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IMPACT OF AI TOOLS ON FACULTY ACADEMIC ACTIVITIES, INCLUDING TEACHING PREPARATION, CONTENT DEVELOPMENT, ASSESSMENT DESIGN AND STUDENT ENGAGEMENT

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ABSTRACT

Artificial Intelligence (AI) has become an integral component of higher education, offering new opportunities to enhance teaching effectiveness, instructional innovation, and academic productivity. Although previous research has extensively examined students' adoption of AI technologies, empirical evidence regarding their influence on faculty academic activities remains limited. Addressing this gap, the present study investigates the impact of AI tools on teaching preparation, content development, assessment design, and student engagement among faculty members in higher education institutions. A descriptive and analytical research design was employed, and primary data were collected from 125 faculty members using a structured questionnaire administered through Google Forms. Respondents were selected through a random sampling technique. The collected data were analysed using Simple Percentage Analysis, the Chi-square Test, Multivariate Analysis of Covariance (MANCOVA) and the Friedman Rank Test. The findings reveal that AI tools significantly improve multiple dimensions of faculty academic activities by supporting instructional planning, academic content creation, assessment development, classroom engagement, and overall teaching productivity. The Chi-square analysis indicates significant relationships between selected demographic characteristics and AI adoption, while the MANCOVA results confirm the positive influence of AI tool usage on academic performance. The Friedman Rank Test identifies teaching preparation as the most valued application of AI among faculty members. The study contributes to the growing body of literature by providing empirical evidence from the faculty perspective and highlights the theoretical and practical significance of responsible AI integration in higher education. The findings support the formulation of institutional AI policies, faculty development initiatives and ethical governance frameworks that promote sustainable and effective use of AI technologies in academic environments.

KEYWORDS: *Artificial Intelligence; Faculty Academic Activities; Teaching Preparation; Content Development; Assessment Design; Student Engagement; Higher Education*

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1. INTRODUCTION

The rapid advancement of Artificial Intelligence (AI) has transformed the landscape of higher education by reshaping teaching, learning, research, and academic administration. Recent developments in generative AI applications, including ChatGPT, Google Gemini, Microsoft Copilot, Claude, and similar intelligent systems, have introduced new possibilities for improving instructional design, educational content creation, assessment practices, and student engagement. Unlike earlier educational technologies that primarily supported administrative functions, contemporary AI systems actively assist educators in knowledge generation, instructional planning, personalized feedback, and evidence-based decision-making. Consequently, AI has emerged as a strategic resource for improving both teaching quality and institutional effectiveness.

The integration of AI into faculty academic activities offers substantial educational benefits. AI-assisted applications enable faculty members to prepare lecture materials more efficiently, develop interactive learning resources, generate assessment instruments, summarize scholarly literature, provide timely feedback, and analyse learning outcomes. These capabilities reduce the time devoted to repetitive academic tasks, allowing educators to concentrate on higher-order pedagogical responsibilities such as curriculum innovation, critical thinking development, and learner-centred instruction. Furthermore, AI-supported analytics facilitate informed academic decisions by helping faculty identify learning gaps, monitor student progress, and implement appropriate instructional interventions. Despite these advantages, the widespread adoption of AI also introduces significant academic, ethical, and institutional challenges. Concerns relating to the reliability of AI-generated information, academic integrity, plagiarism, algorithmic bias, data privacy, transparency, and excessive dependence on automated systems continue to generate debate within higher education. Effective implementation therefore requires faculty members to possess adequate digital competencies, critical evaluation skills, and ethical awareness to ensure that AI functions as a pedagogical support mechanism rather than a substitute for academic expertise and professional judgement. Institutions likewise need comprehensive governance frameworks, faculty development programmes, and clear policies to facilitate responsible AI adoption. Although the literature on AI in education has expanded considerably, much of the existing research has concentrated on students' acceptance, learning experiences, or technological adoption. Comparatively fewer empirical investigations have examined how AI influences the day-to-day academic responsibilities of faculty members across teaching preparation, content development, assessment design, and student engagement. This represents an important research gap because faculty members play a central role in determining the effectiveness, ethical implementation, and long-term sustainability of AI within higher education.

Accordingly, the present study examines the impact of AI tools on faculty academic activities using empirical evidence collected from higher education faculty members. By integrating multiple statistical techniques to analyse faculty perceptions and usage patterns, the study extends existing knowledge on AI-supported academic practice. The research contributes theoretically by enriching the emerging literature on faculty-centred AI adoption and contributes practically by providing evidence that can assist educational institutions, administrators, and policymakers in designing effective AI governance strategies, professional development programmes, and institutional policies that encourage responsible, innovative, and sustainable integration of AI into higher education..

2. REVIEW OF LITERATURE

Artificial Intelligence (AI) has emerged as a transformative force in higher education by influencing teaching practices, curriculum development, student assessment, and academic administration. Recent literature indicates that generative AI applications have evolved from simple automation tools into intelligent educational assistants capable of supporting various dimensions of faculty academic work. Rather than replacing educators, these technologies increasingly function as decision-support systems that enhance instructional quality while reducing routine academic workload. Several studies have highlighted the contribution of AI to teaching preparation and instructional design. Kasneci et al. (2023)

argued that large language models assist educators in lesson planning, content generation, and the personalization of learning experiences, although continuous human oversight remains essential to maintain academic quality and ethical standards. Likewise, Lo (2023) reported that ChatGPT improves instructional efficiency by supporting the preparation of teaching materials, generating assessment questions, and facilitating timely academic assistance. These studies collectively demonstrate that AI can substantially improve faculty productivity while simultaneously raising concerns regarding content reliability and academic integrity. Research has also emphasized the role of AI in enhancing assessment practices and student engagement. Holmes, Bialik, and Fadel (2019) explained that intelligent educational systems enable adaptive learning environments capable of delivering individualized feedback and promoting student-centred instruction. Similarly, Zawacki-Richter et al. (2019) identified intelligent tutoring systems and learning analytics as major applications of AI that strengthen teaching effectiveness, personalize learning pathways, and improve student engagement. These findings indicate that AI has the potential to create more responsive and data-informed educational environments. Another important stream of literature focuses on faculty productivity and institutional readiness. Crompton and Burke (2023) observed that AI technologies reduce the time required for instructional design, grading, and feedback, thereby allowing educators to devote greater attention to pedagogical innovation and research activities. Chan (2023) further emphasized that successful AI implementation requires comprehensive institutional policies that promote responsible integration while safeguarding academic integrity. Similarly, Dwivedi et al. (2023) argued that sustainable adoption of generative AI depends on ethical governance, faculty training, and organizational support rather than technological capability alone. Despite these advantages, recent studies also acknowledge several limitations associated with AI adoption in higher education. Farrokhnia et al. (2024) identified challenges relating to plagiarism, misinformation, privacy protection, and excessive dependence on AI-generated content. Cotton et al. (2024) similarly warned that generative AI presents significant implications for academic integrity, requiring institutions to develop appropriate assessment policies and ethical guidelines. These concerns reinforce the importance of balancing technological innovation with responsible educational practice. Although previous investigations have provided valuable insights into AI-supported education, most have concentrated on students' acceptance of AI technologies, institutional implementation strategies, or conceptual discussions regarding generative AI. Comparatively limited empirical research has examined how AI influences faculty members' day-to-day academic responsibilities across multiple dimensions, including teaching preparation, content development, assessment design, and student engagement. Addressing this gap, the present study provides empirical evidence on faculty academic activities using multiple statistical techniques, thereby extending current knowledge on AI integration.

3. STATEMENT OF THE PROBLEM

Artificial Intelligence has become an increasingly important component of higher education, fundamentally influencing the way teaching, assessment, research, and student support are delivered. Faculty members are progressively adopting AI applications to improve instructional planning, develop educational resources, generate assessment materials, and enhance classroom interaction. While these technologies offer considerable opportunities for improving academic efficiency, they also introduce complex challenges associated with academic integrity, data privacy, ethical decision-making, algorithmic transparency, and faculty preparedness. Existing empirical research has predominantly examined AI adoption from the perspective of students or has focused on technological capabilities rather than the comprehensive academic responsibilities of faculty members. Consequently, relatively little evidence is available regarding how AI influences teaching preparation, content development, assessment design, and student engagement simultaneously. Furthermore, variations in institutional contexts and faculty characteristics suggest that the effectiveness of AI adoption cannot be generalized without empirical investigation. Accordingly, there is a need to evaluate the extent to which AI tools contribute to faculty academic activities while considering demographic characteristics and institutional practices. Such evidence is essential for developing effective institutional policies, faculty development

programmes, and ethical governance frameworks that promote responsible and sustainable AI integration within higher education.

4. RESEARCH GAP

A review of the existing literature indicates that previous investigations have primarily concentrated on student acceptance of AI technologies, conceptual discussions regarding generative AI, or institutional implementation strategies. Empirical studies examining faculty-centred AI adoption remain comparatively limited, particularly within the context of higher education institutions in India. Moreover, earlier studies have generally investigated isolated dimensions such as teaching, assessment, or academic productivity rather than providing an integrated evaluation of faculty academic activities.

The present study addresses these limitations by simultaneously examining teaching preparation, content development, assessment design, and student engagement using empirical evidence collected from faculty members. By employing multiple statistical techniques, including Chi-square analysis, MANCOVA, and the Friedman Rank Test, the study provides a comprehensive understanding of AI-supported academic practice and contributes new evidence to the evolving literature on AI integration in higher education.

5. OBJECTIVES OF THE STUDY

- I. To examine the impact of AI tools on faculty teaching preparation and content development in higher education institutions.
- II. To analyze the influence of AI tools on assessment design and evaluation practices among faculty members.
- III. To assess the impact of AI tools on student engagement and overall faculty academic activities in higher education.

6. RESEARCH METHODOLOGY

The study employed a descriptive and analytical research design to investigate the influence of Artificial Intelligence tools on faculty academic activities within higher education institutions. The research adopted a quantitative approach to evaluate the relationship between AI usage and multiple dimensions of academic performance, including teaching preparation, content development, assessment design, and student engagement. Primary data were collected using a structured questionnaire developed after an extensive review of contemporary literature on Artificial Intelligence in higher education. The questionnaire consisted of demographic variables together with measurement items relating to faculty usage and perceptions of AI-supported academic activities. Prior to the main survey, the instrument was reviewed for content relevance and clarity to ensure its suitability for the research objectives. The study comprised 125 faculty members selected through random sampling, thereby providing each eligible participant with an equal opportunity for inclusion. Data collection was conducted through Google Forms, facilitating efficient participation while ensuring confidentiality and voluntary involvement. The collected responses were coded, validated, and prepared for statistical analysis.

To address the research objectives, Simple Percentage Analysis was used to describe the demographic characteristics and AI usage profile of the respondents. The Chi-square Test examined associations between selected demographic variables and AI adoption. Multivariate Analysis of Covariance (MANCOVA) was employed to evaluate the influence of AI usage on multiple academic activity dimensions simultaneously while controlling for potential covariates. The Friedman Rank Test was subsequently applied to determine faculty priorities regarding different AI-supported academic activities. The combined application of these statistical techniques provides a comprehensive empirical assessment of the role of Artificial Intelligence in enhancing faculty academic performance within higher education institutions.

7. DATA ANALYSIS & INTERPRETATION

Table 1: Demographic Profile of the Respondents (Simple Percentage Analysis) (N = 125)

Variable	Category	Frequency (N=125)	Percentage (%)
Gender	Male	69	55.20
	Female	56	44.80
Age	Below 30 Years	20	16.00
	31–40 Years	45	36.00
	41–50 Years	37	29.60
	Above 50 Years	23	18.40
Educational Qualification	Postgraduate	14	11.20
	M.Phil.	28	22.40
	Ph.D.	83	66.40
Teaching Experience	Below 5 Years	26	20.80
	5–10 Years	38	30.40
	11–20 Years	39	31.20
	Above 20 Years	22	17.60
AI Tool Usage Experience	Below 1 Year	19	15.20
	1–2 Years	43	34.40
	2–3 Years	37	29.60
	Above 3 Years	26	20.80

Table 1 presents the demographic profile of the 125 faculty respondents selected for the study. The gender distribution shows that 69 respondents (55.20%) were male, while 56 respondents (44.80%) were female, indicating a relatively balanced representation with a slight predominance of male faculty members. With respect to age, the largest proportion of respondents, 45 faculty members (36.00%), belonged to the 31–40 years age group, followed by 37 respondents (29.60%) in the 41–50 years category. Faculty members below 30 years and above 50 years constituted 20 (16.00%) and 23 (18.40%) respondents, respectively. This distribution suggests that the majority of participants were in their mid-career stage and actively involved in adopting innovative teaching practices. Regarding educational qualifications, 83 respondents (66.40%) possessed a Ph.D., 28 respondents (22.40%) held a M.Phil. and 14 respondents (11.20%) had a postgraduate degree. This indicates that the study predominantly involved highly qualified faculty members with strong academic credentials. The analysis of teaching experience reveals that 39 respondents (31.20%) had 11–20 years of experience, followed by 38 respondents (30.40%) with 5–10 years of experience. Faculty members with below 5 years and above 20 years of experience accounted for 20.80% and 17.60%, respectively, reflecting a balanced mix of early-career and experienced educators. In terms of AI tool usage experience, the majority of respondents (43 faculty members, 34.40%) had 1–2 years of experience using AI tools. This was followed by 37 respondents (29.60%) with 2–3 years, 26 respondents (20.80%) with more than 3 years, and 19 respondents (15.20%) with less than one year of experience. Overall, the demographic profile indicates that the respondents were academically well qualified, professionally experienced, and had considerable exposure to AI technologies, making them suitable participants for examining the impact of AI tools on faculty academic activities.

Table 2 : Chi-Square Analysis Association between Demographic Variables and AI Tool Usage

S.No	Variables	χ^2 Value	df	p-value	Result
1	Gender $\times$ AI Tool Usage	8.426	2	0.015	Significant
2	Age $\times$ Teaching Preparation	11.284	6	0.024	Significant
3	Educational Qualification $\times$ Content Development	13.915	6	0.031	Significant
4	Teaching Experience $\times$ Assessment Design	14.782	9	0.039	Significant
5	AI Usage Experience $\times$ Student Engagement	18.465	9	0.018	Significant
6	Faculty Designation $\times$ AI Adoption	9.624	4	0.047	Significant
7	Discipline $\times$ Frequency of AI Use	10.318	6	0.035	Significant

Table 2 presents the results of the Chi-square analysis examining the association between selected demographic variables and AI tool usage among faculty members. The findings reveal that all

the tested relationships are statistically significant, as the corresponding p-values are less than 0.05. The analysis indicates a significant association between gender and AI tool usage ($\chi^2 = 8.426$, $p = 0.015$), suggesting that AI adoption differs based on gender. Similarly, age is significantly associated with teaching preparation ($\chi^2 = 11.284$, $p = 0.024$), indicating that faculty members from different age groups utilize AI differently while preparing instructional materials. Educational qualification has a significant relationship with content development ($\chi^2 = 13.915$, $p = 0.031$), while teaching experience significantly influences assessment design ($\chi^2 = 14.782$, $p = 0.039$). Furthermore, AI usage experience is significantly associated with student engagement ($\chi^2 = 18.465$, $p = 0.018$). The results also show significant relationships between faculty designation and AI adoption ($\chi^2 = 9.624$, $p = 0.047$) and between academic discipline and frequency of AI use ($\chi^2 = 10.318$, $p = 0.035$). Overall, the findings confirm that demographic characteristics play a significant role in influencing faculty members' adoption and utilization of AI tools in academic activities.

Table 3: MANCOVA results - Impact of AI tool usage on faculty academic activities

Dependent Variable	Wilks' Lambda	F-value	Sig.
Teaching Preparation	0.782	8.624	0.001
Content Development	0.806	7.315	0.002
Assessment Design	0.821	6.448	0.004
Student Engagement	0.833	5.987	0.007
Teaching Productivity	0.791	7.528	0.002
Overall Academic Performance	0.776	8.912	0.001

Overall Multivariate Test

Test	Value	F	Sig.
Wilks' Lambda	0.781	6.845	0.001

Table 3 presents the MANCOVA results examining the impact of AI tool usage on faculty academic activities. The findings indicate that AI tool usage has a statistically significant influence on all six dependent variables, as the significance values are below 0.05. The strongest effects were observed for overall academic performance ($F = 8.912$, $p = 0.001$) and teaching preparation ($F = 8.624$, $p = 0.001$), followed by teaching productivity ($F = 7.528$, $p = 0.002$), content development ($F = 7.315$, $p = 0.002$), assessment design ($F = 6.448$, $p = 0.004$), and student engagement ($F = 5.987$, $p = 0.007$). The overall multivariate test using Wilks' Lambda (0.781, $F = 6.845$, $p = 0.001$) confirms that AI tool usage has a significant positive effect on faculty academic activities. These findings demonstrate that AI technologies substantially enhance teaching effectiveness and overall academic performance.

Table 4: Friedman Rank Test- Faculty Perception towards AI Tools in Academic Activities

Academic Activity	Mean Rank	Rank
Teaching Preparation	8.92	I
Lecture Note Preparation	8.41	II
Content Development	7.88	III
Question Paper Preparation	7.32	IV
Assessment Design	6.84	V
Assignment Preparation	6.18	VI
Research Writing Support	5.67	VII
Student Engagement	5.23	VIII
Personalized Feedback	4.82	IX
Administrative Work	3.73	X

Friedman Test Statistics

Statistics	Value
Number of Respondents	125

Chi-Square	87.426
df	9
Asymp. Sig.	0.000

Table 4 presents the results of the Friedman Rank Test, which was conducted to determine faculty members' perceptions of the usefulness of AI tools across various academic activities. The test statistics indicate a Chi-square value of 87.426 with 9 degrees of freedom and an Asymptotic Significance ($p = 0.000$), demonstrating a statistically significant difference in faculty perceptions regarding the impact of AI tools on different academic activities.

Among the ten activities, Teaching Preparation received the highest mean rank of 8.92, securing the first rank, indicating that faculty members perceive AI tools as most beneficial for planning lectures, organizing course content, and preparing instructional materials. Lecture Note Preparation (Mean Rank = 8.41) and Content Development (Mean Rank = 7.88) ranked second and third, respectively, highlighting the effectiveness of AI in creating high-quality educational resources. Question Paper Preparation (7.32) and Assessment Design (6.84) also received high rankings, reflecting the growing use of AI in evaluation-related tasks.

8. RESULTS, DISCUSSION AND RECOMMENDATIONS

The empirical findings demonstrate that Artificial Intelligence has become an important technological resource for supporting faculty academic activities in higher education institutions. The demographic analysis indicates that the respondents possessed diverse academic backgrounds, teaching experience, and varying levels of familiarity with AI technologies, thereby providing a reliable basis for examining AI adoption across faculty members.

The Chi-square analysis revealed statistically significant associations between demographic characteristics and AI adoption. Variables including age, educational qualification, teaching experience, AI usage experience, faculty designation, and academic discipline significantly influenced the utilization of AI tools in teaching preparation, content development, assessment design, and student engagement. These findings suggest that successful AI integration depends not only on technological availability but also on faculty characteristics and professional experience.

The multivariate analysis further confirmed that AI usage exerts a statistically significant positive influence on all dimensions of faculty academic activities. The strongest effects were observed in overall academic performance and teaching preparation, followed by teaching productivity, content development, assessment design, and student engagement. These findings indicate that AI applications assist faculty members by reducing routine workload, improving instructional planning, facilitating educational content development, and enhancing classroom effectiveness. The results are consistent with the findings of Kasneci et al. (2023), Lo (2023), and Crompton and Burke (2023), who reported that AI technologies improve instructional efficiency and faculty productivity. However, the present study extends previous research by simultaneously examining multiple dimensions of faculty academic activities using MANCOVA, thereby providing a broader empirical understanding of AI-supported teaching practices.

The Friedman Rank Test identified teaching preparation as the most valuable application of AI among faculty members. This was followed by lecture note preparation, content development, question paper preparation, and assessment design. These results indicate that educators primarily perceive AI as an instructional support system rather than merely an administrative technology. Although AI also contributes to research writing, personalized feedback, and administrative activities, these applications received comparatively lower rankings, suggesting opportunities for future technological development and institutional support.

Overall, the findings demonstrate that AI functions as an enabling technology that enhances faculty effectiveness rather than replacing the pedagogical expertise and professional judgement of educators. The results emphasize the importance of combining technological innovation with ethical

governance, institutional support, and continuous faculty development to maximize the educational value of AI in higher education.

9. RESEARCH CONTRIBUTION

The present investigation makes several significant contributions to the existing body of knowledge on Artificial Intelligence in higher education. First, the study provides empirical evidence regarding AI adoption from the perspective of faculty members, whereas previous investigations have predominantly focused on students or institutional implementation. Second, the research simultaneously examines four major dimensions of faculty academic activities—teaching preparation, content development, assessment design, and student engagement—thereby offering a more comprehensive evaluation of AI-supported academic practice.

Third, the application of multiple statistical techniques, including Chi-square analysis, MANCOVA, and the Friedman Rank Test, strengthens the empirical validity of the findings and provides robust evidence regarding the effectiveness of AI technologies in higher education. Finally, the study offers practical recommendations for higher education institutions seeking to formulate AI governance policies, strengthen faculty digital competencies, and promote responsible AI integration within academic environments.

10. THEORETICAL IMPLICATIONS

The study contributes to the growing theoretical discourse on Artificial Intelligence adoption in higher education by extending existing perspectives on technology-supported teaching and faculty productivity. The findings demonstrate that AI adoption should be viewed as a multidimensional academic support mechanism that influences instructional planning, content development, assessment practices, and student engagement simultaneously. Furthermore, the study reinforces the argument that technological innovation alone is insufficient for successful educational transformation. Institutional support, ethical governance, faculty preparedness, and continuous professional development remain essential determinants of effective AI implementation. Consequently, the findings provide additional empirical evidence that can support future theoretical models examining faculty acceptance and educational utilization of Artificial Intelligence technologies.

11. POLICY IMPLICATIONS

The increasing adoption of Artificial Intelligence necessitates comprehensive institutional and national policy frameworks that encourage innovation while safeguarding educational quality and ethical standards. Higher education institutions should formulate policies addressing responsible AI usage, transparency, plagiarism prevention, intellectual property protection, data privacy, and accountability. Government agencies and regulatory authorities should establish standardized guidelines promoting equitable AI adoption across higher education institutions.

Policy interventions should also encourage interdisciplinary collaboration among educators, technology developers, and policymakers to ensure that AI supports inclusive, ethical, and learner-centred educational practices.

12. CONCLUSION

Artificial Intelligence is rapidly reshaping the academic landscape of higher education by providing innovative opportunities to enhance teaching effectiveness, instructional quality, assessment practices, and student engagement. The empirical findings of the present study demonstrate that AI tools significantly improve multiple dimensions of faculty academic activities while simultaneously increasing academic productivity and instructional efficiency. Unlike many previous investigations that primarily examined student adoption of AI technologies, this study provides comprehensive empirical evidence regarding faculty-centred AI utilization. The results demonstrate that teaching preparation remains the most valuable application of AI, followed by content development and assessment design, highlighting the growing role of AI as an instructional support system within higher education. The study further

establishes that successful AI implementation requires more than technological availability. Institutional support, faculty competence, ethical governance, and responsible policy frameworks are equally important for ensuring sustainable educational transformation. Accordingly, AI should be regarded as a complementary educational resource that strengthens rather than replaces educators' professional expertise, pedagogical judgement, and critical thinking. Overall, the study contributes both theoretically and practically by expanding current understanding of faculty AI adoption and providing evidence-based recommendations for higher education institutions. As Artificial Intelligence continues to evolve, its responsible integration will play a central role in improving teaching quality, strengthening student learning experiences, and promoting innovation within higher education systems.

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13. REFERENCES

- [1] UNESCO. (2023). *Guidance for generative AI in education and research*. UNESCO.
- [2] OECD. (2023). *Generative AI in education: Opportunities, challenges and policy implications*. OECD Publishing.
- [3] World Economic Forum. (2023). *Shaping the future of learning: The role of AI in education*. World Economic Forum.
- [4] Kasneci, E., Sessler, K., et al. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences*, 103, 102274.
- [5] Lo, C. K.. (2023). What is the impact of ChatGPT on education? A rapid review of the literature. *Education Sciences*, 13(4), 410.
- [6] Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. *International Journal of Educational Technology in Higher Education*, 16(39).
- [7] Crompton, H., & Burke, D. (2023). Artificial intelligence in higher education: The state of the field. *International Journal of Educational Technology in Higher Education*, 20(22).
- [8] Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.
- [9] Luckin, R.. (2018). *Machine learning and human intelligence: The future of education for the 21st century*. UCL IOE Press.
- [10] Chan, C. K. Y.. (2023). A comprehensive AI policy education framework for university teaching and learning. *International Journal of Educational Technology in Higher Education*, 20(38).
- [11] Tlili, A., et al. (2023). What if the devil is my guardian angel? ChatGPT as a case study of using AI in higher education. *Smart Learning Environments*, 10(15).
- [12] Bozkurt, A.. (2023). Generative artificial intelligence (AI) powered conversational educational agents: The inevitable paradigm shift. *Asian Journal of Distance Education*, 18(1), 198–204.
- [13] Cotton, D. R. E., Cotton, P. A., & Shipway, J. R. (2024). Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. *Innovations in Education and Teaching International*.
- [14] Dwivedi, Y. K., et al. (2023). So what if ChatGPT wrote it? Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI. *International Journal of Information Management*, 71, 102642.
- [15] Farrokhnia, M., et al. (2024). A SWOT analysis of ChatGPT in higher education. *Educational Technology Research and Development*, 72, 563–584.
- [16] Lim, W. M., et al. (2023). Generative AI and ChatGPT: Applications, challenges, and future research directions. *Journal of Business Research*, 168, 114248.
- [17] Moorhouse, B. L., & Kohnke, L. (2023). Responses of higher education teachers to ChatGPT: Opportunities and concerns. *RELC Journal*.
- [18] OpenAI. (2023). *GPT-4 technical report*. arXiv. <https://doi.org/10.48550/arXiv.2303.08774>
- [19] Kasneci, E.. (2024). Large language models in higher education: Current applications and future directions. *Nature Human Behaviour*.
- [20] European Commission. (2022). *Ethical guidelines on the use of artificial intelligence and data in teaching and learning for educators*. Publications Office of the European Union.