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ROLE OF AI IN RESEARCH AND INNOVATION IN INDIAN ACADEMIA

*** Dr. Subodh Suresh Barve**

** Associate Professor. Head, Department of Commerce. HVPS R.J College of Arts, Science and Commerce, Ghatkopar (W), Mumbai 400086*

Abstract:

Research is the backbone of human civilization and industrial revolution all over world. Academics is playing a very important role in identifying human and industrial needs and satisfying them by producing desired goods and services through research and innovation. During 2017 to 2022 researches out has increased to 54% whereas research papers have risen to 1.3mn[1]. Currently India ranks. Artificial intelligence is a newly developed domain of knowledge which will affect Indian academics and research positively and negatively.

With the rapid integration of AI-driven tools, machine learning algorithms, and big data analytics, Indian academic institutions are experiencing transformative changes in research methodologies, knowledge dissemination, and innovation. Use of AI tools will increase accuracy of result predictions, data analysis, and reshaping traditional pedagogies, fostering interdisciplinary collaboration, and accelerating scientific breakthroughs. However, infrastructural bottle necks, data security and ethical issues have hampered used of AI in Indian academics. This paper explores the existing role, applications, benefits, and challenges of AI in Indian academic research and innovation.

Keywords : *Artificial intelligence, human civilisation, data predication.*

Introduction:

Research is an on-going process which involves several steps like topic selection, proposal writing, thesis writing, data analysis etc. use of artificial Intelligence (AI) is increasingly influencing higher education in India, bringing transformative changes to teaching, learning, and research. The global AI in education market was valued at $2.5 billion in 2022 and is projected to reach $6 billion by 2025.

In recent years, the Indian government has intensified its focus on AI-enhanced learning and skill development to prepare the future workforce. For instance, during the 2024-2025 period, China dedicated $2.1 billion to AI education funding, while the USA allocated $1.8 billion through its National AI Education Initiative. India, with its unique advantage of a youthful population of 600 million and over 750 million internet users, is well-positioned to leverage

A survey conducted in 2018 revealed that approximately 45% of respondents in India held a strong belief that AI applications would aid global education. This optimism is reflected in the increasing adoption of AI tools in Indian higher education institutions, where AI is utilized for learning management systems, analysing student success metrics, and advancing academic research.

Research paper writing involves a systematic process of synthesizing information from credible sources to contribute to scientific discourse (Noroozi, 2022). Collaborative efforts are required from researchers,

[1]https://timesofindia.indiatimes.com/india/india-is-worlds-4th-in-research-output-but-ranks-9th-in-citations/articleshow/98924312.cms

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government agencies, software developers etc. are needed to overcome challenges and harness more benefits of AI in research and innovation. They suggest that quality of courses must be upgraded with standard reference materials to ensure its internationalization (Dwivedi V. and Joshi Y. 2019)

AI is attempting to transform conventional research techniques with a technology twist, playing a crucial part in transforming Indian higher education by providing chances for better research methodology and learning experiences. To fully utilize AI's promise in this industry, more funding and careful application is required.

Objectives:

1. To analyse the impact of AI-driven tools on research efficiency and innovation.
2. To evaluate the challenges and opportunities of AI adoption in academic research.

Hypothesis:

Null Hypothesis (H_0): AI-driven tools have no significant impact on research efficiency and innovation in academia.

Alternate Hypothesis (H_1): AI-driven tools significantly enhance research efficiency and foster innovation in academia.

Null Hypothesis (H_0): The challenges of AI adoption in academic research outweigh its benefits, limiting its effectiveness.

Alternate Hypothesis (H_2): The benefits of AI adoption in academic research outweigh its challenges, leading to improved research outcomes..

Literature review:

A, Arvinth and Dr. Geeta (2024) have undertaken the study to identify which AI tools are used in higher education in India. Around two third of the respondents are aware about AI tools and they have no objection in integrating AI into academic. Respondents have stated that their grading and results have improved after using AI tools but some have not seen any improvement in their grading due to use of AI.

Sujata. Panda and Dr. Navakiran Kaur (2024) mentioned in their research paper that use of AI in academics and research have shown opportunities as well as challenges AI powered tools have capacity to improve quality of research output, reducing workload and enhancing research efficiency. Balance approach is required to harness benefits as well to face the challenges from AI.

P. S. Aithal and Shubhrajyotsna Aithal (2023) explained in their research out come that ChatGPT will have significant impact on different sectors of the business including teaching and research work. ChatGPT has expedited research work in the form increasing individualistic learning and better administrative procedures. Other AI tools have also helped research in plagiarism checking, data analysis, grammar checking etc.

AI tools used in research and innovation :

AI tools are playing a crucial role in advancing research and innovation in Indian academia. These tools assist in data analysis, literature review, automation, and predictive modelling, thereby improving research efficiency. Below are some widely used AI tools in Indian academic research:

1. **Literature Review and Research Assistance**
   - **ChatGPT & GPT-4** – this platform is useful for searching information , research ideas , summarizing papers etc.
   - **Elicit.org** – this tool is used to automate literature reviews and suggests relevant papers.
   - **Scribbr** – Used in citation of references for research paper or thesis
2. **Data Analysis and Computational Research**
   - **IBM Watson** – it is used in predictive analytics and data-driven decision-making.
   - **Google AutoML** – useful to researchers to build custom machine-learning models with minimal coding.

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- **RapidMiner** – Used for data mining, text analytics, and predictive modelling in research.
- **MATLAB AI Toolkit** – Supports deep learning, statistical analysis, and simulation in various scientific domains.

3. **Plagiarism Detection & Academic Integrity**
   - **Turnitin with AI-based detection** – this tool is used for plagiarism checking for better research work being by the researchers.
   - **Grammarly & QuillBot** – this tool is design mainly rephrasing the sentences and also to check the grammar involved in report writing.
4. **Smart Labs & Research Infrastructure**
   - **LabTwin** – AI-enable digital lab assistant for voice-enabled data recording and experiment tracking.
   - **BenchSci** – useful to analyse scientific papers and find relevant experimental data.
   - **DeepMind AlphaFold** – this prediction tool is used in bioinformatics research.
5. **Innovation & Industry-Academia Collaboration**
   To help universities/ colleges in AI related research collaborations for cloud computing and AI applications different labs have been set up the corporates for encouraging research environment in academics. E.g **Microsoft Azure AI , NVIDIA AI Research Lab , TCS AI Research Lab**
6. **Personalized Learning & Education Research**
   - **Swayam & NPTEL AI Modules** – this platform is useful for e-learning especially for distance learning
   - **Coursera & EdX AI-powered learning** – it is useful for improving skills in research methodology.

Data analysis:

For the purpose of data analysis primary data has been gathered from 73 respondents who are the research scholars, teachers and students from different faculty. Even the secondary data is also used for the study purpose.

Hypothesis 1:-

Null Hypothesis (H_0): AI-driven tools have no significant impact on research efficiency and innovation in academia.

Alternate Hypothesis (H_1): AI-driven tools significantly enhance research efficiency and foster innovation in academia.

Hypothesis 1 is tested by using simple t-test.

$$t = \bar{x} - \frac{\mu 0}{\frac{S}{\sqrt{n}}}$$

- Sample Mean ($\bar{x}$) = 3.69
- Sample Standard Deviation (S) = 0.94
- Sample Size (n) = 345
- Null Hypothesis Mean (μ0\mu_0) = 3

t = 3.69 −3 / 0.94 √345 = 13.70

Interpretation:

The calculated p-value is extremely low (approaching 0), confirming the earlier result of 2.14×10^{-34}. This indicates a highly significant difference from the neutral value. Since the p-value is much smaller than 0.05, we reject the null hypothesis. This confirms that AI tools significantly enhance research efficiency and foster innovation in academia.

Hypothesis 2

Null Hypothesis (H_0): The challenges of AI adoption in academic research outweigh its benefits, limiting its effectiveness.

Alternate Hypothesis (H_2): The benefits of AI adoption in academic research outweigh its challenges, leading to improved research outcomes.

Hypothesis 2 is tested by using Kruskal-Wallis Test,

$$H = \frac{12}{N(N-1)} \sum \frac{Ri^2}{ni} - 3\,(N-1)$$

- N = Total number of observations
- ni = Number of observations in group ii
- Ri = Sum of ranks for group ii

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Determine p-value: Using the Chi-square distribution with k−1 degrees of freedom, where k is the number of groups.

Total Observations (N): 57

Sum of Ranks:

- **Research Scholars:** R_{RS}=175.5
- **Teachers:** R_T=353.5
- **Students:** R_S=1124.0

H Statistic:

$$H = \frac{12}{57 \times 58}\left(\frac{175.5^2}{6} + \frac{353.5^2}{20} + \frac{1124^2}{31}\right) - 3 \times 8 = 0.971$$

Degrees of Freedom: 3− 1 = 2

p-value: 0.615

Interpretation:

The p-value (0.615) is greater than 0.050, indicating no statistically significant difference in perceptions among Research Scholars, Teachers, and Students. Therefore, we fail to reject the Null Hypothesis, suggesting similar views on AI's benefits across these groups.

Findings:

1. Students' category generally use AI tools higher for preparing assignments compared to teachers and research scholars.
2. Research Scholars show a stronger preference for using AI in research paper writing compared to other groups.
3. AI is moderately preferred across all groups, with slightly higher preference among Students.
4. Research Scholars and Teachers are showing a higher preference for AI in data collection compared to Students.
5. In the opinion of the respondents, Machine learning algorithms AI tool is most useful in research with mean score of 3.12 followed by plagiarism tool with AI tools 3.45 whereas paraphrasing AI tool contributes less with mean score of 3.58.
6. Around 89% of the respondents use AI tools in research work for different purposes.
7. Research scholars seem to be using AI tools mostly for projects and research related work and least for using searching information.
8. Students are mainly using AI tools for assignments and other academic related work whereas least purpose of used is data analysis.
9. Teachers rank AI tools most for searching basic information whereas least for using for data analysis.

Recommendations :

1. To conduct training programme for targeted groups to encourage use of user-friendly tools in research methodologies subject to validation of results.
2. To identify the reasons for not using AI tools and conduct workshops for teachers, students and research scholars to bridge the gap in actual use of AI tools and availability of AI tools.
3. Encourage ethical use of AI tools, particularly for paraphrasing and literature reviews, by developing guidelines and awareness programs.
4. To exhibit positive impact of AI tools on research productivity, supporting the narrative of AI as a catalyst for efficiency and innovation.
5. The government should clearly define the guidelines for ethical use of AI in academics, data security and ethical concerns.
6. There should be public private partnership for effective use of and easy access to affordable AI tools.
7. Encourage educational institutes to set up AI enable labs for ethical use of AI in research and innovation. This cane be achieved by collaboration between private institutes, government agencies and educational institutes.
8. To conduct awareness programmes for ethical use of information and data security measures.
9. To develop ethical guidelines for responsible AI usage in research, addressing plagiarism, paraphrasing, and data privacy concerns.

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10. Government and private organisations need to make good amount of investment in development of AI tools in India.
11. Effort should be made to enhance the creative skills of the students and research scholars and to kill their natural intelligence.

Conclusion:

AI being buzz word in India in recent past but still many of the Indian citizens are still not aware of this concept. In recent years due to availability of open AI tools, use of AI tools in Indian academia has increased to some extent. ChatGPT and Deep seek AI tools have made revolution in human life. Ethical use of Grammarly AI, Turnitin, scribbr etc. will certainly help the researcher's plagiarism checking, grammar checking, Bibliography etc. AI tools have immense potential to make revolution in Indian research work and innovation. To harness the benefits of AI, there should be clear guidelines from the government is needed for ethical use of artificial intelligence in research and innovation work. Over dependence on AI will likely to affect students' skills, quality of research and natural intelligence adversely. This purports that challenges emerging from AI cannot be overlooked and needed clear guidelines from the government. At the end we can say that any technology has pros and cons but its usefulness depends upon honest application by the users. Thus, policy frame work from the Indian government will give clear idea about application of AI Indian academics and research.

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