

Artificial Intelligence and Machine Learning in the Development of remote and Underdeveloped Areas

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Abstract: Artificial Intelligence and Machine Learning, commonly known as AI and ML, are advanced computer-based technologies that enable machines to perform tasks that normally require human intelligence. These technologies allow computer systems to understand, learn, analyze, and work in ways similar to human thinking and decision-making processes. AI and ML can easily perform various tasks such as language translation, interpretation of information in a meaningful form, business decision-making, and speech recognition, where spoken language is converted into written text, as seen in applications such as Siri and Google Assistant.

A country can be considered truly developed only when all of its geographical regions, including backward and underdeveloped areas, are equally developed. This is possible only when the country provides access to education, economic opportunities, social development, scientific advancement, research facilities, and future-oriented thinking to all its people. In this context, AI and ML play a very important role in the development of all sectors, including education, the economy, society, science, and research.

This paper studies the history and evolution of AI and ML, examines how these technologies can support the development of backward and underdeveloped areas, and explores the use of AI tools in the overall progress and development of a country.

Keywords—AI tools for underdeveloped area, AI importance in remote area, AI in economic growth, AI in education, AI in rural, AI uses rate country wise.

1. INTRODUCTION

Artificial Intelligence (AI) refers to the replication of human intelligence in machines. It enables machines to think like humans, perform activities and actions, solve problems, and make decisions intelligently. Because of this capability, Artificial Intelligence is also known as machine intelligence or computer intelligence.

Machine Learning (ML) is a subfield of Artificial Intelligence. It is a branch of computer science that gives computers the ability to learn automatically from data without being explicitly programmed for every task. In traditional programming, algorithms are written first and then applied to data to produce results. This can be represented as:

$\text{Data} + \text{Algorithms} = \text{Results}$

However, in machine learning, the process is different. The machine learns patterns from data and results, and then creates algorithms or models automatically. This can be represented as:

$\text{Data} + \text{Results} = \text{Algorithms}$

The broader goal of Artificial Intelligence is to build machines that can mimic human intelligence, while Machine Learning serves as an important subset of AI that focuses on enabling computers to learn from data rather than following only fixed, explicit rules.

2. Research Methodology and Area of analysis

This study adopts a **descriptive, exploratory, and qualitative research methodology** based primarily on secondary data. The main objective of the study is to examine the role of Artificial Intelligence (AI) and Machine Learning (ML) in the development of remote, rural, backward, and underdeveloped areas, with particular emphasis on education, healthcare, agriculture, economic development, governance, and scientific research.

The research process can be summarized as:

Literature Review → Collection of Secondary Data → Classification of Information → Sector-wise Analysis → Comparative Analysis → Identification of Benefits and Challenges → Interpretation of Findings → Conclusions and Recommendations.

Through this methodology, the study aims to provide a comprehensive understanding of how AI and ML can contribute to inclusive development and help reduce technological, educational, healthcare, agricultural, and economic disparities between developed and remote or underdeveloped regions.

Areas of Analysis

The study analyzes the application of AI and ML in the following major sectors:

1. **Education:** AI-based tutoring, adaptive learning, language translation, digital learning, and teacher-support systems.

2. **Healthcare:** AI-assisted diagnosis, medical image analysis, telemedicine support, and healthcare accessibility.
3. **Agriculture:** Crop monitoring, disease detection, weather forecasting, irrigation management, and agricultural decision support.
4. **Economic Development:** Business decision-making, forecasting, productivity improvement, financial services, and support for local enterprises.
5. **Governance and Public Services:** Digital public services, information management, citizen support, and decision-making.
6. **Scientific Research:** Data analysis, prediction, automation, and research support.

3. Evolution of Artificial Intelligence (AI)

- 1950 → First AI Concept
- 1956 → Official Birth of AI
- 1966 → ELIZA Chatbot
- 1980 → Expert Systems
- 1997 → Deep Blue Defeats Chess Champion
- 2000 → Machine Learning Expansion
- 2012 → Deep Learning Breakthrough
- 2017 → Transformer Architecture
- 2020 → AI in Healthcare
- 2023 → GPT-4 Released
- 2024 → AI Regulations & Ethical AI
- 2025 → Agentic AI Systems

Evolution of AI:

Year	Development	Description
1950	1 st AI concept	The 1 st AI concept introduced by British mathematician Alan Turing. He purposed a turing test that if a machine could successfully converse with a human without revealing it was a computer, it could be deemed "intelligent"
1956	official birth of AI	Official birth of AI in academic discipline in the conference 1956 where computer scientist John Mearthy coined the term AI.
1966	ELIZA Chatbot	JOSEPH WEIZENBAUM created ELIZA, is a natural language processing program that transformed the

		field of artificial intelligence. ELIZA used the pattern matching techniques to reproduce conversation with humans.
1980	Expert System	An expert system works on logical rules to stored knowledge in its database.
1997	Deep Blue Defeats Chess Champion	Deep Blue is an advanced chess-playing computer developed by IBM, famously defeated world chess champion Garry Kasparov in a six-game match.
2000	Machine learning in Academy and Industries	In the early 2000 machine learning is used to solve the problem in academy and industries.
2012	Deep learning Breakthrough	A major breakthrough in AI occurs, mainly by neural networks.transitioning machines from rigid, rule-based programming to systems that learn from experience, recognize patterns, and generate new content.
2017	Transformer Architecture	The Transformer architecture is a deep learning framework by replacing sequential processing with self- attention mechanism. utilized to produce AI applications
2020	AI in health care	AI in healthcare uses appropriate algorithms and machine learning to analyse drug discovery, predicting virus spread, and the development of vaccines.
2023	GPT-4 Released	OpenAI launches GPT-4, is more

		powerful and refined version of GPT3. demonstrating abilities to processing both images and text.
2024	AI Regulations and Ethical AI	Governments and organizations worldwide implement stricter AI regulations and focus on ethical AI development,
2025	wave of autonomous "agentic" systems	The wave of autonomous "agentic" systems show a massive shift from static AI chatbots to dynamic, self-directed systems..

4. Why used AI tools in remote area:

AI tools reduced the gaps between the developed area and underdeveloped area. AI boosting the productivity in localize industries like agriculture & food, reduced the apprehension of climate risk, daily satellite and weather report, education and skill development in public, healthcare and diagnosis to patient and government and public services to development the remote area of particular country.

5. AI tools for development to underdevelopment area:

1. For Agriculture and food security tools:

1. cropIn: it is AI based predictive tools to analyze satellite imaginary and weather report. It reduce the crop loss of small scale farmer.

2. Nuru App. : it is a AI based lightweight tools that allow farmer used Smartphone to take photograph of diseases leaves and diagnose immediately.

II. Healthcare and diagnosis to patient:

1. omdena: this tools used to collaborate a local person or doctor to communicate with developing regions of global AI expert to diagnosis a particular disease of patient.

2. Smartphone –based Diagnostics: it is image based AI tools are used by frontline community health worker to identify skin infection and nutritional deficiencies .

III. Education and Skill building:

1. Eneza education: It is mobile based platform that provide educational lessons and assignments by SMS and simple web connections .

2. Daption: it is learning platform that customizes course content, structure, and assessments to adjust to the strengths and weaknesses of students.

IV. Economic development & Governance:

1. openAI and ChatGPT; it accessible via low bandwidth connection to generating economic growth plan.

6. Important role of AI in development of remote areas and underdevelopment area of country.

AI play main role in the progress of developing country. There are major fields those develop the country.

- 1. AI in Education:** Artificial Intelligence (AI) modernisation in educational development in remote and rural areas where teacher shortages. In National Education Policy (NEP), the focus and importance on regional languages, adaptive virtual tutoring and classes in educational institutions where lack of teachers, and basic digital literacy to ensure inclusive growth for all learners.

Year-wise Development and Strategy:-

1. 2020–2021: Foundation and Planning Policy and Standards:

With the launch of NEP 2020 and the National Digital Education Architecture (NDEAR), it became essential to integrate AI and Design Thinking into the school curriculum.

2. 2022–2024: Pilot Programs and Teacher Support Capacity Building:

AI-based teacher assistance programs and virtual tutors were introduced in remote areas. Under various state initiatives, AI tools were used to translate textbooks into regional languages and support schools facing shortages of qualified teachers.

3. 2025–2026: Large-Scale Expansion and Technology Integration Curriculum Implementation:

With the launch of the India AI Mission, the Central Board of Secondary Education (CBSE) began implementing AI curricula on a large scale from Grade 3 onwards, laying the foundation for basic AI literacy across the country.

4. 2027–2035: Focused Implementation in Rural Areas:

State education boards implement mandatory AI curricula in semi-urban and rural schools. AI-powered learning systems adapt to each student's and improve educational outcomes.

Key Applications of AI in Remote Areas

Adaptive Learning in Multiple Languages

AI platforms create, translate, and deliver educational content in local languages and dialects (such as Hindi and Telugu etc.), ensuring that students in remote regions are not disadvantaged by language barriers in textbooks and learning materials.

AI Tools for Inclusive Education:

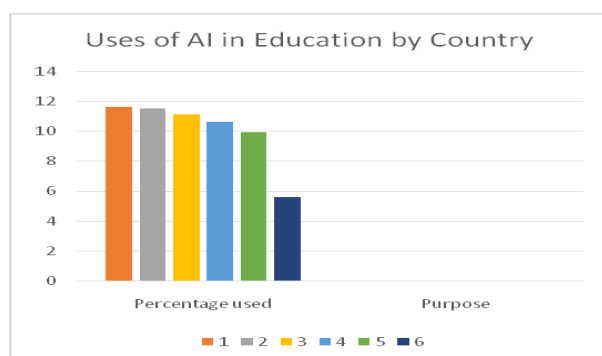
AI technologies, including speech-to-text and voice-recognition models, are used to identify and support children with learning disabilities. These tools help provide specialized educational assistance to students living in communities that lack access to urban support centers and expert services.

AI uses rates in education by country.

In year 2026, . 86 % students Universal used AI in Education Purpose.

Sr. No	Countr y	Percent ge used	Purpose

1	Brazil	11.6	Students used AI for coursework
2	India	11.5	uses AI for academic task
3	Italy	11.1	uses AI for school work
4	Canada	10.6	Uses AI for educational workflow
5	United State	9.9	Uses AI for school work
6	Japan	5.6	Uses AI for Educational Purpose



2. AI in growing economic:

Today AI with Economic change the structure of business operation, decision making and adopting new policies in government and private sector.

Impact or effect of AI in Economic sector:

1. Business and industries: AI transformed the way to take efficient and right decision in an organization to run business and implement new scheme for business growth. AI deduct the Fraud in finance.
2. Economic Policies and Decision Making : AI manage the economic policies in an organization (related to raw material cost, labour cost, machine cost and other related expenses). For growing any business right decision is important, that can possible if you can take right time. AI help to take right decision in business at right time to split related information from previous database.
3. Economic forecasting and Modelling: Economic forecasting is the process of prediction for economic. AI play critical role in economic forecasting. Many institutions engaged in economics forecasting national governments, banks and central banks, consultancies and private sector. An economic model is a simplified representation of economic phenomena. Economist uses such models to explain and predict the different types outcome. These outcome includes prices of goods, revenues cost, wages and rate etc.

AI contributes 1.0 % to 1.5% in growing India GDP

growth between the years 2020 to 2026.

Impact of AI year 2020 to 2026:

1. Market Expansion: in internal AI market of India grew at a compound annual growth rate of roughly 25% to 35%.
2. Enterprise Integration: more than 87% of Indian companies and industries include small and large scale uses AI solution in business working.

7. AI growing up to Rural area:

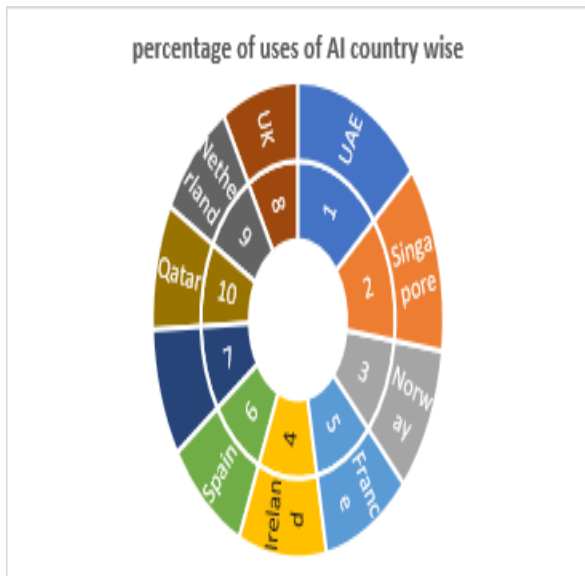
Artificial Intelligence (AI) is helping farmers make more efficient decisions and use different tools that support weed control and improve crop production. In addition, technologies such as image recognition, drones, automated intelligent monitoring, and irrigation systems are also important parts of this development. We cannot deny that AI will make agriculture more efficient, affordable, and advanced for countries with large rural areas like India.

One example of developing country is India, where essential health facilities issue due to the growing more population. There are large amount of healthcare problems that overpopulation causes, lack of good doctors and inadequate infrastructures. Despite this, using Artificial Intelligence and technology, problems like this can be solved and improve healthcare system and get better results.

8. Under Top ten countries Uses of AI in daily work:

In year 2026, 17.8 % of the world working -age population uses AI.

Sr.no	Country	Percentage of AI uses
1	UAE	70
2	Singapore	63
3	Norway	49
4	Ireland	48
5	France	48
6	Spain	44
7	New Zealand	43
8	UK	42
9	Netherland	42
10	Qatar	42



9. Scope and Limitations

The study is primarily based on secondary information and therefore depends on the accuracy, reliability, and availability of existing sources. AI technologies and their adoption rates are changing rapidly; consequently, some statistics and technological developments may become outdated over time. In addition, the study does not conduct primary surveys or experiments with users in remote areas. Therefore, the findings describe potential and documented applications rather than establishing causal effects for every region.

10. Ethical Considerations

The study also considers important ethical issues associated with the use of AI in remote and underdeveloped areas. These include **data privacy, security, algorithmic bias, transparency, accountability, digital inequality, and human oversight**. The research emphasizes that AI should complement rather than unnecessarily replace human expertise, particularly in sensitive sectors such as healthcare and education.

11. Case-Based Analysis and Data Collection

Selected AI tools and initiatives are discussed as illustrative cases, including applications in agriculture, healthcare, education, and economic development. These examples are examined to understand how AI technologies can be adapted to environments with limited infrastructure and professional resources.

Data Collection

Relevant literature was identified using keywords such as Artificial Intelligence, Machine Learning, AI in rural development, AI in education, AI in healthcare, AI in agriculture, AI for economic development, remote areas, underdeveloped regions, digital inclusion, and AI-based

public services. The collected material was reviewed to identify major applications of AI and ML and their possible contribution to reducing developmental gaps between urban and remote regions.

Conclusion:

Artificial Intelligence and Machine Learning have become powerful technologies that are transforming every sector of society and contributing significantly to the development of countries. Help in learning, decision-making, language processing, prediction, and problem-solving in a smart and efficient way. The evolution of AI grown and influencing education, healthcare, agriculture, business, governance, and research.

For backward, rural, and underdeveloped areas, AI and ML can play a major role in reducing inequality and improving quality of life. AI-based tools can support farmers through crop monitoring and weather prediction, improve healthcare through early diagnosis and remote medical support, enhance education through adaptive learning and regional language content, and strengthen economic growth by improving decision-making, forecasting, and productivity. In countries like India, where development must reach every village and remote region, AI can become an important bridge between urban progress and rural advancement.

Overall, AI and ML are not only technologies of innovation but also tools for inclusive national development. If used responsibly, ethically, and with equal access for all, they can help build a more educated, healthy, productive, and developed society.

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