A Case Study on AI Adoption in Higher Education

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Abstract— **This comprehensive study explores the evolving landscape of artificial intelligence (AI) adoption in higher education, with a particular focus on faculty perceptions, usage patterns, and the critical barriers to implementation. As technologies like large language models become integral to teaching and research, understanding the dynamics of faculty adoption is essential for strategic institutional decision-making. Despite AI's promise to enhance learning and accelerate research, widespread adoption is hindered by significant barriers, including a lack of formal training, inadequate infrastructure, pressing ethical concerns, and severe time constraints.**

Drawing on survey data from over 100 faculty members, this study analyzes the extent of AI tool usage, perceived benefits, and the key challenges that vary across different adopter groups. The findings reveal an even split in current adoption (52% vs. 48%) and highlight a crucial divergence: low-intensity users are primarily blocked by ethical concerns, while high-intensity users are constrained by a lack of resources and institutional support. These insights lead to the central recommendation that universities must abandon a one-size-fits-all approach in favor of a segmented strategy to foster responsible and effective AI integration.

Keywords— ***Artificial Intelligence (AI), Higher Education, Faculty Perceptions, Technology Adoption, Generative AI, Adoption Barriers, AI Ethics, Institutional Strategy, Faculty Development, ChatGPT, Gemini.***

I. INTRODUCTION

The pace of innovation in **artificial intelligence (AI)** is reshaping industries worldwide, and higher education is no exception. Universities and colleges are witnessing an unprecedented influx of digital tools and intelligent systems designed to enhance teaching, streamline administration, and support research. Applications such as intelligent tutoring systems, automated grading, predictive analytics for student performance, and AI-powered research assistants are rapidly expanding their footprint across campuses.

Despite this surge, the effective and ethical adoption of AI within higher education remains a complex challenge. Faculty and institutional leaders must navigate issues such as data privacy, algorithmic bias, infrastructure readiness, and the need for comprehensive training. In many cases, educators lack sufficient exposure or support to integrate AI into their teaching and research practices, leading to uneven adoption and underutilized potential.

This survey examines the current state of **AI adoption in higher education**, focusing on faculty awareness, usage patterns, perceived benefits, and obstacles. By analyzing survey data from academic staff across departments and designations, the study highlights key trends, identifies gaps in adoption, and offers insights into priority areas for future integration. In doing so, it provides a clearer understanding of how institutions can foster a more informed, responsible, and effective approach to AI in academia.

II. ANALYSIS OF FACULTY SURVEY DATA

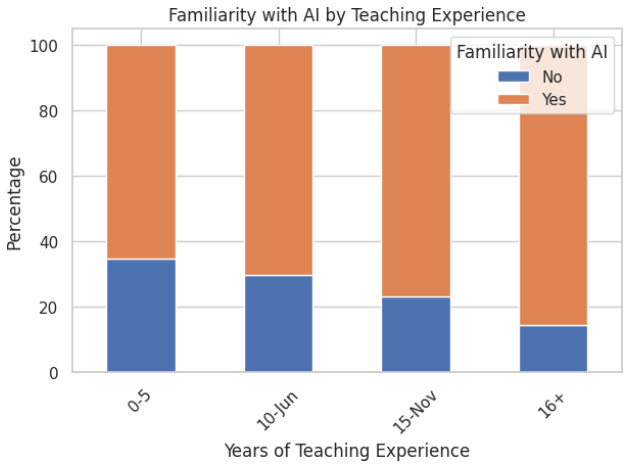
This section presents the findings from a survey conducted with over 100 faculty members representing six major departments—**Computer Science, Mechanical, Electrical, Civil, Management, and Science**. The respondents included **Professors, Associate Professors, and Assistant Professors** with a broad range of teaching experience spanning **0–5 years to 16+ years**.

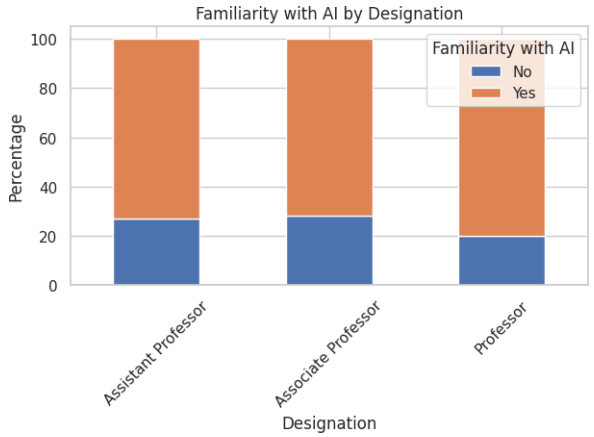
The survey captured both quantitative and qualitative data regarding **familiarity with AI**, **frequency of AI tool usage**, and **perceptions of AI's impact on teaching and learning outcomes**. Faculty members were asked about their usage of popular tools such as **ChatGPT, Gemini, Perplexity, and Copilot**, the **challenges** they face in adopting AI (including lack of training, infrastructure, ethical concerns, and time constraints), and the **priority areas** where they believe AI should be integrated (teaching, assessment, research, administration, and student support).

The analysis that follows synthesizes these responses to uncover patterns of adoption, benefits, barriers, and future directions for AI in higher education.

1. Faculty Familiarity with AI Across Designations and Experience Levels

This section examines how faculty members' familiarity with AI varies across different academic designations and levels of teaching experience, highlighting patterns of awareness and potential gaps in knowledge.



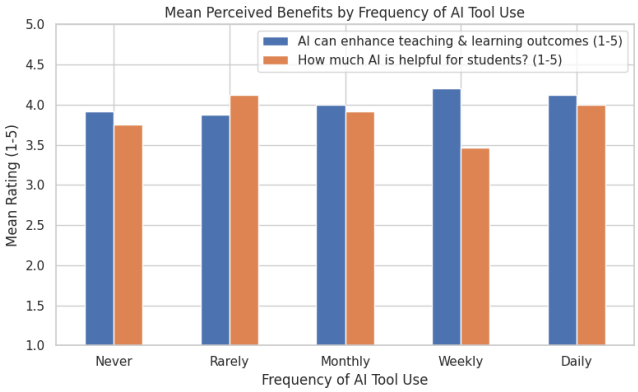


Most faculty know about AI. **Professors show the highest familiarity (80%)**, followed by **Assistant Professors (73%)** and **Associate Professors (72%)**. By teaching experience, familiarity grows from **65% for 0–5 years** to **86% for 16+ years**. The highest familiarity is among **Professors with 15+ years (100–86%)**, while the lowest is among **Professors with 0–5 years (60%)** and **Associate Professors with 0–10 years (62–61%)**. Overall, AI awareness rises with experience but is lower for some early-career groups.

2. Relationship Between AI Tool Usage Frequency and Perceived Benefits

This section explores how often faculty members use AI tools and how this relates to their views on AI's ability to improve teaching, learning, and student outcomes.

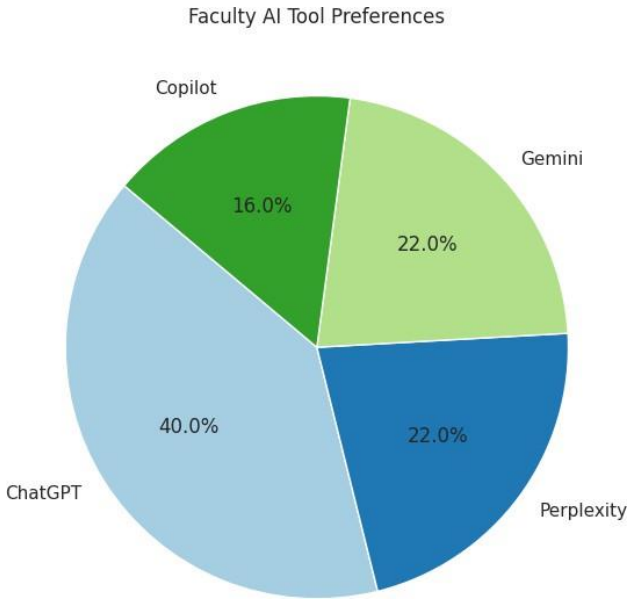
AI benefit ratings are fairly high across all groups. Teaching outcome scores rise from 3.9 (Never) to 4.2 (Weekly), with Daily users at 4.1. Student helpfulness peaks at 4.1 (Rarely, Daily) but dips to 3.5 (Weekly). Majority of faculty use AI Rarely (32%) or Monthly (25%). Statistical tests show no significant differences ($p > 0.1$).



3. Comparative Analysis of AI Tool Preferences: ChatGPT, Gemini and Others

This section compares faculty preferences for different AI tools, focusing on ChatGPT, Gemini, and other alternatives, to understand which platforms are most widely adopted and how their usage relates to teaching and research activities.

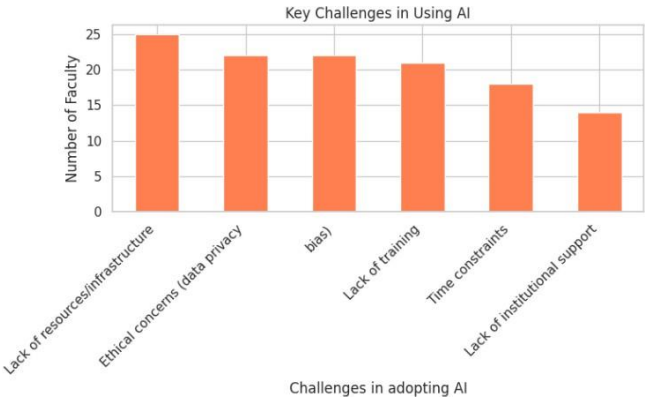
ChatGPT is the most preferred AI tool with **40% (n=40)** faculty users. Gemini and Perplexity share equal adoption at **22% (n=22 each)**, while Copilot is least preferred at **16% (n=16)**. Together, ChatGPT accounts for nearly **2×** the share of Copilot and remains the dominant choice.

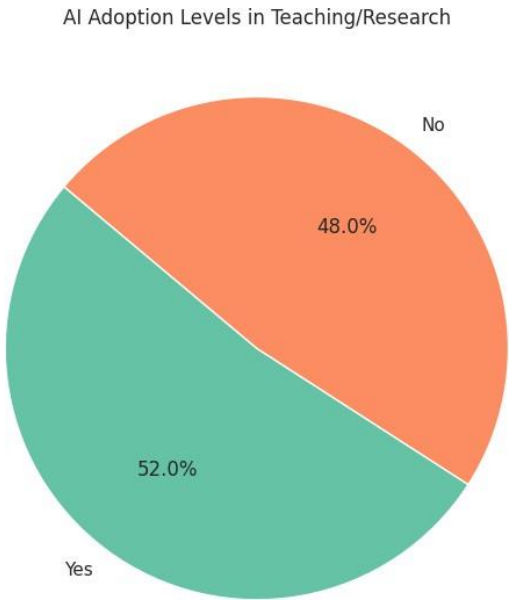


4. Adoption Levels Versus Challenges in Using AI

This section examines how widely AI tools are adopted by faculty and contrasts these adoption levels with the key challenges they face, providing insight into the balance between usage and barriers.

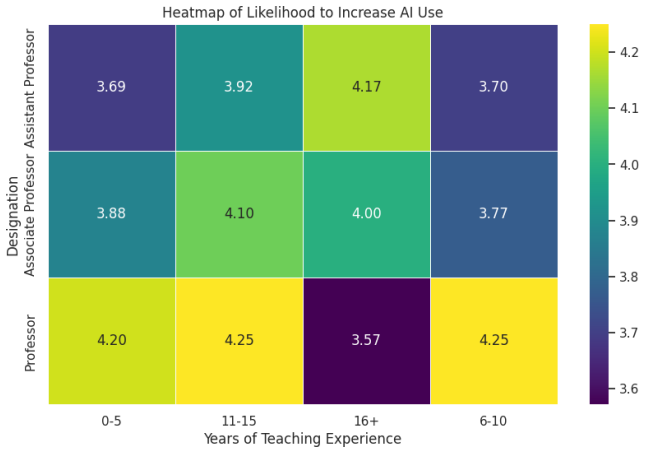
Faculty adoption is evenly split, with **52% (n=52)** using AI tools and **48% (n=48)** not. The most significant challenges are a **lack of resources/infrastructure** (cited by 25 faculty), **ethical/bias concerns** (22), and a **lack of training** (21), highlighting that foundational support and guidance are the primary barriers.





5. Likelihood of Increased AI Use by Designation and Teaching Experience

This section analyzes whether a faculty member's academic rank and years of teaching experience influence their plans to increase AI adoption in the coming years.

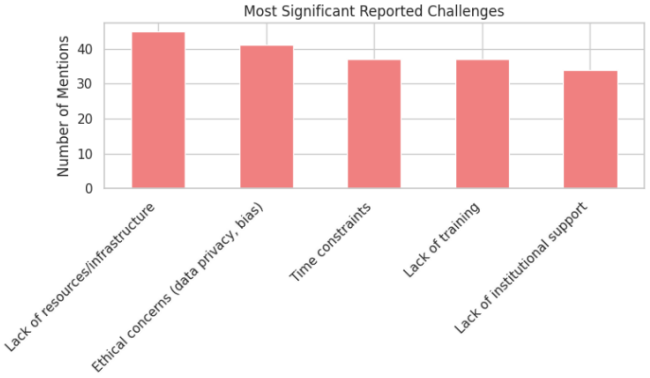


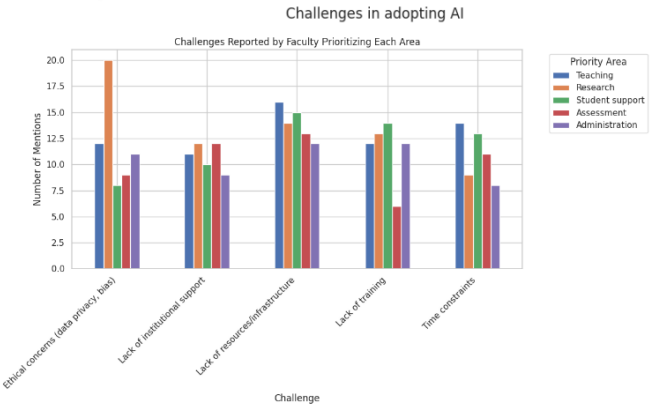
A generally positive intent to increase AI use is evident across all faculty, as every group scored **above 3.5 out of 5**. Within this positive trend, a sharp contrast still appears among the most experienced faculty: **Professors with 16+ years** show the lowest likelihood (**3.57**), while **Assistant Professors with 16+ years** are among the highest (**4.17**). The strongest overall intent comes from **Professors with 0-15 years of experience**, who consistently score the highest on the chart (**4.20-4.25**).

6. Priority Areas for AI Integration and Corresponding Challenges

1) This analysis highlights which areas faculty want to prioritize for AI and connects those priorities to the most significant reported challenges, revealing where institutional ambition and obstacles intersect. **Analysis**

While the top institutional challenges are a **lack of resources/infrastructure** (~43 mentions) and **ethical concerns** (~41), the data reveals these barriers impact priority areas differently. **Ethical concerns** are the overwhelming obstacle for faculty prioritizing **Research (20 mentions)**—the highest single challenge reported for any area. In contrast, a **lack of resources** is the primary barrier for those focused on **Teaching (16 mentions)** and **Student Support (15 mentions)**.





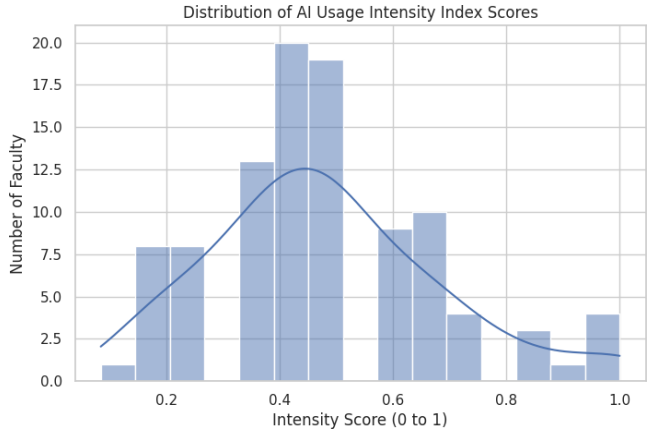
7. Construction of an AI Usage Intensity Index and Its Implications

this section constructs a composite **"AI Usage Intensity Index"** by combining faculty scores on usage frequency, time spent, and self-rated use. This index helps classify faculty into distinct adopter groups (e.g., high, medium, low) to explore how their experiences and challenges differ.

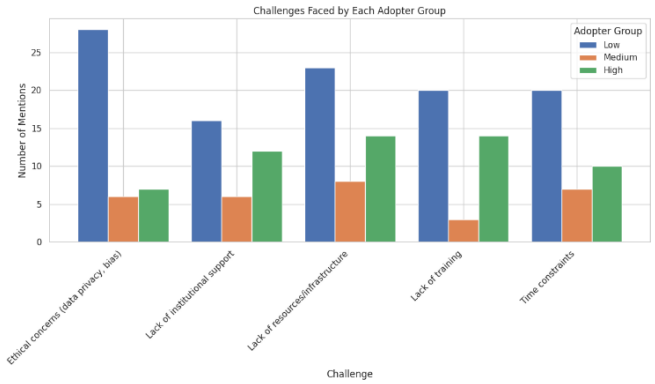
This analysis created an **AI Usage Intensity Index** by combining faculty responses on their frequency of AI tool use, time spent using AI, and self-rated overall AI use. This index provides a standardized measure of how actively faculty are currently engaging with AI.
Based on this index, faculty were segmented into three **Adopter Groups: Low, Medium, and High**.

- **Low Adopter Group:** These faculty members generally report lower frequency of AI tool use, spend less time using AI, and rate their overall AI use as low.
- **Medium Adopter Group:** These faculty members fall in the middle range across the AI usage metrics.

- **High Adopter Group:** These faculty members report higher frequency of AI tool use, spend more time using AI, and rate their overall AI use as high.



Adopter Group
Low 50
High 31
Medium 19



- **Challenges Faced:** The challenges faced by faculty vary significantly based on their AI usage intensity. **Low-intensity users** report the highest number of barriers overall, with **Ethical concerns (data privacy, bias)** being their dominant obstacle by a large margin (~28 mentions). In stark contrast, **High-intensity users** are least concerned with ethics (~7 mentions) and are instead primarily constrained by practical issues like **Lack of resources/infrastructure** and a need for more **training** (~14 mentions each).

FUTURE RESEARCH DIRECTIONS

Based on the findings of this study, several avenues for future research emerge that could provide a deeper and more actionable understanding of AI adoption in higher education. The following directions are proposed:

1. Qualitative Exploration of Adoption Barriers
This study's quantitative data reveals *what* the key challenges are, but not always *why*. Future research should employ qualitative methods, such as interviews and focus groups, to explore:

- Why senior **Professors with 16+ years of experience** are significantly more hesitant to increase AI use compared to their junior counterparts.
- Why **low-intensity users** perceive **ethical concerns** as their primary barrier, while high-intensity users are more focused on practical limitations like infrastructure. A deeper inquiry could reveal whether this is due to a knowledge gap or differing philosophical stances.

2. Longitudinal Tracking of Adoption Trends
AI technology is evolving at an exponential rate. A cross-sectional study like this one provides a valuable snapshot, but a **longitudinal study** tracking the same faculty cohort over several years would be highly insightful. This would allow researchers to measure how perceptions, tool preferences, and adoption challenges change over time in response to new technologies and institutional policies.

3. Discipline-Specific AI Integration Patterns
This study grouped faculty into broad departments. A more granular analysis comparing AI adoption between distinct academic divisions, such as **STEM versus the Humanities**, is a logical next step. Such research could uncover discipline-specific use cases, preferred tools, and unique ethical challenges (e.g., AI in creative writing vs. AI in computational modeling).

4. Measuring the Impact on Student Learning Outcomes
While this research focused on faculty perspectives, the ultimate goal of educational technology is to improve student outcomes. Future studies should aim to correlate **faculty AI usage intensity** with measurable student metrics, such as engagement levels, academic performance, and qualitative feedback on their learning experience. This would help validate the perceived benefits reported by faculty.

5. Efficacy of Institutional Support and Interventions
Given that a **lack of training** and **resources** were identified as major barriers, a future interventional study could be highly effective. Researchers could design and implement a targeted AI training program or provide premium tool access to a specific department, measuring the subsequent changes in adoption rates and attitudes against a control group. This would provide evidence-based guidance for university administrators on how to best support their faculty.

CONCLUSION

This survey of over 100 faculty members provides a critical snapshot of the current state of artificial intelligence adoption in higher education, revealing a landscape of cautious optimism fraught with significant, multifaceted challenges. The findings indicate that while faculty are almost evenly split between adopting (52%) and not adopting (48%) AI in their teaching and research, there is a strong, overarching intent to increase its use in the near future.

The primary takeaway from this study is that a "one-size-fits-all" institutional strategy for promoting AI is destined to fail. The barriers to adoption are not uniform; they differ dramatically based on a faculty member's existing level of engagement with the technology. Novice or **low-intensity users** are stalled by foundational barriers, with **ethical concerns** and a basic **lack of training** being their most significant hurdles. In stark contrast, **high-intensity users** have moved past these initial questions and are now constrained by practical, systemic issues like a **lack of resources, infrastructure, and institutional support** needed to scale their efforts. This divergence is also reflected in seniority, with the most experienced professors showing the greatest hesitancy.

Ultimately, this study demonstrates that the path to effective AI integration is not a single road but a series of distinct journeys. For universities to successfully navigate this technological transformation, they must develop a segmented support strategy. This involves providing clear ethical guidance and foundational training for those just beginning, while simultaneously investing in robust infrastructure and advanced development opportunities for the early adopters who are pushing the boundaries. By understanding and addressing these varied needs, institutions can move beyond simply providing tools and begin to foster a culture of responsible and impactful AI-driven innovation in education.

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