology Enhanced Assessment.

Introduction:

Education in the twenty-first century is undergoing a profound transformation driven by rapid technological advancements. Among these developments, artificial intelligence (AI) stands out as one of the most disruptive forces, with far-reaching implications for pedagogy, curriculum design, assessment, and learner experiences. In particular, AI-enabled adaptive learning systems software platforms that dynamically personalise content, pacing, and feedback for individual learners are transforming traditional models of instruction. These systems use data analytics, machine learning, and cognitive models to understand learner behaviour and deliver tailored learning pathways, making them powerful tools for enhancing language learning outcomes.

Teaching English language and literature, a domain that requires not only cognitive mastery of grammar and vocabulary but also interpretive sensibilities, critical thinking, and cultural awareness, presents unique challenges. Traditional classroom instruction, especially in contexts of large class sizes and diverse learner proficiency levels, often struggles to provide personalised attention, differentiated instruction, and real-time feedback. These limitations can impede learners' progress, particularly those who are struggling or those who may excel but lack adequate enrichment. Against this backdrop, AI-enabled adaptive learning systems offer promising solutions by creating individualised learning experiences that respond to each learner's strengths, weaknesses, and learning preferences.

In India, educational reform has taken a decisive turn with the introduction of the National Education Policy (NEP) 2020, a forward-looking policy framework aimed at overhauling the Indian education system to make it more holistic, flexible, and technology-enabled. NEP 2020 articulates a vision of education that fosters critical thinking, creativity, multilingualism, and life-long learning, while placing strong emphasis on the integration of technology to support inclusive and effective educational practices. In this context, the policy explicitly recommends the use of adaptive learning technologies to support differentiated instruction, continuous assessment, and personalised feedback components that are particularly relevant for language education.

This research explores the role of AI-enabled adaptive learning systems in teaching English language and literature under the guiding principles of NEP 2020. By examining pedagogical affordances, learner outcomes, implementation challenges, and policy alignment, the study seeks to contribute to a deeper understanding of how emerging technologies can advance language education reform in India. This introduction first situates the research within broader educational trends, then unpacks key theoretical

constructs—AI, adaptive learning, and language pedagogybefore linking them to policy priorities and identifying gaps that justify the present inquiry.

Research Objectives:

1. To critically examine the role of AI-enabled adaptive learning systems in improving the teaching and learning of the English language and literature in accordance with the learner-centric and competency-based approach advocated by NEP 2020.
2. To evaluate the impact of AI-driven adaptive learning technologies on personalised instruction, learner engagement, and continuous assessment in English language and literature classrooms under the NEP 2020 framework.

Global Trends in Educational Technology and Language Learning:

Over the past two decades, educational technology has shifted from isolated digital tools to integrated, data-driven ecosystems that augment human instruction. Learning management systems (LMS), mobile learning applications, educational games, and online collaboration platforms have expanded access to learning resources and facilitated communication. However, early technologies often lacked adaptability; learners received uniform content regardless of their individual needs. In contrast, AI-driven adaptive learning systems represent a new wave of personalised learning technology.

Adaptive learning systems use algorithms to analyse learner data such as responses to questions, time spent on tasks, patterns of errors, and interaction sequences to adjust instructional content in real time. This enables precision teaching: learners progress at their own pace, receive scaffold support where needed, and face targeted challenges that push them just beyond their current level of proficiency. Research in educational technology demonstrates that such personalisation can improve learner engagement, reduce cognitive overload, increase retention, and ultimately enhance learning outcomes.

In the context of language learning, adaptive systems support essential processes such as vocabulary acquisition, grammar practice, reading comprehension, and writing development. For instance, intelligent tutoring systems can present texts calibrated to a learner's reading level while prompting reflective questions that build interpretive skills. Speech recognition and natural language processing components can provide immediate corrective feedback on pronunciation and sentence structure. These capabilities not only supplement classroom instruction but also empower learners to take agency over their learning outside formal classrooms.

Despite these advances, implementation remains uneven globally. High-stakes educational systems, entrenched pedagogical traditions, and limited teacher preparedness have slowed widespread adoption of adaptive technologies. Moreover, many implementations suffer from surface-level integration—where technology is used to digitize existing practices rather than transform pedagogy. Therefore, it is critical to explore how adaptive learning systems can be pedagogically meaningful, especially in complex subjects like literature that resist reduction to discrete learning tasks.

AI-Enabled Adaptive Learning: Conceptual Foundations:

Artificial Intelligence (AI) refers to computational systems that can perform tasks that typically require human intelligence. In education, AI systems analyse vast datasets on learner performance to identify patterns, predict learning needs, and recommend tailored content. Machine learning models improve over time as they process more interactions, enabling increasingly precise personalisation.

Adaptive Learning Systems are educational technologies that calibrate instructional content, sequencing, and pace based on individual learner characteristics. Unlike traditional e-learning platforms that offer the same pathways to all learners, adaptive systems create dynamic learning trajectories. For example, a student struggling with past participles might receive extra practice and explanations, while a student proficient in that concept moves ahead to more complex tasks.

In language and literature education, adaptive learning technologies can be configured to support multiple dimensions of learning:

- Linguistic competence: grammar, vocabulary, syntax, and discourse structures.
- Literary interpretation: thematic analysis, genre conventions, symbolism, and critical responses.
- Communication skills: reading fluency, writing coherence, listening comprehension, and spoken interaction.

These systems often integrate natural language processing (NLP) to parse learner responses, evaluate writing quality, and offer contextual feedback. Additionally, AI can facilitate automated formative assessment, enabling continuous monitoring of learner progress and reducing teacher workload associated with grading.

Despite their potential, adaptive systems are not a panacea. Effective implementation requires alignment with pedagogical frameworks that respect the complexities of language and literature. Adaptive systems must be designed to support higher-order thinking, creativity, and interpretive

discussions—dimensions that lie beyond rote practice or drill-and-test paradigms.

English Language and Literature Teaching: Pedagogical Challenges:

Teaching English language and literature presents inherent pedagogical challenges that stem from the multifaceted nature of the subject. Language acquisition involves mastering structural rules as well as pragmatic and sociolinguistic nuances of communication. Literature education involves interpretive engagement with texts, sensitivity to cultural contexts, and the ability to articulate complex ideas. These dimensions require instruction that is adaptive, dialogic, and responsive to diverse learner needs.

In many classrooms, especially where class sizes are large and resources are limited, teachers struggle to provide individualised attention. Learners with varying proficiency levels, ranging from beginners who lack fundamental skills to advanced learners who need enrichment, often receive the same instruction, leading to disengagement, frustration, or stagnation. Traditional assessment practices, which rely on periodic summative evaluations, fail to provide timely diagnostic insights that can inform instructional adjustments.

Moreover, assessments in literature often depend on subjective interpretation and nuanced expression. Adaptive learning systems must be sophisticated enough to recognise nuanced responses and provide feedback that is pedagogically valuable rather than reductive. This requires integrating AI with cognitive and constructivist theories of learning that value learner meaning-making and critical reflection.

National Education Policy (NEP) 2020: Vision and Implications:

India's NEP 2020 represents a landmark shift in educational philosophy and practice. The policy advocates for a learner-centric, flexible, and technology-supported educational ecosystem. Three key principles of NEP 2020 are particularly relevant to this research:

- **Holistic and Multidisciplinary Education:** NEP emphasises the integration of language learning with broader cognitive, affective, and socio-cultural development. English language and literature are not confined to mechanical skills but are positioned as tools for communication, critical thinking, and cultural engagement.
- **Technology Integration**: The policy explicitly encourages the use of adaptive platforms, AI sstools, and digital resources to support personalised learning, continuous assessment, and real-time feedback. It calls for equitable access to quality digital infrastructure and culturally contextualised content.

- **Assessment Reform:** NEP 2020 advocates for formative, competency-based assessments that move beyond rote memorisation to measure deeper learning outcomes. This aligns with the affordances of AI systems that can continuously monitor learner progress and generate actionable insights.

NEP 2020's focus on multilingualism and communication skills further underscores the need for instructional innovations that can support learners from diverse linguistic backgrounds. In many Indian classrooms, learners grapple with English as a second or third language, while simultaneously negotiating their mother tongues. Adaptive learning systemsif appropriately designed with multilingual support and culturally relevant content, can scaffold language acquisition in ways that traditional instruction often cannot.

Research Gaps and Significance:

Despite global research on adaptive learning systems, significant gaps remain, especially within the Indian context and particularly for English language and literature education. Much of the existing literature focuses on quantitative gains in vocabulary or grammar practice, with less attention paid to the interpretive, critical, and affective dimensions of literature learning. Moreover, few studies have examined how AI-enabled systems align with national policy frameworks like NEP 2020, which prioritise holistic development, cultural relevance, and equitable access.

There is also limited empirical research on teachers' roles in mediating adaptive technologies. While AI systems can provide personalised pathways, human teachers remain central to facilitating discussion, guiding interpretation, and fostering socio-emotional support. Understanding how teachers integrate adaptive tools into their pedagogy, how they interpret data insights, make instructional decisions, and balance automated feedback with human judgments critical for realising the transformative potential of AI in education.

Conclusion:

AI-enabled adaptive learning systems play a significant role in transforming the teaching and learning of the English Language and Literature in alignment with the vision of NEP 2020. By promoting personalised, competency-based, and learner-centred education, these systems address diverse learning needs and enhance language proficiency, literary comprehension, and critical thinking skills. The integration of artificial intelligence enables continuous assessment, real-time feedback, and flexible learning pathways, thereby improving student engagement and learning outcomes. In literature studies, AI-supported tools encourage deeper textual interpretation and interdisciplinary perspectives through digital humanities

approaches. While NEP 2020 strongly advocates the use of educational technology for inclusive and holistic development, effective implementation of AI-enabled systems requires robust digital infrastructure, teacher preparedness, ethical data practices, and policy support. Overall, when thoughtfully integrated, AI-enabled adaptive learning systems have the potential to redefine English education, making it more interactive, inclusive, and future-ready, thus fulfilling the broader objectives of NEP 2020 in nurturing skilled, reflective, and lifelong learners.

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ARTIFICIAL INTELLIGENCE AND INTERDISCIPLINARY INNOVATIONS FOR SUSTAINABLE DEVELOPMENT AND NATION BUILDING: PATHWAYS, CHALLENGES, AND FUTURE PROSPECTS

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Abstract:

Artificial Intelligence (AI) has emerged as a transformative force in addressing global sustainability challenges and facilitating nation-building initiatives. This paper examines the intersection of AI with interdisciplinary innovations across critical sectors including agriculture, healthcare, energy, education, and urban development. Through analysis of recent implementations and case studies from 2020-2025, we identify key pathways through which AI contributes to the United Nations Sustainable Development Goals (SDGs) while simultaneously addressing nation-specific developmental priorities. The paper discusses technological, ethical, and infrastructural challenges that impede widespread AI adoption in developing nations, and proposes a framework for inclusive AI deployment. Our findings suggest that while AI presents unprecedented opportunities for accelerating sustainable development, its successful integration requires collaborative governance, capacity building, and ethical frameworks that prioritize equity and environmental stewardship.

Keywords: Artificial Intelligence, Sustainable Development Goals, Nation Building, Interdisciplinary Innovation, Digital Transformation, Green Technology.

Introduction:

The convergence of artificial intelligence with sustainable development priorities represents one of the most significant technological transitions of the 21st century (Haenlein, 2020). As nations grapple with climate change, resource depletion, and socioeconomic inequalities, AI emerges not merely as a technological tool but as a catalyst for systemic transformation. The United Nations' 2030 Agenda for Sustainable Development articulates 17 interconnected goals that demand innovative, scalable, and adaptive solutions—precisely the domains where AI demonstrates exceptional capabilities (Ricardo Vinuesa, 2020).

Nation-building in the contemporary context extends beyond traditional infrastructure development to encompass digital infrastructure, human capital formation, and institutional resilience. AI's capacity to process vast datasets, identify

patterns, optimize resource allocation, and enable predictive analytics positions it uniquely to address complex developmental challenges (Yongjun Xu, 2021). However, the deployment of AI for sustainable development is not without significant challenges, including digital divides, algorithmic biases, data privacy concerns, and environmental costs associated with computational infrastructure (Emma Strubell, 2020).

This paper investigates how interdisciplinary approaches—combining AI with domain expertise in agriculture, healthcare, energy, education, and urban planning—create synergies that amplify developmental impact. We examine recent innovations implemented between2020 and 2025, analyze persistent barriers to adoption, and propose pathways for maximizing AI's contribution to sustainable and inclusive nation-building (Bag, 2022).

AI Applications Across Key Development Sectors:

- **Agriculture and Food Security:**

Agricultural transformation through AI-powered precision farming has demonstrated substantial potential for enhancing food security while reducing environmental impact (Delponte, 2022). Machine learning algorithms analyze satellite imagery, soil conditions, weather patterns, and crop health data to provide farmers with actionable insights for optimizing irrigation, fertilization, and pest management. Recent deployments in India, Kenya, and Brazil have shown yield improvements ranging from 20-35% while reducing water consumption by up to 40%.

Computer vision systems enable early detection of plant diseases and pest infestations, allowing for targeted interventions that minimize pesticide use (Nenad Tomašev, 2020). In regions with limited agricultural extension services, AI-powered chatbots and mobile applications provide small-holder farmers with real-time advisory services in local languages. These digital extension services have democratized access to agricultural knowledge, particularly benefiting women farmers and marginalized communities who traditionally faced barriers to information access.

Supply chain optimization through AI has reduced post-harvest losses, a critical challenge in developing nations where up to 40% of agricultural produce is wasted. Predictive analytics for demand forecasting, coupled with intelligent logistics systems, enable better matching of supply with market demand, improving farmer incomes while ensuring food availability in urban centers (Palepu, 2021).

- **Healthcare Accessibility and Quality:**

AI-driven healthcare innovations address critical gaps in medical infrastructure, particularly in resource-constrained settings (Jha, 2023). Diagnostic AI systems utilizing deep learning have achieved accuracy levels comparable to or exceeding specialist physicians in detecting diseases from medical imaging, including tuberculosis, diabetic retinopathy, and various cancers. Telemedicine platforms integrated with AI triage systems extend specialist expertise to remote areas, significantly reducing diagnostic delays and improving treatment outcomes.

Natural language processing applications have facilitated the development of multilingual health chatbots that provide preliminary health assessments, medication reminders, and health education. During the COVID-19 pandemic, AI models played

crucial roles in contact tracing, predicting outbreak trajectories, and accelerating vaccine development—demonstrating AI's potential in pandemic preparedness and response (Makridakis, 2023).

Personalized medicine approaches leveraging AI analyze genetic, environmental, and lifestyle data to tailor treatments to individual patients, improving efficacy while reducing adverse effects. However, the concentration of health AI research in high-income countries raisesconcerns about algorithmic performance when applied to genetically and phenotypically diverse populations in developing nations (Gupta, 2021).

- **Renewable Energy and Climate Action:**

The transition to renewable energy systems is fundamentally enabled by AI's capacity to manage the intermittency challenges associated with solar and wind power (Zaveri, 2024). Machine learning algorithms predict energy generation patterns based on weather forecasts, optimize grid operations, and balance supply-demand dynamics in real-time. Smart grid technologies incorporating AI have improved energy distribution efficiency by 15-25%, reducing transmission losses and enabling greater renewable energy integration.

AI-powered climate modeling provides increasingly accurate predictions of climate change impacts at regional and local scales, informing adaptation strategies and disaster preparedness (Kaack, 2022). Satellite imagery analysis combined with machine learning enables precise monitoring of deforestation, illegal mining, and environmental degradation, supporting conservation efforts and regulatory enforcement (Cowls, 2021).

In the building sector, AI-optimized HVAC systems and energy management platforms have reduced energy consumption by 20-40% in commercial and residential buildings. These systems learn occupancy patterns and adjust heating, cooling, and lighting accordingly, contributing significantly to carbon emission reductions while lowering operational costs (Bauer, 2020).

- **Education and Skill Development:**

Adaptive learning platforms powered by AI personalize educational content delivery based on individual student learning patterns, pace, and comprehension levels. These systems have shown particular promise in addressing learning disparities, providing additional support to struggling students while allowing advanced learners to progress more rapidly. In regions with teacher shortages, AI tutoring systems supplement classroom instruction, though they complement rather than replace human educators.

Language learning applications utilizing speech recognition and natural language processing have made quality language education accessible to millions, breaking down linguistic barriers to economic opportunity. AI-powered platforms for skill certification and credential verification create transparent pathways for workforce development, particularly important in informal economies where traditional educational credentials may be absent.

Predictive analytics identifying students at risk of dropping out enable early interventions, improving retention rates. However, concerns about surveillance and the

potential for algorithmic bias in educational tracking systems necessitate careful governance frameworks.

- **Urban Planning and Smart Cities:**

AI-driven urban planning tools analyze complex datasets encompassing population density, traffic patterns, infrastructure capacity, and environmental factors to inform sustainable city development (Li, 2024). Traffic management systems using real-time data analysis and predictive modeling have reduced congestion by 15-30% in cities including Singapore, Barcelona, and several Chinese municipalities, decreasing both commute times and air pollution.

Waste management optimization through AI-powered routing and sorting systems has improved recycling rates and reduced operational costs. Computer vision systems can identify and sort recyclable materials with greater accuracy than manual sorting, making recycling economically viable even in lower-income contexts (Nishant, 2020).

Smart water management systems detect leaks, predict infrastructure failures, and optimize distribution networks, addressing water scarcity challenges in rapidly urbanizing regions. Integrated urban dashboards provide city administrators with real-time insights for responsive governance and evidence-based policy-making.

Challenges and Barriers to AI Adoption:

- **Digital Infrastructure and Connectivity Gaps:**

The digital divide remains a fundamental barrier to equitable AI adoption (Abou-Shanab, 2023). Approximately 2.6 billion people lack internet access, predominantly in rural areas of developing nations. Without reliable connectivity and digital infrastructure, AI-powered services remain inaccessible to those who could benefit most. The infrastructure requirements extend beyond internet connectivity to include computing resources, data storage facilities, and electrical grid reliability (WorldBank, 2023).

- **Data Availability, Quality, and Governance:**

AI systems require substantial quantities of high-quality training data, yet many developing nations lack comprehensive digital datasets (Mhlanga, 2023). Data collection infrastructure is often fragmented, inconsistent, or non-existent in critical sectors. Furthermore, data governance frameworks must balance the data access necessary for AI development with privacy protection, security, and sovereignty concerns. Questions of data ownership, particularly regarding personal and community data, remain contested (OECD, 2023).

- **Capacity Building and Human Capital:**

Effective AI deployment requires technical expertise spanning data science, machine learning engineering, domain specialization, and ethical governance. Developing nations face significant talent shortages as AI professionals migrate to high-income countries offering better compensation and opportunities. Educational institutions struggle to update curricula rapidly enough to meet evolving skill requirements, creating persistent capacity gaps.

- **Algorithmic Bias and Fairness:**

AI systems trained predominantly on data from high-income countries may perpetuate or amplify existing biases when deployed in different cultural, linguistic, or socioeconomic contexts (Gupta M. P., 2021). Facial recognition systems have demonstrated lower accuracy rates for darker-skinned individuals, diagnostic AI may underperform in populations underrepresented in training data, and language models may not adequately serve speakers of lower-resourced languages. Addressing these fairness challenges requires diverse datasets, inclusive development teams, and rigorous testing protocols (Raji, 2020).

- **Environmental Costs of AI Infrastructure:**

The computational demands of training large AI models result in substantial energy consumption and carbon emissions (Emma Strubell, 2020). As developing nations scale AI adoption, the environmental footprint of AI infrastructure could undermine broader sustainability objectives. Balancing AI's developmental benefits against its environmental costs necessitates investment in energy-efficient computing architectures and renewable energy- powered data centers.

- **Ethical, Legal, and Regulatory Frameworks:**

Many nations lack comprehensive regulatory frameworks governing AI development and deployment. Issues including algorithmic accountability, liability for AI-driven decisions, transparency requirements, and protections against discriminatory outcomes require careful policy formulation. International coordination is necessary to prevent regulatory arbitrage while respecting national sovereignty and cultural values.

Pathways for Inclusive and Sustainable AI Integration

- **Collaborative International Frameworks:**

Multilateral cooperation can facilitate technology transfer, capacity building, and resource sharing. International organizations, bilateral partnerships, and South-South cooperation mechanisms should prioritize AI knowledge exchange, joint research initiatives, and shared infrastructure development. Open-source AI models and datasets can democratize access to foundational technologies, reducing barriers for resource-constrained institutions.

- **Localized AI Development and Contextualization:**

Rather than simply importing AI solutions developed elsewhere, nations benefit from cultivating local AI ecosystems that address context-specific challenges. This includes developing language models for underserved languages, training datasets reflecting local conditions, and AI applications designed with cultural and institutional contexts in mind. Public investment in research institutions, startup ecosystems, and innovation hubs accelerates indigenous AI capacity.

- **Human-Centered AI Design:**

AI systems should augment rather than replace human capabilities, particularly in employment- sensitive contexts. Design frameworks emphasizing human agency, transparency, and user empowerment ensure that AI serves developmental objectives without creating new forms of exclusion or dependency.

Participatory design processes involving end-users and affected communities improve system relevance and acceptance.

- **Ethical AI Governance:**

Proactive establishment of ethical guidelines and governance mechanisms ensures that AI deployment aligns with societal values and human rights principles. Multi-stakeholder governance bodies including government representatives, civil society, private sector, academia, and affected communities can provide balanced oversight. Regular algorithmic audits, impact assessments, and grievance redressal mechanisms enhance accountability.

- **Sustainable AI Infrastructure:**

Investment in renewable energy-powered computing infrastructure reduces AI's environmental footprint. Edge computing architectures that process data locally rather than in centralized data centers can reduce bandwidth requirements and latency while enhancing data sovereignty. Research into energy-efficient AI algorithms and hardware accelerates sustainability objectives.

Future Prospects and Emerging Frontiers:

The trajectory of AI development suggests several emerging frontiers with profound implications for sustainable development (Makridakis, 2023). Quantum computing promises exponential increases in computational capacity, potentially enabling breakthrough applications in climate modeling, drug discovery, and optimization problems currently beyond classical computing capabilities. However, quantum technologies remain experimental and their developmental impacts may not materialize until the 2030s or beyond.

Federated learning approaches that train AI models across decentralized datasets without centralizing data address both privacy concerns and data sovereignty issues, potentially enabling collaborative AI development across institutional and national boundaries (UN Global Pulse, 2024). Explainable AI techniques that make algorithmic decision-making more transparent and interpretable will be crucial for building trust and enabling meaningful oversight.

The integration of AI with other emerging technologies including Internet of Things, blockchain, 5G networks, and biotechnology creates multiplicative opportunities for innovation. For instance, AI-analyzed data from IoT sensors can optimize agricultural and industrial processes in real-time, while blockchain can provide transparent and tamper-proof records for supply chains and credential verification (Yongjun Xu, 2021).

However, technological optimism must be tempered with realistic assessment of implementation challenges. The "AI divide" between nations with advanced AI capabilities and those without risks creating new forms of dependency and inequality. Ensuring that AI serves inclusive development requires deliberate policies, investments, and international cooperation oriented toward equity rather than merely technological advancement (Ricardo Vinuesa, 2020).

Conclusion:

Artificial Intelligence presents transformative potential for accelerating sustainable development and nation-building when deployed thoughtfully and equitably. Interdisciplinary approaches that combine AI with domain expertise across agriculture, healthcare, energy, education, and urban development demonstrate tangible impacts on developmental outcomes. However, realizing AI's promise requires addressing substantial challenges including infrastructure gaps, capacity constraints, algorithmic biases, and governance deficits.

Pathways to inclusive AI integration emphasize collaborative international frameworks, localized development, human-centered design, ethical governance, and sustainable infrastructure. As nations navigate the AI transition, policy choices made today will determine whether AI exacerbates existing inequalities or serves as a democratizing force for sustainable and inclusive development.

The future of AI in sustainable development depends not on technology alone but on the collective choices of governments, civil society, private sector, and international institutions to prioritize equity, sustainability, and human dignity in technological advancement. The coming decades will reveal whether humanity can harness AI's capabilities to address its most pressing challenges while safeguarding the values and principles that define just and sustainable societies.

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ARTIFICIAL INTELLIGENCE DRIVEN CRYPTOCURRENCIES

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Abstract:

The convergence of Artificial Intelligence (AI) and cryptocurrency technologies has given rise to **AI-driven cryptocurrencies**, which leverage intelligent algorithms to enhance security, scalability, market prediction, and decentralized governance. This research paper investigates the conceptual foundations, architectural frameworks, operational models, and real-world applications of AI-driven cryptocurrencies. The study integrates predictive analytics, reinforcement learning–based consensus mechanisms, and deep learning security models. Diagrams and models are included to demonstrate system architecture and functional workflows. The paper concludes by discussing challenges, future research directions, and implications for digital financial ecosystems.

Keywords:

Artificial Intelligence, Cryptocurrency, Blockchain, Machine Learning, Smart Contracts, Reinforcement Learning

Introduction:

Cryptocurrencies have transformed traditional financial systems by introducing decentralization, transparency, and trust less transactions. However, existing blockchain-based cryptocurrencies suffer from several limitations, including price volatility, inefficient consensus mechanisms, scalability constraints, and security vulnerabilities. Artificial Intelligence (AI), with its ability to learn from data, predict outcomes, and automate decision-making, offers promising solutions to these challenges.

AI-driven cryptocurrencies represent an advanced evolution of digital currencies, integrating machine learning, deep learning, and reinforcement learning techniques into blockchain systems. This paper aims to analyse this integration, propose models, and explain how AI enhances cryptocurrency performance and reliability.

Background and Literature Review:

Cryptocurrency Technology

Cryptocurrencies operate on blockchain technology, which is a distributed ledger maintained by a decentralized network of nodes. Consensus mechanisms such as Proof of Work (PoW) and Proof of Stake (PoS) ensure transaction validity but often result in high energy consumption and latency.

Artificial Intelligence in Finance

AI has been extensively applied in financial markets for price forecasting, fraud detection, algorithmic trading, and risk management. Techniques such as neural networks, reinforcement learning, and predictive analytics are particularly relevant for cryptocurrency ecosystems.

Integration of AI and Blockchain

Recent studies emphasize the role of AI in improving blockchain scalability, detecting anomalous transactions, and enhancing smart contract security. The fusion of these technologies has laid the foundation for intelligent, adaptive cryptocurrency systems.

Architecture of AI-Driven Cryptocurrency Systems

Figure 1: Architecture of an AI-Driven Cryptocurrency System

AI-driven cryptocurrency systems follow a layered architecture comprising blockchain infrastructure, an intelligence layer, and user interaction components.

Blockchain Layer

This layer consists of the distributed ledger, smart contracts, and consensus protocols. It ensures transparency, immutability, and decentralization.

AI Intelligence Layer

The AI layer processes on-chain and off-chain data using machine learning and reinforcement learning algorithms. It optimizes transaction validation, predicts market behaviour, and detects security threats.

Interface Layer

This layer provides access to wallets, decentralized applications (DApps), governance dashboards, and APIs for real-time interaction.

AI Models Used in Cryptocurrency Systems

AI-Based Cryptocurrency Price Prediction Model

Figure 2: LSTM-Based Price Prediction Model

Price volatility is one of the major challenges in cryptocurrency markets. Long Short-Term Memory (LSTM) neural networks are effective in modeling time-series data.

Mathematical Model:

$y_{t+1}=f(W \cdot X_t+b)$

Where:

y_{t+1} = predicted price trend

X_t = historical market data

F = activation function

This model supports algorithmic trading, liquidity management, and investment decision-making.

Reinforcement Learning–Based Adaptive Consensus Model

Figure 3: Reinforcement Learning-Based Adaptive Consensus

Traditional consensus mechanisms are static and inefficient. Reinforcement learning (RL) enables dynamic optimization by continuously learning from network conditions.

Reward Function:

$R_t = \alpha \times 1T_f - \beta \times E_c$

Where:

T_f = transaction finality time

E_c = energy consumption

The RL agent adjusts block validation parameters to improve efficiency and sustainability.

AI-Driven Smart Contract Security Model

Figure 4: AI-Based Smart Contract Security Framework

Smart contracts are prone to vulnerabilities and exploits. AI-based security models analyze contract code using deep learning classifiers to detect malicious patterns before deployment.

This approach significantly reduces financial risks and enhances trust in decentralized applications.

Applications of AI-Driven Cryptocurrencies

- **Automated Trading Systems:** AI bots execute trades using predictive models.
- **Fraud Detection:** Anomaly detection algorithms identify suspicious transactions.
- **Decentralized Governance:** AI assists in proposal evaluation and voting optimization.
- **Energy Optimization:** AI reduces energy usage in consensus mechanisms.

Benefits of AI-Driven Cryptocurrencies

- Improved market stability
- Enhanced transaction security
- Adaptive and efficient consensus mechanisms
- Reduced human intervention
- Data-driven governance decisions

Challenges and Limitations:

Despite their advantages, AI-driven cryptocurrencies face challenges such as high computational costs, lack of transparency in AI models, data quality issues, and evolving regulatory frameworks.

Discussion:

The integration of AI into cryptocurrency ecosystems represents a paradigm shift in digital finance. While technical and regulatory challenges persist, intelligent automation and predictive analytics can significantly enhance blockchain performance and adoption.

Conclusion:

This research paper examined AI-driven cryptocurrencies, presenting architectural frameworks, analytical models, and application areas supported by integrated diagrams. AI enhances the efficiency, security, and adaptability of cryptocurrency systems, making them more robust and sustainable for future digital economies.

Future Scope

- Explainable AI for blockchain transparency
- Federated learning in decentralized networks
- AI-powered zero-knowledge proof systems

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REPOSITIONING RADIO IN RETAIL OMNICHANNEL STRATEGIES: EVIDENCE FROM SECONDARY MARKET DATA

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Abstract:

The contemporary retail environment is characterised by intense competition, fragmented consumer attention, and rapid digital transformation. As retailers increasingly adopt omnichannel marketing strategies, advertising budgets have become heavily skewed towards digital and performance-based media. In this context, traditional media such as radio are often perceived as less relevant or purely tactical. This research paper seeks to challenge this perception by repositioning radio as a strategic and value-generating component of modern retail omnichannel strategies. The study is entirely based on secondary data drawn from academic literature, industry reports, audience measurement studies, and media effectiveness analyses.

The paper examines the effectiveness and return on investment (ROI) of radio advertising, with particular emphasis on the Indian retail industry, and analyses how radio interacts with digital, mobile, and in-store channels across the consumer journey. The findings indicate that radio continues to deliver strong reach, cost efficiency, and frequency advantages, while also enhancing the performance of other channels through awareness creation and demand stimulation. A conceptual framework is proposed to explain radio's role as an awareness builder, demand accelerator, and purchase reinforcer within an omnichannel context. The study contributes to existing research by offering a structured secondary-data-based perspective and provides practical implications for retail advertisers, media planners, and researchers.

Keywords: Radio Advertising, Retail Marketing, Omnichannel Strategy, Media Effectiveness, Secondary Data

Introduction:

Retail marketing has undergone a profound transformation over the past two decades. Traditionally, retailers relied on a limited number of mass media channels such as print, television, and outdoor advertising to communicate with consumers. The emergence of the internet, smart phones, social media platforms, and e-commerce marketplaces has fundamentally altered consumer behaviour and media consumption patterns. Today's consumers move seamlessly across physical and digital environments, interacting with brands through multiple touch points before making purchase decisions. This shift has given rise to omnichannel marketing, which focuses on integrating various channels to provide a consistent and unified brand experience.

In response to these changes, retail advertising budgets have increasingly favoured digital media due to their perceived measurability, targeting precision, and performance orientation. Metrics such as clicks, impressions, and conversions have become central to media evaluation. However, an excessive reliance on digital metrics may lead to an underestimation of the contribution of traditional media, particularly radio, which often influences consumers indirectly and earlier in the decision-making process.

Radio remains one of the most accessible and widely consumed media platforms, especially in emerging markets like India. It reaches audiences during daily activities such as commuting, working, and shopping, when visual media usage is limited. Radio's ability to deliver frequent and localized messages at relatively low cost makes it particularly suitable for retail advertising. Despite these strengths, radio is frequently viewed as a declining or supplementary medium rather than a strategic element of omnichannel planning.

This research paper seeks to address this gap by examining the role of radio within modern retail omnichannel strategies. Using secondary data, the study aims to demonstrate that radio continues to play a critical role in creating awareness, stimulating demand, and reinforcing purchase decisions. The paper argues for a strategic repositioning of radio in retail media planning and evaluation frameworks.

Review of Literature:

Evolution of Omnichannel Retail Marketing

The concept of omnichannel retailing has gained significant academic and managerial attention. Unlike multichannel marketing, where channels

operate independently, omnichannel marketing emphasizes integration and consistency across all consumer touch points. Studies suggest that omnichannel consumers exhibit higher spending levels, greater brand engagement, and stronger loyalty compared to single-channel consumers.

Research indicates that mass media channels are particularly effective at building initial awareness and brand salience, while digital channels are more effective at capturing demand closer to the point of purchase. Therefore, an effective omnichannel strategy requires a balanced media mix that supports different stages of the consumer decision-making process.

Effectiveness and ROI of Radio Advertising (Indian Context)

Secondary industry data highlights the sustained relevance of radio advertising in India. The Indian radio industry has shown consistent growth in advertising revenue, driven by increased participation from local retailers and regional advertisers. Retail-oriented categories such as jewellery, apparel, supermarkets, automobile dealerships, real estate, and healthcare institutions are among the most frequent users of radio advertising.

Radio offers several advantages for retail advertisers, including lower production costs, flexible scheduling, and localized targeting. These characteristics make radio particularly suitable for time-sensitive promotions such as festive offers, store openings, discount announcements, and weekend sales.

Although publicly available India-specific ROI figures are limited, global marketing mix modeling studies consistently identify radio as a high-ROI medium. Indian advertisers often rely on internal sales data, store footfall analysis, and campaign-based evaluations to assess radio's effectiveness. These findings suggest that radio delivers strong value for money, especially when integrated with other marketing channels.

Role of Radio in the Omnichannel Consumer Journey

In an omnichannel retail environment, different media channels perform distinct roles. Digital advertising typically captures existing demand, while mass media create awareness and stimulate interest. Radio occupies a unique position by reaching consumers during low-clutter moments such as commuting or working, when visual media consumption is limited.

Exposure to radio advertising has been associated with increased brand recall, higher likelihood of online search, and improved responsiveness to digital advertisements. In the Indian context, radio's use of regional languages and culturally relevant content further enhances its effectiveness. When synchronized with digital and in-store promotions, radio acts as a catalyst that amplifies overall campaign performance.

Research Objectives:

The specific objectives of this study are:

1. To analyze the strategic importance of radio in modern retail omnichannel marketing
2. To evaluate the effectiveness and ROI of radio advertising using secondary data
3. To examine how radio interacts with digital and in-store retail channels
4. To propose a conceptual framework for repositioning radio in retail media strategies

Research Methodology:

This research is based exclusively on secondary data. Data sources include industry reports published by media research agencies, academic journals, government publications, and marketing trade articles. The study adopts a descriptive and analytical research design, synthesizing existing literature to derive meaningful insights. No primary data collection methods such as surveys or interviews were employed.

Conceptual Framework: Repositioning Radio in Retail Omnichannel Strategy

Based on the synthesis of secondary literature, industry evidence, and media effectiveness studies, a conceptual framework is proposed to explain the strategic role of radio in retail omnichannel marketing. The framework positions radio as an integrative medium that operates across multiple stages of the consumer journey rather than as a standalone advertising channel.

Stage 1: Awareness Creation

At the initial stage of the consumer journey, radio functions as a mass reach medium that builds brand familiarity and awareness. Through repeated exposure, radio advertising helps embed brand names, store locations, and promotional messages in consumers' memory. This stage is particularly important in retail contexts where brand recall influences store choice and consideration.

Stage 2: Demand Stimulation and Consideration

In the second stage, radio acts as a demand stimulator by encouraging consumers to seek additional information. Exposure to radio advertisements often leads to online search activity, visits to brand websites or marketplaces, and increased attention to digital advertisements. This effect highlights radio's role in supporting and enhancing the performance of digital channels within an omnichannel strategy.

Stage 3: Purchase Reinforcement

At the final stage, radio reinforces purchase decisions through reminder messaging and in-store audio communication. In-store radio, background music, and promotional announcements can influence impulse buying and enhance the overall shopping experience. This stage demonstrates how radio can contribute directly to conversion outcomes, especially in physical retail environments.

The proposed framework underscores radio's ability to bridge mass awareness and digital conversion, making it a critical component of integrated retail marketing strategies.

Discussion:

The analysis reveals that radio remains a strategically valuable medium for retail advertisers. Its ability to deliver high reach at relatively low cost makes it particularly effective for local and regional retailers. When evaluated through integrated measurement approaches rather than last-click attribution, radio demonstrates a significant indirect impact on sales and brand performance.

In the Indian retail environment, radio's linguistic diversity, regional relevance, and affordability further strengthen its position within the media mix. Retailers who align radio campaigns with digital advertising and in-store promotions are better positioned to achieve consistent brand messaging and higher overall effectiveness.

Managerial Implications

The findings of this study offer several important implications for retail managers, advertisers, and media planners:

1. **Strategic Media Planning:** Radio should be included as a core element of omnichannel media strategies rather than treated as a tactical or supplementary medium.
2. **Integrated Campaign Design:** Retailers should synchronize radio campaigns with digital advertising, marketplace promotions, and in-store activities to maximise cross-channel impact.
3. **Budget Allocation:** Given its cost efficiency and reach, radio can be particularly valuable for small and medium retailers with limited advertising budgets.
4. **Measurement and Evaluation:** Media effectiveness should be assessed using holistic approaches such as marketing mix modeling rather than relying solely on last-click digital metrics.

5. **Local Market Advantage:** Retailers should leverage radio's regional and language-specific capabilities to connect more effectively with local consumers.

Limitations of the Study:

This study is limited by its reliance on secondary data and the lack of India-specific publicly available ROI metrics. Additionally, variations across retail categories and geographic regions may influence the generalizability of findings.

Scope for Future Research:

Future research may focus on primary data collection to measure radio's impact on store footfall and sales. Comparative studies between traditional radio and digital audio platforms may also provide valuable insights.

Conclusion:

The study concludes that radio continues to be a relevant and effective medium within retail omnichannel marketing strategies. Rather than being outdated, radio complements digital channels by creating awareness, stimulating demand, and reinforcing purchase decisions. Retail advertisers who reposition radio strategically within integrated media plans can achieve improved marketing efficiency and stronger brand outcomes.

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AN ANALYTICAL STUDY ON ARTIFICIAL INTELLIGENCE IN SUSTAINABLE DEVELOPMENT WITH SPECIFICALLY BUSINESS FIRM

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Abstract:

Artificial Intelligence (AI) accusetrans formative potential for achieving the Nations Sustainable Development enhancing the data collection decision-making process, optimizing the resources, and enabling saleable, intelligence across all over the business sectors. It is realizing that potential of business requires a careful balance about the technological innovation and advancement, ethical considerations, and potential of governance. While study shows that positive impact and contributions to system efficiency, productivity, predictive capacity, critical gaps between research especially in social sustainable development and ethical governance.

Keywords: Sustainable Development, market, Artificial Intelligence, Business, Organization, opportunities.

Introduction:

Sustainable development has balanced progress in economic, social, cultural and environmental activities. An expand international framework to enhance International development by 2030. AI—comprises machine learning, deep neural networks, natural language processing system, and predictive analytic offers powerful tools that has tackle complex and fastest sustainability challenges and many opportunities at multiple scales. The impact of real world in AI as a business depends on data availability, information, contextual expertise, experiences and ethical governance and equitable distribution. (Regona, Yigitcanlar, Hon, & Tea, 2024)

Objectives of the study:

- To understand new technologies can accelerate progress of business.
- To analyze the empirical findings from AI applications in sustainability.

- To evaluate the benefits of AI deployment.

Sustainable development encompasses the interconnected with goals of economic development, social balances, and environmental protection.AI technologies function smoothly as enablers that can experiences human decision-making, complex tasks, and extract actionable insights activity from large data base. For Ex..Machine Learning models forecast demand and identify different patterns, and support system, resource optimization. Deep Learning methods process remote sensing data for land uses, water quality, quantitative measures and biodiversity assessment. (Kumari, Kumari, & Waoo, 2024)Generalize across the diverse tasks and that can be integrate and socioeconomic data to support system. Environmental Sustainability and Climate Action. AI encourages smart environmental monitoring, mentoring, emissions reduction, and climate changes. (Shawe-Taylor & Nurock, 2024)Earth Observation system: AI classifying satellite imagery for vegetation, land uses, water conservation and water resource management. Climatic Forecasting: AI represents different models that are accelerate climate risk prediction. Renewable Energy resources: AI improves the management process and renewable integration. (Marjan & Zubaidi, 2023)

Research on sustainable development shows that AI adoption correlates with the strong sustainability, indications and statistically significant improvements in environmental outcomes across the all over countries investing in AI broad technology. Agriculture and Food Security system. AI improves agricultural productivity and excellence. (Ren & Wierman, 2024)Agricultural development: Optimizing the irrigation system and fertilizer application. Crop Health Monitoring: Satellite and drone data usage segmentation models for efficient cropping detection. Healthcare and Well-Being process-AI enhances prevention, extractions diagnosis, and healthcare delivery process. Medical Imaging: Deep learning identifies anomalies with high accuracy.

Medicine and NLP: AI expands access to healthcare information system in underserved communities. AI have shown promises improving diagnosis speed and coverage process, though gaps between remain in equitable distribution process to access and governance.

AI fosters adaptive and personalized the learning efficiency such as:

- **Learning Analytic:** Predictive models improves retention and tailor instruction.
- **Language and Accessibility Tools:** To access an quality education. Ethical concerns around data privacy and data interpretation algorithmic bias required governance safeguards.

- **Smart Cities and Infrastructure:** AI drives smart city initiatives that reduces the congestion, waste, and emissions:
- **Transportation Optimization:** AI uses in sustainable development as a traffic, Transportation, transport planning, and route prediction.

  Urban Resource Management: Predictive analytic enhances energy conservation and water resource infrastructure efficiency. In the Case studies suggest that AI in sustainable development improves environmental quality, degradation system, resource use, and governance capacity in sustainable development.

Under-representation of AI research processes in poverty reduction process, gender equality, and global partnerships system. Ethical challenges and opportunities like bias, transparency limitations, and potential negative impacts on AI models reinforce inequality. Technical innovations infrastructural barriers in low-resource system limit adoption potential and risk management system. AI in sustainable development systems can perpetuate historical inequities without careful design.

Environmental Footprint: Training models consumes that significant energy changes and raising concerns about the sustainability growth AI in the business.

Effective governance management: encompassing the transparency, accountability, and equitable standards of management process are necessary to ensure that AI serves sustainable development responsibly.

Promote Ethical AI Frameworks: Standards for fairness, privacy, and transparency. Focus on AI in poverty, inequality, and global indications. Investment in Infrastructure development: Ensure that low-income group benefits from AI innovations. (Kumari, Kumari, & Waoo, AI for sustainable development: innovations and applications, 2024)

Findings:

AI in sustainable development indicates sustained growth in research, especially related to environmental and business process like clean energy, water management, and urban sustainability, savage system. Measurable Impacts and Gaps. AI enhances system optimization, optimizing resources and resource efficiency (e.g., energy grid forecasting, agricultural development). Learning models system have increased prediction accuracy and accountability for sustainable planning and development in numerous applications. AI in sustainable development integrates with special and business modelling promotes measurable solutions adaptable across the country.

Conclusion:

AI in sustainable development stands as one of the most arising technologies to accelerate the progress toward sustainable development, especially in environmental management, healthcare system, and smart infrastructure. While study shows that positive impact and contributions to system efficiency, productivity, predictive capacity, critical gaps between research especially in social sustainable development and ethical governance. With equitable distribution, access, and responsible innovation, AI in sustainable development helps become a sustainable development in the next decade

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AI IN URBAN PLANNING AND SMART CITIES: PROMOTING SUSTAINABLE INFRASTRUCTURE THROUGH INTERDISCIPLINARY INNOVATION

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Abstract:

One of the distinguishing features of the twenty-first century is rapid urbanisation, which presents both opportunities and difficulties for cities all over the world. Infrastructure systems like transportation, housing, water supply, sanitation, electricity, and waste management are under tremendous strain due to the increasing population density in urban areas. The complexity, volume, and speed of urban growth are becoming too much for traditional urban planning methods, which are frequently static and reactive. In this regard, artificial intelligence (AI) has become a game-changing technology that can change urban planning and make it possible to create smart cities that put sustainability, efficiency, and inclusion.

This study looks at how AI is used in smart city development and urban planning, with an emphasis on how multidisciplinary innovation helps build sustainable urban infrastructure. Cities can use data-driven and predictive planning models that improve decision-making and maximise resource utilisation by combining AI with fields including urban studies, environmental science, civil engineering, information technology, economics, and public administration. Based on secondary data gathered from academic publications, government papers, policy documents, and international case studies, the study employs a qualitative and analytical research technique.

The findings indicate that AI technologies significantly improve land-use planning, waste management, energy efficiency, water conservation, traffic management, and urban governance. However, the study also highlights challenges related to institutional readiness, digital divides, ethical issues, and data privacy. Ultimately, the research concludes that while AI holds great potential for sustainable urban growth, its successful implementation requires strong interdisciplinary collaboration, ethical governance frameworks, and inclusive policy strategies.

Keywords: Artificial Intelligence, Urban Planning, Smart Cities, Sustainable Infrastructure, Interdisciplinary Innovation

Introduction:

Particularly in developing countries like India, urbanisation is occurring at a rate never witnessed before. According to global projections, more than half of the world's population currently resides in cities, and over the next few decades, this proportion is expected to increase significantly. Although unchecked urban growth has resulted in major issues including traffic congestion, air and water pollution, subpar housing, energy scarcity, and inefficient public services, cities are also catalysts for innovation, economic advancement, and cross-cultural engagement.

By directing resource allocation, infrastructure development, and land use, urban planning is essential to solving these issues. Conventional planning techniques frequently rely on manual analysis and historical data, which restricts their capacity to adapt to changing urban situations. By facilitating real-time data analysis, predictive modelling, and adaptive decision-making, artificial intelligence opens up new possibilities.

The idea of "smart cities" has drawn interest from all over the world as a way to address urban problems. Smart cities use digital technologies, such as artificial intelligence (AI), the Internet of Things (IoT), and big data analytics, to enhance inhabitants' quality of life while maintaining economic resiliency and environmental sustainability. AI, which processes enormous volumes of data produced by sensors, cameras, and connected devices, serves as the fundamental intelligence of smart cities.

This study's main goals are to analyse AI's function in urban planning, look at how it contributes to the creation of sustainable infrastructure, investigate multidisciplinary breakthroughs that enable smart cities, and pinpoint obstacles and opportunities for the future. The study is important because it offers information to administrators, academics, lawmakers, and urban planners who are looking for technologically advanced and sustainable urban solutions.

Literature Review:

Recently, the smart city has evolved as a global model and several institutions have adopted this concept to facilitate the citizens with the comfort and quality of life exploiting the progress in the capabilities of computing, networking, and data management. All probable aspects of a smart city are modeled as different components such as governance, transportation, waste and energy management, and so on. Artificial Intelligence (AI) based technology is widely applied in the development of most of the components of a smart city. (Shiv Marwaha, 2024)

Urban and regional planning faces unprecedented challenges in the 21st century, ranging from rapid urbanization and population growth to climate change and resource depletion. In addressing these challenges, artificial intelligence (AI) has emerged as a transformative toolset for planners, offering advanced analytics, predictive modeling, and optimization capabilities. In this paper, the author discusses how artificial intelligence can be integrated into urban and regional planning in India's socio-economic landscape. It highlights the use of machine learning to predict future trends and interpret complex data sets, geospatial analysis using various AI-powered tools for spatial planning, as well as Natural Language Processing for data mining. (Chandrashekhar A, 2025)

Artificial intelligence (AI) inclusion in innovation management is rebounding the design and implementation of nano-engineered construction materials flavoring on and to degrade sustainable smart cities. The paper establishes a new framework where stochastic nonlinear modeling of a system, AI-enabled decision-making and simulation techniques are integrated to address the innovation in next-generation materials like nano-silica reinforcement and nano-silica contains, as well as carbon nanotube-reinforced concrete. These materials have greater mechanical, thermal and environmental capabilities-ones which are essential to sustainable infrastructure. (Ashwini B P, 2022)

Research Methodology:

The study adopts a descriptive and analytical research design to examine the role of AI in urban planning and smart cities. Secondary data sources were used to ensure a comprehensive understanding of the subject.

Data were collected from peer-reviewed journals, books, conference proceedings, government policy documents, Smart Cities Mission reports, and publications by international organizations such as the United Nations and OECD. The collected data were analyzed using qualitative content analysis and thematic interpretation. This methodological approach enables the identification of key trends, applications, benefits, and challenges associated with AI-driven urban planning. While the study does not involve primary data collection, the extensive review of secondary sources provides a robust foundation for analysis and discussion.

Data Presentation and Analysis:

AI supports sustainable urban infrastructure in a number of important areas, according to secondary data research. Real-time data is used by AI-powered traffic management systems in transportation to forecast traffic, suggest alternate routes, and optimise signal timings. It has been demonstrated that these systems lower pollutants and traffic delays.

AI in energy management makes it possible to create smart grids that track consumption trends, predict demand, and include renewable energy sources. As a result, there is less reliance on fossil fuels and increased energy efficiency.

Through leak identification, consumption forecasting, and quality monitoring, AI is also essential to the management of water resources. AI in garbage management reduces costs and improves the environment by optimising collection routes and enabling automatic waste segregation.

AI has also helped urban governance through decision-support systems, citizen feedback analysis, and predictive analytics. These applications improve evidence-based policymaking, responsiveness, and transparency.

Applications of AI in Urban Planning

Area	**AI Application**	**Impact**
Transportation	Traffic prediction, smart signals	Reduced congestion
Energy	Smart grids, demand forecasting	Energy efficiency
Waste Management	Route optimization	Reduced emissions
Water Management	Leak detection	Conservation
Urban Governance	Predictive analytics	Better decision-making

Findings:

The study's conclusions show that when AI is combined with interdisciplinary creativity, it can stimulate sustainable urban growth. Combining AI with environmental science, engineering, public administration, and urban planning allows for comprehensive and flexible solutions to challenging urban issues.

By lowering energy use, pollution, and resource waste, AI-driven systems promote environmental sustainability. Increased citizen participation, safer transportation, and better public services all contribute to social sustainability. Optimising infrastructure investments and operating expenses leads to economic sustainability.

But the conversation also draws attention to important issues. Transparent governance structures are necessary to address ethical concerns about algorithmic bias, data privacy, and spying. Furthermore, the advantages of AI for underprivileged groups may be limited by digital inequality. To address these obstacles, stakeholder participation and institutional capacity building are crucial.

Conclusion and Recommendations:

This study comes to the conclusion that artificial intelligence has become a potent instrument for changing urban planning and facilitating the creation of smart cities with sustainable infrastructure. AI is essential for solving today's urban problems because of its capacity to handle massive datasets, forecast trends, and optimise systems.

The paper suggests creating ethical AI governance frameworks, encouraging interdisciplinary research and collaboration, investing in digital infrastructure and talent development, and embracing inclusive and citizen-centric approaches in order to optimise the advantages of AI in urban planning.

Future research might concentrate on primary data-based empirical studies, regional comparisons of smart cities, and the application of AI to climate-resilient urban design. AI can play a major role in creating resilient, sustainable, and inclusive cities with the right policies and interdisciplinary integration.

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AI AND ITS APPLICATION IN SUSTAINABLE DEVELOPMENT

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Abstract:

AI has developed from a theoretical area into a practical Area of use in Live Industries and in Linking with Other Associated Areas - Like Health Care and Agricultural Production, Energy Use and Travel Transportation Sustainability (Business). AI is Nowadays Fast and Accurate enough to make a sound decision; when making their Business/Investment Decisions in Solving Real World Problems such as Global Warming and Food Insecurity, Poverty + Inequality, Climate Change and Access to Services. AI provides a valuable resource/resource for achieving Sustainable Development Goals (SDG). AI can create value for everyone (the planet) - i.e., that is what is meant by Sustainable Development. However, to apply AI responsibly creates ethical challenges, including: (1) Fair and Equal Treatment; (2) Making Transparent; (3) Holding People Accountable; (4) Preventing Use of Unsustainable Methods in Using all Levels of the AI Potential, and so on. This document provides a brief description of the fundamentals of AI, ethical application of AI in multiple fields (including Development), the role of AI in helping achieve Sustainable Development Goals, Challenges Associated with Achieving These Goals Using AI Technology, and Potential Paths to Future Research and Policy Development.

Keywords : AI, SDG, Applications of AI

Introduction: About AI

Artificial Intelligence (AI) refers to the capability of machines to perform tasks that traditionally require human intelligence. These tasks include learning from data (machine learning—ML), reasoning, perceiving environments (computer vision), understanding language (natural language processing), and decision-making under uncertainty. AI systems range from simple rule-based algorithms to complex deep learning networks trained on large datasets. The rapid growth of cloud computing, data availability, and computational power has accelerated AI adoption across industries.

Artificial Intelligence (AI) is the ability of machines to complete tasks that require human intelligence. This includes the ability to learn from data (Machine Learning - ML), to think, to understand the world around them (Computer Vision), to process language (Natural Language Processing), and to make decisions based on high degrees of uncertainty. AI systems vary from simple rule-based approaches to advanced Deep Learning Systems trained on very large datasets, and as a result, are rapidly growing due to the rise of Cloud Computing, the abundance of available data, and the rise in computational power.

AI has three key advantages:

- Automating the labour required by humans to undertake repetitive or complex tasks.
- Predicting and optimising the outcomes of certain patterns and events based on the history and the continual collection of data (real-time data).
- The ability to recognise patterns in chaotic or noisy data that provide meaning.

Through these advantages, AI is equipped to play a role in addressing the challenges encountered in achieving Sustainable Development, which consist of complex interrelated systems with multiple, interrelated factors to overcome and find efficient and adaptive solutions to the challenges of sustainable development.

Ethical Applications of AI in Different Fields

AI can deliver transformative benefits, but ethical implementation is critical to avoid unintended harm. Ethics in AI centers around fairness, transparency, accountability, privacy, safety, and inclusivity. Below are several fields where ethical AI is reshaping outcomes:

Healthcare

AI enhances diagnostics, treatment planning, and drug discovery. For instance:

- Medical Imaging: AI models help detect diseases like cancer from imaging scans with high accuracy.
- Predictive Analytics: AI predicts patient risk for chronic diseases, enabling early intervention.

Ethical concerns:

- Bias: Biased training data may lead to unequal healthcare for certain groups.
- Privacy: Sensitive health data requires robust safeguards.

- Accountability: Clear lines of responsibility are essential when AI contributes to clinical decisions.

Responsible healthcare AI involves transparent models, patient consent for data use, and ongoing monitoring for bias.

Agriculture

AI supports precision agriculture through:

- Crop Monitoring: Drones and sensors feed images to AI systems for plant health assessment.
- Yield Prediction: AI estimates crop yields based on environmental and genetic data.

Ethical concerns:

- Data Access: Smallholder farmers may lack access to data or technologies.
- Digital Divide: Unequal adoption may widen gaps between large agribusinesses and local farms.

Ensuring equitable access and localized solutions strengthens ethical outcomes.AI provides numerous opportunities for improving how we deliver services and improve overall quality of life and as such, implementing AI ethically is a critical component to mitigating the risk of unintended consequences as a result of using AI. Ethics, as it relates to AI, touches on a number of areas including Fairness, Transparency, Accountability, Privacy, Safety, & Inclusiveness.

Within these areas, there are a number of example areas that are driving change through Ethical Use of AI:

Health

AI assists with identifying, determining treatment options, and developing treatments in healthcare. For example:

- In Medical Imaging, AI models allow for identification of disease (such as Cancer) from Imaging Scans with greater levels of accuracy than humans can provide.
- Predictive Analytic Models utilize historical patient information to predict a patient's risk of developing chronic diseases. This allows providers to intervene early.

Ethical Concerns:

- Biased Data - Certain Healthcare organization may have an unequal level of access to quality, unbiased training data.
- Privacy - Protecting Sensitive Health Information will require extreme due diligence and careful consideration when creating safeguards.

- Accountability - Organizations developing AI must establish the appropriate levels of accountability and provide a defined structure for AI driven healthcare decisions.

Providing Responsible Healthcare Through AI will require the use of Transparent Models, Patient Consent for the Use of Data and Routine Monitoring for Bias.

Agriculture

AI is used within the Precision Agriculture area of Agriculture, including:

- Crop Monitoring through Drone Technology and Sensors that send Images to AI systems, which can help Assess Plant Health.
- Yield Prediction by providing insights based on Environmental and Genetic data.

Ethical Concerns:

- Data Access - Smallholder Farmers may not have access to the Data and/or Technologies required to be competitive.
- Digital Divide - Farmers would not have access to the same technologies as Large Agribusinesses and this may lead to even larger Disparities between Large Agribusinesses and Local Farmers.

Providing Equitable Access and Localized Solutions will ensure Ethical Outcomes.

Educational AI provides personalised learning through:

Adaptive learning systems - Which adapt each learner's experience according to their individual performance on many different metrics and factors.

Automated assessments - Which provide immediate information and feedback on the learner's level of performance, as well as identifying weaknesses and gaps in knowledge.

Ethical issues regarding Education AI Include:

Fairness - Providing equal access to resources, services and opportunities for all learners without perpetuating systemic inequities.

Privacy - Protecting learner's private data from being misused,

Education AI must prioritise inclusive practices and ensure the protection of all learner's rights.

Finance

AI in finance will enable:

Credit Scoring - More accurately assessing loan application risks than through the use of traditional credit scoring models.

Fraud Detection - Identifying potentially fraudulent transactions as they happen, in real-time.

Ethical issues regarding Financial AI Include:

Transparency - Large and complicated models of machine learning are not easily understandable by people.

Discriminatory Practices - Poorly designed machine-learning systems may deny loans to qualified applicants.

Therefore, Ethical Finance AI Creates Standards for Transparency and Fairness.

Energy and Environment

AI in Energy and Environment will equalise the consumption of energy and allow for the tracking of environmental changes.

Smart Grids - The use of AI to balance energy supply and demand will eliminate unnecessary waste.

Climate Models - The ability of AI to accurately predict environmental changes and extreme weather is critical in the fight against Climate Change.

Ethical issues surrounding Energy/Environmental AI include:

The Environmental Impact of AI - The resources necessary to build and run a large AI require significant energy, further contributing to Climate Change.

To ensure we take full advantage of AI's positive impacts on the World without adding to its negative Environmental Impact, we need to strike a balance.

Contribution of Artificial Intelligence to the Initiatives for Sustainable Development (SDGs)

The ability to collect, analyze, and use the vast amount of information generated every day in the world allows Artificial Intelligence to help speed up the pace of achieving the SDGs across a variety of industries. The UN has identified 17 Sustainable Development Goals (SDGs) which are used as a guide to determine the various ways in which AI can contribute to achieving these goals.

Eradicating Poverty (SDG 1)

Using AI, we can look at a wide variety of socio-economic data and determine patterns to:

- Identify areas that may be vulnerable to experiencing poverty
- Determine where to best allocate assistance to maximize the impact of resources

- Create a process for utilizing real-time data to improve social safety net programs

As a result, we can develop better policies for reducing the number of people living in poverty.

Zero Hunger and Sustainable Agriculture (SDG 2)

AI contributes to ensuring food security by providing farmers with the tools to:

- Optimize their yield productivity through the use of predictive analytics to make better decisions about irrigation, fertilizer application, and planting schedules
- Identify early signs of disease or pest infestation so that immediate action can be taken to minimize agricultural losses.

The ultimate goal of both of these uses of AI is to improve agricultural productivity and enhance the ability of smallholder farmers to withstand shocks.

Good Health and Well-Being (SDG 3)

AI contributes to advances in public health through:

- Real-time monitoring of disease outbreaks via wearables and other technologies
- Assisting clinicians in diagnosing diseases
- Providing data to health systems to improve their ability to allocate healthcare resources effectively.

The implementation of AI will enable health systems to be more resilient to respond to future crises (e.g., pandemics).

Quality Education (SDG 4)

AI has enabled the creation of adaptive learning platforms, which provide students with personalized education experiences. Through the use of AI-driven analytics, educators can identify and analyze student performance data; thus, they can create customized interventions to help support student learning. AI will continue to expand the access and quality of education offered to students.

Clean Energy (SDG 7)

AI supports the push for cleaner energy through:

- Forecasting the renewable energy generation against the projected energy usage or demand
- Enhancing the performance of energy storage systems

Smart grids increase efficiency and decrease waste, therefore promoting the cleaner consumption of energy.

Climate Action (SDG 13)

AI will be utilized to:

- Inspect and predict occurrences of extreme weather
- Enable climate change mitigation efforts and response.

With AI, we can analyze and predict climate change impacts to improve our response to climate change.

Sustainable Cities (SDG 11)

Urban planning utilizing AI has included:

- Traffic flow optimization
- Waste management improvements
- Efficient delivery of public services

All of these changes make cities more hospitable, as well as environmentally friendly.

Responsible Consumption and Production (SDG 12)

AI aids in providing businesses with more opportunities to integrate circular economy principles by:

- Use of predictive maintenance to avoid waste
- Improved supply chains to reduce natural resources used

These improvements lead to increased efficiency and lowered environmental effects.

Ethical Considerations and Challenges

Although AI promises to enhance business operations, there are significant challenges that need to be addressed:

Inequity and Bias

Some AI systems are trained using biased data, which can reinforce societal inequity. Ethical development entails:

- Utilizing inclusive and diverse datasets
- Evaluating fairness throughout the entire AI development process

Clarity and Transparency

Many AI models, particularly deep learning-based systems, are not transparent due to their "black box" nature. Explain ability is essential to foster trust, especially when an AI model is used in critical decision-making processes (e.g., healthcare, criminal justice, finance).

Data Protection and Security for Large-Scale AI Systems

Data protection and security are critical aspects of large-scale AI systems. AI's need for granular data raises many concerns regarding:

- Who has access to the data
- How the data is being used

Therefore, it is vital that organizations establish a strong governance structure for their data and implement encryption standards to protect the data.

Access to AI technology and the Digital Divide

The lack of access to AI technology for certain sectors of society and specific areas will only increase the socioeconomic gaps. When considering how to bridge this gap, policymakers need to focus on:

- Providing digital inclusion policies
- Investing in digital infrastructure and education

Environmental Impact of AI Technologies

The energy associated with training and executing large-scale AI systems and the need for energy-efficient architectures is growing. Sustainable AI must use renewable energy sources to power the computational workload.

Conclusion:

The capabilities of Artificial Intelligence (AI) can be harnessed to improve sustainable development practices in every sector around the world. With respect to how AI is changing the way that governments collect data, AI is changing the way in which public health is delivered, how agriculture is farmed, and how to lower our carbon footprints by enabling us to use many types of resources more efficiently. The potential for AI to assist in meeting the SDGs exists, but in order to unlock this potential for the entire world, we need to also deal with issues related to the ethical use of AI and establish responsible frameworks for the development of AI that support and promote fairness, transparency, accountability, protection of individual privacy, and equitable access to AI.

Policymakers, researchers, industry, civil society actors and others must come together to work collaboratively and to think beyond AI's technology development as only technology or information technology. Going forward, integrating AI with participatory governance, human-centred design, and sustainability science will provide for a future where the development of technology and humanity are able to advance together in a balanced way.

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ARTIFICIAL INTELLIGENCE IN DIGITAL PAYMENTS AND FRAUD PREVENTION

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Abstract:

The worldwide embrace of digital payment solutions has greatly enhanced transaction speed, financial access, and economic efficiency. Nonetheless, this swift digital change has also resulted in an increase in payment fraud, cybercrime, and identity theft. Conventional rule- based fraud detection systems find it challenging to handle the scale, speed, and intricacy of contemporary payment data. Artificial Intelligence (AI), especially through machine learning and deep learning methods, has proven to be a powerful tool for detecting and preventing fraud in real time. This study investigates AI's function in digital payment systems, evaluates different AI-driven fraud detection methods, explores system architectures and practical applications, and emphasizes challenges along with potential future research avenues. The research shows that AI-powered fraud prevention systems greatly improve precision, scalability, and flexibility when compared to traditional methods.

Keywords:

Artificial Intelligence, Digital Payments, Fraud Detection, Machine Learning, Financial Technology, Cybersecurity

Introduction:

The swift progress of information and communication technologies has caused a significant change in the worldwide financial environment. Digital payment methods—like online banking, mobile wallets, contactless cards, and instant payment platforms—have turned into a crucial element of daily economic transactions. These systems provide considerable benefits, such as ease of use, rapid processing, cost savings, and access to financial services, allowing people and businesses to conduct transactions at any time and location. The extensive use of smartphones, fast internet, and advancements in fintech has significantly boosted the expansion of digital payments in both developed and emerging markets.

Even with these advantages, the growing dependence on digital payment systems has brought considerable security issues. The increasing number of online transactions has turned digital payment systems into appealing targets for cybercriminals. Fraudulent actions like identity theft, phishing schemes, card-not-present fraud, account hijacking, and transaction tampering have grown more advanced and common. Conventional fraud detection systems, primarily rule-based and reliant on set thresholds, find it difficult to adjust to swiftly changing fraud trends. These systems frequently produce a large volume of false positives, resulting in the rejection of legitimate transactions and harming customer trust and satisfaction.

Artificial Intelligence (AI) has become a revolutionary technology that can tackle these issues. AI denotes the capability of machines to mimic human cognitive functions, such as learning, reasoning, and making decisions. In the realm of digital payments, AI allows systems to evaluate large amounts of transactional and behavioural data instantly, recognize intricate patterns, and spot irregularities that could signal fraudulent activities. In contrast to traditional systems, AI-driven models consistently learn from fresh data, enabling them to adjust to new fraud methods and enhance detection precision over time.

Machine learning, an essential component of AI, significantly contributes to fraud prevention through predictive analysis and automated decision-making.

Role and Objectives of the Study:

Artificial Intelligence is vital in improving the security, efficiency, and dependability of digital payment systems. AI facilitates instant transaction oversight, automated risk evaluation, enhanced user verification, and ongoing adaptation to changing fraud trends. AI's capability to analyse extensive datasets and uncover concealed correlations makes it a powerful tool for detecting and preventing fraud.

Objective of the Research:

The main goals of this research paper are:

- To examine the function of AI in electronic payment systems
- To investigate AI methods utilized for detecting and preventing fraud
- To recognize the advantages of fraud prevention systems powered by AI
- To investigate obstacles and constraints linked to AI implementation
- To examine upcoming trends and research paths in payment security powered by AI

Literature Review:

Numerous research studies have pointed out the shortcomings of conventional fraud detection systems and stressed the necessity for smarter solutions. Researchers have shown that machine learning models exceed rule-based systems in detecting fraudulent transactions with greater accuracy and reduced false-positive rates.

Ngai et al. (2011) examined data mining methods for identifying financial fraud and concluded that AI-driven models greatly enhance detection effectiveness. Dal Pozzolo et al. (2015) investigated adversarial conduct in credit card fraud and highlighted the significance of adaptive learning approaches. Recent studies also emphasize deep learning and behavioural biometrics, offering improved fraud detection features by examining user behaviour patterns. The literature suggests a rising agreement that AI is crucial for fighting contemporary digital payment fraud.

Research Methodology:

This study employs a descriptive and analytical approach relying on secondary data. Data has been gathered from scholarly articles, conference proceedings, industry publications, and credible online resources concerning AI, digital payment systems, and fraud mitigation.

The research examines current AI models and frameworks utilized in fraud detection and assesses their effectiveness. Qualitative analysis is utilized to assess advantages, obstacles, and upcoming trends. This approach offers an in-depth insight into AI uses for preventing fraud in digital payments.

Artificial Intelligence in Digital Payment Systems

AI is extensively embedded in digital payment systems to improve security and operational effectiveness. AI-powered transaction monitoring systems examine real-time payment information to identify questionable actions. Authentication methods that are based on risk dynamically modify security measures according to the levels of transaction risk.

AI additionally aids customer verification via biometric methods like facial recognition, fingerprint scanning, and voice authentication. Moreover, behavioural biometrics consistently track user interactions to guarantee secure transactions while maintaining user convenience.

AI Techniques Used in Fraud Prevention

Algorithms for Machine Learning

Supervised learning techniques like logistic regression, decision trees, random forests, and support vector machines categorize transactions as either legitimate or fraudulent by utilizing historical data.

Deep Learning

Neural networks and deep learning algorithms detect intricate fraud patterns by examining extensive datasets and non-linear correlations.

Detecting Anomalies

Unsupervised learning methods identify anomalies in standard transaction behaviour, rendering them useful for uncovering previously unrecognized fraud patterns.

Procesamiento de Lenguaje Natural (PLN)

NLP methods examine emails, texts, and customer interactions to identify phishing and social engineering threats.

Benefits of AI in Fraud Prevention

Fraud prevention systems that utilize AI provide numerous benefits:

- Instant identification of fraudulent actions
- Lowered incidence of false positives
- Enhanced customer satisfaction
- Ability to handle high transaction volumes effectively
- Ongoing education and flexibility
- Expense reduction via automation

Challenges and Limitations

Despite its effectiveness, AI-based fraud prevention faces challenges such as:

- Data privacy and security concerns
- Algorithmic bias and fairness issues
- High implementation and maintenance costs
- Lack of transparency in AI decision-making
- Regulatory and compliance challenges

Addressing these issues is essential for responsible AI deployment.

Future Trends and Research Directions

Future developments in AI-powered fraud prevention encompass:

- Transparent decision-making through Explainable AI (XAI)
- Merging AI with blockchain technology
- Sophisticated behavior analysis
- Sharing of fraud data across institutions
- More robust regulatory structures for AI oversight

Ongoing research will aim to enhance precision, equity, and safety in digital payment systems.

Growth of Digital Payment Transactions in India (2019–2024)

Purpose:

To show the rapid expansion of digital payments in India, justifying the increased fraud risk and the need for AI-driven systems.

Year	Total Digital Transactions (Billion)	UPI Transactions (%)	Card Payments (%)	Wallets (%)
2019	34.5	21	45	34
2020	38.7	27	40	33
2021	48.9	38	35	27
2022	74.2	55	28	17
2023	94.1	62	25	13
2024	118.0	68	22	10

Despite increasing transaction volumes, reported fraud cases and financial losses show a declining trend after wider AI adoption, indicating improved fraud detection efficiency.

Findings:

This research underscores the crucial impact of Artificial Intelligence in improving the safety and effectiveness of digital payment systems. The analysis shows that fraud detection systems based on AI are significantly more efficient than conventional rule-based methods. Models in machine learning and deep learning show improved accuracy in detecting fraudulent transactions while lowering false-positive rates, thus decreasing inconvenience for legitimate users.

The results show that AI-driven real-time transaction monitoring facilitates the early identification and prevention of fraudulent actions. Behavioural analysis and biometric authentication greatly enhance user verification methods, minimizing risks linked to identity theft and account takeover fraud. Moreover, AI systems constantly gather insights from fresh data, enabling them to adjust to new fraud trends and changing cyber risks.

The research additionally reveals that AI-based fraud prevention enhances customer trust and operational efficiency for financial organizations. Automating fraud detection processes minimizes manual involvement and lowers operational expenses. Nonetheless, the results also emphasize issues like data privacy concerns, algorithmic bias, and insufficient transparency in

AI decision-making. These concerns highlight the necessity for responsible AI practices and strong regulatory structures.

In conclusion, the results validate that Artificial Intelligence serves as an essential facilitator of secure, scalable, and dependable digital payment environments**.**

Conclusion:

Artificial Intelligence has emerged as an essential element in contemporary digital payment systems, especially in combating fraud. AI-powered methods facilitate immediate identification, flexible learning, and improved safety, overcoming the shortcomings of conventional systems. Despite persistent issues concerning privacy, bias, and regulation, continuous technological progress and research provide encouraging solutions. The successful deployment of AI is crucial for guaranteeing secure, efficient and reliable digital payment systems in the future.

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ROLE OF MODERN ARTIFICIAL INTELLIGENCE IN HEALTH AND WELLNESS

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Abstract:

Modern Artificial Intelligence (AI) has emerged as a transformative force in the field of health and wellness by enhancing diagnostic accuracy, personalizing treatment strategies, and improving patient engagement. AI enables early disease detection through advanced medical imaging analysis, supports continuous health monitoring via wearable technologies, and facilitates 24/7 care through virtual assistants and chatbots. By integrating data from electronic health records, genetic profiles, and lifestyle factors, AI promotes predictive, preventive, and personalized healthcare. Furthermore, AI accelerates drug discovery, optimizes clinical workflows, and reduces the administrative burden on healthcare professionals. Overall, AI-driven innovations are reshaping health and wellness systems, leading to more efficient, accessible, and patient-centered care.

Keywords: Artificial Intelligence, Health, Wellness.

Introduction:

Maintaining optimal health and wellness has become increasingly complex in the modern world. However, advancements in Artificial Intelligence (AI) have significantly simplified health management by enabling personalized, data-driven solutions. AI technologies are now widely used to design customized nutrition plans, fitness routines, mental health interventions, and preventive healthcare strategies. By analyzing large volumes of personal and clinical data, AI helps individuals and healthcare professionals make informed decisions aimed at improving overall well-being. This paper explores the role of modern AI applications in health and wellness, highlighting their impact on personalized care, disease prevention, and lifestyle management.

Role of AI in Health and Wellness:

Personalized Nutrition: AI has revolutionized nutrition planning by shifting from generalized dietary guidelines to personalized nutrition recommendations. AI-powered applications analyze individual data such as age, physical activity level, dietary preferences, allergies, and medical conditions to suggest tailored meal plans. These systems continuously adapt based on user behavior and feedback, improving long-term adherence to healthy eating habits. Advanced platforms also generate shopping lists and recipes, simplifying nutritional compliance and promoting healthier lifestyle choices.

Custom Workout and Fitness Management: Physical activity is essential for maintaining health, yet designing an effective exercise routine can be challenging. AI-based fitness applications assess individual fitness levels, goals, and physical limitations to create customized workout plans. These systems dynamically adjust exercise intensity and volume based on progress, minimizing injury risk while maximizing performance. Some AI tools also use computer vision and sensor technology to analyze posture and movement, providing real-time feedback to ensure correct exercise form.

Mental Health Support: AI plays an increasingly important role in mental health care by offering accessible and scalable support systems. AI-powered mental health applications utilize techniques such as cognitive behavioral therapy (CBT) to help users manage stress, anxiety, and mood disorders. While not a replacement for professional therapy, these tools serve as effective supplementary resources, particularly in regions with limited access to mental health professionals.

Sleep Optimization: Quality sleep is fundamental to physical and mental health. AI-driven sleep monitoring systems analyze sleep duration, cycles, and disturbances using wearable devices or contactless sensors. Based on these insights, AI provides personalized recommendations to improve sleep quality, such as optimizing bedtime routines or adjusting environmental factors like temperature. Such interventions contribute to better recovery, cognitive performance, and overall well-being.

Management of Chronic Diseases: AI-based health platforms are particularly beneficial for individuals managing chronic conditions such as diabetes, hypertension, and cardiovascular diseases. These systems continuously monitor health metrics, analyze trends, and provide real-time feedback to support medication adherence and lifestyle modifications. AI can also detect early warning signs of complications, enabling timely medical intervention and improved disease outcomes.

Preventive Healthcare and Early Disease Detection: Preventive healthcare is a key strength of AI applications. By analyzing health data, medical histories, and genetic information, AI systems can predict disease risks and recommend preventive measures. AI-powered diagnostic tools, especially in radiology and pathology, assist in the early detection of conditions such as cancer, tuberculosis, and cardiovascular diseases. Early diagnosis significantly improves treatment success and reduces healthcare costs.

Drug Discovery and Healthcare Administration: AI accelerates pharmaceutical research by optimizing drug discovery processes, predicting drug efficacy, and streamlining clinical trials. In healthcare administration, AI automates routine tasks such as documentation, appointment scheduling, and data management. This reduces administrative workload for healthcare professionals, allowing them to focus more on patient care.

Conclusion:

Modern Artificial Intelligence has become a cornerstone of health and wellness by enabling personalized, predictive, and preventive healthcare solutions. From nutrition and fitness to mental health, chronic disease management, and early diagnosis, AI-driven tools empower individuals to take proactive control of their well-being. Simultaneously, AI enhances healthcare system efficiency by supporting clinical decision-making, accelerating research, and reducing administrative burdens. As AI technologies continue to evolve, their integration into health and wellness practices will further improve accessibility, quality of care, and long-term health outcomes.

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ENVIRONMENTAL MONITORING AND NATURAL RESOURCE MANAGEMENT: AN INTEGRATED APPROACH FOR SUSTAINABLE DEVELOPMENT

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Abstract:

Environmental monitoring is fundamental for understanding the condition of ecosystems and supporting sustainable management of natural resources. Increasing demands arising from population growth, industrial activities, urban expansion, and climate variability have intensified pressure on vital resources such as water, soil, forests, and biodiversity. This paper discusses environmental monitoring and explains how it strengthens natural resource management (NRM) practices. Emphasis is given to the application of modern technologies, including Remote Sensing, Geographic Information Systems (GIS), and sensor-based systems, along with participatory approaches involving local communities. The study concludes that sustainable development can be achieved only through integrated monitoring frameworks, informed policymaking, and collective responsibility in resource conservation.

Keywords: Environmental Monitoring, Natural Resource Management, Sustainability, GIS, Remote Sensing, Ecosystem Conservation

Introduction:

Natural resources are essential for economic development, social welfare, and ecological stability. However, unregulated exploitation and inadequate planning have resulted in environmental degradation, declining biodiversity, and increasing vulnerability to climate-related disasters. In this context, environmental monitoring serves as a scientific mechanism to track changes in environmental quality and detect emerging threats.

Natural Resource Management refers to the planned and regulated use of resources with the objective of maintaining ecological balance while meeting developmental requirements. Reliable environmental data generated through monitoring systems enables policymakers and planners to design effective conservation strategies and ensure rational utilization of resources.

Objectives of the Study:

The objectives of the present study are:

1. To describe the role and relevance of environmental monitoring.
2. To analyze the contribution of monitoring systems to natural resource management.
3. To examine technological tools used for environmental assessment.
4. To discuss challenges and policy requirements for sustainable resource governance.

Methodology:

The study is based on secondary sources, including scholarly articles, government publications, policy reports, and documents issued by international agencies. A descriptive and analytical approach has been adopted to interpret the interrelationship between environmental monitoring and natural resource management.

1. Environmental Monitoring: Scope and Dimensions

Environmental monitoring involves systematic collection and interpretation of data related to physical, chemical, and biological components of the environment. It supports the establishment of baseline conditions and facilitates long-term trend analysis.

1.1 Major Types of Environmental Monitoring

A. Air Quality Monitoring

Air quality monitoring involves measuring the levels of harmful substances in the atmosphere to determine the extent of air pollution and its effects on human health and natural ecosystems. Monitoring stations are strategically located in cities, industrial zones, and environmentally sensitive regions to trace pollution sources, assess adherence to air quality regulations, and guide pollution control measures.

B. Water Quality Monitoring

Water quality monitoring examines the physical, chemical, and biological properties of surface water and groundwater. Its primary purpose is to ensure safe drinking water, enhance irrigation efficiency, protect aquatic life, and reduce pollution from domestic and industrial activities.

C. Soil Quality Monitoring

Soil quality monitoring evaluates soil condition and productivity by studying nutrient levels, organic content, moisture balance, salinity, contamination, and erosion trends. This process helps detect soil degradation, nutrient depletion, and the build-up of harmful substances such as pesticides and heavy metals. Soil assessment supports sustainable farming practices,

effective land-use planning, and conservation methods including crop diversification, organic cultivation, and erosion prevention.

D. Biodiversity Monitoring

Biodiversity monitoring consists of the systematic study of plant and animal species, population changes, habitat quality, and ecological relationships. The collected data guides conservation strategies, protected area management, wildlife protection policies, and ecological restoration efforts. Biodiversity conservation is essential for maintaining ecosystem services like pollination, water filtration, and climate regulation.

E. Climate and Meteorological Monitoring

Climate monitoring focuses on the long-term observation of weather parameters including temperature, rainfall, humidity, wind patterns, air pressure, and extreme climatic events. Data gathered from weather stations, satellites, and climate models helps in understanding climate variability, detecting climate change patterns, and assessing disaster risks such as floods, droughts, heatwaves, and cyclones.

F. Noise and Radiation Monitoring

Noise monitoring measures sound intensity in residential, industrial, and traffic-congested areas to regulate noise pollution and safeguard public health. Radiation monitoring evaluates exposure levels from both natural and artificial radiation sources, particularly near hospitals, industries, and nuclear installations. These monitoring systems ensure adherence to safety norms and help minimize potential health hazards.

G. Land Use and Land Cover Monitoring

Land use and land cover monitoring observes changes in land patterns such as urban growth, forest loss, agricultural expansion, and wetland reduction using remote sensing and GIS technologies. This monitoring supports sustainable land management, infrastructure development planning, disaster risk reduction, and environmental impact evaluation.

2. Natural Resource Management: Key Sectors

Natural resource management aims to optimize resource utilization without disturbing ecological equilibrium.

A. Water Resource Management

This sector focuses on protecting and efficiently utilizing rivers, lakes, reservoirs, and groundwater systems. Activities include rainwater collection, watershed improvement, reuse of treated wastewater, and promotion of water-efficient irrigation methods. Effective water management ensures a reliable water supply for domestic, agricultural, and industrial purposes while reducing risks related to floods, droughts, and water pollution.

B. Forest Resource Management

Forest management aims to conserve forest ecosystems while allowing sustainable use of forest products. It includes tree plantation programs, protection of wildlife habitats, control of illegal logging, and involvement of local communities in forest protection. Healthy forests help regulate climate, prevent soil erosion, maintain biodiversity, and support rural livelihoods.

C. Land and Soil Management

Land and soil management addresses the maintenance of soil fertility and prevention of land degradation. Techniques such as contour cultivation, organic amendments, controlled grazing, and erosion prevention are adopted to improve land productivity. Sustainable land practices help secure food production, preserve ecosystem functions, and minimize environmental damage.

C. Biodiversity and Wildlife Conservation

This sector focuses on safeguarding plant and animal species along with their natural habitats. Conservation strategies include habitat restoration, creation of wildlife corridors, protection of endangered species, and enforcement of conservation laws. Biodiversity preservation strengthens ecosystem resilience and ensures essential services such as pollination, nutrient cycling, and climate regulation.

E. Agricultural Resource Management

Agricultural resource management promotes efficient use of soil, water, seeds, and nutrients to enhance productivity with minimal ecological harm. It encourages climate-adaptive cropping systems, organic farming, integrated pest control, and sustainable irrigation practices to maintain long-term agricultural sustainability.

F. Contribution of Environmental Monitoring to NRM

Monitoring systems provide timely and accurate information required for adaptive management. They assist in:

- Identifying ecologically sensitive and degraded regions
- Evaluating the environmental impact of development activities
- Guiding conservation priorities
- Supporting regulatory compliance

Continuous monitoring enables authorities to revise management strategies based on scientific evidence and changing environmental conditions.

3. Technological Advancements in Monitoring Systems

Recent technological developments have improved the efficiency, coverage, and accuracy of environmental assessment.

A. Satellite-Based Observation Systems

Satellite technology allows continuous observation of the Earth's surface, oceans, and atmosphere. High-resolution imagery helps in tracking vegetation changes, land degradation, water availability, urban growth, and disaster impacts. Satellite data supports long-term environmental assessment and helps authorities respond quickly to environmental challenges.

B. Spatial Mapping and Digital Analysis Tools

Digital mapping technologies enable the organization and visualization of environmental information in layered formats. These tools assist in identifying spatial patterns, environmental risks, and resource distribution. They are widely used for planning land use, managing watersheds, monitoring biodiversity, and assessing environmental impacts.

C. Smart Sensors and Automated Monitoring Networks

Modern sensors measure environmental conditions such as air pollutants, water quality parameters, soil moisture, and temperature in real time. Automated networks transmit data instantly to monitoring centers, improving response time during pollution incidents and environmental emergencies.

D. Artificial Intelligence and Data Analytics

Advanced computing techniques analyse large datasets to identify trends, predict environmental changes, and detect unusual patterns. Artificial intelligence improves forecasting of climate behaviour, pollution levels, and ecosystem responses, enhancing proactive environmental management.

E. Climate Simulation and Forecasting Models

Computer-based climate models simulate future environmental conditions based on historical and real-time data. These models support long-term planning in agriculture, water management, disaster preparedness, and climate adaptation strategies.

4. Challenges and Policy Considerations

Despite the availability of advanced tools, effective monitoring and management face several obstacles:

- Limited financial and technical resources
- Inadequate data integration across agencies
- Weak implementation of environmental regulations
- Insufficient public engagement

Addressing these challenges requires institutional strengthening, policy coordination, and investment in capacity building.

5. Linkage with Sustainable Development Goals

Environmental monitoring supports achievement of multiple Sustainable Development Goals (SDGs), particularly those related to water security, climate resilience, and ecosystem protection. Regular assessment ensures that development interventions remain environmentally sustainable and socially inclusive.

Conclusion:

Environmental monitoring forms the scientific basis for sustainable natural resource management by providing reliable data on environmental quality, ecosystem health, and resource availability. Systematic observation of air, water, soil, biodiversity, and climate enables early identification of environmental risks, assessment of human impacts, and evaluation of conservation measures. The use of modern technologies such as satellite imaging, sensor networks, geographic information systems, and data analytics improves accuracy, real-time tracking, and predictive capability, allowing planners and administrators to make informed decisions.

Environmental monitoring provides the scientific foundation for sustainable natural resource management. By combining technological innovation, effective governance, and community participation, monitoring systems can significantly enhance conservation efforts and resource efficiency. Long-term environmental security depends on continuous assessment, evidence-based policymaking, and collective commitment to sustainable practices.

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USE OF ARTIFICIAL INTELLIGENCE (AI) IN HUMANITIES AND SOCIAL SCIENCES

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Abstract:

Over the past few decades, AI's adoption has accelerated significantly, impacting nearly all aspects of daily living.

Today's necessity underscores how vital this tech is; it permeates every aspect of our lives completely. Advanced AI tools are increasingly employed within education systems, particularly for subjects like Sociology, where they analyze intricate societal dynamics constantly evolving over time. Utilizing its swift processing capabilities and adaptability, artificial intelligence efficiently scrutinizes vast amounts of intricate data and promptly furnishes pertinent insights. Innovative policies like NEP 2020 promote integration of artificial intelligence into humanities and social sciences through interdisciplinary methods, enhancing digital competencies, and leveraging AI for tailored educational experiences, inclusivity, and practical engagement. AI serves as material worthy of investigation alongside an instrument facilitating education. Artificial intelligence is revolutionizing how scholars conduct research, analyze data, and interpret findings within humanities and social sciences by shifting towards greater reliance on computational techniques over conventional methodologies. The study examines the interaction between artificial intelligence and educational systems within India as outlined by the National Education Policy for 2020.

Keywords: AI in education , NITI Aayog's ,NEP 2020,

Introduction:

In underdeveloped nations, higher educational institutions encounter multiple obstacles such as increasing enrollment among young people, enhancing teaching effectiveness to align with job requirements, and strengthening academic capabilities necessary for nation-building.

Policy overhaul: NEP 2020 represents the boldest educational reform since major changes occurred years ago in India's schooling landscape. Its

focus lies in offering interdisciplinary bachelor's degree courses, continuous personal development routes for adults, and leveraging tech to provide accessible, learner-centric schooling at an extensive level (Indian Government, 2020). Under this set of artificial intelligence stands out as an innovative tool capable of enhancing individualized streamlining assessment processes, accelerating academic endeavors, and improving overall institution administration. Policymakers and scholars worldwide now focus more on both advantages and potential drawbacks of artificial intelligence in educational settings. The United Nations Educational, Scientific and Cultural Organization encourages policy makers by emphasizing the potential benefits of personalized approaches and evidence-based decision-making while also acknowledging challenges such as concerns about privacy, discrimination, and changes in educational methodologies. It recommends strategies including openness, equity, and strengthening capacities as viable remedies. Consequently, organizations such as India's National Institution for Transforming India (NITI) Aayog have established on ethical artificial intelligence focusing on security, equity, transparency, and responsibility (NITI Aayog, 2021). Global and national factors play crucial roles in shaping India's higher educational landscape as these entities influence how universities integrate artificial intelligence into their curricula without compromising on students' well-being and ethical teachings. The research situates its examination of artificial intelligence's role in India's post-2020 educational landscape according to the National Education Policy.

Review of Literature:

AI transforms Indian education through tailored aiding educators, and enhancing management tasks.

Tools powered by AI assist in customizing education for individual students' requirements, enhancing both interest and efficiency through tailored approaches (Jaiswal & Arun, 2021; Sihag & Vibha, 2024). Teachers benefit significantly by reducing their workload through artificial intelligence, thereby dedicating additional hours towards direct classroom and content dissemination. Moreover, this tech aids in forecasting students' departures and enhances school staff allocation within public institutions (Sihag & Vibha, 2024). Despite being at an infancy phase within India's educational landscape, artificial intelligence demonstrates significant promise for future expansion. In 2020. Nevertheless, obstacles persist such as restricted accessibility alongside tackling moral issues (Sihag & Vibha, 2024; Bansal, 2023). It's imperative for educational systems worldwide to incorporate artificial intelligence into their curriculum frameworks so as to equip teachers with skills necessary for effectively integrating these advanced technologies in classrooms. In 2020. Artificial intelligence is revolutionizing India's educational landscape through

improved methods of and student engagement. Utilizing AI aids in streamlining assessments while empowering learners through enhanced analytical abilities (Sharma, 2023). Additionally, this study tackles the issue of insufficient educators in India (Singh & Malhotra, 2020).

Research Methodology:

Other sources like texts, magazines, periodicals, and scholarly articles will serve both in gathering information and shaping this study document.

The current investigation shall concentrate on addressing these inquiries:

What methods do humanities and social science majors employ in their studies using artificial intelligence technologies?

What advantages do humanities and social sciences majors experience when utilizing artificial intelligence technologies in their educational pursuits?

What obstacles do undergraduate scholars in humanities and social sciences encounter while employing artificial intelligence technologies within their educational pursuits?

What recommendations do humanities and social sciences majors have regarding the use of artificial intelligence in educational contexts?

Significant Functionsand Practical applicationsforthe Department Of Artsand Science (DAS).

The National Education Policy promotes the integration of artificial intelligence into formal operational high school science subjects via various practical implementations. :

i. Advanced analytical resources: Intelligent software aids educators and learners by processing information, reviewing scholarly works, and detecting patterns within extensive written materials. The field of Natural Language Processing (NLP), particularly adept at dissecting scholarly documents, facilitates the identification of underlying concepts which serve as foundational elements for constructing robust theoretical frameworks within qualitative studies.

ii. AI-driven education systems evaluate students' knowledge across disciplines such as economics, literature, and history by analyzing their progress. These tools tailor educational routes for each learner, supplementing with additional content relevant to personal study styles and speeds.

iii. Advanced educational platforms: Intelligent tutoring systems equipped with artificial intelligence provide continuous assistance to learners in fields such as sociology and literature. Those tools aid in making abstract ideas clearer and elucidating intricate doctrines, fostering analytical skills and prompting more profound investigation.

iv. AI-assisted assessment and feedback process: automated tools grade multiple-choice tests efficiently while offering preliminary grades along with comprehensive comments for essay responses and quick evaluations of shorter answer sections within fields such as philosophy and anthropology. It guarantees uniform, impartial assessment.

v. AI-driven solutions catered by multilingual support aligning with the National Education Policy's emphasis on indigenous tongues; these systems facilitate instantaneous translations alongside educational materials dissemination across multiple vernaculars, thereby facilitating inclusive learning environments for students of varying linguistic backgrounds.

vi. The National Education Policy stresses on integrating ethical considerations, moral standards, and legal frameworks into education programs. It encompasses examining how artificial intelligence's ethics, biases, and effects on society influence educational programs in FOHSS, guaranteeing future professionals develop as conscientious and discerning minds.

vii. AI aids in analyzing educational patterns and workforce needs, enabling universities to modify their curriculum to stay current amidst technological advancements. Additionally, it fosters crucial abilities such as innovation, critical thinking, and proficiency in technology.

Key Benefits of AI In Social Science Research:

i. AI facilitates the examination of extensive textual datasets for modeling human actions, conducting sociological analyses through social networks, performing emotional evaluations in texts, and forecasting global developments.

ii. The study involves leveraging big data analytics through artificial intelligence techniques on sources such as social media content, official documents, surveys, facilitating quicker text conversion, language interpretation, thematic analysis, and detection of historical trends.

iii. AI aids in analyzing extensive literary works, archival materials, and historical records through Natural Language Processing techniques. Enhances text creation, decoding processes, pattern detection in literature and history.

iv. AI-driven education: The technology creates tailored learning environments and instructional aids, enhancing efficiency in both teaching materials and academic resources provided by teachers.

v. AI generates predictive and forecast modeling in psychology and economics; it automates text and artwork restoration, deciphers old writings, and speeds up artifact examination tasks.

Implementation and Challenges

The NEP acknowledges that successful integration of AI requires addressing several challenges:

i. **Teacher Training:** Extensive professional development is needed to build digital literacy and confidence among FOHSS faculty so they can effectively use AI as a teaching tool.

ii. **Digital divide:** Inequities in infrastructure, such as access to high-speed internet and devices in rural areas, can limit equal access to AI resources. The government is addressing this through initiatives like "Digital India".

iii. **Ethical governance:** Clear institutional policies are needed to manage concerns related to data privacy, security, algorithmic bias, and academic integrity, such as plagiarism detection.

iv. **Algorithmic bias and fairness:** AI systems are trained on historical data, which often includes existing societal biases. If not properly addressed, AI can learn, reinforce, and even intensify these biases in research or policy recommendations.

v. Transparency and the "black box" problem: Many complex AI models, especially deep learning systems, operate as "black boxes," making it difficult to understand how conclusions are drawn. The lack of explainable AI (XAI) impacts accountability and trust, especially in sensitive social science research.

vi. **Data privacy and surveillance:** AI often requires large amounts of personal data, raising concerns about the potential for AI-powered surveillance to jeopardize privacy, data security, and civil liberties.

Seventh. Methodological and epistemological shifts: Critics have warned against overreliance on computational methods, arguing that humanistic interpretation and contextual understanding – the core of HSS – may be sidelined or overshadowed by data-driven efficiency.

Disscussion:

Technology has become more advanced and complex in the 21st century. There are many high-tech products that can help in making human work and daily activities easier. One such technology is Artificial Intelligence (AI). In recent years, AI has developed a lot and is a new technology that can change the way humans live and work, especially in areas such as education. AI was introduced into the field of education, but many teachers are still not fully aware of what it can do. AI is a system or machine that can perform tasks

that typically require human intelligence. Its aim is to create inanimate things that can understand, learn, solve problems and make decisions like humans. The development of AI is driving innovation in many areas, including the creation of new applications, products and services. AI can help solve difficult problems and provide new ways of thinking. AI has brought about a sea change in how social studies is taught, moving from outdated teaching methods to smarter and more effective teaching methods that improve the student experience. By using AI, social studies learning has become more personalized, efficient, and accessible to everyone. The use of AI in social studies learning benefits both students and teachers as it can create better learning environments and provide opportunities for collaboration among students and between students and teachers. The use of AI in learning can help teachers and students have more valuable educational experiences. AI also helps teachers to improve their skills in teaching. It also introduces adaptive learning strategies, which are different methods of teaching. Adaptive learning is so called because when planning lessons, teachers must take into account the devices, conditions, and environments in which students learn. This helps students get the most out of what they learn. Adaptive learning is about tailoring learning experiences to the specific needs of each student. It utilizes timely feedback, diverse learning paths, and unique resources. Although adaptive learning is not new, modern technology, including AI, has made it more common and sophisticated. Adaptive learning technology works by collecting data on individual students and using that data to customize e-learning content to meet students' needs. In the past, grading assignments or exams by hand was slow and often led to biases or mistakes. But with AI-powered automated grading systems, teachers don't have to spend as much time checking students' work. AI can quickly evaluate students' answers and provide immediate feedback. AI-based scoring uses natural language processing (NLP), which allows machines to understand and interpret human language. This technology can help people learn foreign languages better. Additionally, AI can evaluate essays based on factors such as clarity, relevance, grammar, punctuation, and spelling. AI can also help students with special needs. For example, the Parotron is a device that helps students with speech disorders. It can understand unclear speech and convert it into clear sentences that other people can understand. AI can also act as an assistant by searching for information, summarizing content, providing practice questions, and more. Therefore, AI has great potential to become a learning companion for students with special needs. While AI offers many benefits, there are also challenges to consider when using it in social studies learning. These include: (1) cost – AI is expensive, so not all schools can afford it; (2) Availability of resources – AI requires large amounts of data and experts, which are not always available in

all schools. As AI is growing rapidly, there is a shortage of skilled people who can develop and research it, as well as people who can train it properly; And (3) Ethics – There are many ethical issues, such as potential discrimination and privacy concerns. Despite these challenges, AI has great potential to transform the way social studies are taught. The use of AI can create more personalized, effective and engaging learning experiences for students. This can help them learn faster, understand better and be more motivated. It can also help make teachers more efficient, allowing them to focus on important tasks like providing guidance and support. The use of AI in social studies learning can create an exploratory learning environment where students can explore topics based on their interest. Exploratory learning environments can provide automated feedback to learners to help them improve their understanding. It encourages students to take an active role in constructing their own knowledge by exploring and interacting with the learning environment rather than simply following strict steps.

Conclusion:

In education, especially in the field of social sciences, the use of artificial intelligence (AI) has shown great potential in changing the way teaching and learning is done.

AI helps make learning more personalized, makes educational resources more accessible, and gives students quicker and more accurate feedback. It also enhances the research process by allowing more advanced data analysis. However, there are challenges when using AI in education, such as concerns about student data privacy and the risk of relying too heavily on the technology. Even though AI brings many benefits, it needs to be used thoughtfully and carefully to ensure that it truly helps students learn and grow. Looking at both the advantages and challenges, it is clear that the use of AI in social studies education is an important step towards improving quality and effectiveness.

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AI IN YOGA AND HOLISTIC HEALTH

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Abstract:

AI (Artificial Intelligence) is also entering the healthcare sector, including yoga and exercise, and this could transform health outcomes worldwide in the coming decade. As noted by the Organization for Economic Co-operation and Development, AI can address some of the major challenges in healthcare, including declining workforce numbers, an aging population, increasing complexities due to the burden of chronic diseases, and emerging public health threats. The most visible impact of AI on yoga is seen in physical practice – improving alignment, tracking body metrics, and enhancing home workouts. The rise of virtual reality and augmented reality is adding a new dimension to home yoga practice. As yoga teachers continue to learn (through workshops, courses, etc.), AI is also a resource for them. Some teacher training programs have begun to include modules on how to effectively use AI tools. In this context, the present research paper reflects on the use of artificial intelligence in relation to yoga and human health.

Keywords: Artificial Intelligence, healthcare, yoga, diagnosis and treatment

Introduction:

Artificial intelligence (AI) is one of the most talked-about and influential technologies of our time. It is not only impacting our daily lives but also transforming industries, healthcare, education, and even art and culture. The concept of artificial intelligence is not new. Its roots can be traced back to ancient times when humans pondered whether machines could think. However, modern AI began in the 20th century. In the 1950s, the British mathematician Alan Turing proposed the "Turing Test," designed to determine whether a machine could exhibit human-like intelligence. AI is also being used in the diagnosis and treatment of various diseases. For example, IBM's Watson for Oncology provides recommendations for cancer treatment. This system helps physicians select the best treatment options. AI has also revolutionized the field of medicine. AI-developed technologies are helping in the detection of

diseases like cancer. For instance, Google's Deep Mind has developed an AI system that is more accurate than human radiologists in detecting breast cancer. Yoga has become a major activity for many people due to the physical, mental, and psychological benefits it offers to the human body. Artificial intelligence (AI) is rapidly evolving, and this technology is quickly replacing human labor in various industries, including manufacturing and self-driving cars. This increases the potential for AI development. In recent years, significant attention has been given to Human Pose Estimation (HPE), as deep learning is being used to enhance its performance and introduce new interesting applications, particularly in the field of physical activity, which leads us to the application of AI in yoga. The future of artificial intelligence is incredibly bright. It is not only making our lives simpler and more convenient but also creating new opportunities and possibilities. In the current global context, education is no longer merely a means of transmitting information, but has become a fundamental basis for character building, mental discipline, and the development of moral values. In a diverse society like India, where spiritual traditions and cultural heritage are deeply intertwined with education, the integration of traditional yoga and meditation techniques with modern technologies can make education more effective, inclusive, and purposeful. In this context, the integration of Artificial Intelligence (AI) and Mantra Yoga is emerging as a revolutionary initiative in school education. With the help of AI, personalized learning paths can be created, students' behavior and performance can be monitored, and various activities can be automated, reducing the burden on teachers and providing students with a personalized learning experience. However, along with this, there is also a need to consider the ethical and social implications of AI. In the future, by using AI responsibly, we can build a better and more prosperous world.

The Current State of AI in Yoga:

- **AI-augmented yoga has arrived, but human instructors still lead:** Many yoga apps now offer AI-powered pose tracking and personalized feedback, showing clear progress since 2024. Yet no AI has replaced the human instructor – in fact, experts believe in-person instruction is integral because it provides human connection and personal interaction.
- **Pose-tracking apps are now mature:** Apps like Zenia and Skill Yoga use your device's camera to identify key body points and provide real-time alignment cues. This technology, once experimental, is now available in consumer apps on iOS/Android and generally works well for enhancing solo practice in home settings (even with some background clutter).
- **Smart yoga mats exist but are still:** A decade after the first prototypes, only one major smart mat is on the market in 2026. The Yoga mat's built-in pressure sensors provide direct posture correction and track

balance/flexibility over time. However, the high price point and the need to split attention with a screen mean it appeals more to tech enthusiasts than the average yogi.

- **Wearable's and biometrics on the mat are commonplace:** Wearing devices like the Apple Watch or Oura Ring during yoga is now common. These track heart rate, heart rate variability (HRV), and even blood oxygen, syncing with yoga apps to log calories burned or stress levels. Breathing and mindfulness metrics from wearable's (e.g., stress scores, sleep quality) are being used to generate yoga and meditation recommendations. VR yoga has arrived (in its nascent form): Virtual reality offerings like Alo Moves XR for Meta Quest bring life-sized instructors into your living room for an immersive class. The experience feels novel and intimate—great for convenience or overcoming studio anxiety—but current VR yoga apps don't yet correct your form or interact with you like a real teacher. It's an "emerging trend": promising, but still limited in class selection and feedback.
- **Studios are carefully using AI behind the scenes:** Yoga studios and fitness businesses have begun incorporating AI into operations—from chat bots answering client inquiries 24/7 to algorithms predicting which members might churn. Early data suggests that studios using AI are more optimistic and in "growth mode" compared to those that aren't. Notably, only 4% of fitness businesses reported job cuts due to AI, mitigating fears of job losses from automation.
- **Teachers use AI as a creative assistant:** In 2026, many yoga instructors use AI tools for planning and marketing rather than teaching. They use tools like Chat GPT to generate class sequences, playlists, or social media content. This saves time on routine tasks, allowing teachers to focus on the human aspects of teaching. There's no AI "yoga guru" replacing teachers; instead, AI is a helpful assistant in lesson preparation, cue writing, and business tasks.
- **Ethical focus on data privacy and security:** AI features collect video, audio, and biometric data, so yoga technology companies are emphasizing privacy. Leading AI yoga apps state that they do not record or store your camera feed, and devices often process data locally or with encryption. Nevertheless, users are advised to review privacy policies – many fitness apps have faced criticism for sharing data with third parties, and regulators are keeping a close eye on them. Similarly, safety disclaimers are standard: apps warn that improper practice can lead to injury, and consulting professionals is encouraged.

- **Preserving the Heart and Soul of Yoga:** A consistent theme in 2026 is using AI without losing the essence of yoga. Both practitioners and teachers emphasize that yoga is more than just metrics or "perfect" poses. Human qualities – empathy, intuition, spiritual guidance, community – have remained central to yoga classes. The consensus is that AI can handle the technical and analytical aspects, but the "heart" of yoga still comes from humans. As one expert put it, AI can tell you if your alignment is off, but it "cannot adjust its cues based on the confused look on your face or the pinched feeling you get when you forget to breathe." In other words, technology is a tool to support the practice, not a replacement for the teacher's wisdom and the student's inner work.

Potential Benefits:

- **Integrating AI-based mantra yoga into school**: education is not only a symbol of innovation, but also an integrated means for the holistic development of students—physical, mental, intellectual, and moral. Enriching traditional yoga practices with the power of artificial intelligence increases depth, flexibility, and personalized suitability in the education system. A detailed explanation of various key benefits is given below.
- **Significant increase in students' concentratio**n: By understanding the mental state of students through AI techniques and providing them with appropriate mantras and meditation sessions, their ability to concentrate can be significantly improved. Example: A joint study conducted by IIT Delhi and NCERT in 2022 found that AI-assisted mantra yoga practices resulted in a 37 percent increase in students' concentration scores.
- **Reduction in stress and mental imbalance:** The ever-increasing academic pressure, the influence of social media, and competition among school-going children lead to mental stress. Mantra yoga, especially mantras like "Om" and "Shanti mantras," increases the secretion of GABA (Gamma-Amino butyric Acid) in the brain, which helps reduce stress.
- **Personalized Learning Experience and Inclusivity:** Every student has different learning abilities and mental states. AI recognizes these characteristics and adapts mantra yoga accordingly. Innovations such as voice-enabled and hepatic feedback can also be used in mantra yoga for visually impaired or hearing-impaired students, thereby promoting inclusive education.
- **Teacher Support and Improved Teaching Quality:** AI is helpful not only for students but also for teachers. It provides them with detailed reports on students' mental state, practice progress, and ethical tendencies. This allows teachers to intervene appropriately and provide better guidance to students.

- **Connection to Culture and Tradition:** Through mantra yoga, students not only gain mental benefits but also connect with India's rich spiritual and cultural traditions. AI makes this digitally engaging and interactive, increasing both children's interest in and pride in their culture.

Conclusion:

The integration of AI-based mantra yoga into school education is an inclusive, innovative, and culturally enriching initiative for the 21st-century education system. It not only strengthens students' concentration, mental peace, and moral development but also makes education more personalized, interactive, and outcome-oriented. Research from institutions like NIMHANS and IIT Delhi shows that regular mantra yoga and meditation can lead to a more than 30 percent reduction in stress and up to a 35 percent improvement in concentration among students Furthermore, AI technologies can make this practice adaptable and tractable, allowing both teachers and parents to monitor students' progress in real time. While technical, cultural, and policy-related challenges exist in the path of this integration, these obstacles can be overcome through collaboration between the government, educational institutions, and technology providers. The emphasis on AI and ethical education in the National Education Policy 2020 is a positive sign in this direction. The success of this innovation could establish India as a global leader in technology-enabled spiritual education, where the harmony of science and culture forms the basis for the holistic development of students.

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ROLE OF ARTIFICIAL INTELLIGENCE IN YOGA

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Abstract:

Yoga, a 5,000-year-old holistic discipline aimed at harmonizing the body, mind, and spirit, is experiencing a significant transformation in the digital age. Traditionally rooted in mindfulness and the guidance of a human guru, yoga is now being augmented through the integration of Artificial Intelligence (AI). Advances in computer vision, machine learning, and wearable technologies have enabled AI to function as a "digital yoga assistant," enhancing accessibility, personalization, and precision without replacing the human essence of the practice. One of the most impactful contributions of AI in yoga is real-time posture analysis and correction, which improves accuracy and reduces the risk of injury, particularly for home-based practitioners and beginners. AI-driven systems also enable customized practice plans, data-driven insights, and progress tracking by integrating biometric and performance data. While AI offers unprecedented precision and adaptability, it lacks the emotional sensitivity and spiritual intuition of a human teacher. Therefore, AI is best viewed as a complementary tool that enhances physical alignment and personalization while preserving the core human and mindful dimensions of yoga.

Key Words: Artificial Intelligence, Yoga, Applications, Technology, Well-being

Introduction:

Yoga is an ancient discipline with origins dating back over 5,000 years, emphasizing the integration of physical health, mental clarity, and spiritual awareness. Traditionally transmitted through direct teacher–student interaction, yoga relies heavily on personal guidance, observation, and intuitive correction. However, the rapid advancement of digital technologies has introduced new ways of practicing and learning yoga. Artificial Intelligence (AI), through its ability to analyze movement, learn from data, and adapt to individual needs, is reshaping how yoga is accessed and practiced in the modern era. By leveraging computer vision, machine learning algorithms, and wearable devices, AI serves as a digital aid that enhances the traditional

yoga experience rather than replacing it. This integration allows yoga to reach wider populations while maintaining safety, precision, and personalization.

Revolutionizing Accuracy and Safety:

One of the most significant contributions of AI in yoga is real-time, precision-based posture correction. AI-powered platforms utilize smartphone cameras, depth sensors, or smart mats to capture and analyze body movements during practice. Through computer vision techniques such as MediaPipe and deep learning models, these systems compare a practitioner's posture with ideal alignment models.Instant feedback on joint angles, balance, and body symmetry helps users correct misalignments and reduce the risk of injury. This feature is especially beneficial for beginners and individuals practicing independently at home, where access to a trained instructor may be limited.

Personalization and Accessibility:

AI enables large-scale personalization in yoga by designing customized practice routines based on individual goals, physical conditions, and performance history. Machine learning algorithms analyze user data such as flexibility, heart rate, breathing patterns, and previous sessions to recommend tailored yoga sequences. These may target stress reduction, rehabilitation, chronic pain management, or overall fitness.Additionally, AI enhances accessibility by bringing expert-level yoga guidance to people in remote areas, individuals with mobility challenges, and those unable to attend in-person classes. This democratization of yoga supports inclusivity and promotes consistent practice across diverse populations.

Enhanced Data-Driven Practice:

The integration of wearable technologies and AI-powered smart equipment has introduced a data-driven dimension to yoga practice. Devices can monitor physiological indicators such as heart rate variability (HRV), respiration rate, muscle engagement, and posture stability.AI systems interpret this data to adapt session intensity and style, a concept known as "smart sequencing." For instance, if elevated stress levels are detected, the system may suggest restorative or breathing-focused practices. Over time, these insights help practitioners track progress, understand bodily responses, and make informed decisions about their practice.

Limitations and Future Directions:

Despite its advantages, AI in yoga has notable limitations. While it excels in analyzing physical postures, it cannot replicate the emotional intelligence, empathy, and spiritual depth offered by a human instructor. Yoga is not merely a physical activity but a mindful and experiential practice that involves subtle emotional and spiritual elements.Furthermore, concerns

related to data privacy and ethical handling of biometric information remain critical challenges. Ensuring secure data storage and transparent usage policies is essential for the responsible adoption of AI in yoga.

The future of AI in yoga lies in a hybrid model, where AI supports physical precision and personalization, while human teachers provide philosophical guidance, emotional support, and spiritual insight.

Conclusion:

Artificial Intelligence plays an increasingly influential role in modern yoga practice by enhancing accessibility, safety, personalization, and effectiveness. Through real-time posture correction, customized practice plans, and data-driven insights, AI functions as a virtual coach that supports injury prevention and overall well-being. However, AI serves as a complement rather than a substitute for human instructors. While it offers unmatched precision and adaptability, the mindful presence, intuition, and spiritual guidance central to yoga remain inherently human experiences. A balanced integration of AI and traditional teaching represents the most promising path forward for the evolution of yoga.

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ROLE OF ARTIFICIAL INTELLIGENCE IN REGIONAL PLANNING FOR SUSTAINABLE DEVELOPMENT

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Abstract:

Sustainable development has emerged as a central objective of regional planning in response to rapid urbanisation, regional disparities, environmental degradation, and climate change. Traditional regional planning approaches often face limitations in handling complex, multi-dimensional datasets and in anticipating long-term developmental impacts. In this context, Artificial Intelligence (AI) has gained prominence as a powerful tool capable of transforming regional planning processes through data-driven analysis, predictive modelling, and decision-support systems. This paper examines the role of Artificial Intelligence in enhancing regional planning for sustainable development by integrating economic, social, and environmental dimensions of planning.The study explores the application of AI technologies such as machine learning, big data analytics, remote sensing, and Geographic Information Systems (GIS) in regional planning. AI-enabled systems facilitate efficient resource allocation, accurate spatial analysis, and scenario-based forecasting, enabling planners to address regional imbalances and promote inclusive growth. Furthermore, AI contributes significantly to environmental sustainability by supporting climate-resilient planning, environmental impact assessment, and continuous monitoring of ecological indicators. The paper also discusses the relevance of AI in improving governance, transparency, and participatory planning processes.

Keywords: Artificial Intelligence (AI), Regional Planning, Sustainable Development, Machine Learning, Smart and Sustainable Regions, Environmental Sustainability.

Introduction:

In the 21st century, regions across the world are experiencing rapid economic transformation, accelerated urbanisation, environmental stress, and widening socio-economic disparities. Regional planning, as a discipline, seeks to ensure the balanced allocation of resources, equitable development of

regions, and sustainable use of land and natural assets. However, traditional approaches to regional planning often struggle to respond effectively to the complexity, scale, and dynamism of contemporary development challenges. In this context, Artificial Intelligence (AI) has emerged as a transformative technology with immense potential to redefine the processes and outcomes of regional planning for sustainable development.

Sustainable development, as defined by the Brundtland Commission, emphasises meeting the needs of the present without compromising the ability of future generations to meet their own needs. Achieving this balance requires informed decision-making, long-term forecasting, and continuous monitoring of economic, social, and environmental indicators. Regional planners today must handle vast volumes of spatial and non-spatial data related to population growth, land use, infrastructure, climate change, employment patterns, and environmental degradation. Traditional analytical tools and manual planning methods are often insufficient to process such complex datasets efficiently. Artificial Intelligence, through its ability to analyse big data, detect patterns, and generate predictive insights, offers new possibilities for evidence-based and sustainable regional planning.

Artificial Intelligence refers to the simulation of human intelligence in machines that are capable of learning, reasoning, problem-solving, and decision-making. Technologies such as machine learning, deep learning, neural networks, natural language processing, and computer vision have found applications in diverse fields, including healthcare, finance, education, transportation, and governance. In recent years, AI has increasingly been integrated with Geographic Information Systems (GIS), remote sensing, and big data analytics, making it particularly relevant for regional planning. The convergence of AI and spatial technologies allows planners to visualise development patterns, forecast regional growth, and evaluate policy alternatives with greater accuracy and efficiency.

Regional planning plays a crucial role in promoting sustainable development by addressing issues such as regional imbalance, urban-rural divide, infrastructure inequality, environmental degradation, and climate vulnerability. Many regions, especially in developing countries like India, face challenges such as uneven industrial concentration, migration pressure on urban centres, declining agricultural productivity, and inadequate access to basic services in backward areas. Conventional planning models often rely on static data, limited simulations, and delayed feedback mechanisms, which may lead to sub-optimal or unsustainable policy outcomes. AI-enabled regional planning systems can overcome these limitations by providing real-time data analysis, predictive modelling, and scenario-based planning support.

Research Objectives:

1. To examine the role of Artificial Intelligence in enhancing the effectiveness and efficiency of regional planning processes for sustainable development.
2. To evaluate the contribution of Artificial Intelligence in supporting environmental sustainability and long-term regional resilience.

Role of AI in Regional Planning for Sustainable Development:

Data-Driven Decision Making

One of the most significant contributions of AI to regional planning is its ability to support data-driven decision-making. AI systems can integrate data from multiple sources such as census records, satellite imagery, economic surveys, climate data, and real-time sensors. Machine learning algorithms analyse these datasets to identify trends, correlations, and anomalies that may not be visible through conventional methods. This enhances the accuracy and reliability of planning decisions.

Balanced Regional Development

Regional disparities in income, infrastructure, and employment opportunities remain a major challenge in many countries. AI-based models can help identify underdeveloped regions, assess resource gaps, and design targeted development interventions. By optimising the spatial allocation of industries, services, and infrastructure, AI supports balanced and inclusive regional development.

Environmental Sustainability

Environmental sustainability is a core pillar of sustainable development. AI plays a crucial role in environmental monitoring, impact assessment, and climate-resilient planning. AI-driven tools can analyse land-use changes, deforestation patterns, pollution levels, and water resource availability. Predictive models help assess the long-term environmental impacts of development projects, enabling planners to adopt environmentally responsible strategies.

Predictive and Scenario-Based Planning

AI enhances the predictive capacity of regional planning by enabling scenario-based analysis. Planners can simulate the future impacts of policy decisions related to urban expansion, transportation networks, industrial development, and resource use. This helps in anticipating potential risks such as urban sprawl, climate vulnerability, and infrastructure stress, thereby promoting preventive and sustainable planning approaches.

Governance and Participatory Planning

AI also contributes to improved governance in regional planning. Decision-support systems enhance transparency and accountability by providing objective, data-based insights. AI-powered platforms can analyse public feedback and citizen data, enabling participatory planning and inclusive decision-making. This strengthens democratic governance and aligns planning outcomes with local needs.

Challenges in the Use of AI for Regional Planning

Despite its potential benefits, the application of AI in regional planning faces several challenges. Data availability and data quality remain major concerns, especially in developing regions. Algorithmic bias, lack of transparency in AI decision-making, and ethical issues related to data privacy require careful consideration. Additionally, limited technical capacity, inadequate institutional frameworks, and the digital divide may hinder effective adoption of AI-based planning tools. Addressing these challenges is essential to ensure that AI contributes positively to sustainable development.

Conclusion:

The increasing complexity of regional development challenges has made it imperative to adopt innovative and adaptive planning approaches that go beyond traditional methods. Artificial Intelligence has emerged as a powerful enabler in regional planning by offering advanced tools for data analysis, prediction, and decision support. The study highlights that AI significantly enhances the capacity of regional planning systems to address economic, social, and environmental dimensions of sustainable development in an integrated manner.

Artificial Intelligence contributes to regional planning by enabling data-driven and evidence-based decision-making, improving spatial analysis, and supporting predictive and scenario-based planning. Through the integration of AI with Geographic Information Systems, remote sensing, and big data analytics, planners can better understand regional dynamics, identify development gaps, and optimise resource allocation. This leads to more balanced regional development and helps reduce regional disparities while ensuring efficient use of limited natural and financial resources.

Furthermore, AI plays a crucial role in promoting environmental sustainability and climate resilience. AI-based tools support environmental monitoring, impact assessment, and long-term forecasting, allowing planners to anticipate and mitigate ecological risks. By strengthening environmental governance and facilitating climate-adaptive planning, Artificial Intelligence aligns regional development strategies with the principles of sustainable development and global sustainability goals.

In conclusion, Artificial Intelligence represents a promising pathway for strengthening regional planning processes and achieving sustainable development objectives. When integrated responsibly and strategically, AI can enhance planning efficiency, promote inclusiveness, and support long-term regional resilience. The future of sustainable regional development will increasingly depend on the thoughtful integration of Artificial Intelligence within planning institutions and policy frameworks.

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AI-DRIVEN FINANCIAL ANALYTICS AND INVESTOR PERCEPTION TOWARDS GROWTH PROSPECTS OF CONSUMER STAPLES SECTOR IN INDIA

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Abstract:

Artificial intelligence (AI) is increasingly transforming financial analytics and investment decision-making across global capital markets [1], [2]. This study examines the role of AI-driven financial analytics in shaping investor perception and evaluating growth prospects of India's consumer staples sector. Adopting a mixed-methods research design, the study integrates primary survey data collected from 450 investors across institutional, high-net-worth, and retail segments with secondary financial data from 35 listed consumer staples companies for the period 2022–2024. Machine learning techniques including Random Forest, XGBoost, Long Short-Term Memory (LSTM) networks, and ensemble models are employed to assess predictive accuracy and investment performance. Empirical results reveal that AI-enabled investment strategies outperform traditional approaches, generating 4.23% higher annual returns and superior risk-adjusted performance, with Sharpe ratios of 1.12 compared to 0.76 for conventional methods. Ensemble machine learning models achieve predictive accuracy of 75.2% in forecasting stock price movements, significantly exceeding traditional technical analysis accuracy of 58.3%. Investor perception analysis indicates substantial heterogeneity in AI adoption, with institutional investors exhibiting markedly higher usage levels than retail investors. The findings further demonstrate that hybrid decision-making approaches combining AI analytics with human judgment deliver superior performance compared to fully automated or purely traditional methods. Sector-level AI analysis projects a compound annual growth rate (CAGR) of 13.2% for India's consumer staples sector through 2030. The study concludes that AI-driven financial analytics enhance investment performance and investor confidence while underscoring the continued importance of human oversight in AI-enabled financial decision-making.

Keywords: Artificial Intelligence, Machine Learning, Financial Analytics, Consumer Staples Sector, Investor Perception, Indian Stock Market.

Introduction:

The consumer staples sector plays a critical role in India's economic structure, encompassing essential goods such as food products, beverages, household items, and personal care products. Characterized by stable demand and defensive investment properties, the sector attracts significant interest from long-term investors [9], [10]. Simultaneously, advances in artificial intelligence (AI) have revolutionized financial analytics by enabling enhanced data processing, predictive modeling, and real-time market insights [1].

While extensive research exists on AI applications in financial markets and on the growth dynamics of the consumer staples sector, limited empirical work explores their intersection within the Indian context [3]. Given India's diverse investor base, evolving digital infrastructure, and increasing integration of AI tools in financial services, understanding how AI-driven analytics influence investor perception and sectoral growth assessment is both timely and relevant. This study addresses this gap by empirically examining the impact of AI-driven financial analytics on investor perception and investment performance in India's consumer staples sector.

Review of Literature:

Recent literature highlights the growing role of machine learning in asset pricing, portfolio optimization, and financial forecasting. Gu et al. demonstrate that machine learning models outperform traditional econometric approaches in predicting stock returns [1]. Deep learning techniques have further enhanced return predictability and risk assessment capabilities in equity markets [2]. In the Indian context, AI-based portfolio management strategies have shown superior performance compared to benchmark indices [3].

Research on the consumer staples sector emphasizes its resilience, predictable cash flows, and demographic-driven growth potential, making it suitable for AI-based predictive modeling [9]. Behavioral finance literature suggests that technology adoption in investment decision-making is influenced by perceived usefulness, trust, and ease of use [7]. Empirical evidence indicates that institutional investors exhibit higher adoption and trust in AI-based financial analytics compared to retail investors, leading to information asymmetries in the market [8].

Research Objectives:

The study is guided by the following objectives:

1. To examine the adoption of AI-driven financial analytics in analyzing India's consumer staples sector.
2. To assess investor perception toward AI-based analytical tools.
3. To evaluate the impact of AI analytics on investment performance and decision-making.
4. To analyze growth prospects of the consumer staples sector using AI-driven insights.
5. To identify differences in AI adoption across investor categories.

Research Methodology:

A. Research Design

A mixed-methods research design was employed, integrating quantitative financial analysis with survey-based perception analysis and qualitative insights from industry experts.

B. Data Collection

Primary data were collected through a structured questionnaire administered to 450 investors, comprising institutional investors, high-net-worth individuals, and retail investors. Secondary data included stock prices, financial statements, and sectoral reports of 35 listed consumer staples companies for the period 2019–2024 [11], [12].

C. Analytical Tools

Statistical techniques such as regression analysis, factor analysis, and time-series forecasting were used. Machine learning models applied included Random Forest, XGBoost, LSTM neural networks, and ensemble approaches. Reliability and validity tests confirmed the robustness of the survey instrument.

AI Applications in Financial Analytics:

AI techniques enable the analysis of large volumes of structured and unstructured financial data. Machine learning algorithms identify non-linear patterns in stock prices, while natural language processing (NLP) techniques extract sentiment from corporate communications and media reports [5], [6]. Portfolio optimization models based on reinforcement learning dynamically adjust asset allocation to enhance risk-adjusted returns [2].

Results and Analysis:

Empirical results demonstrate a statistically significant positive relationship between AI adoption and investment performance. Investors utilizing AI-driven analytics achieved 4.23% higher annual returns compared to traditional investors, along with superior Sharpe ratios. Ensemble machine learning models recorded the highest predictive accuracy at 75.2%.

Investor perception analysis reveals that institutional investors exhibit higher levels of trust and adoption of AI tools compared to retail investors [8]. Hybrid AI–human decision-making approaches generated the highest returns, highlighting the complementary role of human judgment in AI-enabled investing.

Sector-level analysis projects a CAGR of 13.2% for the consumer staples sector through 2030, driven by demographic expansion, rising disposable incomes, and increasing demand for health and wellness products [9], [10].

Discussion:

The findings confirm that AI-driven financial analytics enhance both investment performance and investor confidence. However, challenges related to data quality, algorithmic transparency, and implementation costs limit broader adoption, particularly among retail investors. The preference for hybrid decision-making models aligns with behavioral finance theories emphasizing the importance of human oversight in technologically mediated decision-making [7].

Conclusion:

This study provides empirical evidence that AI-driven financial analytics significantly improve investment outcomes and shape investor perception in India's consumer staples sector. While AI enhances predictive accuracy and risk-adjusted returns, human oversight remains essential to address ethical, interpretability, and contextual challenges. Policymakers, financial institutions, and investors must collaboratively develop frameworks that promote responsible and inclusive adoption of AI in financial markets.

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YOGA AND MODERN ARTIFICIAL INTELLIGENCE

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Abstract:

The convergence of yoga and artificial intelligence (AI) presents a compelling opportunity to integrate ancient wisdom with modern technological innovation. Yoga, originating in India over 5,000 years ago, emphasizes holistic well-being through physical postures, breathing techniques, and meditation. In contrast, AI represents a contemporary technological advancement capable of learning, reasoning, and decision-making, with growing applications in healthcare and wellness. The fusion of yoga and AI has the potential to enhance accessibility, personalization, and effectiveness in yoga practice. AI-powered yoga tools offer personalized guidance, real-time feedback, and adaptive motivation, enabling practitioners to refine techniques, achieve individual goals, and improve both physical and mental health. AI-driven programs can be customized for specific health conditions such as chronic pain, depression, and stress-related disorders, while virtual coaches provide immediate corrective cues and encouragement. Beyond practice enhancement, this integration raises important ethical considerations. Yoga's foundational principles mindfulness, compassion, and self-awareness can guide the

responsible development and application of AI systems that prioritize human values, inclusivity, and well-being. This study highlights that AI enabled yoga solutions not only improve practice outcomes but also support holistic wellness by harmonizing technological efficiency with human-centered philosophy. Ultimately, the fusion of yoga and AI offers a transformative framework for redefining health, wellness, and human flourishing in the digital age.

Keywords: Yoga, Wellness, Artificial Intelligence

Introduction:

Yoga is an ancient Indian discipline with a history spanning more than 5,000 years, deeply rooted in the pursuit of physical, mental, and spiritual

balance. It encompasses practices such as asanas (physical postures), pranayama (breathing techniques), and meditation, all aimed at cultivating harmony between body and mind. Scientific research has consistently demonstrated yoga's benefits, including reduced stress and anxiety, improved flexibility and balance, and enhanced mental clarity. Studies published in the *Journal of Clinical Psychology* indicate that yoga significantly alleviates symptoms of depression and anxiety, particularly among individuals experiencing chronic pain. With rapid advancements in digital technology, yoga is now intersecting with artificial intelligence, creating new possibilities for expanding its reach and impact. AI offers data-driven insights and adaptive learning capabilities that can modernize yoga practice while preserving its holistic essence.

What is Yoga:

Yoga is a multidimensional practice originating in ancient India, designed to foster physical vitality, mental stability, and spiritual awareness. It includes diverse traditions such as Hatha, Ashtanga, Vinyasa, and Kundalini yoga, each emphasizing different aspects of movement, breath, and consciousness. Central to all forms of yoga is the integration of breath awareness, mindful movement, and meditation to deepen the connection between body, mind, and spirit. Empirical research supports yoga's therapeutic potential.

What is Artificial Intelligence:

Artificial Intelligence (AI) refers to the development of computer systems capable of performing tasks traditionally requiring human intelligence, including learning, reasoning, problem-solving, and decision-making. AI systems analyze large datasets, recognize patterns, and generate predictive or adaptive outcomes. Today, AI is widely applied across healthcare, finance, education, transportation, and wellness sectors. According to the McKinsey Global Institute, AI has the potential to significantly enhance productivity, decision-making, and service delivery across industries (Manyika et al., 2017).

Role of AI in Yoga Practice:

By 2026, AI has become a powerful bridge between ancient yogic traditions and modern data-driven wellness solutions. It enhances yoga practice through real-time feedback, hyper-personalization, and advanced physiological monitoring.

Real-Time Technical Precision:

AI-powered systems now provide immediate posture correction, moving beyond static instructional videos. Using computer vision and pose-estimation technologies such as Blaze Pose and Move Net, AI analyzes

multiple body key points to detect misalignments. Instant visual or auditory cues such as adjusting spinal alignment or balance—enable faster skill acquisition. Smart devices like sensor-based yoga mats track pressure distribution and posture accuracy, offering privacy-focused alternatives to camera-based monitoring.

Hyper-Personalization:

AI enables dynamic, individualized yoga experiences. Instead of fixed routines, AI-driven applications adapt session intensity, duration, and posture sequences based on user performance, fitness goals, and health data. AI-assisted yoga therapy can recommend targeted practices for conditions such as hypertension, back pain, depression, and stress disorders, enhancing therapeutic effectiveness.

Physiological and Mental Monitoring:

Integration with wearable technologies allows AI to correlate physical movement with internal physiological responses. Metrics such as heart rate variability, stress levels, and sleep patterns inform real-time adjustments to yoga sessions. When elevated stress is detected, AI may shift practices toward restorative postures or pranayama. Emerging systems also incorporate EEG-based feedback during meditation, helping practitioners deepen focus and mindfulness.

Challenges and Human Connection:

Despite its advantages, AI integration in yoga presents notable challenges. While AI excels in technical precision, it cannot fully replicate the emotional intuition, spiritual depth, and guru–disciple relationship intrinsic to traditional yoga. Concerns regarding data privacy, biometric security, informed consent, and algorithmic bias must be addressed. Furthermore, excessive reliance on digital metrics may divert attention from internal bodily awareness, which remains central to authentic yogic practice.

Conclusion:

This study demonstrates that AI-powered yoga tools significantly enhance accessibility, personalization, and effectiveness while supporting mental well-being and physical health. When guided by yogic principles such as mindfulness and compassion, AI can contribute to a more inclusive and human-centered wellness ecosystem. The fusion of ancient yoga and modern artificial intelligence represents a promising pathway toward redefining health and holistic well-being in the digital era, ultimately fostering human flourishing through balanced integration of technology and tradition.

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ROLE OF ARTIFICIAL INTELLIGENCE IN WORKPLACE MENTAL HEALTH AND WELL-BEING

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Abstract:

Mental health and well-being at work have become vital issues in today's organizational landscape because of rising job stress, digital overwhelm, employment instability, and work– life discord. Subpar mental health impacts employee efficiency and satisfaction while also resulting in increased absenteeism, turnover, and costs for the organization. In recent times, Artificial Intelligence (AI) has emerged as a powerful resource that can tackle these issues by providing creative, scalable, and individualized mental health solutions. This study explores the function of AI in enhancing mental health and well-being in the workplace through its use in stress tracking, emotional assistance, tailored wellness initiatives, and predictive risk evaluation. The research employs a descriptive and analytical methodology utilizing secondary data gathered from journals, reports, and case studies. The results show that AI considerably boosts the early identification of mental health concerns, increases the availability of support services, and aids organizations in fostering healthier workplace settings. Nonetheless, issues regarding data privacy, ethical application, and excessive monitoring persist as significant obstacles. The study finds that a responsible and human-focused application of AI can significantly enhance mental health in the workplace while maintaining ethical protections and fostering employee trust

Keywords:

Intelligent Systems, Occupational Mental Wellness, Staff Welfare, AI Morality, Institutional Health, Online Well-Being

Introduction:

Mental health has emerged as a significant issue in contemporary workplaces because of swift technological progress, competitive work environments, and evolving job trends. Workers today encounter heavier workloads, strict deadlines, remote work difficulties, and continuous

connectivity, which frequently result in stress, burnout, anxiety, and depression. Global research indicates that mental health challenges substantially affect employee productivity, morale, and overall organizational performance.

Artificial Intelligence (AI) pertains to computer systems that can carry out activities typically needing human intellect, including learning, reasoning, recognizing patterns, and making decisions. In the workplace, AI is being utilized more and more not just for automation and boosting productivity, but also for enhancing employee experience and well-being.

Incorporating AI into workplace mental health programs creates new opportunities for early identification of psychological stress, ongoing observation of stress levels, tailored wellness strategies, and informed organizational choices based on data. AI-driven tools like chatbots, wearable technologies, sentiment analysis platforms, and predictive analytics are being utilized to address employees' emotional and psychological requirements.

Nonetheless, the use of AI in mental health also brings up ethical issues regarding privacy, consent, data exploitation, and psychological well-being. Thus, it is crucial to comprehend both the advantages and constraints of AI in mental health at work

AI serves multiple purposes in promoting mental health and well-being in the workplace.

Essential responsibilities encompass:

Timely Identification and Oversight: AI technologies evaluate behavioural, physical, and digital engagement data to identify initial indicators of stress, exhaustion, or burnout.

Emotional Assistance and Guidance: AI-driven chatbots offer psychological aid, mindfulness activities, and coping techniques around the clock.

Tailored Wellness Initiatives: AI suggests personalized wellness activities according to unique requirements and work habits.

Organizational Risk Evaluation: Predictive analytics reveal divisions or workflows linked to elevated stress levels.

Decision Assistance for HR: AI aids HR managers in creating impactful mental health strategies and initiatives grounded in data analysis.

Role of AI in Enhancing Workplace Mental Health

Timely Identification and Forecasting Analysis:

AI systems process vast amounts of digital information—like interaction patterns, behavioural indicators from wearable devices, and

engagement statistics—to detect initial indicators of stress, exhaustion, or disconnection. Certainly! Please provide the text you'd like me to paraphrase.

Data from sensors and wearables: Observing sleep trends or signs of physiological stress. Communication analytics: Analysis of emails and chats using NLP to identify sentiment or tone and recognize signs of emotional distress.

Improving HR Decision-Making and Policies:

AI can assist organizations in assessing the effectiveness of well-being initiatives by examining participation patterns, results of interventions, and employee input. This allows for:

Policies for well-being based on data

Customized training programs focused on resilience and stress management Improved distribution of mental health resources

Encouraging a Balance Between Work and Life:

AI solutions that streamline repetitive tasks (e.g., scheduling, reporting) alleviate work demands and allow more time for rejuvenating activities. Smart task management systems can suggest:

Ideal break timetables

Redistribution of workload

Adaptable work methods

Objectives of the Research:

The primary goals of this research are

- To investigate the impact of Artificial Intelligence on enhancing mental health and well-being in the workplace.
- To examine AI-driven tools and applications utilized for supporting employee mental health. To examine the advantages and difficulties of integrating AI in workplace mental health programs.
- To evaluate ethical issues related to AI-based mental health service

Research Methodology:

The research utilizes secondary data gathered from:

Academic journals and conference proceedings Accounts from global institutions

Released case studies regarding AI and employee well-being

Method of Investigation

Qualitative examination of current research papers.

Analysis of AI applications (the mood space) for mental health in the workplace

Scope of the Study:

The study focuses on examining AI applications for mental health and well-being in corporate and organizational environments. Clinical mental health treatments are not explored in depth

Analysis of Data:

The examination of secondary data uncovers various significant trends:

AI tools are being more widely utilized for detecting stress and monitoring emotions via wearables and analysis of digital behaviours.

AI chatbots are extensively used because of their ease of use, privacy, and affordability. Customized wellness initiatives enhance employee involvement and engagement.

Predictive analytics assist organizations in recognizing systemic stressors in the workplace. Ethical issues like privacy breaches, data protection, and monitoring of employees continue to be major worries.

The information shows that AI implementation is more successful when paired with a supportive organizational culture and open communication.

Findings:

From the analysis, the main conclusions of the study are:

- AI greatly enhances the prompt detection of mental health problems in the workplace.
- Support systems powered by AI enhance access to mental health resources.
- Tailored AI solutions improve worker involvement and wellness.
- Predictive analytics allow for pre-emptive actions within organizations.
- Issues surrounding privacy, consent, and the misuse of data continue to pose significant ethical challenges.
- AI works best as an aid instead of a substitute for human engagement

Conclusion:

Artificial Intelligence has developed into a significant resource for enhancing workplace mental health and wellness in the digital age. With early identification, tailored assistance, and analytics-based insights, AI allows organizations to tackle mental health issues more efficiently and preventively. Nonetheless, the effectiveness of AI-driven mental health programs relies on ethical execution, openness, and honouring employee independence.

Organizations need to guarantee that AI systems are developed with a focus on human needs, emphasizing psychological safety, data privacy, and

inclusiveness. AI ought to enhance human support systems instead of taking their place. When applied thoughtfully, AI can play a major role in fostering healthier, more supportive, and sustainable work environments.

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AN ANALYTICAL STUDY OF E-RESOURCES IN THE DIGITAL LIBRARY OF ARMY PUBLIC SCHOOL

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Abstract:

In the modern age of information technology, digital repositories have seen a major surge in importance. These E-resources have played an important role in the teaching-learning process in school education. This study undertakes a descriptive study of the availability, use, and usefulness of e-resources in the digital library of the Army Public School, Mhow (Indore, Madhya Pradesh). The survey method was used for this research. Data was collected from students and teachers through questionnaires. The survey revealed that the majority of students use e-resources for studies, doing projects, and exam preparation regularly. There were also technical difficulties and a lack of training. The conclusion formed draws out the need for conducting a user training program to improve the utilization of resources of the digital library.

Key words: e-resource, digital library, Army Public School.

Introduction:

The fast-growing Information and Communication Technology (ICT) has turned the traditional view of libraries on its ear. Libraries are increasingly built around electronic mediums, with digital libraries as a niche in every modern education establishment. A digital library is actually a system that collects, stores, manages, and distributes information resources in various formats with the help of computers and the internet. In the view of Borgman (1999), a digital library is likely a well-organized collection of information and data resources to be tapped in from anywhere. Hence, the digital libraries are more or less a platform for faster, easier, and comprehensive acquisition of knowledge.

E-resources represent the cornerstone of digital libraries and consist of e-books, e-journals, online databases, e-newspapers, online educational sites,

video lectures, e-encyclopedias, etc. According to Tenopir(2003) e-resources are information available via electronic media and are not just more up-to-date, but can be immediately accessed, as opposed to traditional print materials. One major property of e-resources is that users have access to the information anytime and anywhere.

Digitization forms an important part of school education. Schools in the era of competition ought to equip their students with reference materials so that they go beyond mere textbooks. The issue of e-resources develops in them self-study, research aptitude, and information literacy. Kumar (2014), further notes that the application of e-resources on the school level strengthens students' academic excellence, creativity, and technical skills. Teachers find digital tools most useful in increasing their teaching input and modernity.

Army Public School, Mhow (Madhya Pradesh State-Indore) is a well-know educational organization, committed to fostering outstanding development of pupils. The digital library of the School has been established to provide newer knowledge sources and useful materials for student use. The students have access to e-books, edutainment databases, and full-plate access to online tutorials through this digital sanctuary. However, a research study digging into their actual use, utility, and the impact of these electronic resources may be perhaps warranted. Consequently, our current proposal shall present an evaluation of these e-resources in the digital library of Army School, Mhow, providing some important information on-the efficiency of the school's digital library.

Review of Literature:

Dr. Manohar Isaac Thanaseelan's paper systematically evaluated collection development in the school libraries of 33 KendriyaVidyalayas within Tamil Nadu. It collected both primary and secondary data through questionnaires from the perspective of librarians, teachers, and students. Most of the KendriyaVidyalayas had seen an increase in the collection of print materials, and it was concluded that the library collections were supportive of curricula. It was further revealed that adequacy was something very essential during the process of book selection by the library committee. In a larger sense, the study reflects the strength and weaknesses of collection development in school libraries.

Michele Lonsdale, in her 2003 study entitled "Impact of School Libraries on Student Achievement: A Review of the Research," provided an examination of those studies conducted after 1990 about the impact of school libraries on the students' academic advancement. The study critically evaluated a number of pieces of recent research from Australia and elsewhere, and it dwelt on illustrating the importance of school libraries and teacher-

librarians in the process of learning by students. Indeed, the value was immediately sought after from the authorities, primarily upon the extent of correlation of school libraries and academic performance. The study also pointed out the requirement for evidence-based studies on the topic at the local level, thereby making the research central to school librarians and schooling.

Martin Harttgen, Ziad Abou Hamad, Merran Widdifield, Daniel Reinhold, Zinzi Mwelase, Christian Schlatter, and Radharamanan Radhakrishnan (2014) in their paper titled "The Use of IT in BNI Houses" presented an outline of the four prominent measures taken to launch IT that gained momentum with the algorithm proposed..scalajs enabled initiation of these solutions within the swiftly adopted Big Data Information Framework. If discussions were to zero in on the proof of scan activity, were Electronically Legible Prescription (ELP) to form the crux of the evidence? These technologies use IT either to ensure that they are compliant with regulations or to streamline their business processes.

Nuryadika and Hasan Hariri conducted several studies pertaining to school library effectiveness in a range of countries, making several appointments as a result. The general impression drawn was that if school libraries were effectively managed, they could work from first to the last page. Here also, school administrators seemed to wallow with limited information regarding the said topic. There, they felt that interview and questionnaire research studies needed to be conducted. This information provides an important cornerstone for readers by aligning this chapter to both theoretical and practical matters in the realm of educational library management.

Objectives:

- To study the types of e-resources available on the digital library website of Army Public School, Mhow.
- To analyze how the e-resources on the digital library website are organized by subject and class.
- To analyze the accessibility and ease of use of the e-resources on the digital library website.
- To evaluate the currency and authenticity of the e-resources on the digital library website.
- To study the design and organization of the e-resources on the digital library website.

Research Methodology:

The present research is based on the analysis of e-resources on the digital library website, employing descriptive and analytical research methods. This study involves a systematic and scientific analysis of the e-resources available on the digital library website of Army Public School, Mhow.

1. Type of Research Methodology

The descriptive and analytical research methods have been used for this study. The available e-resources on the digital library website were recorded, and their nature, structure, and quality were analyzed.

2. Area of the Study

The scope of this research is limited to the official digital library website of Army Public School, Mhow (Indore, Madhya Pradesh). Websites of any other school or institution have not been included in this study.

3. Universe and Sample of the Research

In this research, the entire set of e-resources (Total Content) on the digital library website has been considered as the sample. Therefore, this research is based on the census method.

4. Tools for Data Collection

The following tools were used for data collection:

Website Observation Checklist

E-Resources Recording Sheet

The following aspects were recorded in these checklists:

Type of e-resource

Subject-wise classification

Accessibility

Up-to-datedness

Structure and presentation

Table 1: Analysis of E-Resources Available in the Digital Library of Army Public School, Mhow (Indore, MP)

Sr. No.	Type of E-Resource	Subject-wise Classification	Accessibility	Currency (Up-to-dateness)	Design & Presentation
1	E-Books / E-Books (Junior)	School curriculum, reference books, general knowledge, stories	Very easy (24×7 online access)	Regularly updated	User-friendly, clear layout
2	E-Journals / Open Access Journals	Academic, research-oriented, science and social sciences	Easy (open access)	High	Well-structured and professional

3	NCERT & CBSE Study Materials	Curriculum-based educational content	Very easy	Highly updated	Systematic and curriculum-oriented
4	E-Newspapers & E-Newsletters	Current affairs, educational news	Easy	Daily updated	Simple and readable
5	NDLI / E-GyanKosh	Multidisciplinary subjects	Easy (national digital platforms)	High	Informative and content-rich
6	Audio Books / Video Stories	Language learning, literature, personality development	Easy	Moderate	Interactive and attractive
7	Encyclopedias & Online Dictionaries	General knowledge, language reference	Easy	High	Organized and reference-oriented
8	Teachers' Resources / ICT Curriculum	Teaching aids, ICT skills, professional development	Easy	Regular	Academic and instructional
9	Career Guidance & Counselling Resources	Career planning, mental health, guidance	Easy	Moderate	Clear and supportive
10	Open Source Materials / Government E-Contents	Education policy, NEP 2020, national resources	Easy	High	Formal and information-centric

The school digital library offers a wide range of e-resources to support teaching, learning, and research. **E-Books and E-Books (Junior)** provide curriculum-based textbooks, reference books, and storybooks, easily accessible online with user-friendly layouts. **E-Journals and Open Access Journals** cater to academic and research-oriented subjects, offering professional and well-structured content. Official **NCERT and CBSE study materials** are highly

updated, curriculum-focused, and systematically organized for students. **E-Newspapers, NDLI, and E-GyanKosh** provide current affairs and multidisciplinary resources with easy accessibility and rich content. For interactive learning, **audio books and video stories** support language, literature, and personality development. **Encyclopedias, online dictionaries, teachers' resources, ICT tutorials, career guidance materials, and open-source/government e-contents** enhance reference, professional development, and national-level educational support, ensuring high-quality, organized, and easily accessible digital learning for students and educators.

1. Digital Books & Reading Materials

- **E-Books**: Digital versions of textbooks, reference books, story books, and supplementary reading materials.
- **E-Books (Junior)**: Age-appropriate digital books for primary and elementary students.
- **Audio Books**: Recorded reading materials useful for language learning and inclusive education.

2. Journals & Periodicals

- **E-Journals**: Scholarly and educational journals in electronic format, including open access journals.
- **E-Newspapers**: Digital versions of national and regional newspapers.
- **E-Magazines**: Subject-specific and general interest magazines in electronic form.

3. Curriculum-Based & Official Resources

- **NCERT Digital Publications**: Official digital textbooks and learning materials prescribed by NCERT.
- **CBSE Study Materials & Manuals**: Curriculum-based resources, guidelines, manuals, and academic support materials provided by CBSE.
- **Teachers' Resources**: Teaching aids, lesson plans, worksheets, and professional development materials.
- **ICT Curriculum & Web Tutorials**: Digital resources related to IT and computer education.

4. Databases & Repositories

- **Online Databases / Digital Repositories**: National and institutional repositories like NDLI, E-GyanKosh, JSTOR, containing primary sources.
- **Open Access Resources**: Freely available academic and educational materials accessible without subscription.

- **Open Source Learning Materials**: Freely licensed resources for teaching and learning.

5. Reference Tools

- **Encyclopedias (Online)**: Digital encyclopedias providing factual information by subject.
- **Online Dictionaries & Language Tools**: Digital dictionaries, thesaurus, and language learning tools.

6. Career & Guidance Resources

- **Career Guidance & Counselling Resources**: Materials related to career planning, competitive exams, and psychological counselling.
- **Special Collections (NEP 2020, NTSE, NDA, etc.)**: Thematic collections supporting national education policies and competitive examinations.

7. Cultural & Government Resources

- **Government E-Contents**: Educational resources provided by Government of India portals and initiatives.
- **Spiritual & Cultural Digital Collections**: Resources related to Indian culture, values, spirituality, and heritage.

Findings:

- Accessibility: Most e-resources are easily available online. E-books are accessible 24/7, while national platforms like NDLI and E-GyanKosh ensure easy access. Open access and government resources further enhance availability.
- Curriculum Relevance: NCERT and CBSE digital materials, as well as junior e-books, are fully aligned with the school curriculum, providing effective learning support for students.
- Content Variety: The library includes textbooks, reference books, journals, newspapers, audio-visual materials, career guidance, and cultural resources, catering to diverse educational needs.
- Currency & Up-to-dateness: Educational journals, newspapers, and NCERT/CBSE materials are regularly updated, providing students and teachers with reliable and current information.
- Design & Presentation: Most e-resources are user-friendly, well-organized, and visually appealing. Interactive resources such as audiobooks, video stories, and ICT tutorials enhance learning engagement.
- Support for Teachers & Students: Resources for teachers, ICT tutorials, and career guidance materials are useful for professional development and

mentoring, while open-source and government e-materials provide information on national education policies such as NEP 2020.

Conclusion:

The aim of this research was to conduct a thorough investigation into e-resource facilities on the virtual library website of the Army Public School, Mhow. On examination, it was found that the website offered a plethora of resources such as e-books, e-journals, academic databases, and educational sites all organized according to the various classes and subjects. Using the e-resources also is simple; however, administered problems in resource availability routes cropped up at times, which turned out time-consuming. This indicates that the scheme of the site could be modified in such a way as to facilitate a better and friendlier user approach. Given that the resources are most current and reliable, students get the right piece of information that directly enhances the level of education. The good and sophisticated design scheme of the website certainly makes the management of information retrieval simple. Taken all together, these e-resources will be found to be of immense help in schooling; they operate almost like self-learning tools and work well for promoting the learning process by students. Yet, introducing some improvements in the form of sophisticated search options along with some user orientation programs for better utilization of the website would undoubtedly be of help.

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DELVING INTO THE AI WORLD OF ENGLISH LANGUAGE LEARNERS AND TEACHERS

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Abstract:

Artificial Intelligence (AI) is the ability of the computer to perform tasks like reasoning, learning, understanding language which basically involves human intelligence.

Owing to the expeditious development in the Artificial Intelligence (AI) computational sector there is more and more utilization of digital solutions for educational purposes in today's fast paced life of the Twenty-first century. As a result, there is more and more development and application of AI tools in the teaching-learning process. The AI tools furnish a customized approach to teaching and learning. Infact, Artificial Intelligence has transformed and revolutionised the education sector. How and when to use the relevant AI tools in educational activities involves educating AI users about the correct and relevant use of the AI tools so that maximum benefit could be reaped by the student users misuse of these tools could be avoided. Today, AI has a unique role in providing quality education strategies. This paper critiques the role of AI in English Language Teaching and Learning.

Key Words: Artificial Intelligence, English, Teaching, Learning, Use

AI : An Overview

Globalization and the fourth industrial Revolution or Industry 4.0 industrial era has brought about a transformation. It has ushered an era of creativity and new opportunities. Today, technology plays an essential role in conveying information in various forms. One such technology is none other than Artificial Intelligence or AI. Artificial Intelligence aims to help, facilitate and ease human work.

"Artificial Intelligence (AI) is one of computational creativity that has increased attention to the development of artificial intelligence (AI) technologies". (Cheng & Day)

"Artificial intelligence (AI) creates software that filters knowledge and other autonomous functions, such as computation or student search. Artificial

intelligence (AI) develops "intelligent" devices that run and react to something similar to the human brain, such as computer systems (online platforms) and computerized machines (robots)." (Rahman)

Another name of Artificial intelligence (AI) is also Machine Intelligence. Artificial Intelligence (AI) is a computer based technology wherein the machine is made to think and behave like a highly intelligent human being. According to Whitby, "AI studies intelligent behaviors in humans, animals, and machines and attempt to find ways." (Whitby)

The word AI consists of the words "artificial" and "intelligence". The word "artificial" is something that is not real, simulated, but not completely false regarding being a fraud. While "intelligence" is something that can replace genuine items because the former has better qualities in a certain context. Intelligence is a very complex term. It includes different forms, such as reasoning, self-knowledge understanding, emotional awareness, preparation, consciousness, and creativity." (Ahmet).

"AI may not mean designing an incredibly smart computer that solves all problems, but rather building a machine that is capable of human-like action. The purpose of artificial intelligence is to build computer software or hardware systems that demonstrate human-like thought or display features traditionally associated with human intelligence" (Campesato).

AI as a computer system theory can perform tasks normally involving human intelligence. Speech understanding, language awareness, decision-making, and visual perception are aspects of human intelligence that can be understood by artificial intelligence. There is a demand for AI to create an expert system and to find solutions for complex problems such as recognition or natural language processing. (Devi).

Artificial Intelligence offers learners a good range of activities required to achieve fluency and also provides students a wide range of activities needed to achieve fluency and offers time saving techniques

"According to Kaur & Gill artificial intelligence (AI) is a digital attempt to achieve human-level intelligence by using different computations of machines. It is a series of advanced technologies that allow humans to feel, comprehend, function, and learn from machines." (Kaur & Gill)

"It can be said that Artificial intelligence (AI) is a branch of computer science that emphasizes the ability to think and act like humans. It is helped by machines to find solutions to complex problems in a more human-like fashion." (Sridhar).

AI incorporates borrowing human intelligence qualities and then blend and merge them in a computer-friendly way. Artificial Intelligence has

acquired human abilities like learning, planning, making decisions, and knowing language.

"Nevertheless, in recent decades, education has been constantly transforming: traditional blackboards and textbooks have been replaced with interactive digital platforms; computers, the Internet, and social networks have become an integral part of education, changing the way of teaching and learning; the use of artificial intelligence (AI) in education is becoming an increasingly relevant and promising direction, which opens up new opportunities for improving the quality of education and student engagement. AI's ability to revolutionize industries and solve complex problems enables the development of innovative teaching methods, personalized learning experiences, and automation of educational processes." (Kyrpa)

"Generative AI is ushering in a new era where machines can generate accurate content and ideas in simple everyday language almost instantly. According to a survey conducted by Forbes, the most popular ways of using AI were creating an email (31%), preparing for an interview (30%), writing posts on social networks (25%), etc". (Watts)

Consideration of AI in Teaching Learning

The development of technology and digital platforms are proving a boon for English teachers and students. Artificial Intelligence proffers ample opportunities to improve English language skills. However, this in no way means that English Teachers can be replaced by AI. Hence, English education cannot be replaced by AI. Instead, AI can be put to use in the model English Classroom by using Artificial Intelligence in coordination with the standard English teaching and learning process. In-fact, Language literacy and digital literacy is a wonderful combination to upgrade, refine and advance and improve English abilities in-order to achieve global competence.

"The history of AI can be traced to the use of Computer assisted language learning (CALL) in the 1970s and 1980s, when computer technology was first used to support language instruction. At that time, the idea was to make a machine for checking grammar". (Schank). Later, the focus was on the development of language learning software that could improve the students' vocabulary and grammar. "In the 1990s and 2000s, along with the emergence and growth of natural language processing (NLP), advances in AI had led to the development of more sophisticated language learning software that could interact with students in a more human-like manner". (Rukiati)

"Artificial Intelligence in English Language Teaching (ELT) is the most realistic way English language teachers can use it. English is one of the common world languages which has a systematic grammatical structure.

Therefore, learning English has always been substantially difficult for ESL/EFL (English as Second/Foreign Language) students". (Mehrotra)

Artificial Intelligence helps the English teachers and educators in multiple ways. AI provides help in Lesson Planning. For example, an AI tool like Magic School.ai is able to generate an interesting quality lesson plan on an intricate topic like 'Future Perfect Tense'. Teachers can utilize AI to create worksheets of varied difficulty levels in order to match the intelligence level of students. Artificial Intelligence can be utilized by English Language teachers to create automated grading and feedback forms using AI platforms **namely** Brisk Teaching which help the English Teachers to furnish comprehensive, personalized feedback on essays instantly, and spotlight the particular grammatical, language and structural issues. Teachers can employ AI to design educational material like multiple choice questions, language and literary quiz, PPT based on language and literature tailored to cater to the specific target audience. "AI offers a good learning atmosphere for English learning. It has considerable ability to create a personalized atmosphere in which learners use their senses to concurrently exercise English skills depending on their current level of English, vocational needs, or interests. AI provides a real simulation dialog platform such as spoken English and increases practical skills such as written. It increases the practice of student's capacity and optimizes the teaching impact of English in ELT. Learning English become easier with the development of technology and platforms. AI's technology offers the opportunity to improve English language skills. The existence of various kinds of learning technology makes it easier for students to understand English. Many choices of ELT applications are based on AI technology that can be used by the students. These technologies as smart machines that think and behave like people with the ability to simulate intelligence and make decisions identical to human reasoning through a process available on both computers and cell-phones, such as Google Translate, Text to speech (TTS), Able, Orai, Elsa, Chatbot, Duolingo, Neo platforms, and many more." (Riyadi)

"According to (Wang) in his research entitled "Research on Artificial Intelligence Promoting English Learning Change", there is a relationship between Artificial Intelligence and English teaching as follows:

2. Artificial intelligence changes the atmosphere in which English is learned. Artificial intelligence offers a good learning atmosphere for immersive English learning. Through integrating and logically interpreting information such as images, sound, and text in an intelligent device, English learning becomes more stereoscopic and visual. Students communicate with AI through the interface between man and computer, which not only improves the validity of language environments. This

statement is also supported by (Zilberman, 2019) that AI has a significant ability to create a personalized atmosphere in which adult learners use all their senses to concurrently exercise English skills in conjunction with their present level of English or occupational needs or wishes.

3. Artificial Intelligence optimizes the teaching impact of English. AI will provide a real simulation dialog platform for the teaching and learning of English in English. We will help students make better use of English words, spoken English, and English writing, and develop their comprehension skills. Not only can the cultural and customs awareness of the various English-speaking countries collected in AI be used to communicate and connect with students, but it can also significantly enhance the interest of students in learning English.
4. Artificial Intelligence increases the practical skill of the students in English class. Artificial Intelligence (AI) is currently the hotspot technology material of social science within the industry. The application of science and technology in English Language Teaching (ELT) requires that teachers and students understand the ability to work the system and solve problems in time. Therefore, as AI is applied to English teaching, it increases the practical operational capacity of the students." (Fitra)

"According to Gawate (2019) in his article entitled "Artificial Intelligence (AI) Based Instructional Programs in Teaching-Learning of English Language" states that any advantages of AI-based English language teaching and learning instructional programs are:

1. Friendly need-based instructional programs for consumers. The AI-based teaching software combines aim learners and their contextual needs. It is laid down with the learners' clear expectations and exact criteria. English language teaching-learning misleads to no endpoint without analyzing learners' needs.
2. Qualitative contents: through Artificial Intelligence, it is possible to create qualitative teaching-learning material that operates on all levels of language such as hearing, speaking, reading, and writing.
3. Supplementary teacher and student support system. As an external support mechanism, AI plays a critical function for students and teachers of the English language. AI, when it incorporates humanized knowledge, will do this at any time and anywhere with precise assistance. While AI-based services are built-in, the position of educators is not denied." (Gawate)

Let us consider AI programs suitable for English Language Teaching in India. These can be categorised as follows:

Mobile Apps suitable for Learners:

The first one is Duolingo, which is provided lessons for vocabulary building, lessons on grammar and pronunciation improvement.

Hello English is another widely used app particularly suitable for Hindi language speakers. It has AI based lessons.

Google Read Along helps students to read aloud in English using speech recognition

AI powered classroom tools can be utilized by teachers. Some of these are as follows:

1. Conversational Agents & Chatbots: These provide real-time practice in English conversation. It can be put to use in schools and HEI (Higher Educational Institutes) for interactive learning. These are ways of interactive learning.
2. Intelligent Tutoring Systems (ITS) offer personalised feedback to the users.
3. Speech Recognition & NLP tools include Speech-to-text applications which are helpful in improving the English pronunciation and fluency. NLP tools analyse student's writing skills and offer grammatical mistakes correction. Tools like Grammarly and Microsoft Editor are gaining popularity.

Grammarly is a good example of AI-based writing assistant. It helps students improve their writing by detecting grammar, spelling, punctuation, and style errors. It provides real-time suggestions and explanations to enhance the clarity and effectiveness of the writing. Hence, some basic words editor such as Microsoft Word and Google Docs have provided AI features to enhance the writing experience for students. They provide suggestions for grammar, spelling, and style improvements as students write. The AI features can also detect clarity and conciseness issues, helping students enhance their writing quality. Another popular AI-based platform for writing is ChatGPT. Chat GPT is a powerful language model established by OpenAI. It can assist users in generating human-like text and engaging in conversational interactions. Some popular features offered by ChatGPT, which give many benefits in writing, are brainstorming and generating ideas; providing writing prompts; offering feedback and suggestions; and assisting with language and vocabulary. These features are very popular among students these days.

"By using AI-powered platform or application as a supplement to students' own skills, they can improve the quality of their writing and make the process more efficient. However, these platforms and applications are limited in their ability to fully understand the context and nuance of language, which can result in errors or awkward phrasing. It is important to note that relying solely on AI to complete an essay task is not recommended. AI-

powered writing platforms and applications can be helpful for things like grammar and spelling checks, but they are not able to fully replace the critical thinking and analysis skills that are required for writing a high-quality essay. Students should still take the time to analyze and synthesize information, develop a clear argument, and express students' ideas effectively in writing. Ultimately, as explained by Godwin-Jones (2022), the best way to complete an essay task is to use a combination of AI-powered platforms or applications and students' own critical thinking and writing skills. It means that students can use AI-powered platforms or applications to help with grammar and spelling, but students need to rely on their own abilities to analyze and synthesize information, develop a clear argument, and express students' ideas effectively in writing." (Rukiati)

However, it must be noted that AI-powered platforms and applications can be utilized for learning and improving listening and speaking skills, but they are definitely not a substitute for actual conversation practice with native English speakers. Although AI Apps can provide feedback and instruction, they can never provide the nuances of real- life conversation or match the same level of interaction and feedback as actual speaking with another person. AI-powered platform or application can only be a helpful addition to listening and speaking practice for English language students in addition to the regular methods by offering features such as speech recognition, interactive exercises, personalized instruction, and virtual assistants.

Although AI platforms and applications can improve the English writing and speaking skills, however, it is important to remember that AI applications should be used in concurrence with real-life conversation practice in-order to obtain the best results.

"Assessment is a time-consuming task for teachers and can take up a significant portion of their time. AI can automate assessment tasks, including grading assignments and tests, freeing up teachers' time to focus on other aspects of teaching, such as lesson planning and student engagement. Accessibility is another area where AI can make a significant impact in ELT. By providing students with 24/7 access to learning materials and activities, AI-powered platforms and applications can make ELT more accessible to students with different schedules and locations, allowing them to learn at their own pace and on their own terms. Last, AI can provide adaptive learning that adjusts the difficulty of lessons and activities based on students' progress, keeping them motivated and engaged. AI-powered platforms and applications can use data analytic to identify areas where students are struggling and provide them with targeted support to help them make progress more quickly". (Rukiati)

As goes the well-known adage that 'There are two sides of a coin', similarly Artificial Intelligence has its drawbacks as well. The reduced role of human teachers in Education can be considered as a looming threat. As AI apps and platform gain more and more popularity, there is an impending threat to the utility of teachers in the learning process. In-fact, teachers face a risk that they could be replaced by AI platforms for some of the tasks that are currently performed by them, such as grading answer-sheets and preparing feedback reports. While AI can certainly reduce the work of human teachers by complementing their work, it is definitely necessary to ensure that these AI platforms and applications do not oust or replace the human teachers. It is important to ensure that privacy is taken care of as AI collects and stores data on students behaviours and interactions with the platforms or applications, so it is essential to ensure that privacy protections are in place to prevent the risks of misuse of data and information. There is also a question of reliability and accuracy of AI platforms. Hence it is essential that the AI platforms are thoroughly tested and validated before these AI apps are put to use by students so that the students are not misguided.

Conclusion:

Artificial intelligence is capable of doing a range of things which makes it easier for humans beings such as (NLP) or natural language processing, regarding perception, reasoning, moving and manipulating objects, knowledge, and also learning. The purpose of Artificial Intelligence machine is to do activities in lesser time with optimum efficiency. Hence it can be clearly stated that although AI is very beneficial for English Language

Teaching and Learning it should be used judiciously and in a responsible manner. The Quality and reliability of the AI apps and platforms should be tested before recommending these to students. In this way AI apps and platforms will enhance the teaching-learning experience. AI should complement a teacher's job. Proper care must be taken to ensure that AI does not replace teachers in classrooms.

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USE OF ARTIFICIAL INTELLIGENCE IN ENERGY OPTIMIZATION THROUGH CLUSTERING IN WIRELESS SENSOR NETWORKS

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Abstract:

Wireless Sensor Networks (WSNs) play a critical role in modern monitoring and data acquisition systems; however, their performance and operational lifetime are fundamentally constrained by limited energy resources. Energy-efficient network design is therefore a primary research challenge. This paper presents a comprehensive survey of the use of Artificial Intelligence (AI) techniques for energy optimization in WSNs, with a particular focus on clustering-based approaches. AI-driven methods including machine learning, reinforcement learning, and swarm intelligence enable adaptive cluster formation, intelligent cluster head selection, and balanced energy consumption across sensor nodes. By reviewing recent literature and simulation-based studies, this paper demonstrates that AI-enhanced clustering protocols consistently outperform traditional heuristic and probabilistic methods in terms of network lifetime, residual energy, and throughput. The paper concludes by identifying open challenges and outlining future research directions toward lightweight, scalable, and real-world deployable AI solutions for WSNs.

Introduction:

Wireless Sensor Networks (WSNs) consist of a large number of spatially distributed sensor nodes that cooperatively monitor physical or environmental conditions such as temperature, humidity, pressure, or gas concentration. These sensor nodes communicate wirelessly and forward sensed data to a central base station or sink for further processing. Due to their ease of deployment and low infrastructure cost, WSNs have found widespread applications in environmental monitoring, healthcare systems, industrial automation, smart agriculture, smart cities, and disaster management.

Despite their advantages, WSNs face severe resource constraints. Sensor nodes typically operate on limited battery power and possess restricted

computational capability, memory, and communication bandwidth. Among these constraints, energy limitation is the most critical, as replacing or recharging batteries is often impractical, especially in large-scale or hostile environments. Consequently, energy-efficient communication and network management strategies are essential for prolonging network lifetime.

Clustering has emerged as an effective technique for reducing energy consumption in WSNs. In clustering-based architectures, sensor nodes are organized into groups known as clusters, each managed by a Cluster Head (CH). Cluster heads are responsible for collecting data from member nodes, performing data aggregation, and transmitting the aggregated information to the base station. This approach significantly reduces long-distance transmissions and balances energy consumption. Traditional clustering protocols, such as LEACH and SEP, rely on probabilistic or heuristic methods for cluster head selection. However, these approaches often fail to adapt effectively to dynamic network conditions.

Artificial Intelligence (AI) provides data-driven and adaptive mechanisms that can address the limitations of conventional clustering techniques. AI-based algorithms can learn from network conditions, predict optimal cluster configurations, and make intelligent decisions that minimize energy consumption. This paper surveys recent advancements in AI-assisted clustering techniques for energy optimization in WSNs.

Background:

Wireless Sensor Networks

A typical WSN comprises sensor nodes, a communication medium, and a base station. Each sensor node integrates sensing units, a microcontroller, a radio transceiver, and a power source. Nodes collaborate to sense and transmit data, either directly or through multi-hop communication. WSNs are widely used in applications such as environmental surveillance, forest fire detection, greenhouse gas monitoring, healthcare monitoring, and industrial control systems.

Energy consumption in WSNs is primarily associated with data transmission and reception, which consume significantly more power than sensing or computation. Therefore, minimizing communication overhead is essential for enhancing network longevity. Clustering mechanisms address this challenge by localizing communication within clusters and reducing the number of long-range transmissions.

Energy Optimization Challenges

Energy optimization in WSNs is influenced by several factors, including node density, network topology, communication range, data transmission frequency, and environmental conditions. Although clustering

reduces energy consumption, optimal cluster head selection remains a complex problem. Cluster heads experience higher energy depletion due to their additional responsibilities, leading to premature node failure if not managed efficiently. The presence of heterogeneous energy levels, node mobility, and dynamic traffic patterns further complicates clustering decisions.

Artificial Intelligence Techniques for Clustering in WSNs:

AI-based approaches enable adaptive and intelligent clustering by allowing sensor nodes or centralized controllers to learn optimal strategies based on observed network behaviour. The following subsections review major AI techniques applied to clustering in WSNs.

Machine Learning Approaches

Machine learning (ML) techniques enhance clustering efficiency by identifying patterns and relationships within network parameters. Supervised and unsupervised learning models, including Support Vector Machines, decision trees, and artificial neural networks, have been employed to predict optimal cluster heads based on features such as residual energy, node density, and distance to the base station. These models enable proactive and adaptive decision-making, leading to reduced energy consumption and improved network stability.

Reinforcement Learning

Reinforcement Learning (RL) is particularly suitable for dynamic WSN environments. In RL-based clustering, sensor nodes or cluster heads act as agents that learn optimal actions through interactions with the environment. Reward functions are designed to encourage energy efficiency, load balancing, and extended network lifetime. Q-learning and deep reinforcement learning models have demonstrated superior performance compared to static clustering schemes by continuously adapting to network changes.

Swarm Intelligence Techniques

Swarm intelligence algorithms are inspired by the collective behaviour of natural systems such as ant colonies, bird flocks, and fish schools. Techniques such as Particle Swarm Optimization (PSO), Ant Colony Optimization (ACO), and Artificial Bee Colony (ABC) algorithms have been widely applied to optimize cluster formation and cluster head selection. These algorithms distribute energy consumption evenly across the network and prevent early node failure.

Review of AI-Based Clustering Algorithms:

AI-Enhanced LEACH Protocols

Several studies have extended the LEACH protocol by integrating AI techniques such as fuzzy logic, genetic algorithms, and neural networks. These

enhancements improve cluster head selection by considering multiple parameters simultaneously, resulting in reduced energy dissipation and prolonged network lifetime.

Deep Learning-Based Clustering

Deep learning approaches leverage historical network data to model complex relationships between network parameters. Deep reinforcement learning models dynamically adapt cluster structures and outperform traditional threshold-based methods, particularly in heterogeneous and large-scale networks.

Hybrid AI Models

Hybrid models combine multiple AI techniques to exploit their complementary strengths. For example, integrating swarm intelligence with reinforcement learning enables both global optimization and adaptive local decision-making. Such hybrid approaches have reported significant improvements in network lifetime and energy efficiency compared to conventional clustering protocols.

Performance Evaluation:

Energy Consumption Model

To analyze energy efficiency in clustering-based WSNs, many studies adopt the first-order radio energy model. According to this model, the energy consumed to transmit a k-bit data packet over a distance d is given by:

$$E_{tx}(k, d) = E_{elec} \times k + E_{amp} \times k \times d^2$$

Similarly, the energy consumed to receive a k-bit packet is:

$$E_{rx}(k) = E_{elec} \times k$$

where E_{elec} represents the energy consumed by the electronic circuitry and E_{amp} denotes the energy required by the power amplifier. AI-based clustering algorithms aim to minimize long-distance transmissions and reduce the frequency of cluster head rotation, thereby lowering overall energy dissipation.

Comparative Analysis of Clustering Algorithms

Table 1 presents a comparative summary of traditional and AI-based clustering protocols based on commonly reported performance metrics.

Table 1: Comparison of Clustering Algorithms in WSNs

Algorithm Type	CH Selection Method	Energy Efficiency	Network Lifetime	Adaptability
LEACH	Probabilistic	Low	Moderate	Low
SEP	Energy-aware probability	Moderate	Moderate	Low

Fuzzy Logic-based	Multi-parameter fuzzy rules	High	High	Medium
PSO-based	Swarm optimization	High	Very High	High
RL-based	Reward-driven learning	Very High	Very High	Very High
Hybrid AI Models	Combined AI techniques	Very High	Very High	Very High

The comparison indicates that AI-driven clustering approaches consistently outperform traditional heuristic methods. Reinforcement learning and hybrid AI models demonstrate superior adaptability to changing network conditions, resulting in prolonged network lifetime and balanced energy consumption.

Performance Metrics Discussion

Simulation-based evaluations reported in the literature commonly measure performance using metrics such as residual energy, first node death (FND), half node death (HND), throughput, and packet delivery ratio. AI-based clustering protocols have been shown to improve network lifetime by approximately 20–40% compared to conventional LEACH-based methods, particularly in heterogeneous and dynamic WSN scenarios.

Challenges and Future Research Directions:

Despite their advantages, AI-based clustering approaches face several challenges. Computational overhead and memory requirements may exceed the capabilities of resource-constrained sensor nodes. Scalability and real-world deployment remain open research issues, as most studies rely on simulation environments. Future research should focus on lightweight AI models, distributed and federated learning approaches, and integration with edge computing to enhance practicality.

Conclusion:

This paper reviewed the application of Artificial Intelligence techniques for energy optimization in Wireless Sensor Networks through clustering. AI-driven approaches—including machine learning, reinforcement learning, and swarm intelligence—offer adaptive and intelligent solutions that significantly outperform traditional clustering methods. While challenges related to complexity and deployment remain, continued advancements in lightweight and scalable AI models are expected to play a crucial role in the development of energy-efficient WSNs.

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INSTITUTIONAL ACCREDITATION CHALLENGES AND ITS EFFECT: A STUDY OF NAGPUR AND AMRAVATI REGION

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Abstract:

The role of institutional accreditation in the Indian higher education context is extremely important as a quality assurance parameter. In the present paper, the authors will explore the accreditation of higher education institutions (HEI) in the Nagpur and Amravati areas of the state of Maharashtra and apply a comparative statistical methodology to this subject. The situation at the moment demonstrates a major lack of Accreditation Gap: on the one hand, Nagpur district demonstrates a greater concentration of NAAC-accredited colleges (104 of 194), and on the other hand, the lack is evident in rural areas and in technical courses, that is, those in need of NBA accreditation. Among the major structural and administrative issues, which are identified in the study, are lack of financial resources, high faculty turnover rates, and the complicated documentation requirements of the Revised Accreditation Framework. Moreover, a geographical divide is also present, in which urban-focused institutions are able to use superior infrastructure to obtain better grades, and the rural HEIs in areas such as Gadchiroli and Washim can barely be able to pass inspection. The results imply that the Paris Sparsh mentorship program in the state is critical but needs to be enhanced on the local level. The study offers a policy guide on how the policy makers can bridge the quality gap in order to maintain fair academic quality in the various educational ecosystems of Vidarbha.

Keywords: Government Policy, Role of University, Role of Institutes, Effect on Non Accreditation Institutes, Effect of Non Accreditation.

Introduction:

In India, quality assurance is a reliance on institutional accreditation in higher educational institutions, which performs as an official legitimization of institutions and academic values and excellence (NAAC, 2023). The Nagpur and Amravati divisions in Maharashtra are a special case study as they have

varied educational topography comprising of urban hubs, semi-urban areas and majorly rural districts. However, recent statistics show that there is a strong accreditation gap in Vidarbha with Nagpur district having 104 NAAC-accredited colleges of 194 colleges, but Amravati division is considerably lower in terms of accreditation coverage of these colleges, especially in rural districts like Gadchiroli, Washim, and Akola (Maharashtra Higher Education Department, 2024). This derailment shows the imbalance of quality assurance tools and indicates the problem of geographical and infrastructural disadvantage of non-metropolitan institutions.

One of the main structural issues is insufficient funding, which limits the establishment of the infrastructure of laboratories, libraries, and faculty support services to comply with the accreditation standards (Joshi and Deshmukh, 2022). All this is compounded by high vacancy rates on teaching and administrative posts, thus complicating the process of colleges meeting the demanding documentation and reporting requirements of the NAAC Revised Accreditation Framework (RAF) and NBA standards of technical programs (Patil, 2023). Also, it is possible that urban-based institutions in Nagpur and Amravati urban areas use advantageous infrastructure and mentoring networks to score better accreditation grades, whereas rural HEIs cannot meet even minimum standards (Shinde& Kale, 2021).

The Paris Sparsh mentorship program of the state designed to help institutions to pass through accreditation exercises has proven successful, but the benefits are not evenly distributed with the rural districts getting little on-ground assistance (MHRD, 2023). To close the quality gap, a variety of suggestions are put forward by policymakers to enhance local mentoring, offer special financial support, and focus on the faculty recruitment in lower-quality areas. Through the resolution of these systemic and administrative challenges, Maharashtra will be able to make accreditation not a symbolic declaration, but a catalyst to fair academic growth throughout the Vidarbha higher education universe (Rao, 2022).

In Nagpur and Amravati division, the accreditation of HEIs is a complicated combination of infrastructure, administrative capability, and geographic difference. To attain the balanced quality assurance, strategic interventions are necessary to promote the inclusive education growth in Maharashtra.

Government Policy

In Maharashtra, institutional accreditation is encouraged by the Government of Maharashtra as a prerequisite to grant, admission, and autonomy. These policies focus on harmonizing academic quality in the state. The Nagpur and Amravati divisions, however, have uneven implementation,

late financial aid and local mentoring, which reduce the participation of institutions. Despite the awareness campaigns such as Paris Sparsh, the policy cannot be effectively implemented due to the regional disparity especially in the rural and semi-urban institutions.

Role of University

Universities play the role of intermediaries by instructing, managing, and directing associated colleges in the process of accreditation. Nonetheless, their efficacy is diminished by administrative overload, poor accreditation cells and inadequate follow up. This is leading to institutional ill preparedness particularly in rural colleges which has led to low coverage of accreditation and disparate quality assurance in the region.

Role of Institutes

The main activities of institutes in the attainment of accreditation are the enhancement of governance, academic planning, faculty development, and infrastructure. In Nagpur and Amravati divisions, the lack of faculty, the poor digital documentation, and the poor financial autonomy impede the progress. The lack of proper Internal Quality Assurance Cells further limits on continuous improvement. Accreditation has thus become a formality as opposed to quality development process.

Impact on Non-Accredited Institutions.

Institutions that are not accredited in Maharashtra have limited grants, admissions, funding of research as well as academic freedom and loss of reputation. The difference in the quality of urban and periphery institutions is enhanced by the fact that the rural colleges in the Nagpur and Amravati divisions are hit disproportionately. In the long term, the lack of accreditation will decrease student demand, faculty turnover, and institutional stagnation, undermining the development of higher education in the region and the quality of access to education.

Effect of Non Accreditation

The lack of NAAC/ NBA recognition poses a major constraint to non-accreditated institutes in Maharashtra by direct influence on their academic and administrative operations. These institutions are not open to government grants, development fund or quality improvement schemes that are offered by the State and Central Governments. They are not given academic freedom, approval of new course and upsurge in the admission of students. Research funding and innovation grants, as well as faculty development programs are also limited. Also, non-accredited institutes experience diminished student admissions, ineffective collaboration with the industry, fewer scholarships, and loss of reputation, which in the long run have impact on the growth and sustenance of the institution.

Difficulties under Non Accreditation.

The Nagpur and Amravati divisions of the institutions are having numerous challenges to attain and maintain accreditation. On a structural level, the lack of proper infrastructure, financial resources, and absence of digital facilities make it difficult to adhere to NAAC standards. Administratively, documentation and quality assurance processes are influenced by the lack of trained personnel in the accreditation, weak governance and faculty shortages. Low research rate, faculty development, and industry connectivity means that the performance indicators are lower, especially in the rural and semi-urban institutions.

Challenges Rural Institutes encounter in the Accreditation.

i. **Inadequate Infrastructure:** In rural institutes, they do not have properly equipped laboratories, modern libraries, smart classrooms, and digital learning places. The lack of good internet connectivity also contributes to noncompliance with the ICT-based accreditation requirements.

ii. **Financial Constraints:** Majority of the rural colleges rely on the government funding that tends to be inadequate or slow. The low production of internal revenue limits the investment in infrastructure, research and quality improvement activities.

iii. **Faculty Problems of Shortage and Retention:** The high vacancy rates, the use of staff on contract basis, and the lack of qualified faculty negatively impact on the teaching quality, research output, and faculty development indicators.

iv. **Poor Parent Bureaucracy:** Absence of qualified personnel in the administrative side and skills in accreditation lead to ineffective operation of Internal Quality Assurance Cells (IQACs) and poor documentation and data management.

v. **Low Research Output:** As a result of poor accessibility to research funding, academic networks and institutional support rural institutes have low rates of publications, patents as well as innovation activities.

vi. **Limited Industry Linkages:** Geographical remote location limits cooperation with industries, including internships, placements, MoU, and employability outcomes needed to achieve accreditation.

vii. **Inadequate Access to mentoring and training:** The awareness programs on accreditation and mentoring programs are usually limited in the remote districts and the institutes end up without guidance.

viii. **Low Accreditation Grade Fears:** Most of the rural institutes are reluctant to seek accreditation because of the fear of low grades, tarnished reputation and decreased admissions.

ix. **Geographical and Social Constraints:** The geographical distance, transport challenges, and poor exposure to best practice further alienate the rural institutes to quality improvement programs.

x. **Compliance-Oriented Approach:** The accreditation is commonly considered as a compulsory task and not a constant quality improvement cycle, which restricts the institutions development in the long term.

Literature Review

Institutional accreditation has emerged as a central mechanism for quality assurance in Indian higher education, with the National Assessment and Accreditation Council (NAAC) playing a pivotal regulatory role. Several scholars have examined accreditation patterns in Maharashtra, consistently highlighting significant regional disparities. Singh and Bhatt (2025) demonstrate that although Maharashtra performs relatively well at the state level, divisions such as Nagpur and Amravati remain underrepresented in accreditation outcomes due to infrastructural inadequacies and uneven institutional preparedness.

The Revised Assessment and Accreditation Framework (RAF) has further intensified these challenges. Trivedi (2024) argues that the shift toward data-driven, outcome-based metrics disproportionately affects rural and semi-urban institutions, which lack robust digital systems and trained administrative staff. This issue is reflected by Ahluwalia (2024) who discovers an increasing disconnect between accreditation opportunities and institutional capacity, especially in affiliated colleges in non-metropolitan areas.

From a policy perspective, Karnwal (2024) positions accreditation as a transformative tool for institutional development but cautions that its benefits remain unevenly distributed. Institutions in economically weaker regions, such as Vidarbha, struggle to sustain quality benchmarks due to chronic faculty shortages, limited research output, and financial constraints. National-level analyses by Singh, Dutta, and Soodan (2025) further substantiate these findings, noting that regional inequities significantly influence NAAC grading outcomes.

This regional description is reinforced by empirical evidence provided by educations based on the media. Reports by the Times of India (2023) reveal that only a small proportion of Nagpur University–affiliated colleges possess valid NAAC accreditation, while many institutions deliberately avoid assessment due to fear of poor grades. Pandit (2025) similarly highlights administrative delays and lack of mentoring support as major deterrents across Maharashtra, with pronounced effects in Nagpur and Amravati divisions.

While recent policy initiatives and incentives have contributed to an increase in accredited institutions (Economic Times, 2024), the literature

collectively indicates that numerical growth has not translated into equitable quality enhancement. Notably, existing studies tend to emphasize state-level trends, leaving a critical research gap in division-specific, data-driven analyses of accreditation challenges in Vidarbha

Objectives:

i. To examine the current accreditation status of higher education institutions in the Nagpur and Amravati divisions of Maharashtra.

ii. To identify and analyze the major structural, administrative, and academic challenges faced by institutions in Nagpur and Amravati divisions in achieving and sustaining accreditation.

iii. To determine the impact of institutional accreditation and non-accreditation on academic excellence, institutional progress and stakeholder participation.

Data Collection:

Secondary Data: Collected from various regulatory bodies and accreditation reports.

Data Analysis:

District / Region	**Total Colleges**	**NAAC Accredited (Active + Valid)**	**No NAAC Accreditation / Not Yet Accredited**
Nagpur District	194 (Approx.)	104	90
Amravati Region	142 (Approx.)	70	72
Estimated Total	**336**(Approx.)	**174**	**162**

Table 1: Total number of non-accredited colleges in Nagpur and Amravati Region

Region	**Not Yet Accredited**
Nagpur	405
Sambhaji Nagar	331
Panvel	266
Pune	263
Jalgaon	57
Solapur	36

Table 2: and Graph 1: Number of Institutes not accredited in MH

Source: The Indian Express

The data reveals a significant accreditation gap across the Nagpur and Amravati regions. In Nagpur district, only 104 out of 194 colleges are NAAC accredited, leaving 46% without accreditation. Similarly, the Amravati region shows a nearly equal split, with 70 accredited and 72 non-accredited colleges, indicating weaker accreditation penetration. Overall, 162 out of 336 colleges remain non-accredited, reflecting systemic challenges. Region-wise estimates further show Nagpur having the highest number of non-accredited colleges, highlighting urgent quality assurance and policy intervention needs.

Conclusion:

The study highlights a persistent accreditation gap in the Nagpur and Amravati divisions, driven by structural inadequacies, administrative constraints, and academic limitations, particularly in rural institutions. While government policies and initiatives like Paris Spars have improved awareness, uneven implementation and limited institutional capacity hinder outcomes. The findings emphasize that accreditation must move beyond compliance to become a developmental mechanism. Targeted policy support, strengthened university mentoring, and institutional commitment are essential to achieve equitable quality assurance and inclusive higher education development across Vidarbha.

Suggestions to Regulatory Bodies

To support non-accredited institutes, the government should adopt a supportive–corrective approach rather than only regulatory pressure.

i. First, targeted financial assistance and special grants should be provided to rural and semi-urban colleges for infrastructure, ICT facilities, and laboratories.
ii. Second, district-level accreditation mentoring cells with trained experts should be strengthened to guide institutes through NAAC/NBA processes.
iii. Third, faculty recruitment drives and incentives must be prioritized in under-accredited regions.
iv. Simplified documentation provision, gradual accreditation schedules and continuous capacity-building programs will facilitate staged accomplishment and maintaining accreditation standards in institutes.

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ROLE OF ARTIFICIAL INTELLIGENCE IN HIGHER EDUCATION

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Abstract:

In today's scenario use of AI is increase in teaching, learning and evaluation, in teaching teacher can easily access the content what they want, student is also easily access the content what they want even to the use of AI administrative work is easy as the use of AI data can be calculated and compare easily, evaluation process is also easy due to AI as we can say that by the use of AI in education we can save our time and efforts, which can be used for other work, this research paper is to highlight the Role of Artificial Intelligence in Higher Education.

Keywords: Artificial Intelligence, Higher Education

Introduction:

AI, or Artificial Intelligence, refers to computer systems designed to perform tasks that typically require human intelligence, like learning, problem-solving, understanding language, recognizing patterns, and making decisions, often by processing large amounts of data to simulate human-like reasoning. In short we can say that AI is a technology like computer assisted instruction to push a right button to get a desired result with limited time and accuracy.

Role of Ai in higher education now a days is increasing day by day by personalizing learning through adoptive tools, automatic administrative task like grading for efficiency and efficient evaluation with real time analysis and immediate feedback, calculate the thousand of figure, with comparative analysis, letter writing content, a search engine which provide the customized information in ready form, that's why the role of Ai in education is increase day by day. As the students, teachers, and the concern parties get the information what they required within a second and in a systematic manner which save their time and efforts.

AI Powered Personalized Learning:

Personalized learning facilitated by AI we can make educational content to meet the needs of each students, by compare and analyzing the data of students interaction performance and preferences.

1. Identify Strength and Weakness: As through AI it is easy to identify the strength and weakness of a particular students on the basis of that we can make personalized program and content for the students as per their performance which helps to in-depth learning for the students on target basis, which get immediate feedback which helps to understand whether the particular students learn the content in the same sense that we are communicated.

2. Customized Learning Plan: AI helps to develops customized study plan focusing as per the needs and requirement of a particular or targeted students who are required the needs for improvement.

3. Provide Immediate Feedback: AI helps to offer real time assessment and feedback on the basis of computer assisted software.

Such type of personalization fosters a more engaging and more effective learning environment.

Virtual Classroom and Ai Tutors

AI Tutors: Institution like Physics Wala introduce AI Tutors online by online education to students and AI Guru providing education to students provide assistance to students 24/7 these tutors offer support not only in academics but also beyond the academics they also offer career guidance and career counseling as per the needs and requirement of the students.

Interactive Learning Environment: AI facilitated interactive learning process they provide virtual classroom where students can interact with one another participate in different brainstorming games, conversation with one another, group discussion with no geographical boundaries. In short we can say that they can freely interactive learning virtually.

AI in Assessment and Grading

1. Automated Grading System: AI powered tools can evaluated assignment and exam efficiently and effectively providing objective grading system. This reduced the workload on teachers and teachers can get feedback immediately.

2. Detailed Feedback Generation: With the help of Ai we can generate detailed feedback on the basis of that we have to prepare a comparative statement, find out fast learner and slow learner which help to plan a policy for different learner on target basis.

3. Bias Reduction: AI helps to reduce bias decision, which is not possible by human, as many person take bias decision or on favor to few students, as there is no scope of favor if we use of AI in teaching, learning and evaluation process.AI is important particularly in evaluation process.

Role of AI I Teaching, Learning and Evaluation:

Teaching:

Content Creation:

As Ai helps to generate customized learning material like video lectures, quiz, group discussion which helps the teaching learning process easy and effective.

Virtual Teaching Assistant:

With the help of AI we can prepare frequently asked question and answer which help a many learner at a time which reduce the efforts of repeatedly answer of particular question. AI also helps a model question paper and answer book which helps the students quick and easily.

Classroom Analysis:

Ai helps to analysis of performance of different students date wise and topic wise which helps the teacher to find out the performance of students date wise and topic wise and also helps to find out slow learner and fast learner, which help the teacher to developed strategy for slow learner and fast learner students.

Learning:

AI makes available the content in easy and understandable language along with video lecture and group discussion, live example, which helps the learning easy.

Evaluation:

With the help of AI teacher can make automated assessment system, with the help of Ai teacher can make various MCQ and feedback system which they receive immediate responses of students along with feedback on the basis of that he can make changes as per the requirement of students feedback.

Benefit of AI in Education

Improved outcome:

With the help of AI teacher can make comparative analysis of teaching learning process which helps him to focus more on a particular topic set a parameters for slow learner and fast learner set different goals for slow learner and fast learner which help him to make teaching learning and evaluation process more effective.

Increase Efficiency:

AI automated generate the required data with comparative statement as per the requirement for example weekly monthly quarterly which helps the teacher find out the performance of student as per the needs and requirement and helps to decide future lesson plan as per the performance of the students.

Enhance Engagement:

AI tools make the teaching learning process is more effective and efficiently with no geographical limitation which helps the student to interact nationally of internationally through seminar, lectures, group discussion webinar etc. which helps to developed their personality.

Challenges & Ethical Concern of AI in Education

Data Privacy: as we have to collect a lot of data related to students like survey feedback and in many times personal information also, a there is a continuous threats misuse of data by some people for their personal gain so data security is the main concern in the use of AI.

Dependence of Technology: as AI helps us beyond imagination AI provides whatever information what we want and we can say that as per our requirement we get the desired information as and when required, but we should totally depend on technology even students also depends on technology and their thinking power and imagination power are weak and they are totally depends on the technology which is not good for any country.

Job Displacement: as AI did the job of automated generated information with more comprehensive pattern which actually need by the people in education field it may lead to job losses administrative and supporting staff.

Conclusion:

On the basis of above discussion we know the needs and importance of AI in education, as we can say that Ai provide many information in as per requirement of the respondent, in addition comparative statement, content which definitely helps human to perform their task in effective and efficient manner, AI can improve the accuracy and speed of task reducing the risk of human errors, apart from this advantages careful thoughts to what extends AI should used as we can say that we have to fixed the limit of use of AI, if not we have to lost a lot of creative mind of young generation as we cannot totally depends on AI, p[particular I India as we have more talented young generation who have lot of ideas and creative minds, and have a solution for any critical problem. In simple wards it has to be suggested that definitely AI is useful but excessive use of AI is not suitable for India.

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THE STUDY OF USE OF ARTIFICIAL INTELLIGENCE (AI) IN HIGHER EDUCATION COLLEGES IN MADHYA PRADESH WITH SPECIAL REFERENCE TO ATASH COLLEGE OF MANAGEMENT & TECHNOLOGY, PANDHURNA M.P.

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Abstract:

AI has emerged as a tool in education, teaching, learning, and administration in higher education institutions (HEIs) worldwide. This study explores how AI tools and practices are being adopted in HEIs in Madhya Pradesh, India, with special focus on Atash College of Management & Technology in Pandhurna. The research explains current trends, benefits, challenges, and the potential implications for education quality, pedagogy, and student outcomes.

Keywords: Artificial Intelligence Higher Education.

Introduction:

Artificial Intelligence (AI) refers to systems and software capable of performing tasks that normally require human intelligence, such as problem-solving, language processing, and personalized recommendations. In education, AI enhances learning experiences, supports administrative tasks, and introduces data-driven decision-making. Recent national reports indicate rapid integration of AI tools across Indian higher education.

In the context of **Madhya Pradesh**, a largely diverse and semi-urban educational state, HEIs face unique challenges and opportunities in adopting AI. This paper focuses on understanding the extent and nature of AI use in HEIs in MP, with a **case study on Atash College of Management & Technology, Pandhurna.**

Literature Review:

AI Adoption in Indian Higher Education

Recent studies show that **over 60 % of higher education institutions in India now permit students to use AI tools**, and more than half use AI to develop learning materials. Key applications include AI-powered tutoring,

chatbots, adaptive learning systems, and automated assessment. AI in Indian HEIs is advancing from isolated pilots to more integrated practices—such as automated grading, plagiarism detection, curriculum support, and digital content creation. However, these advancements also bring challenges related to policy, governance, ethics and digital skills.

Conceptual Perspectives

Academic research in AI and education highlights the need for ethical frameworks and governance to ensure AI enhances learning without compromising equity or academic integrity. AI research frameworks emphasize human-centric design and ethical oversight to support equitable and transparent AI use in HE.

Methodology:

Data collectedfrom Atash College, this study uses a **mixed exploratory approach** combining:

- **Secondary research** on national and state trends in AI in higher education.
- **Institution profiling** via educational directories and institutional data.
- **Qualitative insights** into potential AI adoption paths and related teacher training initiatives.

This exploratory method helps situate Atash College within broader AI adoption patterns in Indian HEIs.

Profile Of Atash College Of Management & Technology:

Atash College Of Management and Technology is a **private affiliated higher education college in Pandhurna, district, Madhya Pradesh**, established in 2004 and affiliated with Dr. Harisingh Gour Vishwavidyalaya, Sagar and recognised by Govt. of M.P. and U.G.C. It offers a range of UG and PG programs.

The institution has infrastructure that includes computer labs, science labs, library facilities, and academic support centers, making it suitable for integrating AI-related tools into teaching and learning processes. Additionally, opportunity exists for teacher training linked to AI application in teaching—programs such as the **AI Teacher Training Certification** show ways in which faculty could apply tools like ChatGPT, Google Gemini, or Microsoft Copilot to everyday academic tasks (lesson planning, question generation, assessment support).

AI in Higher Education – Trends, Use Cases & Impact:

National Trends in India

- **AI Tools Usage:** Over 60 % of HEIs now permit student use of AI tools.

- **Generative AI:** More than half use generative AI for creating learning materials.
- **Application Areas:** AI is employed for tutoring systems, chatbots for student support, adaptive learning systems tailoring content, automated grading, and curriculum design assistance.

These tools enhance learning by providing personalized support, quick feedback, and adaptive educational pathways, fostering more student-centric teaching. However, institutions must balance innovation with clear policies governing AI use, ethics, and data privacy.

Benefits of AI in HEIs

Pedagogical Gains

- Personalized learning paths tailored to student performance and pace.
- AI-assisted content creation enabling rich, diversified course material.

Administrative Efficiency

- Automated grading and attendance solutions free faculty time for mentoring.
- AI chatbots and virtual assistants enhance student support services.

Skill Development

- Exposure to AI tools prepares students for future jobs and industry 4.0 skill demands.

Potential Challenges:

Despite benefits, HEIs in MP and in India face several challenges:

- **Digital infrastructure gaps** (connectivity, hardware, software access)
- **Faculty digital literacy**—teachers need structured training for effective AI use
- **Policy and governance**—ethical frameworks for AI use in assessment and student data management
- **Equity concerns**—ensuring AI tools benefit all student groups equally

These issues highlight the need for strengthening digital strategies and capacity development plans at institutional levels.

Discussion – Implications for Atash College, Pandhurna:

Atash College could benefit from AI implementation in areas such as:

- **Curriculum enhancement and content generation** for all programs.
- **AI-assisted learning labs** encouraging students to engage with practical tools.
- **Faculty development** through structured teacher training programs.

- **AI-based academic support systems** for tutoring, feedback, and administrative functions.

While formalized use of AI at the college is not widely documented, **teacher training opportunities** and digital infrastructure suggest promising potential for phased AI adoption and experimentation.

Conclusion:

AI adoption in Indian higher education is advancing rapidly, transitioning from pilot experimentation to substantive classroom and administrative integration. Over 60 % of institutions permit AI tool usage, and many are using generative and adaptive systems to enhance teaching, learning, and governance.

For colleges like Atash College of Management & Technology in MP, structured AI strategy—combining infrastructure development, faculty training, and responsible governance—can meaningfully improve educational quality and student outcomes.

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THE STUDY OF AI-ENABLED TEACHING, LEARNING AND ASSESSMENT

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Abstract:

Artificial Intelligence (AI) is emerging as a transformative force in education. This paper explains the application of AI in teaching, learning, and assessment, outlining its benefits, challenges, ethical concerns, and future potential. By analysing available literature and identifying key components of AI integration, the study highlights how AI can support personalized learning, improve instructional quality, enable real-time assessment and support decision-making for educators. Ethical and technical challenges, including bias, digital divide and are examined. The paper concludes with recommendations for integrating AI responsibly and effectively into educational systems.

Keywords: Artificial Intelligence, Teaching and Learning

Introduction:

The educational has continuously evolved with technological advancements. Artificial Intelligence (AI) has generated significant interest due to its potential to revolutionize teaching, learning, and assessment. AI technologies such as machine learning, natural language processing and intelligent tutoring systems offer capabilities to learning to individual needs, automate administrative tasks and increase student outcomes.

The objective of this research is to explore how AI is transforming education, the pedagogical implications of its implementation, and the challenges and ethical considerations that must be addressed to ensure equitable, effective and responsible use.

Artificial Intelligence in Education:

AI refers to computer systems that perform tasks normally requiring human intelligence. In education, AI aims to support human educators, not replace them. Historical developments from early adaptive testing systems to modern neural networks have emphasized personalized learning and automation.

Drivers for AI Adoption in Education

Several factors drive AI adoption:

- Increasing learner diversity and needs
- Demand for personalized learning experiences
- Administrative workload on educators
- Global expansion of online and blended learning

AI responds to these drivers by offering scalability, adaptability and real-time insights.

AI-Enabled Teaching

Intelligent Tutoring Systems (ITS)

Intelligent Tutoring Systems works as AI tools that provide personalized instruction based on learner responses. These systems adapt content, pacing, and feedback to each learner, similar to one-on-one tutoring.

Examples & Impact:

- Immediate feedback accelerates learning.
- Learners progress at their own pace.
- Data analytics help educators understand learning patterns.

AI In Lesson Planning and Content Delivery

AI supports teachers by generating lesson ideas, optimizing content sequencing, and recommending resources based on learning objectives and student profiles.

Benefits:

- Saves time on curriculum design.
- Ensures alignment with standards.
- Uses data to predict student engagement.

Virtual and Augmented Reality with AI

Immersive environments powered by AI create experiential learnings. AI analyses student interaction within these conditions and to cop up challenges.

Ai-Enhanced Learning

Personalization and Adaptive Learning

AI systems analyse learner data (performance, time on task, response patterns) to personalize instruction. Adaptive learning platforms restructure content based on competencies.

Outcomes:

- Better engagement due to tailored learning paths.

- Efficient mastery of skills.
- Reduced achievement gaps.

Natural Language Processing in Learning

Applications like AI chatbots and writing assistants help learners practice language skills, receive instant feedback, and clarify doubts.

Use Cases:

- Feedback on essays.
- Conversational practice in foreign languages.

Collaborative AI Tools

AI facilitates collaborative learning by grouping students based on learning styles, predicting productive partnerships, and tracking group dynamics.

AI-Based Assessment

Automated Grading Systems

AI systems now enable automated grading of objective and, increasingly, subjective assessments like essays. These systems use NLP and machine learning to evaluate content quality.

Advantages:

- Reduces teacher workload.
- Provides instant feedback to students.
- Enables frequent low-stakes assessment.

Real-Time Formative Assessment

AI dashboards suggest real-time insights into student progress, alerting teachers to misconceptions and suggesting interventions.

Impact:

- Timely support for struggling learners.
- Data-driven instruction.

Predictive Analytics and Learning Analytics

AI analyses historical and real-time data to predict outcomes such as areas of struggle enabling proactive support or risk of failure.

Case Studies and Applications

Intelligent Tutoring in Mathematics

Research suggests ITS can improve achievement compared to traditional instruction by offering step-by-step guidance and feedback.

Language Learning AI (E.G., Chatbot-Based Tools)

Language learners benefit from conversational AI that gives interactions, correcting pronunciation and grammar.

AI for Assessment in Higher Education

Universities use AI to conduct plagiarism checks, analyse exam responses, and provide adaptive quizzes tailored to mastery levels.

Benefits of AIin Education

Personalization

AI provides personalized instruction, addressing diverse learning needs and pacing differences.

Efficiency and Scalability

AI automates grading, administrative tasks, and content recommendation saving time for educators.

Data-Driven Decision Making

AI analytics help educators identify learning patterns, detect gaps and optimize instruction.

Learner Engagement

Interactive AI tools (games, simulations, chatbots) boost motivation and participation.

Challenges and Limitations

Ethical Concerns

Privacy and Data Security

AI systems require intensive data collection, raising concerns about storing and using sensitive student information.

Bias and Fairness

Algorithms trained on biased data can perpetuate inequities, disadvantaging certain learner demographics.

Technical Limitations

AI models may be inaccurate, opaque, or fail in unpredictable educational contexts. There's also a risk of overreliance on technology.

Teacher Training and Adoption

Effective AI integration requires professional development. Many educators lack the skills and confidence to use AI tools meaningfully.

The Digital Divide

Not all learners have equal access to devices, internet, and AI-enabled platforms potentially widening educational inequalities.

Ethical Frameworks and Guidelines

To address ethical challenges, educators and policymakers must adopt frameworks that prioritize:

- **Transparency**: Users understand how AI makes decisions.
- **Accountability**: Human educators remain central in decision-making.
- **Equity**: AI systems are evaluated for fairness and bias mitigation.
- **Privacy**: Student data collection follows strict consent and security standards.

Policy and Implementation Considerations

Effective AI adoption involves policy strategies such as:

- **Infrastructure Investment**: Ensuring reliable internet and devices.
- **Standards and Interoperability**: Promoting open platforms and data standards.
- **Professional Development**: Training educators to use and interpret AI tools.
- **Continuous Evaluation**: Monitoring AI's impact on equity, learning outcomes, and classroom practices.

Future Trends

Emerging directions in AI and education include:

- **Explainable AI (XAI)**: Making AI decisions understandable to educators.
- **Emotion-Aware Systems**: Detecting learner affect to adapt instruction.
- **AI-Enhanced Collaborative Platforms**: Supporting teamwork with AI facilitation.
- **Lifelong Learning Assistants**: Personal AI tutors across learners' educational journeys.

Conclusion:

AI has the potential to significantly increase teaching, learning, and assessment by personalizing instruction, automating tasks, and providing insights that improve educational outcomes. However, realizing this potential requires careful attention to ethical design, equity, and humancentred implementation. Educators, technologists, and policymakers must work collaboratively to ensure AI supportsnot to replacethe core human elements of education.

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THE USE OF ARTIFICIAL INTELLIGENCE IN THE TEACHING OF GEOGRAPHY AT THE MASTER OF ARTS LEVEL

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Abstract :

Artificial Intelligence (AI) is increasingly influencing higher education by reshaping teaching methodologies, learning experiences, and academic research. Geography, as a discipline that integrates spatial analysis, environmental studies, and human–environment interactions, stands to benefit significantly from AI-driven tools and technologies. This paper examines the role of Artificial Intelligence in teaching Geography at the Master of Arts (MA) level. Using a qualitative and conceptual research approach, the study analyses existing literature, educational practices, and technological applications relevant to AI in geographic education. The findings suggest that AI enhances spatial data analysis, supports personalized learning, enables intelligent tutoring, and provides innovative virtual fieldwork experiences. At the same time, challenges related to infrastructure, ethical concerns, faculty preparedness, and digital inequality remain significant. The study concludes that AI, when thoughtfully integrated, can substantially enrich MA-level geography education by fostering higher-order thinking, analytical skills, and interdisciplinary learning. Recommendations for curriculum integration and future research are also provided.

Keywords: Artificial Intelligence, Geography Education, Higher Education, Master of Arts, GIS, Educational Technology

Introduction:

The rapid advancement of Artificial Intelligence (AI) has brought transformative changes across multiple sectors, including education. Higher education institutions worldwide are adopting AI-driven technologies to enhance teaching, learning, assessment, and research. Geography, as a multidisciplinary field that relies heavily on data analysis, spatial reasoning, and environmental modelling, is particularly well suited to benefit from AI

integration. At the Master of Arts (MA) level, geography education emphasizes advanced theoretical understanding, critical analysis, research methodology, and applied skills such as Geographic Information Systems (GIS), remote sensing, and spatial modelling. Traditional pedagogical approaches—lectures, seminars, fieldwork, and map-based analysis—remain central but face limitations in addressing diverse learning needs, managing large datasets, and simulating complex geographic phenomena. Artificial Intelligence offers innovative solutions to these challenges. AI technologies such as machine learning, natural language processing, intelligent tutoring systems, and predictive analytics can support both teaching and learning processes. These tools enable personalized learning experiences, automated feedback, advanced spatial analysis, and virtual simulations, thereby enhancing the academic rigor of MA-level geography programs. This paper aims to explore the use of Artificial Intelligence in the teaching of Geography at the Master of Arts level. It examines theoretical foundations, pedagogical applications, benefits, challenges, and future prospects of AI integration. By synthesizing existing research and educational practices, this study contributes to understanding how AI can support advanced geography education while maintaining academic integrity and inclusivity.

Artificial Intelligence in Education:

Artificial Intelligence refers to the capability of machines and computer systems to perform tasks that typically require human intelligence, such as learning, reasoning, problem-solving, and decision-making (Russell & Norvig, 2021). In the context of education, AI is used to design systems that adapt to learners' needs, analyze learning data, and support instructional decision-making.

Types of AI Used in Education:

AI in education can be broadly categorized into the following types:

- **Machine Learning (ML):** Algorithms that identify patterns in data and improve performance over time.
- **Natural Language Processing (NLP):** Enables systems to understand, interpret, and generate human language.
- **Intelligent Tutoring Systems (ITS):** Provide personalized guidance and feedback to learners.
- **Learning Analytics and Predictive Modeling:** Analyze student performance data to identify learning trends and risks.

These AI technologies form the foundation for applications in geography education, particularly in spatial analysis, data interpretation, and research-oriented learning.

Literature Review:

- **AI in Higher Education**

Research on AI in higher education highlights its potential to improve student engagement, learning outcomes, and institutional efficiency. According to Holmes et al. (2019), AI supports adaptive learning environments that cater to individual learning styles and academic progress. Automated assessment and feedback systems reduce faculty workload while providing timely responses to students.

Several studies emphasize the role of AI in promoting self-directed learning and critical thinking, particularly at the postgraduate level. However, concerns regarding data privacy, algorithmic bias, and over-reliance on technology are frequently noted (Selwyn, 2020).

- **Geography Education at the Postgraduate Level**

Postgraduate geography education focuses on advanced conceptual understanding and research skills. GIS, remote sensing, climatology, urban studies, and environmental management are core components of MA geography programs. These areas involve complex datasets and analytical techniques, making them ideal candidates for AI-supported instruction (Goodchild, 2018).

Traditional teaching methods often struggle to provide individualized attention or real-time analytical feedback. This gap has encouraged educators to explore digital and AI-based solutions.

- **AI and Geographic Information Science**

Geographic Information Science (GIScience) has increasingly adopted AI techniques such as machine learning and neural networks for spatial pattern recognition, land-use classification, and environmental modeling. Studies show that AI-based GIS tools enhance accuracy and efficiency compared to conventional methods (Li et al., 2020).

Applications of AI in Teaching Geography:

- **AI in Spatial Data Analysis**

One of the most significant contributions of AI to geography education is in spatial data analysis. Machine learning algorithms assist students in analyzing satellite imagery, identifying land-use patterns, and modeling environmental changes. These tools allow MA students to engage with real-world datasets and develop advanced analytical skills.One of the most prominent applications of AI in geography education is its integration with Geographic Information Systems (GIS). Machine learning algorithms are used to process large spatial datasets, detect patterns, and generate predictive models. AI assists MA students in tasks such as land-use and land-cover classification, spatial clustering, and environmental risk assessment.AI-enabled

GIS tools allow students to analyze satellite imagery and geospatial data with greater accuracy and efficiency. This application not only strengthens technical skills but also enhances students' ability to interpret complex spatial relationships, which is essential for advanced geographic research.

- **Personalized Learning and Adaptive Systems**

AI-driven learning platforms adapt content delivery based on student performance and learning pace. This personalization is particularly beneficial in MA programs, where students often have diverse academic backgrounds. Adaptive systems help bridge knowledge gaps and support independent learning.

- **Intelligent Tutoring and Assessment**

Intelligent tutoring systems provide real-time feedback on assignments, research proposals, and data interpretation tasks. Automated assessment tools evaluate quizzes, map exercises, and analytical reports, enabling faculty to focus on higher-level mentoring and research supervision.

- **Virtual Fieldwork and Simulations**

Fieldwork is a core component of geography education but is often constrained by cost, accessibility, and environmental factors. AI-powered virtual simulations allow students to explore geographic landscapes, climate models, and urban environments in immersive digital settings. These tools complement traditional fieldwork and enhance experiential learning.

Benefits of AI in MA-Level Geography Education:

- **Enhanced analytical capabilities:** AI supports complex spatial analysis and modeling.
- **Improved student engagement:** Interactive tools increase motivation and participation.
- **Skill development:** Students gain technological and data literacy skills relevant to modern careers.
- **Research support:** AI assists in literature review, data analysis, and hypothesis testing.

These benefits align with the learning objectives of MA geography programs, which emphasize critical inquiry and applied knowledge.

Challenges and Ethical Considerations: SSS

Despite its advantages, AI integration presents notable challenges.

- **Infrastructure and Accessibility**

Many institutions lack the technological infrastructure required to implement AI tools effectively. Limited access to software and high-speed internet can exacerbate educational inequalities

- **Faculty Training**

Effective AI integration requires faculty members to develop technological competencies. Lack of training and resistance to change may hinder adoption.

- **Ethical Issues**

Ethical concerns include data privacy, surveillance, algorithmic bias, and academic integrity. Institutions must establish clear policies to ensure responsible AI use in education (Floridi et al., 2018).

Conclusion:

AI should be viewed as a pedagogical aid rather than a replacement for educators. In MA-level geography teaching, the role of the instructor remains central in guiding research, facilitating critical discussion, and contextualizing AI-generated insights. When integrated thoughtfully, AI enhances traditional teaching methods and supports deeper learning. Artificial Intelligence has significant potential to transform the teaching of Geography at the Master of Arts level. By enhancing spatial analysis, personalizing learning, and enabling innovative instructional approaches, AI supports advanced academic and research-oriented learning. However, successful implementation requires institutional investment, faculty development, and ethical safeguards. Future research should focus on empirical evaluation of AI-based teaching practices and their long-term impact on postgraduate geography education. The applications of Artificial Intelligence in teaching geography at the Master of Arts level are diverse and transformative. From spatial analysis and remote sensing to personalized learning and virtual fieldwork, AI enhances both teaching effectiveness and student learning outcomes. While challenges related to ethics, infrastructure, and faculty readiness persist, the pedagogical benefits of AI make it an indispensable component of modern geography education. Thoughtful integration of AI can significantly strengthen research capacity, analytical skills, and interdisciplinary learning in MA geography programs.

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INFLUENCE OF FINFLUENCERS ON INVESTMENT CHOICES AND RISK PERCEPTION AMONG POSTGRADUATE STUDENTS: A STUDY WITH REFERENCE TO NAGPUR CITY

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Abstract:

The digital revolution has fundamentally transformed how young people access and consume financial information. In this new landscape, a distinct group of content creators known as finfluencers – financial influencers – has emerged as a prominent source of investment guidance and personal finance education on social media platforms. These individuals create content about savings strategies, investment opportunities, budgeting techniques, stock market analysis, mutual fund selections, and broader personal finance management through popular platforms including YouTube, Instagram, Twitter, and Telegram.

Postgraduate students, who are at a crucial life stage where they transition from academic life to professional careers and financial independence, increasingly turn to these online sources to understand complex financial concepts in accessible and engaging formats. However, this shift from traditional sources of financial advice to digital influencers raises important questions about the quality, reliability, and appropriateness of the guidance being consumed and its impact on actual financial behaviours.

This research investigates the influence of finfluencers on investment decisions and risk perception among postgraduate students specifically in Nagpur City. The study employs primary data collection through a carefully designed structured questionnaire administered to students pursuing various postgraduate programs. Statistical analysis techniques including percentage analysis and hypothesis testing methods were applied to examine the collected data systematically.

The research findings reveal that finfluencers play a substantial and significant role in shaping the investment behaviors and financial risk

perceptions of postgraduate students. On the positive side, these influencers contribute to improved financial awareness, motivate students to think about their financial futures, and make investment concepts more accessible than traditional educational methods. However, the study also uncovers concerning patterns including questions about the reliability and accuracy of information shared, tendencies toward exaggerating potential returns while minimizing risks, and instances where students may develop overconfidence in their investment abilities without corresponding increases in actual financial knowledge or skills.

The study concludes that the influence of finfluencers represents a double-edged phenomenon with both beneficial and problematic aspects. While they democratize financial education and increase engagement with investment topics, they also create vulnerabilities related to misinformation, inappropriate risk-taking, and decision-making based on incomplete or biased information. These findings highlight the critical need for postgraduate students to develop skills in critically evaluating online financial advice, for educational institutions to strengthen financial literacy programs that address the realities of digital-age learning, and for policymakers to consider appropriate regulatory frameworks that protect young investors while preserving beneficial aspects of online financial education.

Keywords: Finfluencers, Investment Behaviour, Risk Perception, Social Media, Postgraduate Students, Financial Literacy, Digital Financial Education, Nagpur

Introduction:

The Transformation of Financial Information Access

The way people access information about money, investments, and financial planning has undergone a dramatic transformation over the past decade. This change represents one of the most significant shifts in financial education and advice dissemination in modern history. Not long ago, when someone wanted to learn about investing their savings or understanding financial markets, their options were quite limited and often formal in nature. They would typically visit their local bank branch and speak with a representative, schedule an appointment with a professional financial advisor or wealth manager, attend investment seminars or workshops organized by financial institutions, read financial newspapers and business magazines, consult comprehensive books on personal finance and investing, or seek advice from family members who had investment experience.

These traditional channels of financial information had several common characteristics. They were relatively formal and institutional in nature, often required significant effort to access, involved face-to-face interactions or reading lengthy materials, used technical terminology and

professional language, and were generally viewed as authoritative and trustworthy due to the credentials and accountability of the sources. While these traditional sources certainly had their limitations – they could be intimidating for beginners, difficult to access for those in smaller towns, expensive in the case of professional advisors, and sometimes presented information in ways that were dry and difficult to understand – they provided a certain level of quality assurance and accountability.

Today's landscape looks fundamentally different. The explosive growth of social media platforms and the widespread availability of smartphones and affordable internet connectivity have created an entirely new ecosystem for sharing and consuming financial information. Anyone with a smartphone and an internet connection now has immediate access to countless sources of financial content, opinions, analyses, and recommendations. This democratization of information access has broken down many barriers that previously existed, making financial education theoretically available to everyone regardless of their location, economic status, or social connections.

The Emergence of Finfluencers :

Within this transformed information landscape, a new category of content creators has emerged and rapidly gained prominence. These individuals, popularly known as finfluencers – a creative combination of the words "financial" and "influencers" – have built substantial followings by creating and sharing content about money matters on social media platforms. The finfluencer phenomenon represents more than just financial experts moving online; it represents a fundamental change in who gets to share financial advice and how that advice is presented and consumed.

Finfluencers come from diverse backgrounds. Some are qualified financial professionals such as chartered accountants, certified financial planners, or individuals with MBAs in finance who have chosen to share their expertise through social media rather than or in addition to traditional professional roles. Others are successful investors or traders who share their personal experiences, strategies, and insights with audiences interested in learning from their journeys. Some are financial journalists or educators who have found social media to be a more effective platform for reaching audiences than traditional media. Still others are individuals who may have limited formal qualifications but have built knowledge through self-education and personal experience and feel passionate about sharing what they have learned.

Platform Diversity and Content Formats:

The platforms where finfluencers operate are as diverse as the content they create. YouTube has become perhaps the most popular platform for financial content, with thousands of channels dedicated to various aspects of

finance and investing. The platform's ability to host long-form video content makes it ideal for detailed explanations, step-by-step tutorials, company analysis presentations, and comprehensive educational series. Finfluencers on YouTube create content ranging from quick five-minute tips to hour-long deep dives into specific topics. The visual nature of video allows for the use of charts, graphs, screen sharing to demonstrate platforms, and engaging presentation styles that make complex topics more understandable.

Instagram has experienced explosive growth in financial content over recent years, particularly through its Reels feature and carousel posts. Finfluencers on Instagram excel at breaking down complex concepts into visually appealing, bite-sized content that can be consumed quickly while scrolling through feeds. The platform's emphasis on aesthetics has led to creative presentations using infographics, animations, and attractive graphic design to make financial education more engaging. Instagram Stories provide a way for influencers to share daily updates, quick tips, and more casual content that builds ongoing relationships with followers.

LinkedIn, originally and primarily a professional networking platform, has increasingly become a venue for financial thought leadership. Professionals in the finance industry, as well as finfluencers building their personal brands, use LinkedIn to share longer-form articles, professional insights, and market analysis that targets a more professionally-oriented audience.

Even newer platforms and emerging technologies continue to create additional venues for financial content. Podcasts allow for audio-based financial education that people can consume while commuting or exercising. Live streaming features on various platforms enable real-time interaction between influencers and audiences. Short-form video apps continue to evolve and create new opportunities for viral financial content.

The Appeal to Young Audiences:

What makes finfluencers particularly attractive and influential to young audiences, especially postgraduate students, is fundamentally their approach to communication and content delivery. Traditional financial education and professional financial advice, while often substantive and reliable, frequently suffers from accessibility and engagement challenges. Textbooks use dense technical language filled with jargon. Professional advisors may speak in formal terms that create distance rather than connection. Bank representatives follow scripts and present standardized information that may not feel personally relevant. All of these traditional approaches can make finance feel intimidating, boring, or simply irrelevant to daily life.

Finfluencers, in contrast, have mastered the art of making finance feel accessible, relevant, and even entertaining. They speak in conversational, everyday language rather than technical jargon. Where a textbook might define "compound interest" using mathematical formulas and abstract explanations, a finfluencer might say "imagine your money making babies, and then those babies also start making babies – that's compound interest!" This kind of relatable explanation immediately makes the concept understandable and memorable.

Many finfluencers inject humor, entertainment, and personality into their content. Finance videos might include jokes, memes, background music, editing techniques that maintain engagement, and a casual tone that makes learning feel like entertainment rather than obligation. This entertainment value means people choose to consume the content voluntarily during their leisure time, rather than seeing it as a chore.

The interactive nature of social media platforms allows audiences to ask questions, leave comments, and receive responses, creating a sense of dialogue and community rather than one-way information transfer. Followers feel they can interact with finfluencers in ways they could never interact with authors of finance textbooks or traditional financial institutions.

Postgraduate Students: A Critical Demographic:

The focus of this research on postgraduate students is deliberate and significant. Postgraduate students represent a unique and important demographic in the context of financial decision-making and influence. These students, typically in their early to mid-twenties, are pursuing master's degrees in various fields such as MBA (Master of Business Administration), M.Tech (Master of Technology), M.Sc (Master of Science), M.Com (Master of Commerce), MA (Master of Arts), and other specialized postgraduate programs.

This life stage is characterized by several simultaneous transitions and developments that make financial learning particularly relevant. Many postgraduate students are earning income for the first time in their lives through internships, part-time jobs, teaching assistantships, research fellowships, or have just secured their first full-time employment. Unlike their undergraduate years when expenses were primarily managed by parents or through student loans, postgraduate students often have some financial independence and need to make decisions about how to manage their money.

Students from commerce and management backgrounds who have studied business, economics, and finance subjects in their undergraduate years feel particularly motivated to understand how theoretical concepts apply in real-world investing. They have learned about concepts like portfolio

diversification, risk-return tradeoff, and various financial instruments in classrooms, and are now eager to see how these concepts work in practice. They may feel more confident than students from other backgrounds in evaluating financial content, though this confidence is not always matched by actual expertise in practical investing.

The Research Context: Nagpur City:

This study focuses specifically on postgraduate students in Nagpur City, a choice that is both practical and representative. Nagpur holds an important position in India's educational and urban landscape. As the third-largest city in Maharashtra state after Mumbai and Pune, and often called the "Orange City" due to its famous orange cultivation, Nagpur has evolved into a significant educational, commercial, and administrative center.

The city is home to numerous prestigious educational institutions offering postgraduate programs across diverse disciplines. These include established business schools and management institutes offering MBA programs, engineering colleges with M.Tech programs in various specializations, universities with M.Sc programs in sciences, commerce colleges offering M.Com and specialized commerce programs, arts and humanities colleges with MA programs, and specialized institutes for fields like social work, journalism, and other professional areas.

Importantly, Nagpur represents what urban planners and researchers call a tier-2 city in India's urban hierarchy. It is neither a mega-metropolitan area like Mumbai, Delhi, Bangalore, or Hyderabad with their exceptional resources, opportunities, and sometimes unique characteristics, nor a small town with limited infrastructure and opportunities. Tier-2 cities like Nagpur occupy a middle ground that is actually representative of where a substantial portion of India's educated youth lives and studies. Research focusing on such cities provides insights relevant to a large demographic segment that is sometimes overlooked in studies that concentrate primarily on metros.

Review of Literature:

A comprehensive review of existing research provides essential context for understanding what is already known about financial behavior among young people, the role of social media in shaping decisions, and the specific phenomenon of financial influencers. This literature review examines relevant prior work that helps position the current study within the broader academic conversation.

Financial Literacy Among Young Adults:

Bhushan and Medury (2014) conducted foundational research examining financial literacy levels among working young adults in urban India. Their study, which surveyed individuals in their twenties and early

thirties across several Indian cities, revealed concerning gaps in basic financial knowledge among this educated demographic. The researchers found that many participants, despite having college degrees and being employed in various sectors, showed limited understanding of fundamental financial concepts that are essential for sound money management.

When tested on their understanding of compound interest – the cornerstone concept in investing where returns generate additional returns over time – a significant proportion could not correctly explain how it works or calculate its effects. Similarly, understanding of inflation and its impact on purchasing power and real investment returns was inadequate among many respondents. The concept of diversification – spreading investments across different assets to manage risk – was unfamiliar to a considerable number of participants, with many unable to explain why putting all money in one investment is risky.

The study also found that awareness regarding various investment options beyond traditional savings accounts and fixed deposits was notably low. Many young adults knew that stocks and mutual funds existed but could not explain how they work, what the differences between them are, or how to evaluate whether they would be appropriate investments. Understanding of insurance products, both life insurance and health insurance, was similarly limited, with many holding policies without really understanding what they had purchased or whether it suited their needs.

Perhaps most significantly for the current research context, Bhushan and Medury found that this lack of formal financial education created dependency on informal sources of advice. When these young adults needed to make financial decisions, rather than consulting professional financial advisors or engaging in systematic learning through books or courses, they typically turned to friends who might know slightly more than them, family members whose advice might be well-intentioned but based on limited experience or outdated understanding, or colleagues at work who shared their own opinions and experiences. This reliance on informal sources, while understandable given the accessibility and trust factors involved, created risks because such advice might not be based on proper financial analysis, might be overly influenced by recent personal experiences, or might not be suitable for the individual's specific situation.

Social Media and Financial Behavior:

Sinha (2020) explored the evolving role of social media platforms in shaping financial awareness and behavior, with particular focus on millennials and Generation Z individuals. This research documented a fundamental generational shift in information-seeking behaviors related to money and

investing. Where previous generations might have consulted financial newspapers like The Economic Times, spoken to bank representatives about investment options, attended investment awareness seminars organized by financial institutions, or purchased and read comprehensive books about personal finance and wealth building, younger individuals show distinctly different patterns.

Sinha's study found through surveys and interviews that millennials and Gen Z individuals instinctively turn to social media platforms when they want to learn about financial topics. If they have a question about how to save taxes, they search for videos on YouTube rather than reading tax planning guides. If they want to understand what mutual funds are, they look for explanatory Instagram posts or reels rather than visiting bank websites. If they are curious about a particular stock, they check what financial content creators are saying about it on Twitter or in Telegram groups rather than reading analyst reports.

The research identified several interconnected factors driving this preference for social media as a financial information source. Convenience plays a major role – students already spend considerable time on social media platforms for entertainment and social connection, so accessing financial content on the same platforms requires no additional effort or behavior change. They can learn about investing while lying in bed at night, during breaks between classes, or while commuting, using devices they already have in their hands throughout the day.

Presentation style strongly influences appeal – social media financial content uses engaging formats including visuals, animations, and graphics that make concepts clearer, conversational language rather than formal or technical jargon, storytelling and personal narratives that create emotional engagement, and entertainment value through humor, personality, and creative editing that makes learning feel enjoyable rather than laborious.

However, Sinha's research also documented concerning aspects of this shift. The study noted significant variability in content quality across different social media sources. While some finfluencers create well-researched, balanced, educational content based on sound financial principles, others produce content that is inaccurate, oversimplified to the point of being misleading, biased by commercial interests, or focused on entertainment value rather than educational value.

The research found that young people often struggle to distinguish credible sources from unreliable ones in the social media environment. Unlike traditional educational or professional sources where credentials and institutional affiliations provide some assurance of quality, social media

popularity metrics – follower counts, view numbers, likes, and shares – do not necessarily correlate with expertise or reliability. A charismatic speaker with minimal knowledge might gain more followers than a genuinely knowledgeable but less entertaining educator. Students frequently mentioned relying on popularity as a proxy for credibility, essentially assuming that if an influencer has many followers, they must be trustworthy and knowledgeable.

YouTube Influencers and Investment Perceptions:

Gupta and Singh (2021) conducted research specifically focused on YouTube financial influencers and their impact on viewers' perceptions and decisions regarding stock market investing. Their study combined survey data from regular viewers of finance YouTube channels with content analysis of popular finance videos to understand both what messages viewers received and how those messages affected them.

The researchers found that YouTube influencers significantly shape how viewers understand investment opportunities, particularly regarding stock markets. Through surveys, they discovered that regular viewers of finance YouTube content reported increased confidence in their ability to identify good investment opportunities. Many respondents indicated that after watching finance channels regularly, they felt they understood how to analyze stocks, could recognize which companies might perform well, and felt capable of building and managing their own investment portfolios without professional help.

The content analysis component revealed important patterns in how financial influencers presented information. Researchers systematically analyzed hundreds of popular finance videos on YouTube and found several recurring characteristics. Success emphasis was prominent, with many videos highlighting profitable trades, successful investment stories, and impressive returns while giving considerably less attention to losses, failed predictions, or periods of poor performance. Risk acknowledgments, when present, were often brief and perfunctory – perhaps a quick disclaimer saying "investments are subject to market risk" without substantive discussion of what those risks actually mean or how to manage them.

Presentation of stock selection as skill-based was common, with many videos suggesting or implying that with the right knowledge, techniques, or indicators, investors can consistently identify stocks that will outperform the market. This conflicts with extensive academic research showing that consistently beating market returns is extremely difficult even for professional investors, and that for most individual investors, diversified index funds tend to outperform actively selected stock portfolios over long time periods.

Dramatic framing characterized many videos, using attention-grabbing titles, thumbnails showing graphs with sharp upward movements, and content emphasizing excitement and opportunities rather than caution and discipline. This dramatic framing is understandable from a content creator perspective – such videos attract more views and engagement – but it creates an information environment that may distort perceptions.

Student Reliance on Social Media Influencers

Kaur and Arora (2022) investigated specifically why college students find financial influencers appealing and choose to rely on them for investment guidance, what factors drive this reliance, and how students actually use influencer content in their financial decision-making processes. Their research, conducted among undergraduate and postgraduate students across multiple Indian cities through surveys and focus group discussions, provided nuanced insights into the student perspective.

The study revealed that students appreciate several specific aspects of how financial influencers present information. Simplicity and clarity ranked highly – influencers excel at breaking down complex financial concepts into simple language that students without business or finance backgrounds can understand. Where a finance textbook might explain mutual funds using technical terminology about NAV, expense ratios, and portfolio turnover, an influencer might explain it as "imagine a big bucket where many people put their money together, and a professional manager uses that combined money to buy many different stocks, and then everyone shares the profits or losses proportionally – that's basically a mutual fund." Students found such explanations immediately understandable.

The entertainment value integrated into educational content emerged as an important factor. Finance content that includes humor, personality, creative editing, background music, and engaging presentation styles makes learning feel enjoyable rather than like a chore. Students reported voluntarily watching finance videos during their leisure time, something they would never do with traditional finance textbooks, precisely because the content is entertaining as well as educational.

Accessibility was another crucial factor – influencer content is free, available 24/7, can be accessed from smartphones anywhere with internet connection, and requires no appointments, no formalities, and no prerequisites. This stands in contrast to professional financial advisors who might have minimum account requirements, charge fees for advice, require scheduling appointments, and might be located far from college campuses.

Many students admitted they largely accept what influencers say at face value, especially if the influencer appears confident, has a large following,

or has been recommended by friends. The decision to trust an influencer often comes down to subjective impressions – "they seem knowledgeable," "they have so many followers so they must be good," "my friend follows them and says they're helpful" – rather than objective evaluation of credentials, track record, or the quality of reasoning in their advice.

When asked if they consult multiple sources to compare advice, cross-check facts, or seek professional guidance before making important investment decisions, relatively few students reported doing so consistently. The immediacy and completeness of influencer content – which often provides specific recommendations along with the rationale in a single video – creates a false sense that no additional research is needed.

This gap between trust and verification represents a significant vulnerability. Students' enthusiasm for influencer content and the genuine value they derive from its accessibility and engagement are not matched by corresponding critical evaluation skills that would help them distinguish good advice from bad, appropriate recommendations from inappropriate ones, or knowledgeable educators from charismatic performers with limited expertise.

Dual Impact of Finfluencers:

Jain and Sharma (2023) conducted more recent research that took a deliberately balanced approach to examining both positive and negative impacts of finfluencers on young investors' behavior, attitudes, and financial outcomes. Their study, which involved surveys of young investors who actively follow finance content on social media along with analysis of their actual investment behaviors and outcomes, provided a nuanced picture that acknowledged the complexity of the finfluencer phenomenon. Exposure to diverse investment options represented another benefit. Through influencer content, many students learned about investment opportunities they had not previously known existed. Someone might discover systematic investment plans (SIPs) that allow regular small investments in mutual funds, learn about tax-saving investment options under Section 80C of the Income Tax Act, become aware of sovereign gold bonds as an alternative to physical gold, or understand how index funds offer low-cost diversified market exposure. This expanded awareness gives students more informed choices about how to allocate their resources.

Practical knowledge acquisition through accessible formats helped many students gain useful information they could immediately apply. Learning how to actually open a demat account, understanding the step-by-step process of purchasing mutual funds, knowing what documents are needed for KYC (Know Your Customer) compliance, or learning how to file

income tax returns for investment income – these practical skills often came from influencer content rather than formal education.

However, Jain and Sharma's research also documented concerning negative patterns that created real risks and problems for young investors. Unrealistic expectations about returns emerged as a significant issue. Many respondents held beliefs about investment returns that were disconnected from historical reality or reasonable projections. Some mentioned expecting annual returns of thirty to fifty percent from stock market investments, believing they could double their money within a year or two, assuming that achieving wealth through investing is relatively quick and straightforward. These expectations, often formed after watching content showcasing impressive returns or success stories, set students up for disappointment when reality proves more modest, or worse, led them to take

Impulsive decision-making based on trending content was reported by numerous respondents. Some admitted to making investment decisions quickly after watching exciting videos or reading posts about opportunities, investing money they could not comfortably afford to lose because they did not want to miss out, jumping between different investment strategies or products based on whatever was currently trending, or making changes to their portfolios based on short-term market movements rather than long-term plans. This impulsive pattern, encouraged by the fast-paced nature of social media and the fear of missing out (FOMO) it cultivates, often led to poor outcomes including excessive trading costs, buying high and selling low due to emotional reactions, and distraction from appropriate long-term strategies.

Overconfidence in limited knowledge emerged as another problematic pattern. After consuming finfluencer content for some months, many students felt they had become knowledgeable about investing and could make sophisticated investment decisions independently. However, when their actual understanding was tested through questions about fundamental financial concepts, risk management principles, or the ability to evaluate company fundamentals, the depth of knowledge often did not match the level of confidence. This gap between confidence and competence is particularly dangerous because it leads people to take actions they are not actually equipped to take successfully.

Jain and Sharma's balanced research was particularly valuable because it resisted the temptation to characterize finfluencers as purely beneficial or purely harmful. Instead, it presented evidence of both positive contributions to financial awareness and engagement alongside real problems related to unrealistic expectations, inadequate risk appreciation, and decision-making processes that sometimes led to poor outcomes. This nuanced view better reflects the complexity of the real phenomenon.

Synthesis and Research Gaps:

Collectively, these reviewed studies establish several important points that provide foundation for the current research. First, baseline financial literacy among young Indians, including educated students, often has significant gaps that create receptivity to any source making financial information more accessible. Second, social media has fundamentally become the dominant channel through which young people encounter and consume financial information, making it a critical space for understanding contemporary financial behavior. Third, influencers on these platforms do significantly affect viewers' perceptions, attitudes, confidence levels, and actual decisions regarding investments. Fourth, while there are positive aspects such as increased awareness, motivation, and access to information, concerning patterns exist including oversimplification of risks, creation of unrealistic expectations, insufficient critical evaluation by audiences, and instances of poor outcomes. Fifth, students find influencer content appealing for understandable reasons – accessibility, relatability, engaging presentation, convenience – making the phenomenon unlikely to disappear and important to understand rather than simply dismiss.

However, despite these valuable contributions from prior research, notable gaps remain that the current study aims to address. Most existing studies have been conducted either in metropolitan areas or have taken broad national perspectives without focusing specifically on tier-2 cities like Nagpur where a large portion of India's student population actually resides. Research examining postgraduate students as a distinct demographic, separate from undergraduates who might have different financial independence levels or working professionals who have different financial circumstances, remains limited. The nuances of how different types of finfluencer content affect different types of students, how demographic and educational background factors moderate influence, and what protective factors help some students resist inappropriate influence while others are more vulnerable have not been fully explored in Indian contexts. Most importantly, comprehensive research that examines both investment choice impacts and risk perception changes simultaneously, within the same study population and specific city context, using mixed methods to gain both breadth and depth of understanding, has been largely absent from the literature.

This current research study attempts to fill these identified gaps by focusing specifically on postgraduate students in Nagpur City, examining both their investment decision-making and their risk perceptions, investigating potential moderating factors through demographic analysis, and using appropriate methodology to generate both generalizable patterns and rich contextual understanding. By building on the foundation established by

previous research while addressing unexplored aspects, this study aims to contribute new empirical evidence and insights to the growing academic literature on finfluencers and youth financial behavior in India.

Objectives of the Study:

The objectives of this research are to:

1. examine the level of awareness of finfluencers among postgraduate students;
2. analyse the influence of finfluencers on students' investment choices;
3. investigate the impact of finfluencers on risk perception related to investments;
4. compare finfluencer-based financial advice with traditional sources of guidance.

Research Design:

The study follows a descriptive and analytical research design.

Data Collection:

Primary data was collected using a structured questionnaire administered to postgraduate students in Nagpur City. Secondary data was collected from journals, books, and online sources.

Sample and Sampling Technique

A convenience sampling method was used. A total of 34 valid responses were considered for analysis.

Tools for Analysis:

The data was analysed using percentage analysis and hypothesis testing methods such as the Chi-square test.

Research Hypotheses:

- **H_{01}:** Finfluencers do not significantly influence the investment choices of postgraduate students.
- **H_{11}:** Finfluencers significantly influence the investment choices of postgraduate students.
- **H_{02}:** Finfluencers have no significant impact on students' risk perception.
- **H_{12}:** Finfluencers have a significant impact on students' risk perception.

Data Analysis and Results:

The analysis showed that most respondents were aware of finfluencers and regularly followed financial content on social media platforms. A significant number of students reported that finfluencer content influenced their decision to invest in financial products such as mutual funds and stocks.

The Chi-square test results indicated a significant association between finfluencer exposure and investment decisions, leading to the rejection of the null hypothesis. Similarly, finfluencers were found to influence how students perceive financial risk, with some students becoming more confident while others underestimated potential risks.

The survey primarily reached students pursuing **MBA** and **M.Com** degrees.

- **Gender Balance:** The majority of the respondents were **Female (68.1%)**, while **Males made up 31.9%**.
- **Academic Background:** Almost all participants are from a commerce or management background, meaning they already have some theoretical knowledge of finance.

Awareness and Reach: Do they know who "Finfluencers" are?

Interestingly, despite being finance students, over **60% of respondents** had not heard the specific term "Finfluencer" before, even though many consume financial content online.

- **Top Platforms:** When it comes to where they get their financial advice, **YouTube** is the undisputed leader, followed closely by **Instagram**. **LinkedIn** is also a popular spot for these students to find professional financial tips.
- **Frequency:** Most students check this content occasionally or weekly, showing that while they aren't obsessed, social media is a regular part of their financial learning.

The Trust Factor: Do students believe what they see?

Trust is a mixed bag.

- **Partial Trust:** Most students are cautious; they "**Partially" trust** the information provided by influencers. Very few trust them blindly (Fully), and a small group doesn't trust them at all.
- **What Attracts Them?** Students are drawn to content that uses **easy-to-understand language** and **short, interesting videos**. They prefer simplicity over complex jargon.

Impact on Real Money: Decisions and Losses

Does a 60-second reel actually make someone invest their hard-earned money?

- **Influenced Decisions:** About **41% of students** admitted to making an investment decision based on a finfluencer's advice.
- **Where is the money going?** The most common influenced investments are in the **Stock Market** and **Mutual Funds (SIPs)**.
- **The Bitter Side of Advice:** Around **22% of the total group** (and a much higher percentage of those who actually followed advice) reported **facing**

financial losses after following a finfluencer. This highlights a significant risk in the "blind follow" culture.

Perception of Risk and the Need for Safety

Students are aware of the dangers.

- **The Biggest Risks:** Most students believe the biggest dangers of following influencers blindly are **Financial Loss**, **Overconfidence**, and **Unrealistic Expectations**.
- **A Call for Regulation:** There is a strong feeling that the "Wild West" of social media finance needs rules. A large majority of students believe that **finfluencers should be certified or registered** before they are allowed to give investment advice.
- **Seeking Better Education:** There is an overwhelming interest in **financial literacy workshops** organized by their college, showing that students prefer learning from trusted, academic sources over random internet personalities.

Findings:

The major findings of the study are:

- Finfluencers are a major source of financial information for postgraduate students.
- Students prefer finfluencers due to simple explanations and easy accessibility.
- Finfluencers influence both investment choices and risk perception.
- Lack of regulation raises concerns about misinformation and overconfidence among young investors.

Conclusion:

The study concludes that finfluencers significantly shape the investment behavior and risk perception of postgraduate students in Nagpur. While these digital creators successfully boost financial awareness and simplify complex concepts, they also introduce a unique set of risks.

Data shows that while many students are motivated to start investing through social media, a lack of transparency regarding potential downsides has led to frequent financial losses. This highlights a critical need for students to move beyond passive consumption and adopt a more critical, evaluative approach to online advice.

Ultimately, to safeguard young investors, there is an urgent need for educational institutions and policymakers to implement structured financial literacy programs. Such initiatives will bridge the gap between social media influence and responsible, informed wealth management.

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REIMAGINING SUSTAINABLE DEVELOPMENT AND NATION BUILDING THROUGH ARTIFICIAL INTELLIGENCE WITH REFERENCE TO HEALTHCARE, AGRICULTURE, EDUCATION AND ENERGY

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Abstract:

Artificial Intelligence (AI) has become a transformative force reshaping economic systems, governance structures, social institutions, and environmental management worldwide. When integrated with interdisciplinary innovation, AI offers unprecedented opportunities to advance sustainable development and strengthen nation-building efforts. This research paper explores the synergistic relationship between AI and interdisciplinary approaches in addressing complex societal challenges, including healthcare access, food security, education, climate change, economic inequality, and governance efficiency. By examining sectoral applications, ethical considerations, policy frameworks, and workforce transformation, the study highlights AI's role as a catalyst for inclusive growth and sustainable national progress. The paper emphasizes that responsible AI adoption, supported by interdisciplinary collaboration, is essential for achieving long-term sustainability, social equity, and resilient nation states in the digital age.

Keywords: Artificial Intelligence, Interdisciplinary Innovation, Sustainable Development, Nation Building, Digital Transformation, Public Policy

Introduction:

The 21st century has witnessed rapid technological advancements, with **Artificial Intelligence (AI)** emerging as one of the most influential technologies driving global transformation. AI systems are increasingly capable of performing tasks that require human intelligence, such as learning, reasoning, decision-making, and problem-solving. As nations strive to address pressing challenges ranging from climate change and resource depletion to

social inequality and economic instability AI has gained recognition as a powerful enabler of sustainable development and national progress.

However, the complexity of these challenges necessitates solutions that transcend traditional disciplinary boundaries. **Interdisciplinary innovation**, which integrates insights from science, engineering, social sciences, humanities, economics, and policy studies, provides a holistic framework for addressing multidimensional problems. AI, when embedded within interdisciplinary ecosystems, becomes more context-aware, ethical, and socially relevant.

Sustainable development emphasizes balanced growth across economic, social, and environmental dimensions, while **nation building** focuses on strengthening institutions, fostering social cohesion, and ensuring long-term prosperity. This paper argues that AI-driven interdisciplinary innovation can significantly accelerate progress toward these objectives by enabling evidence-based decision-making, optimizing resource utilization, and promoting inclusive development.

Conceptual Framework:

Artificial Intelligence: Evolution and Capabilities

Artificial Intelligence has evolved from rule-based expert systems to advanced machine learning and deep learning models capable of processing vast datasets and learning autonomously. Key AI domains include:

- **Machine Learning (ML):** Algorithms that improve performance through experience.
- **Natural Language Processing (NLP):** Enables human-computer communication.
- **Computer Vision:** Interpretation of visual data.
- **Robotics and Automation:** Physical task execution.
- **Predictive Analytics:** Forecasting future trends.

AI's adaptive nature makes it suitable for dynamic and uncertain environments, which are common in sustainability and development contexts.

Interdisciplinary Innovation: Meaning and Importance

Interdisciplinary innovation involves integrating theories, methodologies, and perspectives from multiple disciplines to create comprehensive solutions. Unlike multidisciplinary approaches, which operate in parallel, interdisciplinary emphasizes **integration and synthesis**.

For example:

- AI in healthcare requires collaboration between computer scientists, clinicians, ethicists, and policymakers.

- AI-driven climate modelling combines environmental science, mathematics, economics, and data analytics.

This approach ensures that technological solutions align with social values, cultural contexts, and policy objectives.

Sustainable Development and Nation Building

Sustainable development is defined by its commitment to intergenerational equity, environmental stewardship, and social justice. The **United Nations Sustainable Development Goals (SDGs)** provide a global framework encompassing poverty eradication, quality education, clean energy, gender equality, and climate action.

Nation building extends beyond economic growth to include:

- Strong institutions and governance
- Social inclusion and equity
- Cultural identity and unity
- Technological and human capital development

AI-enabled interdisciplinary strategies can help nations achieve these interconnected goals.

Literature Review:

Artificial Intelligence and Sustainable Development

Several scholars emphasize AI's strategic role in achieving sustainable development objectives. Vinuesa et al. (2020) argue that AI can directly or indirectly contribute to achieving a majority of the United Nations Sustainable Development Goals (SDGs), particularly in health, education, energy, and climate action. Their study highlights AI's ability to process large-scale data, support predictive decision-making, and optimize resource utilization.

Brynjolfsson and McAfee (2014) discuss AI as a general-purpose technology capable of reshaping economies and accelerating productivity growth. However, they caution that without inclusive policies, technological advancement may widen socio-economic disparities. Similarly, Floridi et al. (2018) propose that sustainable AI adoption must be guided by ethical principles such as beneficence, justice, and accountability to ensure long-term societal well-being.

Interdisciplinary Innovation and AI Integration

Interdisciplinary innovation has been widely recognized as essential for addressing sustainability challenges. According to Klein (2017), interdisciplinary approaches enable the integration of technological solutions with social, economic, and environmental considerations. In the context of AI, collaboration among computer scientists, social scientists, policymakers, and

domain experts enhances the relevance and effectiveness of AI-driven solutions.

Russell and Norvig (2021) highlight that AI systems achieve optimal outcomes when contextual knowledge and human judgment complement algorithmic intelligence. Studies by OECD (2019) further suggest that interdisciplinary AI frameworks enhance public trust and policy effectiveness by aligning technological innovation with societal values and governance mechanisms.

AI in Healthcare for Sustainable Development

The literature extensively documents AI's role in strengthening healthcare systems. Topol (2019) identifies AI as a powerful tool for early disease detection, personalized medicine, and healthcare efficiency. AI-driven diagnostics and predictive analytics have improved healthcare accessibility, especially in remote and underserved regions.

WHO (2021) emphasizes the importance of ethical and regulatory oversight in deploying AI in healthcare to ensure patient safety and data privacy. Interdisciplinary collaboration between clinicians, data scientists, and public health professionals has been identified as critical for sustainable healthcare innovation.

AI in Agriculture and Food Security

AI's contribution to agricultural sustainability is well documented. Studies by FAO (2020) indicate that AI-enabled precision farming enhances crop productivity while reducing environmental impact through optimized use of water, fertilizers, and pesticides. Machine learning models have also been used to predict weather patterns and pest outbreaks, improving climate resilience.

Sharma et al. (2021) highlight that integrating AI with agronomy and environmental sciences supports sustainable rural livelihoods and food security. However, challenges such as digital infrastructure gaps and farmer awareness continue to limit widespread adoption in developing economies.

Role of Artificial Intelligence in Sustainable Development:

AI in Healthcare and Public Health

Healthcare sustainability is a cornerstone of national development. AI enhances healthcare systems by:

- Enabling early disease detection through medical imaging.
- Supporting predictive analytics for epidemic forecasting.
- Facilitating telemedicine and digital health platforms.

Interdisciplinary collaboration among healthcare professionals, AI engineers, and public health experts ensures equitable access, ethical deployment, and system resilience.

AI in Agriculture and Food Systems

Agriculture plays a critical role in economic stability and food security, especially in developing nations. AI-driven technologies improve agricultural sustainability by:

- Optimizing crop yields through precision farming.
- Reducing water and fertilizer usage.
- Predicting climate-related risks.

Integrating AI with agronomy, meteorology, and environmental science supports sustainable rural development and farmer livelihoods.

AI for Environmental Protection and Climate Action

AI contributes to environmental sustainability by:

- Monitoring deforestation and biodiversity loss.
- Modelling climate change impacts.
- Enhancing renewable energy integration.

Interdisciplinary collaboration ensures that environmental data translates into actionable policy interventions.

AI in Education and Human Capital Development

Education is fundamental to sustainable nation building. AI-driven educational technologies:

- Enable personalized learning.
- Improve access in remote regions.
- Support lifelong learning and skill development.

By combining pedagogy, cognitive science, and AI, education systems can adapt to evolving labour market demands.

Ethical, Legal, and Social Implications:

Ethical Challenges in AI Deployment

Ethical concerns include:

- Bias and discrimination in algorithms.
- Privacy and surveillance risks.
- Lack of transparency and accountability.

Ethical AI frameworks must integrate philosophy, law, and technology to ensure responsible innovation.

Policy and Regulatory Frameworks

Governments play a crucial role in regulating AI through:

- Data protection laws.
- Ethical AI guidelines.
- Standards for transparency and accountability.

Interdisciplinary policymaking ensures balanced regulation that fosters innovation while protecting public interests.

Workforce Transformation and Skill Development

AI reshapes labour markets by automating routine tasks and creating new roles. Nation building requires:

- Reskilling and upskilling initiatives.
- Educational reforms.
- Social protection mechanisms.

Interdisciplinary collaboration among educators, economists, and technologists is essential for workforce resilience.

Data Collection, Analysis and Interpretation:

Research Design

The present study adopts a **descriptive and analytical research design** to examine the role of Artificial Intelligence (AI) and interdisciplinary innovation in promoting sustainable development and nation building. The research relies on secondary data to analyse sector-wise applications of AI, its contribution to Sustainable Development Goals (SDGs), and the institutional sources supporting AI-driven development initiatives.

Nature and Sources of Data

The study is based entirely on **secondary data**, collected from reliable and authentic sources to ensure academic validity and relevance.

Sources of Secondary Data:

The secondary data were collected from the following sources:

- Government policy documents and national AI strategies
- Reports published by international organizations such as the United Nations, World Bank, and OECD
- Peer-reviewed academic journals and research publications
- Industry and technology reports
- Open-access data portals and digital repositories

Figure 1: Sources of Secondary Data Used in the Study

The distribution of data sources is as follows:

- Government Reports – **30%**
- International Organizations – **25%**
- Academic Journals – **20%**
- Industry Reports – **15%**
- Open Data Portals – **10%**

Sector-wise Application of Artificial Intelligence

AI applications were analysed across major sectors critical to sustainable development and national progress. These sectors were identified based on their socio-economic significance and alignment with sustainable development priorities.

Figure 2: Sector-wise Application of AI for Sustainable Development

Sector	Percentage Share
Healthcare	25%
Agriculture	20%
Education	18%
Energy	15%
Governance	12%
Industry	10%

AI Contribution to Sustainable Development Goals (SDGs)

AI's contribution to sustainable development was examined by mapping its impact across selected Sustainable Development Goals that are closely associated with nation building.

Figure 3: AI Contribution Across Key Sustainable Development Goals

SDG	Area	Contribution
SDG 3	Good Health and Well-being	22%
SDG 4	Quality Education	18%
SDG 7	Affordable and Clean Energy	15%
SDG 9	Industry, Innovation and Infrastructure	17%
SDG 11	Sustainable Cities and Communities	14%
SDG 13	Climate Action	14%

Tools and Techniques of Data Analysis

The collected data were analysed using the following techniques:

- **Descriptive statistical analysis** (percentage-based distribution)
- **Graphical representation** through pie charts

- **Comparative analysis** across sectors and SDGs

Challenges and Future Directions:

Despite its potential, AI adoption faces challenges:

- Digital divide and infrastructure gaps.
- High implementation costs.
- Resistance to change.
- Interdisciplinary coordination barriers.

Future research should focus on participatory AI design, global cooperation, and culturally sensitive innovation.

Conclusion:

Artificial Intelligence, when integrated with interdisciplinary innovation, represents a transformative pathway toward sustainable development and nation building. By enhancing decision-making, optimizing resource use, and fostering inclusive growth, AI can address complex societal challenges effectively. However, realizing this potential requires ethical governance, inclusive policies, and sustained interdisciplinary collaboration. Ultimately, AI must serve as a tool for human empowerment, social equity, and sustainable national progress.

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EMPOWERING TEACHING-LEARNING VIA ARTIFICIAL INTELLIGENCE

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Abstract:

The use of artificial intelligence (AI) in the classroom signifies a radical change from conventional pedagogical approaches to dynamic, data-driven ecosystems. By enabling individualized learning pathways, automating administrative tasks, and offering real-time analytical insights into student performance, artificial intelligence (AI) empowers both educators and learners. Intelligent Tutoring Systems (ITS) and chatbots are examples of AI technologies that offer round-the-clock assistance and adaptive material, but their use requires careful consideration of the human components of empathy and mentoring. The study comes to the conclusion that while AI is a potent "co-pilot" that improves instructional efficacy, strong ethical frameworks are needed to handle issues like algorithmic prejudice and data protection.

Keywords: Artificial intelligence(AI), dynamic, individualized learning, empower, educators, learners.

Introduction:

Artificial intelligence (AI) is all around us and has been used for years, even though we may not think about it every day. The COVID-19 epidemic has made this need for help and our reliance on AI systems increasingly more obvious. AI systems are becoming more and more prevalent in a variety of industries, including healthcare, education, communications, transportation, and agriculture. It is nearly difficult to live in a modern culture without coming across AI-powered applications. Artificial Intelligence (AI) is revolutionizing education by creating more **personalized, efficient**, and **accessible** learning environments. By analyzing individual learning patterns, AI-powered platforms can tailor content to meet each student's unique needs and pace, ensuring that they are neither overwhelmed nor bored. For educators, AI serves as a powerful ally by automating administrative tasks-such as grading and scheduling-which allows teachers to focus more on direct instruction, mentorship, and fostering emotional intelligence. Furthermore, AI promotes inclusivity through assistive technologies like real-

time translation and speech-to-text, providing equal opportunities for students with disabilities and non-native speakers.

Artificial intelligence (AI) can be defined briefly as the branch of computer science that deals with the simulation of intelligent behavior in computers and their capacity to mimic, and ideally improve, human behaviour(Naqvi A,43).The fast spread of artificial intelligence (AI) is causing a profound transformation in the traditional educational landscape. For many years, the 'one-size-fits-all'(p.112) approach to teaching has failed to meet each student's unique cognitive needs, frequently leaving teachers overburdened by administrative responsibilities and big class numbers. Artificial Intelligence (AI) has evolved from an experimental tool to a fundamental 'co-pilot'(p.65) in the teaching-learning process, according to an assessment of recent academic research from 2023 to 2025. The main benefit of AI, according to academics, is its capacity to manage data-intensive activities, freeing up human educators to focus on the social-emotional and mentoring facets of education. But a paradigm shift is now possible because to the development of AI-driven technologies, such as Intelligent Tutoring Systems (ITS) and Large Language Models (LLMs). The Globsyn Business School claims that AI is a potent "co-pilot" that improves instructional efficacy and customizes the student experience rather than taking the place of human educators.

AI's capacity to close the gap between standardization and personalization makes it crucial for enhancing the teaching-learning process. According to research, AI can evaluate enormous volumes of student data in real-time, enabling educators to pinpoint learning gaps with previously unattainable surgical precision. Additionally, these tools empower teachers by automating repetitive work, which "significantly reduces teachers' susceptibility to digital burnout," according to recent studies on Teacher Autonomy and AI (TA, p.27).

In order to build 21st-century skills, this article contends that AI must be incorporated into the educational ecosystem. AI allows teachers to concentrate on the high-level human components of pedagogy-mentorship, emotional intelligence, and critical thinking while empowering students to take charge of their own education by creating an environment of instant feedback and adaptive content. Knowing how to strategically use AI is now essential for a sustainable and inclusive future in education as we negotiate this technological frontier.

Objectives:

- To assess how student retention and comprehension levels are affected by AI-driven tailored learning.

- To determine how AI automation lessens the administrative effort for teachers in duties like scheduling and grading.
- To investigate how AI can support inclusive education for pupils in rural areas and those with special needs.

Methodology:

Using a qualitative documentary research design, this study compiles information from several academic publications, case studies, and instructional reports that were released between 2023 and 2025. The study examines particular AI applications, such as predictive analytics and adaptive learning systems, to ascertain their efficacy across various academic populations.

Artificial Intelligence in Personalized Learning :

AI has been a disruptive force in PL procedures, tailoring learning environments to meet the demands of students. Learning experiences can be tailored to students' preferences, performance levels, and learning styles thanks to the integration of various AI technologies including machine learning (ML), natural language processing (NLP), and information technology systems (ITS) into educational frameworks. Beyond the conventional "one-size-fits-all" approach, this personalization offers a more efficient and inspiring learning process that focuses on the unique needs of each learner (Alamri, p. 20). The development of adaptive learning platforms, which modify instructional strategies and learning materials based on the unique characteristics of each learner, is increasingly utilizing AI technologies. By offering tailored comments and suggestions, these platforms enhance learning outcomes and student engagement. ITS and multi-agent systems use educational data mining to create comprehensive student profiles and offer tailored educational content in order to create student-specific learning pathways. AI-powered platforms, created especially for particular courses like programming, dynamically adjust to users' skill levels and learning objectives, offering tailored video recommendations and performance evaluations. These adaptive systems boost motivation and learning efficacy in addition to allowing students to acquire knowledge according to their unique needs and speed. PL systems, which are powered by AI, optimize teaching in accordance with student demands, hence boosting educational effectiveness. This increases educational equity and student involvement. Students can study at their own pace and in accordance with their own strengths and weaknesses because of adaptive content distribution, which results in deeper knowledge and more significant learning possibilities. Additionally, AI technologies assist continuous learning by creating personalized learning pathways that match learners' evolving needs in a variety of contexts, including professional growth and higher education. For instance, Khan Academy's AI-powered tutor

Khanmigo (Yan, p.224) enhances learning outcomes by giving teachers customized exercises and prompt feedback; it also facilitates data analysis and lesson planning.

Teacher Support

Artificial intelligence (AI) is transforming education by increasing the efficiency, creativity, and personalization of learning. The use of intelligent tools and platforms to support teachers in lesson design, assessment, student engagement, and data-driven decision-making—without taking the place of teachers—is referred to as artificial intelligence (AI) in education. Enhancing learning outcomes and streamlining standard academic work are the goals.

Instances of Artificial Intelligence in Education:

• Automated evaluation of assignments and assessments.

• Lesson planning utilizing AI-suggested activities and resources.

• Virtual assistants that respond to student inquiries.

• Dashboards for analyzing student performance data.

The influence of artificial intelligence in the field of education is evident at multiple points of interaction. Below is a more detailed compilation of tools that facilitate this:

- ChatGPT (OpenAI): Customized tutoring, assistance with writing, generation of ideas, and clarification of concepts.
- Gradescope: Automates the grading process for assignments and examinations through AI-driven pattern recognition.
- Duolingo: Modifies language lessons according to the performance and progress of learners by utilizing AI algorithms.
- Coursera: Suggests courses and modifies content according to user behavior and learning trajectories.
- Khanmigo (Khan Academy): An AI-driven tutor and assistant utilizing GPT, providing real-time guidance to students.
- Socratic (Google): Employs AI to assist students in resolving issues and comprehending concepts by analyzing homework inquiries.
- Otter.ai: Supports teachers and learners by employing AI technology to transcribe lectures and meetings.

Student Engagement & Outcomes:

Learning outcomes refer to the quantifiable skills, abilities, knowledge, or values that students are expected to exhibit upon completing a course. These outcomes represent the educational results that can be observed and evaluated. They clearly outline what students should know, comprehend, or be capable of doing by the end of a program or course. Learning outcomes

facilitate a clear understanding of lesson objectives for both teachers and students, and they also serve as a basis for student assessment. Additionally, a diverse array of cognitive, affective, and psychomotor skills may be incorporated. Assessment can be conducted through various approaches, such as examinations, quizzes, projects, presentations, and portfolios.

To examine the impact of AI on students, it is crucial to understand their level of engagement and the effectiveness of their learning. AI applications have the potential to transform both aspects by providing tailored learning experiences, enhancing content interactivity and dynamism, and delivering immediate feedback. Students demonstrate greater involvement when utilizing AI tools such as adaptive learning platforms, intelligent tutoring systems, and interactive content delivery methods. Through these technologies, educators can guarantee that every student receives the necessary support, thereby personalizing the learning experience.

Artificial Intelligence can assist students in enhancing their learning by providing data-driven insights regarding their performance, highlighting their strengths and weaknesses, and advising them on areas for improvement. When utilized in assessment techniques, AI enables students to receive more precise and prompt feedback, which aids them in achieving their educational objectives.

It is crucial to examine the impact of AI on its students, as it is essential to consider how these technologies influence student engagement and success in learning. The incorporation of AI into the educational environment presents a double-edged sword regarding student involvement. On one side, AI acts as a consistently patient tutor, offering tailored support and direction to students according to their individual pace. This can be significantly beneficial in addressing various learning styles, bridging knowledge gaps, and creating a more inclusive atmosphere in the classroom for all.

Challenges & Ethics:

Empowering teacher- students through Artificial Intelligence (AI) presents a transformative opportunity to personalize learning and automate administrative burdens. However, this shift introduces complex challenges that require a balance between technological innovation and human-centered educational values.

Ethical Challenges:

- **Algorithmic Bias & Fairness:** AI systems can replicate and amplify societal biases (racial, gender, or socioeconomic) present in their training data. This may lead to unfair academic assessments or biased student recommendations.

- **Data Privacy & Security:** AI tools require extensive collection of personal student data, raising significant concerns about surveillance, unauthorized data access, and compliance with regulations like GDPR or FERPA.
- **Transparency & the "Black Box" Problem:** Many AI models operate opaquely, meaning neither teachers nor students can easily understand the logic behind a specific prediction or grade.
- Preserving Human Connection**:** Over-reliance on AI risks devaluing the emotional intelligence, empathy, and mentorship that only human teachers provide.
- Digital Equity**:** There is a persistent risk that AI will widen the "digital divide" between affluent institutions and underprivileged schools lacking basic infrastructure.

Implementation & Practical Challenges:

- Lack of AI Literacy: Many future teachers feel self-conscious or unmotivated to adopt AI due to a lack of technical knowledge and structured training.
- Academic Integrity: The ease of generating original-looking work with AI creates new hurdles for maintaining authentic learning and preventing plagiarism.
- Resistance to Change: Traditional institutional cultures and educators comfortable with established methods may resist the integration of disruptive technologies.

Ethical Frameworks & Best Practices:

These ethical concerns suggest an urgent need to introduce students and teachers to the ethical challenges surrounding AI applications in K-12 education and how to navigate them. To meet this need, different research groups and nonprofit organizations offer a number of open-access resources based on AI and ethics. They provide instructional materials for students and teachers, such as lesson plans and hands-on activities, and professional learning materials for educators, such as open virtual learning sessions.

- To address these issues, several global organizations have proposed guiding principles:

  UNESCO's Recommendation on the Ethics of AI: Emphasizes human rights, dignity, and the "human-in-the-loop" principle, ensuring humans retain ultimate responsibility for AI decisions.
- FAT Principles : Advocates for Fairness, Accountability, and Transparency in all educational AI deployments.

- Human-Centered Design: Tools should be designed to augment, not replace, human capabilities, focusing on enhancing teacher efficiency and student agency.
- Strategic Pilot Programs: Institutions are encouraged to 'start small,' defining clear objectives and involving all stakeholders—teachers, parents, and students—in the decision-making process.

Conclusion:

The incorporation of Artificial Intelligence into the realm of education signifies the onset of a more just and effective period for both teaching and learning. This study has shown that AI enhances the educational process by breaking down the barriers of conventional, 'one-size-fits-all' teaching methods. With the aid of tailored learning experiences and predictive analytics, students transition from being mere recipients of knowledge to becoming engaged participants in a personalized intellectual journey. At the same time, AI acts as an essential support mechanism for educators; by streamlining the 'repetitive physical and mental tasks' associated with administration, it allows teachers to regain the professional freedom to focus on their primary roles: mentoring and inspiring.

Nonetheless, the advantages offered by AI come with certain reservations. As highlighted in this study, the effective implementation of these technologies relies on a well-rounded strategy that emphasizes ethical data utilization and a human-centered design. Although AI is capable of mimicking intelligence and offering round-the-clock support, it is unable to duplicate the empathy, moral direction, and social-emotional intelligence that a human educator delivers.

Ultimately, the primary objective of AI in education is not to automate the classroom, but rather to humanize it by eliminating the obstacles that hinder meaningful connections. As we progress, the emphasis should remain on a collaborative synergy in which AI manages the data and scale, while the educator imparts the vision and values. By adopting this hybrid model, the global education system can ultimately realize its commitment to delivering high-quality, personalized learning for every student, irrespective of their location or background.

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EFFECTIVENESS OF DIGITAL MARKETING STRATEGIES OVER CONVENTIONAL MARKETING IN EDUCATION LOAN PROMOTION BY BANKS AND NBFCS

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Abstract:

The growing demand for higher education has significantly increased the need for financial support, making education loans a crucial product offered by Banks and Non-Banking Financial Companies. Banks and NBFCs have increasingly adopted digital marketing strategies to promote their financial products, including education loans. A random sample of 500 marketing and IT executives from banks and NBFCs involved in the education loan industry was used for the study, which was carried out in the Nagpur region. Using SPSS software, descriptive statistics were used to analyse the data. The results show that digital marketing helps reach a larger target audience for education loans and improves customer engagement for education loans. It shortens the customer acquisition cycle for education loans and generates higher quality leads compared to conventional marketing. Digital platforms provide better targeting of student borrowers and provide better measurability and performance tracking. Conversion rates from digital leads are higher than those from conventional leads.

Keywords: Digital Marketing, Conventional Marketing, Education Loan, NBFC

Introduction:

As the cost of education continues to rise, especially for professional and international courses, financial institutions play an important role in enabling students to pursue academic aspirations. In this competitive financial environment, effective promotion of education loan products has become essential for Banks and NBFCs to reach potential borrowers and influence their decision-making process. Traditionally, education loan promotion relied heavily on conventional marketing methods with the rapid advancement of digital technology and increased internet penetration, Banks and NBFCs have increasingly adopted digital marketing strategies such as social media marketing, search engine optimization, online advertisements, email

campaigns, and mobile applications—offer financial institutions the ability to reach a wider audience with targeted, measurable, and cost-effective communication. These platforms enable real-time interaction, personalized messaging, and easy access to information, thereby enhancing customer engagement and convenience. This study focuses on evaluating the effectiveness of digital marketing strategies over conventional marketing methods in the promotion of education loans by Banks and NBFCs. It aims to assess how digital marketing influences awareness, accessibility, customer engagement, and conversion compared to traditional marketing approaches. Understanding the relative effectiveness of these marketing strategies will provide valuable insights for financial institutions in optimizing their promotional efforts and aligning marketing investments with changing customer preferences in the education finance sector.

Research Methodology:

The study was delimited to Nagpur region. The design of the study was random group design, where the Marketing executives and IT executives of various banking & non-banking finance companies operational in education loan sector of Nagpur region were selected randomly. Analysis of data was done with the help of suitable statistical tests. The descriptive statistics, such as mean, standard deviation, percentage, minimum and maximum, etc. were determined from the collected data. All statistical analysis of the data was done by using Statistical Package for Social Sciences (SPSS) 18.0 software.

Data Analysis and Interpretation:

Digital marketing helps reach a larger target audience for education loans

Table 1: Digital marketing helps reach a larger target audience for education loans

Response	Frequency	Percent
Strongly agree	189	37.8
Agree	159	31.8
Neutral	46	9.2
Disagree	64	12.8
Strongly Disagree	42	8.4
Total	**500**	**100.0**

Above Table 1 shows response of the marketing and IT executives working in Banks and NBFC with respect to Digital marketing helps reach a larger target audience for education loans. It is observed that 37.8% and 31.8% executives agreed that digital marketing helps reach a larger target audience for education loans while 9.2% executives were not sure about it. Further 12.8%

and 8.4% executives disagreed about digital marketing helps reach a larger target audience for education loans.

Digital marketing improves customer engagement for education loan products

Table 2: Digital marketing improves customer engagement for education loans

Response	Frequency	Percent
Strongly agree	172	34.4
Agree	156	31.2
Neutral	71	14.2
Disagree	60	12.0
Strongly Disagree	41	8.2
Total	**500**	**100.0**

Above Table 2 shows response of the marketing and IT executives working in Banks and NBFC with respect to digital marketing improves customer engagement for education loans. It is observed that 34.4% and 31.2% executives agreed that digital marketing improves customer engagement for education loans while 14.2% executives were not sure about it. Further 12.0% and 8.2% executives disagreed about digital marketing improves customer engagement for education loans.

Digital marketing shortens the customer acquisition cycle for education loans

Table 3: Digital marketing shortens the customer acquisition cycle for education loans

Response	Frequency	Percent
Strongly agree	178	35.6
Agree	160	32.0
Neutral	50	10.0
Disagree	65	13.0
Strongly Disagree	47	9.4
Total	**500**	**100.0**

Above Table 3 shows response of the marketing and IT executives working in Banks and NBFC with respect to digital marketing shortens the customer acquisition cycle for education loans. It is observed that 35.6% and 32.0% executives agreed that digital marketing shortens the customer acquisition cycle for education loans while 10.0% executives were not sure about it. Further 13.0% and 9.4% executives disagreed about digital marketing shortens the customer acquisition cycle for education loans.

Digital marketing generates higher quality leads compared to conventional marketing

Table 4: Digital marketing generates higher quality leads compared to conventional marketing

Response	Frequency	Percent
Strongly agree	184	36.8
Agree	145	29.0
Neutral	50	10.0
Disagree	69	13.8
Strongly Disagree	52	10.4
Total	**500**	**100.0**

Above Table 4 shows response of the marketing and IT executives working in Banks and NBFC with respect to digital marketing generates higher quality leads compared to conventional marketing. It is observed that 36.8% and 29.0% executives agreed that digital marketing generates higher quality leads compared to conventional marketing while 10.0% executives were not sure about it. Further 13.8% and 10.4% executives disagreed about digital marketing generates higher quality leads compared to conventional marketing.

Digital platforms provide better targeting of student borrowers

Table 5: Digital platforms provide better targeting of student borrowers

Response	Frequency	Percent
Strongly agree	175	35.0
Agree	165	33.0
Neutral	50	10.0
Disagree	63	12.6
Strongly Disagree	47	9.4
Total	**500**	**100.0**

Above Table 5 shows response of the marketing and IT executives working in Banks and NBFC with respect to digital platforms provide better targeting of student borrowers. It is observed that 35.0% and 33.0% executives agreed that digital platforms provide better targeting of student borrowers while 10.0% executives were not sure about it. Further 12.6% and 9.4% executives disagreed about digital platforms provide better targeting of student borrowers.

Online campaigns provide better measurability and performance tracking

Table 6: Online campaigns provide better measurability and performance tracking

Response	Frequency	Percent
Strongly agree	176	35.2
Agree	155	31.0
Neutral	53	10.6
Disagree	65	13.0
Strongly Disagree	51	10.2
Total	**500**	**100.0**

Above Table 6 shows response of the marketing and IT executives working in Banks and NBFC with respect to online campaigns provide better measurability and performance tracking. It is observed that 35.2% and 31.0% executives agreed that online campaigns provide better measurability and performance tracking while 10.6% executives were not sure about it. Further 13.0% and 10.2% executives disagreed about online campaigns provide better measurability and performance tracking.

Conversion rates from digital leads are higher than those from conventional leads

Table 7: Conversion rates from digital leads are higher than those from conventional leads

Response	Frequency	Percent
Strongly agree	179	35.8
Agree	159	31.8
Neutral	53	10.6
Disagree	58	11.6
Strongly Disagree	51	10.2
Total	**500**	**100.0**

Above Table 7 shows response of the marketing and IT executives working in Banks and NBFC with respect to conversion rates from digital leads are higher than those from conventional leads. It is observed that 35.8% and 31.8% executives agreed that conversion rates from digital leads are higher than those from conventional leads while 10.6% executives were not sure about it. Further 11.6% and 10.2% executives disagreed about conversion rates from digital leads are higher than those from conventional leads.

Conclusion:

On the basis of study results it is evident that digital marketing helps reach a larger target audience for education loans and improves customer engagement for education loans. It shortens the customer acquisition cycle for education loans and generates higher quality leads compared to conventional marketing. Digital platforms provide better targeting of student borrowers and provide better measurability and performance tracking. Conversion rates from digital leads are higher than those from conventional leads.

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AI LITERACY FOR THE FUTURE OF WORK: INSIGHTS FROM THE SHUNYAXIS AI LITERACY PILOT EMBEDDED IN AN MBA INDUCTION PROGRAMME

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Abstract:

The accelerating integration of Artificial Intelligence (AI) into business processes is transforming skill requirements and redefining employability, particularly within Micro, Small, and Medium Enterprises (MSMEs). While management education increasingly acknowledges the relevance of AI, a gap persists between formal curriculum delivery and practical AI literacy required in real-world organizational contexts. This paper presents insights from the ShunyaXis AI Literacy Pilot, conducted as an integral component of a comprehensive MBA induction programme held between 8th and 13th September 2025. The pilot aimed to develop foundational AI literacy among management students by emphasizing problem framing, tool awareness, and adaptive thinking rather than technical specialization. Adopting a practice-based exploratory approach, the study draws upon observations, participant reflections, and MSME-linked contextual discussions to examine how short-duration, immersive AI literacy interventions can enhance future-of-work readiness. The findings suggest that embedding AI literacy within broader managerial orientation programmes strengthens employability preparedness, particularly for MSME environments, and supports sustainable workforce development in alignment with national skill development priorities.

Keywords: AI Literacy, Skill Development, Future of Work, MSMEs, Management Education, Employability

Introduction:

Artificial Intelligence has emerged as a transformative force influencing how organizations operate, make decisions, and engage with markets. Its impact is not limited to large corporations or technology-intensive sectors; rather, AI-enabled tools and platforms are increasingly accessible to MSMEs, which form the backbone of employment generation in the Indian

economy. As a result, the future of work is being reshaped not only by automation but by the growing need for human–AI collaboration.

Management graduates entering the workforce are expected to navigate this evolving landscape with agility, technological confidence, and ethical awareness. However, traditional management education has largely focused on functional knowledge and conceptual frameworks, often treating AI as a peripheral or highly technical subject. This has contributed to a mismatch between graduate capabilities and workplace expectations, particularly in MSMEs where employees are required to perform multiple roles and adapt quickly to changing conditions.

In this context, AI literacy defined as the ability to understand, contextualize, and effectively use AI-enabled toolshas become a critical employability skill. This paper examines how AI literacy can be cultivated at an early stage of management education through an immersive induction programme. Specifically, it presents insights from the ShunyaXis AI Literacy Pilot, embedded within an MBA induction programme conducted in September 2025, and linked to MSME realities.

AI, Skill Development, and the Future of Work:

The discourse on the future of work emphasizes a shift from job-specific competencies to transferable, adaptive skills. AI plays a central role in this transition by augmenting human capabilities in areas such as analysis, communication, creativity, and decision-making. Consequently, employability is increasingly associated with an individual's capacity to learn continuously, interact with intelligent systems, and apply judgment in AI-supported environments.

AI literacy differs fundamentally from advanced technical skills such as programming or data science. It encompasses an understanding of AI capabilities and limitations, the ability to frame managerial problems in ways that AI tools can assist, awareness of ethical and contextual considerations, and confidence in using AI-enabled applications. For management graduates, AI literacy supports informed decision-making and enhances productivity without requiring deep technical specialization.

MSMEs present a distinctive context for AI adoption. Limited resources, cost sensitivity, and operational constraints mean that MSMEs rely on affordable, flexible, and human-centric AI solutions rather than large-scale automation. Therefore, graduates entering MSMEs must be capable of identifying relevant AI use cases, integrating tools into existing workflows, and balancing technological possibilities with organizational realities. Embedding AI literacy within management education is thus essential for preparing graduates for sustainable and meaningful employment.

Context of the Study:

The MBA Induction Programme (8–13 September 2025)

The MBA induction programme conducted between 8th and 13th September 2025 was designed as a holistic orientation to management education. The programme aimed to introduce students to the discipline of management as an applied, ethical, and socially embedded practice. Sessions focused on mindset development, professional identity, adaptability, values, and future readiness, rather than on disciplinary silos.

The induction programme followed a progression from self-awareness and learning orientation to organizational understanding and societal relevance. This broader structure provided a fertile environment for introducing AI literacy as a natural component of contemporary managerial competence.

The ShunyaXis AI Literacy Pilot

Within the induction programme, the ShunyaXis AI Literacy Pilot was conducted as a focused intervention aimed at building foundational AI literacy among management students. The pilot did not seek to provide technical training in AI development; instead, it emphasized AI as a managerial enabler.

- The pilot was structured around three core objectives:
- Developing awareness of AI applications relevant to management functions
- Building confidence in interacting with AI-enabled tools
- Encouraging adaptive and reflective thinking about the future of work

Students were exposed to demonstrations of widely accessible AI tools, discussions on AI-driven changes in work practices, and guided reflections on how AI could support decision-making and problem-solving. The emphasis was on experiential learning, curiosity, and ethical awareness rather than formal assessment.

MSME Linkage: SuperPrint's Vibebox

To ground AI literacy in real-world constraints, the pilot was conceptually linked to an MSME context, namely Super Prints Vibebox. This linkage enabled discussions around practical challenges faced by MSMEs, such as multitasking, limited manpower, cost pressures, and the need for rapid decision-making.

The MSME context helped students understand how AI tools could be applied in areas such as customer communication, content creation, workflow organization, and basic analytics without requiring large investments. This

contextualization reinforced the relevance of AI literacy for employability in MSME-dominated economic environments.

Methodology:

The study adopts a practice-based exploratory research design. Given the pilot nature of the intervention, the focus was on generating insights rather than testing predefined hypotheses. Data sources included programme design materials, facilitator observations, informal participant reflections, and discussions arising from MSME-linked examples.

The researcher's role was that of a facilitator observer, actively involved in programme delivery while systematically reflecting on learning outcomes and participant responses. This methodological approach is appropriate for early-stage initiatives aimed at understanding processes, perceptions, and contextual relevance in skill development interventions.

Key Insights and Discussion:

Analysis of the pilot revealed several important insights relevant to AI literacy and future-of-work preparedness:

AI Literacy Is Primarily Cognitive: Students responded most positively to learning how to think with AI rather than learning specific tools. Problem articulation, questioning, and interpretation emerged as critical competencies.

Contextualization Enhances Relevance: Linking AI discussions to MSME realities significantly increased engagement and understanding. Students were better able to appreciate AI as a practical support system rather than an abstract technology.

Short, Immersive Interventions Are Effective: Even a brief AI literacy exposure during induction produced noticeable shifts in confidence and openness towards technology, suggesting that early-stage interventions can have lasting impact.

Employability Extends Beyond Technical Skills: The pilot highlighted that psychological readiness such as adaptability, willingness to experiment, and comfort with uncertaintyis central to future employability in AI-influenced workplaces.

AI as an Augmenting Force: Students increasingly viewed AI as a complement to managerial judgment rather than a replacement, aligning with ethical and sustainable approaches to workforce development.

Implications

For Management Education

Embedding AI literacy within induction programmes helps normalize AI as an integral managerial capability rather than a specialized add-on.

For MSMEs

AI-literate management graduates can act as internal enablers of incremental, low-cost AI adoption, enhancing productivity without disrupting organizational culture.

For Policy and Institutions

Practice-based pilots such as the ShunyaXis initiative align with national priorities on skill development and employability, offering scalable and context-sensitive models for workforce preparation.

Conclusion:

The ShunyaXis AI Literacy Pilot, conducted as part of an MBA induction programme in September 2025, demonstrates the value of introducing AI literacy as a foundational managerial skill. By embedding AI awareness within a holistic educational framework and grounding it in MSME realities, the pilot contributed to enhanced future-of-work readiness among management students. While limited in scope, the initiative provides meaningful insights into how management education can respond to evolving skill demands in an AI-driven economy. Future research may build upon these findings through longitudinal studies and broader institutional implementation.

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ARTIFICIAL INTELLIGENCE & IT'S APPLICATIONS

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Abstract:

It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable. While no consensual definition of Artificial Intelligence (AI) exists, AI is broadly characterized as the study of computations that allow for perception, reason and action. Today, the amount of data that is generated, by both humans and machines, far outpaces humans' ability to absorb, interpret, and make complex decisions based on that data. Artificial intelligence forms the basis for all computer learning and is the future of all complex decision making. This paper examines features of artificial Intelligence, introduction, definitions of AI, history, applications, growth and achievements.

Keywords: machine learning, deep learning, neural networks, Natural Language Processing and Knowledge Base System

Introduction:

Artificial Intelligence (AI) is the branch of computer science which deals with intelligence of machines where an intelligent agent is a system that takes actions which maximize its chances of success. It is the study of ideas which enable computers to do the things that make people seem intelligent. The central principles of AI include such as reasoning, knowledge, planning, learning, communication, perception and the ability to move and manipulate objects. It is the science and engineering of making intelligent machines, especially intelligent computer programs

Artificial Intelligence Methods:

Machine Learning

It is one of the applications of AI where machines are not explicitly programmed to perform certain tasks; rather, they learn and improve from experience automatically. Deep Learning is a subset of machine learning based on artificial neural networks for predictive analysis. There are various machine learning algorithms, such as Unsupervised Learning, Supervised Learning,

and Reinforcement Learning. In Unsupervised Learning, the algorithm does not use classified information to act on it without any guidance. In Supervised Learning, it deduces a function from the training data, which consists of a set of an input object and the desired output. Reinforcement learning is used by machines to take suitable actions to increase the reward to find the best possibility which should be taken in to account.

Natural Language Processing (NLP)

It is the interactions between computers and human language where the computers are programmed to process natural languages. Machine Learning is a reliable technology for Natural Language Processing to obtain meaning from human languages. In NLP, the audio of a human talk is captured by the machine. Then the audio to text conversation occurs, and then the text is processed where the data is converted into audio. Then the machine uses the audio to respond to humans. Applications of Natural Language Processing can be found in IVR (Interactive Voice Response) applications used in call centres, language translation applications like Google Translate and word processors such as Microsoft Word to check the accuracy of grammar in text. However, the nature of human languages makes the Natural Language Processing difficult because of the rules which are involved in the passing of information using natural language, and they are not easy for the computers to understand. So NLP uses algorithms to recognize and abstract the rules of the natural languages where the unstructured data from the human languages can be converted to a format that is understood by the computer.

Automation & Robotics

The purpose of Automation is to get the monotonous and repetitive tasks done by machines which also improve productivity and in receiving cost-effective and more efficient results. Many organizations use machine learning, neural networks, and graphs in automation. Such automation can prevent fraud issues while financial transactions online by using CAPTCHA technology. Robotic process automation is programmed to perform high volume repetitive tasks which can adapt to the change in different circumstances

Machine Vision

Machines can capture visual information and then analyze it. Here cameras are used to capture the visual information, the analogue to digital conversion is used to convert the image to digital data, and digital signal processing is employed to process the data. Then the resulting data is fed to a computer. In machine vision, two vital aspects are sensitivity, which is the ability of the machine to perceive impulses that are weak and resolution, the range to which the machine can distinguish the objects. The usage of machine

vision can be found in signature identification, pattern recognition, and medical image analysis, etc.

Neural Networks:

Neural Networks are biologically inspired systems consisting of a massively connected network of computational "neurons," organized in layers. By adjusting the weights of the network, NNs can be "trained" to approximate virtually any nonlinear function to a required degree of accuracy. NNs typically are provided with a set of input and output exemplars. A learning algorithm (such as back propagation) would then be used to adjust the weights in the network so that the network would give the desired output, in a type of learning commonly called supervised learning. Applications of AI Artificial Intelligence has various applications in today's society. It is becoming essential for today's time because it can solve complex problems with an efficient way in multiple industries, such as Healthcare, entertainment, finance, education, etc. **AI is making our daily life more comfortable and fast.**

- **AI in Astronomy**

Artificial Intelligence can be very useful to solve complex universe problems. AI technology can be helpful for understanding the universe such as how it works, origin, etc.

- **AI in Healthcare**

In the last, five to ten years, AI becoming more advantageous for the healthcare industry and going to have a significant impact on this industry. o Healthcare Industries are applying AI to make a better and faster diagnosis than humans. AI can help doctors with diagnoses and can inform when patients are worsening so that medical help can reach to the patient before hospitalization.

- **AI in Gaming**

AI can be used for gaming purpose. The AI machines can play strategic games like chess, where the machine needs to think of a large number of possible places.

- **AI in Finance**

AI and finance industries are the best matches for each other. The finance industry is implementing automation, chatbot, adaptive intelligence, algorithm trading, and machine learning into financial processes.

- **AI in Data Security**

The security of data is crucial for every company and cyber-attacks are growing very rapidly in the digital world. AI can be used to make your data more safe and secure. Some examples such as AEG bot, AI2 Platform, are used to determine software bug and cyber-attacks in a better way.

- **AI in Social Media**

Social Media sites such as Facebook, Twitter, and Snapchat contain billions of user profiles, which need to be stored and managed in a very efficient way. AI can organize and manage massive amounts of data. AI can analyze lots of data to identify the latest trends, hashtag, and requirement of different users.

- AI in Travel & Transport o AI is becoming highly demanding for travel industries. AI is capable of doing various travel related works such as from making travel arrangement to suggesting the hotels, flights, and best routes to the customers. Travel industries are using AI-powered chatbots which can make human-like interaction with customers for better and fast response.

- **AI in Automotive Industry**

Some Automotive industries are using AI to provide virtual assistant to their user for better performance. Such as Tesla has introduced TeslaBot, an intelligent virtual assistant.

Various Industries are currently working for developing self-driven cars which can make your journey more safe and secure.

- **AI in Robotics:**

Artificial Intelligence has a remarkable role in Robotics. Usually, general robots are programmed such that they can perform some repetitive task, but with the help of AI, we can create intelligent robots which can perform tasks with their own experiences without pre-programmed.

Humanoid Robots are best examples for AI in robotics, recently the intelligent Humanoid robot named as Erica and Sophia has been developed which can talk and behave like humans.

- **AI in Agriculture**

Agriculture is an area which requires various resources, labor, money, and time for best result. Now a day's agriculture is becoming digital, and AI is emerging in this field. Agriculture is applying AI as agriculture robotics, solid and crop monitoring, predictive analysis. AI in agriculture can be very helpful for farmers.

- AI in E-commerce o AI is providing a competitive edge to the e-commerce industry, and it is becoming more demanding in the e-commerce business. AI is helping shoppers to discover associated products with recommended size, color, or even brand.

- **AI in education**

AI can automate grading so that the tutor can have more time to teach. AI chatbot can communicate with students as a teaching assistant. o AI in the

future can be work as a personal virtual tutor for students, which will be accessible easily at any time and any place.

Future of AI:

Looking at the features and its wide application we may definitely stick to artificial intelligence. Seeing at the development of AI, is it that the future world is becoming artificial. Biological intelligence is fixed, because it is an old, mature paradigm, but the new paradigm of non-biological computation and intelligence is growing exponentially. The memory capacity of the human brain is probably of the order of ten thousand million binary digits. But most of this is probably used in remembering visual impressions, and other comparatively wasteful ways. Hence we can say that as natural intelligence is limited and volatile too world may now depend upon computers for smooth working. Artificial intelligence (AI) is truly a revolutionary feat of computer science, set to become a core component of all modern software over the coming years and decades. This presents a threat but also an opportunity. AI will be deployed to augment both defensive and offensive cyber operations. Additionally, new means of cyber attack will be invented to take advantage of the particular weaknesses of AI technology. Finally, the importance of data will be amplified by AI's appetite for large amounts of training data, redefining how we must think about data protection. Prudent governance at the global level will be essential to ensure that this era-defining technology will bring about broadly shared safety and prosperity.

Conclusion:

Till now we have discussed in brief about Artificial Intelligence. We have discussed some of its principles, its applications, its achievements etc. The ultimate goal of institutions and a scientist working on AI is to solve majority of the problems or to achieve the tasks which we humans directly can't accomplish. It is for sure that development in this field of computer science will change the complete scenario of the world now it is the responsibility of creamy layer of engineers to develop this field.

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ROLE AND CONTRIBUTION OF ARTIFICIAL INTELLIGENCE (AI) IN BUSINESS, MANAGEMENT, AND ENTREPRENEURSHIP

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Abstract :

Artificial Intelligence (AI) has emerged as a transformative force in business, management, and entrepreneurship by enabling data-driven decision-making, operational efficiency, and innovative business models. AI technologies such as machine learning, natural language processing, and predictive analytics are redefining how organizations manage resources, interact with customers, and gain competitive advantage. This study examines the role and contribution of AI across business operations, managerial decision-making, and entrepreneurial innovation. It also explores the impact of AI on productivity, cost reduction, customer satisfaction, and strategic growth. The research uses both primary and secondary data to analyze AI adoption trends and their implications for organizational performance.

Keywords:

Artificial Intelligence, Business Analytics, Management Decision-Making, Entrepreneurship, Automation, Innovation, Digital Transformation

Introduction:

In the era of digital transformation, Artificial Intelligence has become a critical enabler of business excellence and entrepreneurial success. AI refers to the ability of machines and systems to perform tasks that typically require human intelligence, such as learning, reasoning, problem-solving, and decision-making.

Businesses today operate in highly competitive and dynamic environments where speed, accuracy, and innovation are essential. AI supports management functions like planning, organizing, leading, and controlling by providing real-time insights and predictive capabilities. For entrepreneurs, AI reduces entry barriers, enhances scalability, and enables

personalized customer experiences. As a result, AI is not only reshaping existing enterprises but also fostering new entrepreneurial opportunities.

Business:

Artificial Intelligence (AI) has become one of the most influential technologies shaping modern business environments. AI refers to the capability of machines and computer systems to simulate human intelligence processes such as learning, reasoning, problem-solving, and decision-making. With the rapid growth of digitalization, businesses across all sectors are increasingly adopting AI to improve efficiency, accuracy, and competitiveness.

In today's dynamic and data-driven economy, organizations generate vast amounts of information that require advanced analytical tools for effective utilization. AI enables businesses to process large volumes of data in real time, identify patterns, and generate actionable insights. As a result, AI plays a crucial role in strategic planning, demand forecasting, risk management, and customer relationship management.

The contribution of AI in business is evident across various functional areas such as marketing, finance, human resources, operations, and supply chain management. AI-powered technologies like chatbots, recommendation systems, robotic process automation, and predictive analytics help organizations reduce operational costs, enhance customer satisfaction, and improve decision-making quality. Moreover, AI supports business innovation by enabling the development of new products, services, and business models.

Furthermore, AI has lowered entry barriers for entrepreneurs and startups by providing scalable and cost-effective solutions. Small and medium enterprises can now compete with large corporations through AI-driven personalization, automation, and digital platforms. Despite challenges related to data privacy, ethical concerns, and skill gaps, the role of AI in business continues to expand, making it a key driver of sustainable growth and long-term competitive advantage.

Management:

Artificial Intelligence (AI) has emerged as a powerful tool in modern management by transforming the way organizations plan, organize, lead, and control their activities. AI refers to the ability of machines and intelligent systems to perform tasks that require human intelligence, such as learning, reasoning, decision-making, and problem-solving. In a highly competitive and rapidly changing business environment, effective management requires timely decisions, accurate information, and efficient utilization of resources, all of which are enhanced by AI technologies.

AI plays a significant role in managerial decision-making by analyzing large volumes of structured and unstructured data to provide predictive in

sights and strategic recommendations. Managers use AI-based tools for forecasting demand, optimizing operations, evaluating performance, and managing risks. By automating routine and repetitive managerial tasks, AI allows managers to focus more on strategic planning, leadership, and innovation.

The contribution of AI is evident across various management functions such as human resource management, financial management, marketing management, and operations management. AI-enabled systems improve employee recruitment and performance appraisal, enhance financial analysis and fraud detection, support customer relationship management, and streamline supply chain operations. Although challenges like ethical concerns, data security, and skill gaps remain, AI continues to strengthen managerial efficiency and effectiveness, making it an essential component of contemporary management practices.

Entrepreneurship:

Artificial Intelligence (AI) has become a key driver of entrepreneurial innovation and business creation in the digital economy. AI refers to the capability of machines and intelligent systems to perform tasks such as learning, reasoning, prediction, and decision-making that traditionally required human intelligence. For entrepreneurs operating in uncertain and highly competitive markets, AI provides powerful tools to identify opportunities, reduce risks, and create scalable business models.

AI contributes significantly to entrepreneurship by enabling data-driven decision-making and rapid experimentation. Entrepreneurs use AI technologies to analyze market trends, understand customer preferences, forecast demand, and optimize pricing strategies. AI-based automation reduces operational costs and allows startups to operate efficiently with limited resources. Tools such as chatbots, recommendation systems, and intelligent analytics help new ventures enhance customer engagement and personalize products and services.

Moreover, AI has lowered entry barriers for startups by providing access to cloud-based platforms, AI-as-a-service, and digital marketplaces. This has encouraged innovation and fostered the growth of technology-driven startups across sectors such as e-commerce, healthcare, finance, and education. Despite challenges related to funding, technical expertise, and ethical considerations, AI continues to empower entrepreneurs by enhancing innovation, scalability, and long-term sustainability.

Case Study: Amazon – Ai In Business And Entrepreneurship

Amazon is a global leader in leveraging AI across business and management functions.

Key AI Applications at Amazon

- **Recommendation Systems:** AI-driven algorithms analyze customer behavior to suggest personalized products.
- **Supply Chain Management:** Predictive analytics optimize inventory and logistics.
- **Customer Service:** AI-powered chatbots and voice assistants (Alexa) improve customer engagement.
- **Entrepreneurial Ecosystem:** Amazon Web Services (AWS) provides AI tools that support startups and entrepreneurs globally.

Impact:

- Improved customer satisfaction and retention
- Reduced operational costs
- Enhanced decision-making accuracy
- Creation of new AI-based entrepreneurial ventures

Aims:

To analyze the role and contribution of Artificial Intelligence in business, management, and entrepreneurship.

Objectives:

1. To study the application of AI in business operations and management functions
2. To examine the role of AI in entrepreneurial innovation and startups
3. To evaluate the impact of AI on decision-making and organizational performance
4. To identify challenges associated with AI adoption in businesses

Research Hypothesis:

- **H1:** Artificial Intelligence has a significant positive impact on business efficiency and managerial decision-making.
- **H2:** The adoption of Artificial Intelligence significantly enhances entrepreneurial innovation and business competitiveness.

Primary Data

- Surveys of business managers and entrepreneurs
- Interviews with startup founders and IT professionals
- Questionnaires on AI adoption and business performance

Secondary Data

- Research journals and academic publications
- Industry reports (McKinsey, Deloitte, PwC)
- Books on AI and management

- Company websites and government reports

Conceptual Framework:

Artificial Intelligence (Independent Variable)
↓
Business Functions (Operations, Marketing, Finance, HR)
↓
Management Effectiveness (Decision-Making, Productivity, Cost Efficiency)
↓
Entrepreneurial Outcomes (Innovation, Scalability, Competitive Advantage)
↓
Organizational Performance (Dependent Variable)

Discussion of the Findings:

The findings indicate that AI significantly improves operational efficiency by automating repetitive tasks and enhancing accuracy. Managers benefit from predictive analytics and real-time dashboards that support strategic decisions. Entrepreneurs leverage AI to identify market opportunities, personalize offerings, and scale businesses rapidly.

However, challenges such as high implementation costs, lack of skilled workforce, data privacy concerns, and ethical issues were also identified. Despite these challenges, the overall impact of AI on business and entrepreneurship remains strongly positive.

Conclusion:

Artificial Intelligence has become a vital driver of growth, innovation, and competitiveness in business, management, and entrepreneurship. Its ability to process large volumes of data, automate operations, and enhance decision-making makes AI an indispensable tool in the modern business environment. While challenges exist, organizations that strategically adopt AI gain long-term advantages. Future businesses and entrepreneurs must embrace AI to remain relevant and sustainable in the digital economy.

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A STUDY OF ARTIFICIAL INTELLIGENCE: PERSPECTIVES OF STUDENTS FROM THE FIELD OF ARTS, HUMANITIES AND LANGUAGES.

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Abstract :

The present research article is a brief report of UG students views and opinions and perceptions of students on 'Artificial Intelligence; Challenges in present Indian context'. The data has been collected by the researcher by listening to the views expressed by the participants at the inter-collegiate elocution competition that has been organized on the occasion of 127th birth anniversary of Dr. Panjabrao Deshmukh, the first Agriculture Minister of independent India held on date25.12.2025in Dhanwate National College,Nagpur—440012. The elocution was held in a multicultural background with students from different colleges of Nagpur district especially having diversified backgrounds like suburban, rural and urban with different income groups and educational backgrounds and especially non-English medium students along with scholars and academicians. It comprises of the various issues on AI in the minds of students that may or may not be true.

Key words: AI, Chat Gpt, chatbot, online, mobiles,

Introduction:

The emergence of Artificial Intelligence in Education has revolutionized the way students learn and earn. Having a degree of Arts or any other degree in Humanities is not adequate in a speedily moving age of AI. Besides the degree, the students are supposed to acquire skill and training in Technical knowledge. For students from remote rural areas. AI may turn out to be too much beneficial. Complete reliance on AI is still risky for a UG student. Expertise is still needed for guidance and directions. The computers are uploaded with information and the same is downloaded by students in the form of notes, information. There are advertisements by different AI software companies. If the students can make good use of AI for scoring marks or enhancing knowledge, it is developmental; If they learn wrong right from the

starting, it's ruinous and a wastage of their time and money they pay through their sim cards. There are various happenings around the world related to AI. Students have fears in their minds regarding them.

For teachers, AI is a beneficial tool that helps increase and enhance students' interest in learning a foreign language ; develop their speech, personal as well as inter-personal skills.(Marina G.Petrova[1] et al, 2020)

Digital Technologies have had a profound impact on the way that many scholars in the humanities conduct and share their research. Once a text is digitized, even the simplest search facilities allow users to interact with and study texts in entirely new ways. (Jeffrey A[2]. et al., 2006) Copying and pasting as it is, creates the issue of plagiarism in research that the students have to be aware of. In PG, there is a special unit that has to be learnt by the students upon 'plagiarism'. Hitherto unknown issues arise, such as problems in uploading assignments, lack of connectivity, plagiarized content checking. Hardworking and honest students have to face such a situation that they can never imagine of. Knowledge of copyright is a must lest the original author creates problems in lives of students .Acquiring a degree has not remained the same as in the olden times despite the fact that large masses of students become intelligent due to AI nowadays where teachers , experts may be unavailable. 'Unequal access to digital learning tools, privacy related issues, varying learning styles, distractions are some of the crucial issues to be dealt with relation to digital education. Social media platforms, online lectures, language learning apps facilitate collaborative learning, cross cultural exchanges and peer assessments.'(Lanunochit Pongen[3],2024)

Definition of Artificial Intelligence :

The term was coined by John McCarthy[4].

As per Cambridge Dictionary[5], 'Artificial Intelligence is the use of computer programs that have some of the qualities of the human mind such as ability to understand language, recognizepictures, and learn from experience.'

In the present research paper some issues related to AI have been discussed in the form of observations of participants by the researcher.

Aim : Review of an Elocution Competition on AI.

Limitations : The study is limited to

1. UG students from Arts, Commerce, Humanities and Social Sciences, Mass Communication, B Ed BBA etc.
2. Participants of an Inter-collegiate elocution held on 27.12.2025 .
3. Ten elocutors'views on AI : challenges.

Delimitation: The study is delimited to academic session 2025-2026

Reviews : Sarthak Satish Thakre[6] (2024) examined the various ways in which digital tools and technologies have revolutionized the study, interpretation and analysis of literary text; the challenges as well as opportunities as presented by the intersection of Digital Humanities and English Literature studies. (Vasile Gherhes[7] et al, 2018) investigated on how the development of AI is perceived by students from Technical and Humanities fields at two universities of Timisoara. The study revealed that a majority of students perceived that AI will better society and will have positive impact.

Methodology : The researcher listened to the opinions of select participants and noted down their opinions that were , most of them in Hindi, Marathi and a few in English language sand translated them into English especially the main ideas .The researcher has translated herein the main sentences of their speeches. The names of the students herein are not their rue names.

Students' Views on Artificial Intelligence: challenges and opportunities

Vedika : "Its feared that AI has increased unemployment. Thousands of people have become jobless due to AI. AI will make the already employed ones jobless. It does work as ordered to it. AI is man-made. It works too much faster as well as more accurately than human beings. To get out of this jobless condition, students will have to learn technical skills. If they remain disappointed at the same place due to defeat, then where will they go. They must get trained and acquire technical skills and move on in life."

Sanket : "We live in the age of mobiles, internet, computers and nowadays AI." Machines are fed with information by human beings. They have reduced the burden of human beings. AI has revolutionized almost every field be it the banking sector, Health sector, Railways or even the Defenceand Police departments. We can't imagine a student without a mobile nowadays."

Aniket: "AI has silently knocked at thousands of homes. Are we prepared to learn at the same speed as AI? It is feared that AI will create joblessness and unemployment all over the world within the coming two decades. Simultaneously, AI will create millions of jobs. AI will eliminate many jobs; it is testing the mindsets of human beings. Our future must be in our hands. Certain corridors will never be replaced by AI in any time: AI can't take place of Values, duties, responsibilities towards society and nation; principles & ideologies; creativity and genius."

Atharva: "AI is concerned more with the present than the future. It has entered almost every sector and everywhere. It never asks for salary or salary hike or reduction in work timings or medical leave or any other facility that has to be provided to men and women at work. It has already become a threat to human beings at work, offices and society in general. AI turns out to be more skilled than any person. It has not to be trained to improve job skills. A skill crisis gap

has been created. Education sector has to train students such technical skills to compete in an AI-driven world. What AI lacks? The answer is obvious: decision making, creativity, and moral things like duty etc. AI learns from the data that is entered into it. Students learn from real life situations as in a classroom. Students should not fear AI but master it."

Nalini: " AI is keeping a watch upon your job.AI is a software that thinks, calculates, knows a lot about human society and human beings. It is the child of human indolence and inactivity and laziness and his habitand nature to get more with less work. AI has been brought up by human society and now it is eating jobs. Chatbots do tasks like human beings. Now you don't have to read books in depth, or search out files on laws and legislations or go to experts and scholars for their adviseon a topic but get answers to your questions within seconds with the help of AI. You get a high resolution photo in your mobile itself. Hereafter, AI will not only go on improving itself but also the life especially the work of it's users as well. Yet the issue is that only the Engineers and technical field students will get jobs but what about the students with non-technical graduations ? How will they earn incomes and move on? "

Chetan: "AI is a reality today. Every technical revolution brings forth with it some or the other threat and fear. Lesser the machines, more the jobs. For human beings, since the ancient times, strenuous hard manual work had kept life moving on. It is the truth of human life. Hidden unemployment in the agrarian sector comprises of small children working in fields and not going to school just for the sake of a day's wage; the kind and caring government has found out one remedy and that is to provide provisions to them in the form of food grains decades ago or in recent times, midday meals and that is really helpful for the children of poor farmers to get education. As times moved on ,the scientific advancements in Agriculture sector brought pesticides to kill worms; fertilisers to increase production of food grains so as to reduce poverty; nowadays weedicides take toll of manual jobs of marginal and landless farmers; It is true that every farmer family son goes to urban areas in search of jobs; be it in companies, factories or service sector jobs in cities and towns. In offices, AI is speedily replacing the humans and that is truly raising issues of unemployment; for the farmers and company owners who are really profit seekers cut off jobs mercilessly. Time and Tide waits for none. If one job is lost, another comes. Nowadays, just the degree is not important but the knowledge of AI, a computer is important as well. The future is of AI that has invaded almost every important field of life be it Agriculture, Medicine or Education. There's only one option left before students especially belonging to the Humanities and languages and Social Sciences ones and that is to acquire new skills and knowledge of AI. If AI is utilized merely for mercenary gains, then it cannot replace any human being. AI is perfect but human beings are creative.

Human beings will have to take help of AI to get work done , to keep updated; yet the fact remains that AI is man made."

Revati : "One crucial issue is to imagine our future and redefine our present in the age of AI. Machines work faster, harder, cheaper and more accurately. It also thinks, analyzes and calculates. It is changing the way how students think, learn and earn nowadays. Nowadays accounting is automated; in banks ATMs do the work of cashiers; If machines take over jobs, what will happen of educated youth? In a developing country like India, educated unemployment may grow more than it was existent in the earlier times due to AI.Is AI our enemy? AI is not replacing jobs but it is transforming them. If the students lack technical skill, and training, wrong methods and styles of learning such as lack of readiness to learn and just rote learning, won't help them. Our skills and learning can't be stolen from us. It is hoped that AI will provide light that will lead to success. 'Learn, Adapt, Keep learning' so that you won't go unemployed."

Ajay: 'AI has taken toll of many jobs in the industrial sector. Company employees went jobless. As human beings try to solve their problems out of perplexing situations. Due to AI , the tendency to utilize readymade material like notes and answers that are easily available within no time , they don't make use of their brains. The students get automatically everything ready. As per Niti Aayog, by 2030, millions of educated may go jobless due to AI whereas on the other hand millions will get jobs due to AI. There's only one thing that is in the hands of students , to use AI as a friend'. Saved data helps us. In many countries like China, Japan AI is used extensively. Too much dependence upon AI is not good. There is a fear of fake information, fake images that may ruin a career and waste precious time. If you want to do something in life, you will have to change yourself; gain skill-based knowledge. It is expected that every college and educational institution will provide AI skill based courses."

Pawan: As remarked by ElonMusk, 'AI is far more dangerous than crooks.' Why should society depend on AI?' It is feared that in the next decade, millions of youth, especially the educated ones may go jobless due to AI. As per an article in Times of India, Companies have replaced their employees with Chat GPT. Yet uncontrolled use of AI is injurious to human beings.'

Gunjan: AI is like a magic wand that helps us anywhere and everywhere and all the time. AI helps to locate address; helps to learn tables in Maths effectively with the help of images, photos and drawings; thus it has reduced rote-learning. In earlier times, studies were time consuming but nowadays they are not due to AI. Educational videos and games make learning easy, enjoyable and stress-free. AI helps earn incomes from home. During Corona

pandemic times, AI helped to earn income by work from home. Education field has profited by the use of AI. There are limitations to AI: If a document is deleted accidentally and cannot be retrieved, the original documents help. When human beings and employees are few, robots do the work of waiters; Robots are run by AI.'

Akshay: 'AI has increased unemployment in the industrial sector nowadays. It is feared that AI will increase educated unemployment. Who will get affected? Youth, their families may be : rural or urban both. AI has information but no sense, no feelings, no ethics, no justice. Justice can be done by human beings not by AI. Our nation's developmental goals are poverty eradication through employment that may not be attained due to the emergence of AI. For students must develop with the pace of AI. For humanities and social sciences students, digital literacy is a must so that they can keep pace with the present world of AI.'

Conclusions: From the above discussions, it is obvious that Indian students must get technical skills besides their degrees to keep pace with AI based learnings and AI generated incomes; get trainings in the various issues such as plagiarism, copyrights, awareness from fake data and information etc, in the way to knowledge generation and acquisition. It is undoubtedly true that availability of facilities like connectivity, learning systems are like boons to remotely located areas students.

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ROLE OF ARTIFICIAL INTELLIGENCE IN ADVANCING SUSTAINABLE ECONOMIC DEVELOPMENT IN INDIA

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Abstract:

This paper delves into the trans formative role of AI in fostering sustainable economic development within the Indian context, with a particular focus on key sectors including agriculture, healthcare, education, and urban planning. How AI can revolutionize agricultural practices through precision farming, optimize healthcare delivery via advanced diagnostics and personalized treatment plans, enhance educational outcomes through adaptive learning systems, and promote sustainable urban development through smart city initiatives. By analyzing these specific applications, the paper highlights the potential of AI to drive efficiency, improve resource allocation, and create more equitable access to essential services.

Keywords: AI, Sustainable Development, Agriculture, Healthcare.

Introduction:

Artificial Intelligence (AI) has emerged as a transformative technology with the potential to reshape economies and societies across the globe. In a developing country like India, where rapid economic growth must be balanced with social inclusion and environmental sustainability, AI offers powerful tools to advance sustainable economic development. By enabling data-driven decision-making, improving productivity, and optimizing the use of resources, AI can support long-term growth while minimizing ecological and social costs. India faces complex development challenges such as poverty alleviation, unemployment, uneven access to healthcare and education, and environmental degradation. AI technologies—ranging from machine learning and big data analytics to automation and smart systems—can help address these challenges by enhancing efficiency in key sectors like agriculture, manufacturing, healthcare, energy, and urban planning. For example, AI-based solutions can improve crop yields, reduce waste in supply chains, enhance renewable energy management, and strengthen public service delivery.

Moreover, the integration of AI aligns with India's national initiatives such as *Digital India*, *Make in India*, and *Smart Cities Mission*, which aim to

promote innovation-driven and inclusive growth. When implemented responsibly, with adequate attention to ethical concerns, skill development, and digital inclusion, AI can act as a catalyst for sustainable economic development in India. Thus, understanding the role of artificial intelligence is crucial for shaping policies and strategies that ensure economic progress while safeguarding social equity and environmental sustainability.

Artificial Intelligence (AI) is rapidly transforming economies worldwide, serving as a catalyst for innovation and offering potential solutions to pressing global challenges. For India, AI presents a unique opportunity to address long-standing developmental issues such as resource inefficiency, economic disparity, and environmental sustainability. This paper delves into the trans formative role of AI in fostering sustainable economic development within the Indian context, with a particular focus on key sectors including agriculture, healthcare, education, and urban planning. How AI can revolutionize agricultural practices through precision farming, optimize healthcare delivery via advanced diagnostics and personalized treatment plans, enhance educational outcomes through adaptive learning systems, and promote sustainable urban development through smart city initiatives. By analyzing these specific applications, the paper highlights the potential of AI to drive efficiency, improve resource allocation, and create more equitable access to essential services.

Paper also acknowledges the significant challenges that India must overcome to fully realize the benefits of AI. These challenges include the persistent digital divide, which limits access to technology and digital literacy; ethical concerns surrounding data privacy, algorithmic bias, and job displacement; and the current regulatory gaps that hinder responsible AI development and deployment in agriculture, healthcare, education, and urban development to address critical developmental challenges in India.

1. Identify the challenges that hinder AI adoption in India, including the digital divide, skill gaps, ethical concerns, and regulatory barriers.
2. Provide actionable recommendations to overcome these challenges, including policy formulation, infrastructure development, skill development, and fostering public- private collaboration.

Research Methodology:

This study utilizes secondary data from government reports, academic journals, industry white papers, and case studies. By analyzing existing literature, the paper identifies key applications, challenges, and opportunities for AI in India's economic development.

Impact Of Ai In Key Sectors For Sustainable Development:

Agriculture:

Agriculture remains the backbone of India's economy, employing over 50% of the workforce. AI is transforming India's agriculture by improving farming practices through data analysis. AI applications analyze crop yields, soil health, and weather patterns, helping farmers make informed decisions. Agriculture remains the backbone of the Indian economy and a primary source of livelihood for a large population. AI-powered tools such as precision farming, predictive analytics, and satellite-based monitoring help farmers optimize crop yields, manage water resources efficiently, and reduce the excessive use of fertilizers and pesticides. These technologies contribute to food security, increase farmers' incomes, and promote environmentally sustainable agricultural practices.

Key impacts of AI in Indian agriculture:

- **Increased market growth** The Artificial Intelligence in Agriculture Market is projected to grow from USD

  1.7 billion in 2023 to USD 4.7 billion by 2028, with a compound annual growth rate of 23.1%
- **Informed decisions** AI provides farmers with data-driven insights for efficient resource use Farmers can use data from satellites, drones, sensors, and IoT devices to gain real-time insights into soil health, weather patterns, crop growth, and pest infestations.
- **Improved crop health monitoring** AI systems analyze data from satellites, drones, and field images to enable real- time crop health monitoring and early detection of diseases and pest infestations.
- **Increased income** AI initiatives such as the "Saagu Baagu" project have doubled the earnings of 7,000 chili farmers in Telangana by enhancing yields and incomes through agritech and data management Farmers reported a remarkable surge in net income: $800 per acre in a single crop cycle (6 months), effectively double the average income
- **Reduced pesticide** use AI-driven technology can reduce the use of pesticides. For example, the "Saagu Baagu" project saw pesticide use fall by 9% and fertilizers drop by 5%, while quality improvements boosted unit prices by 8%. Blue River Technology has developed cameras trained by AI to recognize weeds, allowing sprayers to apply herbicides to targeted areas rather than an entire field.
- **AI Sowing** App In India (Karnataka and Andhra Pradesh), the AI Sowing App provides farmers information on optimal sowing dates and depths

The government is supporting AI in agriculture through How AI can revolutionize agricultural practices through precision farming, optimize healthcare delivery via advanced diagnostics and personalized treatment plans, enhance educational outcomes through adaptive learning systems, and promote sustainable urban development through smart city initiatives. By analyzing these specific applications, the paper highlights the potential of AI to drive efficiency, improve resource allocation, and create more equitable access to essential services.

Healthcare:

AI is significantly impacting India's healthcare industry, with applications ranging from diagnostics to treatment and beyond. The Indian healthcare AI market is projected to reach $1.6 billion by 2025, demonstrating a compound annual growth rate (CAGR) of 40.5% from 2020 to 2025.AI is transforming healthcare by improving diagnostics, disease prediction, and healthcare delivery, particularly in underserved rural areas. AI-based systems assist in early detection of diseases, personalized treatment plans, and efficient management of healthcare resources. This leads to better health outcomes, reduced costs, and improved access to quality healthcare, supporting sustainable human development.

How AI is Helpful:

- **Personalized Medicine and Early Diagnosis** AI-powered predictive analytics are being used to identify individuals at high risk for diseases, such as diabetes, cardiovascular disorders, and cancer. By analyzing vast datasets that include genetic, lifestyle, and clinical information, AI algorithms can create personalized treatment plans, improving patient outcomes and reducing the economic burden of treatment.
- **Telemedicine and Remote Patient Monitoring** AI-driven telehealth platforms provide real-time consultations, connecting patients with doctors remotely. Remote monitoring devices, combined with AI algorithms, track vital signs and provide early warnings, which has become increasingly relevant in the wake of the COVID-19 pandemic.**Integrating the National Digital Health Mission** Integrating the National Digital Health Mission with AI- ready data protocols through NHRR, India could build a robust AI Healthcare Model.

Education:

AI is significantly changing India's education system through personalized learning, increased accessibility, and support for teachers, and language learning. AI can analyze student data to create customized lesson plans and content suggestions, leading to improved engagement and effective learning experiences.

Benefits of AI in Education:

- **Personalized Learning:** AI can analyze a student's learning preferences, strengths, and weaknesses to create custom lesson plans and content. AI tools can evaluate students' learning patterns to tailor their educational experiences, helping students learn at their own pace and improving understanding.
- **Interactive Learning:** AI enables interactive experiences like virtual classrooms and simulations. Platforms such as Physics Wallah use tools like ChatGPT 4o to provide personalized learning, doubt-solving, and customized content, even in remote areas. AI-generated content can assist educators in saving time while providing immersive and dynamic learning experiences for students.
- **Teacher Support:** By automating tasks like grading and attendance, AI frees up teachers' time for more direct interaction with students. AI can also analyze student performance data to identify areas where students may be struggling.
- **Accessibility:** AI offers tools like speech recognition to support students with disabilities and multilingual learners. Online and remote study options enhance educational accessibility.
- **Efficient Administration:** AI improves efficiency in administrative tasks such as admissions, resource allocation, and attendance tracking.
- **Content Development:** AI can produce customized learning materials, including quizzes, interactive simulations, and virtual reality experiences. It also helps educator's access up-to-date and tailored resources.

Concerns and Challenges:

- Some worry that AI could worsen inequality and impair critical thinking skills.
- There are concerns about AI's potential to encourage plagiarism.
- Opinions vary on whether AI can completely replace traditional teaching methods and whether the Indian education system is fully utilizing AI's benefits.

Urban Development:

AI is significantly impacting urban development in India by offering tools and techniques to analyze data, model scenarios, and make informed decisions. It is being recognized for its potential to transform planning processes and outcomes. The Indian government is showing a willingness to embrace these technologies through various initiatives and policies

Specific Applications of AI in Urban Development:

1. Smart Traffic and Transportation Management

AI-powered traffic management systems use real-time data from sensors, cameras, and GPS to monitor traffic flow and reduce congestion. Intelligent traffic signals, route optimization, and predictive analytics help minimize travel time, fuel consumption, and air pollution. AI also supports the development of smart public transport and autonomous mobility solutions.

2. Waste Management and Sanitation

AI applications improve waste collection and recycling through smart bins, route optimization for garbage trucks, and automated waste segregation. These systems reduce operational costs, prevent overflow of waste, and promote recycling, contributing to cleaner and more sustainable cities.

3. Energy Management and Smart Grids

AI enables efficient energy use by monitoring consumption patterns and predicting demand. Smart grids powered by AI optimize electricity distribution, integrate renewable energy sources, and reduce power losses. This supports energy conservation and lowers carbon emissions in urban areas.

4. Water Resource Management

AI helps in detecting water leakages, monitoring water quality, and optimizing water distribution systems. Predictive analytics can forecast water demand and manage scarcity, ensuring sustainable use of water resources in cities.

5. Urban Planning and Infrastructure Development

AI-based data analysis supports better urban planning by predicting population growth, land use patterns, and infrastructure needs. This helps governments design sustainable housing, transportation networks, and public spaces while minimizing environmental impact.

6. Public Safety and Disaster Management

AI enhances urban safety through surveillance systems, crime prediction models, and emergency response optimization. It also supports disaster preparedness by predicting floods, earthquakes, and other natural hazards, reducing risks to life and property.

Challenges in Implementing AI in Urban Development:

- **Data Quality and Availability:** The absence of reliable data on urban infrastructure, population dynamics, and resource consumption patterns hinders the effective deployment of AI solutions in Indian cities.

- **Digital Divide:** Disparities in internet penetration between tier-1 and tier-3 cities may create 'smart enclaves' within cities, exacerbating existing inequalities and potentially leading to biased AI outcomes that favor already privileged urban areas.
- **Privacy and Data Security Concerns:** It is important to address potential risks to privacy and data security. **Professional Knowledge Gaps and Integration:** Limited infrastructure facilities, professional knowledge gaps among employees and their poor integration into existing planning processes can make it difficult to implement AI techniques locally.
- **To overcome these challenges, the Indian government needs to focus on institutional capacity building, interagency cooperation through governance structures, and open data initiatives**

Challenges to AI Adoption

Digital Divide: India's rural-urban digital divide limits A adoption in underserved areas. Skill Gaps: The shortage of AI-trained professionals restricts the development and deployment of AI solutions. Ethical and Privacy Concerns: Issues like AI bias, data privacy, and algorithmic transparency must be addressed to ensure ethical implementation.

Regulatory Barriers: India lacks comprehensive AI- specific regulations to govern its ethical and economic implications.

Recommendations:

Policy Formulation: Develop robust policies emphasizing AI ethics, inclusivity, and sustainability. Infrastructure Development: Invest in digital infrastructure to bridge the rural-urban divide. Skill Development: Introduce AI education in school and college curricula and promote reskilling programs. Public-Private Collaboration: Encourage partnerships between government and tech companies to create scalable AI solutions. Ethical AI Frameworks: Implement guidelines for transparency, fairness, and accountability in AI applications.

Conclusion:

Artificial Intelligence presents a significant opportunity for India's sustainable economic development. The research demonstrates AI's positive impact across key sectors: increasing agricultural productivity and farmer incomes through precision farming, enhancing healthcare accessibility through improved diagnostics and telemedicine, democratizing education through personalized learning solutions, and enabling smarter urban development through data-driven planning and resource management. However, challenges such as the digital divide, skill gaps, and ethical concerns must be addressed through focused policy interventions and public-private

collaboration. With appropriate regulatory frameworks and investment in digital infrastructure and education, India can leverage AI to achieve inclusive growth while ensuring environmental sustainability. The successful integration of AI technologies will be crucial for India's continued economic development and could serve as a model for other developing nations.

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A STUDY ON CONSUMER'S SATISFACTION TOWARDS ONLINE PURCHASES OF GOODS AT NAGPUR DISTRICT (MH.)

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Abstract:

In the Internet shopping market since there is no face-to-face contact, analyzing and identifying factors that influence the consumer is vital. Moreover, consumers have new demands in the Internet medium. Therefore, it becomes more important to answer consumer's demands to retain the customer. The purpose of this research is to understand on what parameters does consumers purchase online and also their preference and what motivates consumers to shop online for different products.

Keywords: Consumer satisfaction, purchases of goods.

Introduction:

The industry should focus on the factors that affect the buying behavior of Indian customers. Although many studies have shown that customer characteristics are important when it comes to online shopping, but majority of those researches are performed outside India. To fill this gap, the following research is proposed to examine how different customer characteristics affect customer purchase intentions while shopping online in India. Today, internet acts as a channel through which millions of people communicate, perform research, find entertainment and most recently buy and sell products and services. In fact, online shopping is one of the most popular activities that take place on internet.

The study indicate that customer online purchase intentions are significantly related to their gender, education, age, and technological familiarity. Consumer buying behavior is also affected by product type, purchase frequency and expensiveness. Their purchase decisions are also found to be related with the online retailer's services like return, refund and delivery services.

E-Commerce:

" Buying and Selling of goods and services online "

Types of E-Commerce:

1. Business to Consumer (B2C) :- In this case the seller is a business organization whereas the buyer is a consumer. This emulates the situation of physical retailing and so it is commonly called electronic retailing. Typically, electronic stores are setup up on the internet to sell goods to the consumers. Eg. Amazon.com, Established in 1995 by Jeff Bezos, Amazon.com is one of the most well known e-commerce site in general and internet bookseller in particular. It is a typical example of B2C E-Commerce in which business sells already manufactured products to the consumers directly on the internet.
2. Business to Business (B2B) :- In this case, both the buyer and the seller are business organizations. There are three types of systems, namely, buyer-oriented system, seller oriented system, and virtual marketplace. In many situations, it is related to supply chain management. Eg. Trading Process Network (www.tpn.geis.com) is an internet based trading network for buyers and sellers to carry out B2B E-Commerce on the internet. Unlike B2C E-Commerce, it is buyer driven rather than seller driven. That means a buyer submit a request to the system and then respective seller respond to the request. In TPN a typical purchase cycle is describe.
3. Consumer to Consumer (C2C) This refers to situations where both the seller and the buyer are consumers. With the advent of E-Commerce online auctions provide an effective means for supporting C2C E-Commerce. Eg. www.ebay.com , Estabilised in 1995 eBay provides the worlds largest online trading service by means of online auctions. Basically a user places an item on the eBay web site for bidding. Other interested members then bid for it before the deadline. Where the English auction is used, the highest bid wins. This is typical C2C.
4. Consumer to Business (C2B) this is new form of E-Commerce in which a consumer specifies the requirements to a business, which provides a product that meets these requirements. These requirements could be as simple as an acceptable price or could involve considerable customization of an existing standard product or creation of a new product.

Scope of the Study:

This Study focus on the opinion of the respondents regarding online shopping. This research focuses on what are the benefits received and problems faced by the respondents and their attitudes towards the online shopping

Objectives of the Study:

1. To identify the behavior of consumer over online purchase preference.

2. To identify the parameters that motivates the consumers to buy online instead of retail stores and super markets
3. To study the impact of demographic characteristics of consumers on their online purchase pattern.
4. To identify the new demand of customer

Hypothesis:

1. There is no significant relationship between gender and level of satisfaction towards online purchasing.
2. There is no significant relationship between age and level of satisfaction towards online purchasing Hypothesis-2:
3. There is no significant relationship between educational qualification and level of satisfaction towards online purchasing.

Sampling Design

Sample is the process of representative subset of a total population for obtaining data for study of the whole population. The subset is known as sample. Field survey techniques was employed to collect primary data from selected sample respondents in Nagpur District of Maharashtra. The sampling design used in the study was non-probability sampling. Convenience sampling techniques are used for collecting the data.

Research Methodology:

The present study used both primary as well as secondary data. In this study, the primary data will collect through structured questionnaire. Besides the primary data, the secondary data will also collect for the study through websites, journals, magazines and newspapers.

Data Analysis

The data collected from the primary source should arranged sequentially and tabulated in a systematic order in the master table.

Table-1

Demographic Profile of the respondents

S.No	Factors	Category	No. of respondents	Percentage
1	Age	Below 20	58	29
		20-40	96	48
		40-60	40	20
		Above 60	4	3
		Total	200	100
2	Gender	Male	122	61
		Female	78	39
		Total	200	100
3	Monthly Income	Below Rs.20000	16	08
		Rs. 20000- Rs.30000	39	19
		Rs.30000-Rs.40000	62	31
		Above 40000	83	42
		Total	200	100
4	Occupation	Employed	31	15
		Business	56	28
		Students	24	12
		Professional	81	41
		Others	08	4
		Total	200	100
5	Residential Status	Urban	112	56
		Semi-Urban	52	26
		Rural	36	18
		Total	200	100
6	Education Qualification	School Level	40	20
		Graduate	88	44
		Post Graduate	70	35
		Other	2	1
		Total	200	100
7	Reason for Preference	Easy Access	62	31
		Time Saving	110	55
		Convenient	26	13
		Other	01	01
		Total	200	100

Finding :

1. The majority of responded belong to male category
2. The Majority of responded are from urban areas
3. The Majority of respondent are Professional and Graduate.
4. The Majority of respondent give online purchase decision due to saving time
5. The Majority of respondent who purchase goods online have income above rs. 40,000

Conclusion:

This research identifies the influencing factors towards online shoping majority of respondent purchase goods online due the time saving and facility of home delivery. It also measure the level of satisfaction towards online shopping. Majority of respondent are satisfied with online shopping.

Creating awareness about online shopping improve the overall growth of online shopping among illiterate people and the people living in rural areas.

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ARTIFICIAL INTELLIGENCE IN AGRICULTURE: CURRENT TRENDS AND INNOVATIONS

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Abstract:

Artificial Intelligence (AI) is rapidly transforming agriculture by enabling data-driven decision-making, improving productivity, and promoting sustainable farming practices. With the increasing availability of agricultural data from sensors, satellites, drones, and Internet of Things (IoT) devices, AI techniques such as machine learning, deep learning, and computer vision are being widely adopted across the agricultural value chain. Current trends include precision farming, automated crop monitoring, intelligent irrigation systems, yield prediction, soil and crop health analysis, pest and disease detection, and autonomous agricultural machinery. These innovations help optimize resource utilization, reduce operational costs, and minimize environmental impact while increasing crop yield and quality. Furthermore, AI-powered predictive analytics supports farmers in managing climate variability, weather uncertainty, and market fluctuations. Despite its potential, challenges such as data quality, high implementation costs, limited digital infrastructure, and the need for farmer awareness and skill development remain significant. This paper reviews recent trends and innovations in AI-based agricultural systems, highlights real-world applications, and discusses future directions and challenges for the large-scale adoption of AI in agriculture.

Keywords: AI, Sustainable farming, Internet of Things (IoT), machine learning, precision farming, automated crop monitoring, climate variability

Introduction:

Agriculture remains a critical sector for global food security, economic development, and environmental sustainability. However, modern agriculture faces significant challenges, including climate change, unpredictable weather patterns, declining soil fertility, water scarcity, pest infestations, and the growing demand for food driven by population growth. Traditional farming

methods often rely on experience-based decision-making, which can be inefficient and insufficient to address these complex and dynamic challenges.

Artificial Intelligence (AI) has emerged as a powerful technology capable of transforming agricultural practices by enabling precise, timely, and data-driven decisions. AI refers to computational techniques that allow machines to mimic human intelligence, including learning, reasoning, pattern recognition, and problem-solving. In agriculture, AI systems leverage large volumes of data collected from sensors, satellites, drones, weather stations, and Internet of Things (IoT) devices to analyze field conditions and support intelligent farm management.

Recent trends in AI-driven agriculture include precision farming, crop and soil health monitoring, yield forecasting, smart irrigation, pest and disease detection, and autonomous farm machinery. Machine learning and deep learning algorithms are widely used to identify patterns in agricultural data, while computer vision enables real-time analysis of crops and livestock through images and videos. These innovations help optimize resource usage, reduce operational costs, improve crop productivity, and promote sustainable farming practices.

Despite the promising benefits, the adoption of AI in agriculture faces several challenges, such as limited access to quality data, high implementation costs, lack of technical expertise among farmers, and inadequate digital infrastructure in rural areas. Addressing these challenges is essential to ensure inclusive and scalable AI solutions. This paper explores the current trends and innovations in Artificial Intelligence applied to agriculture, examines their practical applications, and discusses future opportunities and challenges for advancing intelligent and sustainable agricultural systems.

Development of Artificial Intelligence in Agriculture:

The development of Artificial Intelligence (AI) in agriculture has evolved gradually, driven by advancements in computing power, data availability, and sensing technologies. Early applications of technology in agriculture focused on mechanization and basic automation, such as the use of tractors, harvesters, and rule-based expert systems designed to assist farmers with crop management decisions. These early systems relied heavily on predefined rules and limited datasets, which restricted their adaptability and accuracy.

With the advancement of information technology in the late 20th and early 21st centuries, agriculture began to incorporate Geographic Information Systems (GIS), Global Positioning Systems (GPS), and remote sensing technologies. These tools enabled site-specific farming practices and laid the

foundation for precision agriculture. However, decision-making still required significant human intervention, and data analysis capabilities were limited.

The emergence of machine learning marked a major turning point in the development of AI in agriculture. Algorithms capable of learning from historical and real-time data made it possible to predict crop yields, detect plant diseases, assess soil conditions, and optimize irrigation schedules. The integration of Internet of Things (IoT) devices further accelerated this development by enabling continuous data collection from farms through sensors that monitor temperature, moisture, nutrient levels, and crop growth.

Recent advancements in deep learning and computer vision have significantly expanded AI applications in agriculture. High-resolution images captured by drones and satellites are now analyzed to identify pest infestations, nutrient deficiencies, and crop stress with high accuracy. Autonomous systems, including AI-powered robots and self-driving tractors, are being developed to perform tasks such as planting, spraying, weeding, and harvesting with minimal human involvement.

Today, the development of AI in agriculture is increasingly focused on sustainability, climate resilience, and scalability. Cloud computing and edge AI enable real-time decision-making, while predictive analytics helps farmers adapt to climate variability and market demands. As AI technologies continue to mature, their development is expected to play a crucial role in building smart, efficient, and sustainable agricultural systems capable of meeting future global food requirements.

Applications of Artificial Intelligence in Agriculture

Artificial Intelligence (AI) is widely applied in agriculture to improve productivity, efficiency, and sustainability through intelligent data analysis and automation. By combining machine learning, computer vision, and Internet of Things (IoT) technologies, AI supports informed decision-making across various agricultural activities.

Precision Farming

AI enables precision farming by analyzing data from sensors, satellites, and drones to monitor field variability. Farmers can apply water, fertilizers, and pesticides only where needed, reducing waste and improving crop yield while minimizing environmental impact.

Crop and Soil Health Monitoring

Machine learning models analyze soil data and crop images to assess nutrient levels, moisture content, and plant health. AI-based systems can detect stress, nutrient deficiencies, and growth abnormalities at an early stage, allowing timely intervention.

Pest and Disease Detection

Computer vision and deep learning algorithms process images of crops to identify pests, weeds, and plant diseases. Early and accurate detection helps prevent large-scale crop losses and reduces excessive pesticide use.

Smart Irrigation Systems

AI-driven irrigation systems use real-time weather data, soil moisture levels, and crop requirements to optimize water usage. This improves water efficiency and supports sustainable agriculture, especially in water-scarce regions.

Yield Prediction and Forecasting

AI models analyze historical data, weather patterns, and crop conditions to predict crop yields. Accurate yield forecasting helps farmers, agribusinesses, and policymakers plan storage, transportation, and market strategies.

Autonomous Farm Machinery

AI-powered robots, drones, and self-driving tractors are used for planting, spraying, weeding, and harvesting. These systems reduce labor dependency, increase operational efficiency, and ensure precision in farming operations.

Livestock Management

In animal farming, AI is used to monitor animal health, behavior, and productivity. Wearable sensors and image analysis help detect diseases, optimize feeding, and improve breeding practices.

Supply Chain and Market Management

AI assists in demand forecasting, price prediction, and logistics optimization. This helps farmers make better marketing decisions and reduces post-harvest losses.

Current Trends:

One of the most significant trends is **precision agriculture**, where AI analyzes data from sensors, drones, and satellites to manage crops at a micro-level. This approach allows farmers to optimize inputs such as water, fertilizers, and pesticides based on real-time field conditions. **Machine learning-based crop monitoring** systems are increasingly used to track crop growth, identify stress factors, and predict potential yield losses.

Another major trend is the adoption of **AI-powered pest and disease detection systems**. Using computer vision and deep learning, these systems can identify plant diseases and pest infestations from images with high accuracy, enabling early intervention and reducing chemical usage. **Smart**

irrigation systems driven by AI are also gaining popularity, as they use weather forecasts and soil moisture data to optimize water consumption and improve water-use efficiency.

The use of **autonomous agricultural machinery** is another growing trend. AI-enabled robots, drones, and self-driving tractors are being deployed for tasks such as planting, spraying, weeding, and harvesting, addressing labor shortages and improving operational precision.

Innovations:

Recent innovations include **deep learning and computer vision applications** for high-resolution crop analysis, **AI-driven yield prediction models**, and **predictive analytics** for climate and market risk management. The integration of **Internet of Things (IoT)** with AI has led to the development of smart farming ecosystems that enable continuous monitoring and real-time decision-making.

Innovations in **livestock farming** involve AI-based health monitoring systems using wearable sensors and image analysis to track animal behavior, detect diseases early, and improve productivity. Additionally, **AI-enabled supply chain optimization** is helping reduce post-harvest losses by improving storage management, transportation, and demand forecasting.

Challenges for Adopting AI in Agricultural Processes and Possible Solutions:

Despite the significant potential of Artificial Intelligence (AI) to transform agriculture, its adoption faces several technical, economic, and social challenges. Addressing these issues is essential for the successful and sustainable implementation of AI-driven agricultural systems.

1. High Implementation Costs

Challenge:

AI technologies require investments in sensors, drones, software platforms, data storage, and maintenance, which can be unaffordable for small and marginal farmers.

Possible Solutions:

- Government subsidies and financial incentives for smart farming technologies
- Development of low-cost AI tools and shared infrastructure models
- Public–private partnerships to reduce deployment costs

2. Limited Data Availability and Quality

Challenge:

AI systems rely on large volumes of accurate and diverse data, but agricultural data is often incomplete, inconsistent, or unavailable, especially in rural areas.

Possible Solutions:

- Standardized data collection methods and open agricultural datasets
- Use of satellite and remote sensing data to fill data gaps
- Improved sensor technologies and data-sharing platforms

3. Lack of Digital Infrastructure

Challenge:

Poor internet connectivity, unreliable power supply, and limited access to digital devices hinder AI adoption in many agricultural regions.

Possible Solutions:

- Expansion of rural broadband and mobile connectivity
- Use of edge computing to enable offline or low-bandwidth AI solutions
- Investment in renewable energy sources such as solar-powered systems

4. Limited Technical Knowledge and Skill Gaps

Challenge:

Many farmers lack the technical knowledge required to use AI-based tools effectively.

Possible Solutions:

- Farmer training programs and digital literacy initiatives
- User-friendly AI applications with local language support
- Collaboration with agricultural extension services and universities

5. Resistance to Change and Trust Issues

Challenge:

Farmers may be hesitant to adopt AI due to unfamiliarity, fear of failure, or distrust in automated decision-making.

Possible Solutions:

- Demonstration farms and pilot projects showcasing real benefits
- Transparent and explainable AI systems
- Community-based adoption models and peer learning

6. Data Privacy and Security Concerns

Challenge:

The collection and storage of farm data raise concerns about data ownership, misuse, and cybersecurity.

Possible Solutions:

- Clear data governance policies and farmer-controlled data ownership
- Secure data storage and encryption techniques
- Legal frameworks to protect agricultural data rights

7. Scalability and Customization Issues

Challenge:

AI solutions developed for specific crops or regions may not easily scale or adapt to different agricultural environments.

Possible Solutions:

- Modular and flexible AI models adaptable to local conditions
- Inclusion of region-specific datasets during model training
- Collaboration with local agricultural experts

Conclusion:

Artificial Intelligence has emerged as a transformative force in agriculture, offering innovative solutions to many of the sector's long-standing challenges. Current trends such as precision farming, smart irrigation, crop and soil health monitoring, pest and disease detection, yield prediction, and autonomous agricultural machinery demonstrate how AI is reshaping traditional farming practices. These innovations enable data-driven decision-making, optimize resource utilization, reduce environmental impact, and enhance agricultural productivity and sustainability.

The integration of AI with emerging technologies such as the Internet of Things, remote sensing, drones, and cloud computing has further strengthened the development of smart farming systems. AI-driven predictive analytics and computer vision applications are helping farmers adapt to climate variability, improve risk management, and make timely and accurate decisions. At the same time, advancements in livestock monitoring and supply chain optimization highlight the expanding role of AI across the entire agricultural ecosystem.

Despite these advancements, challenges related to cost, data availability, digital infrastructure, and technical skills continue to limit widespread adoption. Addressing these issues through policy support, farmer training, affordable technologies, and collaborative research is essential for realizing the full potential of AI in agriculture. In conclusion, as AI technologies continue to evolve, their responsible and inclusive adoption will play a crucial role in ensuring food security, economic growth, and sustainable agricultural development in the future.

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ROLE AND CONTRIBUTION OF ARTIFICIAL INTELLIGENCE (AI) IN LANGUAGE TEACHING & LEARNING

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Abstract:

Artificial Intelligence (AI) has significantly transformed language teaching and learning by introducing personalized, adaptive, and technology-driven instructional methods. AI-based tools such as intelligent tutoring systems, speech recognition software, chatbots, and automated assessment platforms have enhanced learners' engagement, motivation, and language proficiency. This study examines the role and contribution of AI in improving language skills such as listening, speaking, reading, and writing. It also analyzes how AI supports teachers in curriculum design, assessment, and feedback mechanisms. The research employs both primary and secondary data to evaluate the effectiveness of AI-assisted language learning and its impact on teaching-learning outcomes.

Keywords : Artificial Intelligence, Language Teaching, Language Learning, Educational Technology, Personalized Learning, E-Learning, Digital Pedagogy

Introduction :

The rapid advancement of Artificial Intelligence has brought remarkable changes in the field of education, particularly in language teaching and learning. AI refers to the ability of machines to simulate human intelligence, including learning, reasoning, and problem-solving. In language education, AI enables learners to access interactive, personalized, and flexible learning environments beyond traditional classroom boundaries.

Language learning requires continuous practice, immediate feedback, and individualized instruction, which are often difficult to achieve in conventional teaching settings. AI-powered applications such as language learning apps, virtual tutors, speech recognition tools, and automated grammar checkers address these challenges effectively. AI helps learners improve pronunciation, vocabulary, grammar, and comprehension at their own pace.

Moreover, AI assists teachers by automating routine tasks such as assessment, feedback, and lesson planning, allowing them to focus more on pedagogical strategies and learner support. Despite concerns related to data privacy and over-dependence on technology, AI has become an essential tool in enhancing the quality, accessibility, and effectiveness of language education.

Artificial Intelligence (AI) has brought significant transformation to the field of language teaching and learning by making education more interactive, personalized, and learner-centred. AI refers to the ability of machines and computer systems to simulate human intelligence such as learning, reasoning, problem-solving, and language processing. In language education, AI enables learners to practice and improve their language skills using intelligent and adaptive technologies.

Language learning requires continuous practice, immediate feedback, and individualized attention, which are often difficult to achieve in traditional classroom settings. AI-based tools such as intelligent tutoring systems, speech recognition software, chatbots, and language learning applications help learners develop listening, speaking, reading, and writing skills effectively. These tools provide instant feedback on pronunciation, grammar, and vocabulary, allowing learners to learn at their own pace.

AI also supports teachers by automating routine tasks such as assessment, grading, and lesson planning, enabling them to focus more on instructional strategies and learner support. Despite challenges related to digital access, teacher training, and ethical concerns, the contribution of AI in language teaching and learning continues to grow, enhancing the quality, accessibility, and effectiveness of language education.

Aims:

To study the role and contribution of Artificial Intelligence in enhancing language teaching and learning processes.

Objectives:

1. To examine the application of AI in language teaching methodologies
2. To analyze the impact of AI on language learning outcomes
3. To study the role of AI in personalized and adaptive learning
4. To identify challenges associated with AI-based language education

CASE STUDY: DUOLINGO – AI IN LANGUAGE LEARNING

Duolingo is a globally recognized AI-based language learning platform.

AI Applications in Duolingo

- Adaptive learning algorithms personalize lessons based on learner performance

- Speech recognition technology improves pronunciation skills
- AI-based feedback provides instant corrections
- Gamification increases learner motivation and engagement

Impact

- Improved learner retention and language proficiency
- Self-paced and personalized learning experience
- Wide accessibility across age groups and regions
- To identify challenges associated with AI-based language education

Research Hypotheses:

- **H1:** The use of Artificial Intelligence significantly improves learners' language proficiency.
- **H2:** AI-based tools enhance teaching effectiveness and learner engagement in language education.

Primary Data

- Surveys of language teachers and students
- Interviews with educators using AI-based tools
- Questionnaires on learner engagement and skill improvement

Secondary Data

- Research journals and educational publications
- Reports from UNESCO and OECD
- Books on AI in education
- Online articles and case studies

Conceptual Framework:

Artificial Intelligence Tools
(Intelligent Tutors, Speech Recognition, Chatbots)
↓
Teaching-Learning Process
(Personalization, Feedback, Practice)
↓
Language Skill Development
(Listening, Speaking, Reading, Writing)
↓
Learning Outcomes
(Proficiency, Engagement, Retention)

Discussion of the Findings:

The findings reveal that AI-based language learning tools significantly enhance learner engagement and motivation through interactive and adaptive content. Students show improvement in pronunciation, vocabulary, and grammar due to immediate feedback and personalized practice. Teachers benefit from reduced workload and improved assessment accuracy. However, challenges such as limited digital infrastructure, lack of teacher training, and ethical concerns related to data privacy were also observed. Overall, AI positively influences language teaching and learning effectiveness.

Conclusion:

Artificial Intelligence has emerged as a transformative force in language teaching and learning by providing personalized, flexible, and learner-centered educational experiences. AI tools support both learners and teachers by enhancing language skill development, assessment efficiency, and instructional quality. While challenges exist, the integration of AI in language education holds immense potential for improving accessibility and learning outcomes. Strategic and ethical implementation of AI can ensure sustainable and inclusive language education in the future.

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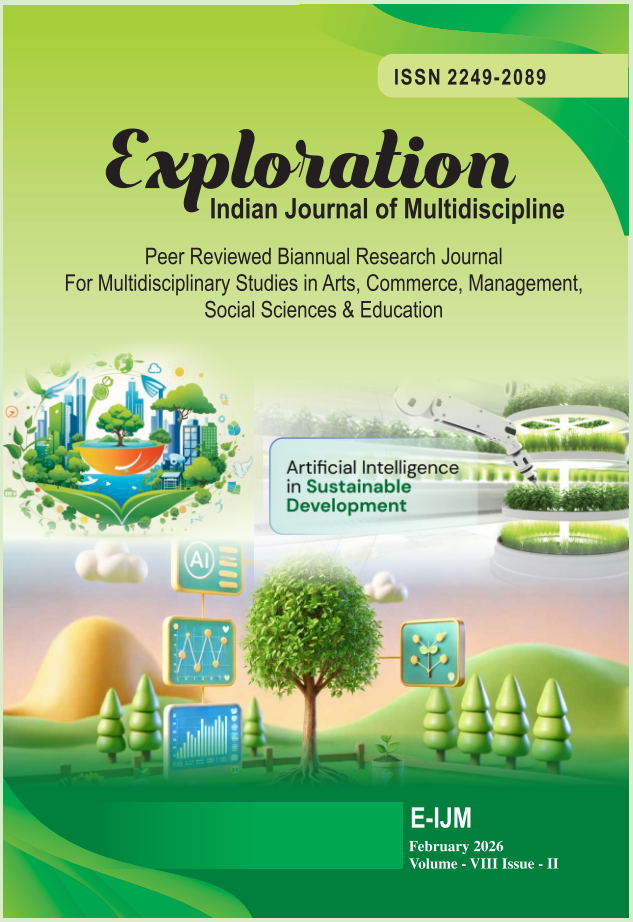

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