



AI-Driven Research Transformation in Bangladesh: A Study on the Integration of Machine Learning and Data Analytics in Scientific Discoveries

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Hello!

Warm greetings to all present. As we gather here today, I am excited to introduce my research on **AI-Driven Research Transformation in Bangladesh: A Study on the Integration of Machine Learning and Data Analytics in Scientific Discoveries**



Agenda Overview

- 01 Background of Study
- 02 Literature Review
- 03 Methodology
- 04 Findings and Results
- 05 Discussion
- 06 Conclusion and Recommendations



Background of the Study

AI as a Global Research Catalyst:

AI, particularly machine learning (ML) and data analytics, is transforming global research practices.

Enables processing of vast datasets, uncovering patterns, and accelerating discoveries.

Widely applied in developed nations across sectors like medicine, climate science, and industry.

Current Status in Bangladesh:

AI adoption in research is still in its early stages.

Emerging applications in key sectors such as healthcare, agriculture, and environmental science.

Examples include AI-based diagnostics and precision agriculture tools showing early benefits.

 Exploring Global Connections



Background of the Study *contd..*

- **Challenges in Bangladesh:**

- Limited computational infrastructure.
- Shortage of skilled professionals in AI and data science.
- Restricted access to high-quality, research-grade datasets.

- **Study Motivation and Objectives:**

- **Aim:** To assess AI's potential in overcoming research limitations in Bangladesh.
- **Objectives:**
 - Evaluate the current level of AI adoption in research.
 - Identify major barriers to widespread AI implementation.
 - Propose strategies to foster an AI-supportive research ecosystem.

- **Broader Context:**

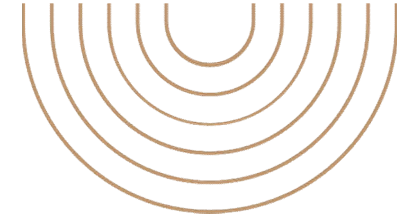
- The study positions Bangladesh within the global AI research movement.
- Highlights both the country's untapped potential and the urgent need for policy and institutional support.

Literature Review

Theme	Key Insights	Supporting Studies
AI and Scientific Discoveries Worldwide	AI accelerates scientific innovation across domains such as medicine, climate science, and genomics. Applications include protein structure prediction, drug discovery, and disaster forecasting.	Jumper et al. (2021); Vinuesa et al. (2020)
Machine Learning Applications in Research	ML supports pattern recognition, prediction, and automation in diverse fields. In healthcare, it improves diagnostics; in agriculture, it enhances crop yield prediction and pest detection.	Esteva et al. (2019); Kamilaris & Prenafeta-Boldú (2018)
Data Analytics in Research Transformation	Data analytics enables large-scale data processing, identifying trends, and guiding evidence-based decisions. It strengthens genomics, social sciences, and interdisciplinary research.	Kitchin (2014)
Challenges in AI Adoption in Developing Nations	Barriers include weak infrastructure, lack of expertise, high costs, and inadequate policy frameworks. In Bangladesh, AI use is growing but hindered by limited resources and training.	Dwivedi et al. (2021); Rahman & Sarker (2022)



Methodology



Qualitative Methods

Approach: Utilized structured surveys to gather measurable data.

Data Collection:

Surveys distributed to academic researchers, research institutions, and AI professionals in Bangladesh.

Designed to assess the extent of AI adoption across various research fields.

Collected data on challenges faced when integrating AI technologies.

Data Analysis:

Applied **descriptive and inferential statistics** to analyze survey responses.

Evaluated the **impact of AI technologies on research productivity** using statistical methods.

Quantitative Methods

Approach: Employed exploratory methods to gain in-depth understanding.

Data Collection:

Case studies of AI-based projects in Bangladesh (especially in agriculture and healthcare).

Semi-structured interviews with key stakeholders:

Government bodies

Universities

Private sector entities

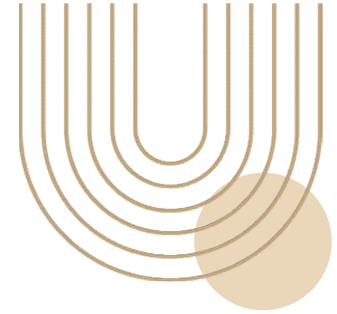
Data Analysis:

Used **qualitative analysis techniques** (e.g., thematic coding) to interpret interview transcripts.

Explored **perceptions, attitudes**, and experiences of stakeholders regarding AI-driven research.

Identified **trends, barriers, and opportunities** in AI infrastructure and expertise.

Findings and Result



Adoption of AI in Bangladeshi Research

- . AI adoption in Bangladesh has gradually increased over the past five years.
- . Adoption remains limited to a few disciplines and is mostly project-based.
- . Growth driven by collaborations with international partners and donor-funded initiatives.
- . Overall use of AI still modest compared to global standards due to resource limitations.

Agriculture

- . AI used to predict crop yields, detect pests, and optimize irrigation.
- . Contributes to addressing food security challenges in an agriculture-dependent economy.

Healthcare

- . AI-driven diagnostic tools (e.g., image recognition for TB and cancer) improve speed and accuracy of diagnosis.
- . Enhances the effectiveness of medical services.

Environment

- . AI applied in climate data analysis, flood forecasting, and air quality monitoring.
- . Supports climate resilience in a country vulnerable to environmental risks.



Findings and Result *contd..*



Institutional and Infrastructural Barriers

- Limited computational infrastructure and research labs.
- Poor access to high-quality datasets.
- Inadequate funding for AI research.
- Shortage of trained professionals in AI and data science.
- These factors slow the development of a robust AI research ecosystem.

Stakeholders' Perceptions and Attitudes

- Researchers, policymakers, and industry representatives are cautiously optimistic about AI integration.
- Recognize AI's potential to address national challenges in health, food security, and climate change.
- Concerns raised about sustainability, ethical risks, and financial costs.
- Emphasize the need for:
 - Stronger collaboration among academia, government, and industry.
 - Policy support and targeted investment.
 - Capacity building and AI education initiatives.

Discussion



Interpretation of Key Findings

AI adoption in Bangladesh's research is progressing but **remains uneven across sectors**.

Early implementations are seen in **agriculture, healthcare, and environmental research**.

Broader adoption is limited by **infrastructural and institutional barriers**.

Findings highlight both the **potential** and **challenges** of AI in a developing country context.

Opportunities for AI-Driven Research in Bangladesh

• Agriculture:

- Use of predictive analytics for yield optimization and climate resilience.

• Healthcare:

- AI-assisted diagnostics can ease pressure on overstretched medical systems.

• Environment:

- AI tools can enhance environmental monitoring and support climate adaptation strategies.

- These sectors offer **high-impact opportunities** for scalable AI integration.

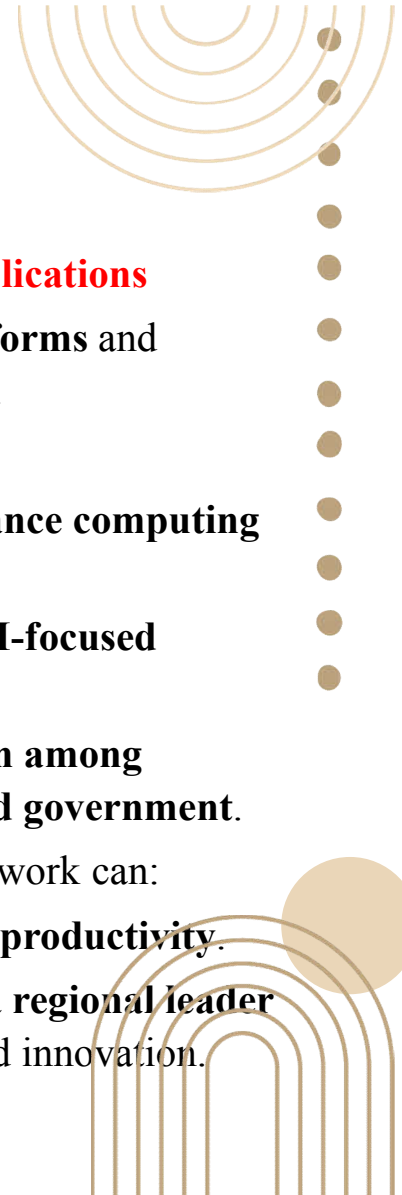
Discussion *contd...*

Comparative Perspective with Other Countries

- Bangladesh's AI adoption is still **nascent** compared to developed countries like the **USA** and **China**.
- Developed nations benefit from:
 - Robust **government policies**.
 - Strong **industry-academia partnerships**.
 - Advanced **computational infrastructure**.
- Bangladesh shares a similar growth pattern with **other emerging economies**, indicating **gradual progress**.
- Emphasizes the risk of a **widening global digital divide** if strategic interventions are not made.

Policy and Institutional Implications

- **Urgent need for policy reforms and institutional development.**
- Key recommendations:
 - Invest in **high-performance computing infrastructure**.
 - Develop and integrate **AI-focused academic curricula**.
 - Strengthen **collaboration among academia, industry, and government**.
- A coordinated policy framework can:
 - Boost national **research productivity**.
 - Position Bangladesh as a **regional leader** in AI-driven research and innovation.



Conclusion and Recommendations

Summary of Key Insights

This study underscores that while Bangladesh has made initial strides in adopting artificial intelligence (AI) for research, its application remains uneven across sectors. Agriculture, healthcare, and environmental science stand out as promising fields where AI has already begun to generate measurable benefits. However, infrastructural gaps, shortage of expertise, and limited funding continue to restrict widespread adoption (Rahman & Sarker, 2022).

Addressing Barriers to AI Adoption

Overcoming these barriers requires deliberate policy and institutional action. Limited access to high-performance computing facilities and quality datasets remains a significant constraint (Dwivedi et al., 2021). Addressing this requires investments in digital infrastructure, strengthening data governance, and promoting open data-sharing frameworks.

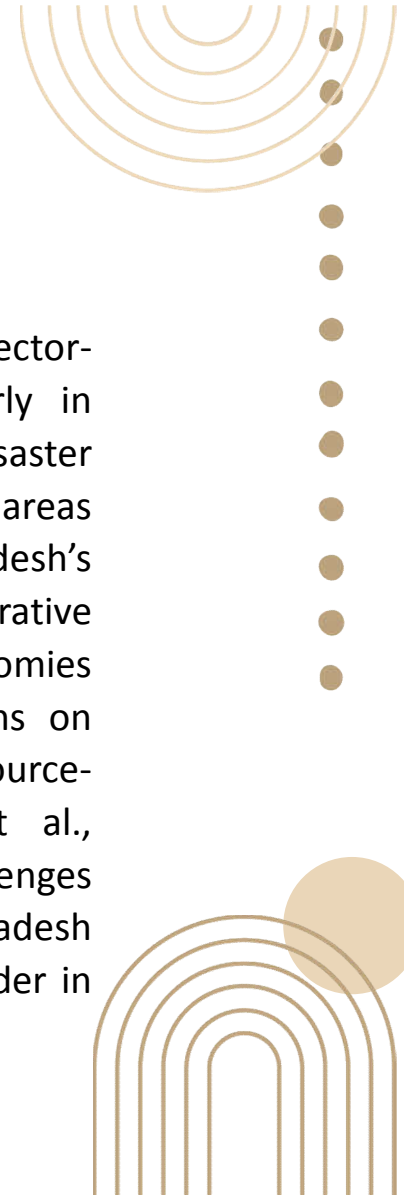
Conclusion and Recommendations *Contd...*

Strategies for Strengthening AI Ecosystem

Building a sustainable AI ecosystem will demand coordinated efforts across government, academia, and industry. Introducing AI-focused curricula in higher education, offering training programs, and incentivizing public–private partnerships can help build human capital and innovation capacity (Hosseini & Kiani, 2021). Furthermore, adopting clear regulatory guidelines can ensure ethical AI practices while fostering trust among stakeholders.

Future Directions for Research

Future research should explore sector-specific AI applications, particularly in climate adaptation, disaster management, and public health, areas highly relevant to Bangladesh's development priorities. Comparative studies with other emerging economies could also provide valuable lessons on scaling AI integration in resource-constrained contexts (Vinuesa et al., 2020). By addressing existing challenges and embracing innovation, Bangladesh can position itself as a regional leader in AI-driven scientific discovery.



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THANK YOU

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