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Artificial Intelligence and Student Learning Practices: A Study of Urban Higher Education in Odisha

By Dinesh Satapathy, Deeptirekha Parida, Sonali Jena & Dr. Deepak Kumar Pradhan

Regional Institute of Education

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Dinesh Satapathy [α], Deeptirekha Parida [σ], Sonali Jena [ρ] & Dr. Deepak Kumar Pradhan [ω]

Abstract- This study examines the adoption patterns of artificial intelligence (AI) among higher education students in urban Odisha, India, emphasising both general and academic applications. Data were collected from 100 students at four major urban universities in Odisha through an online quantitative survey using Google Forms and analysed the data collected using descriptive statistics and the non-parametric Mann-Whitney U test to evaluate the impact of demographic factors on AI engagement. The results indicate that the utilisation of AI for both general activities (including information retrieval, translation, and entertainment) and academic endeavours (such as research, writing, and exam preparation) is prevalent and predominantly unaffected by demographic factors such as gender, age, academic standing, family structure, and field of study. This demographic neutrality underscores AI's widespread allure, indicating that its incorporation into higher education has the capacity to surpass conventional social and institutional barriers. Percentage trends indicate subtle variations in user behaviours; however, these variations lack statistical significance, underscoring the necessity for user-centric methodologies that transcend general demographic classifications. The study emphasises the significance of utilising AI to democratise education and guide inclusive policy and curriculum development, especially in under-represented areas such as Odisha. These insights contribute to the discourse on AI in education by demonstrating its potential to promote equitable access and tailored learning environments, while also indicating avenues for sophisticated qualitative research on individual motivations and longitudinal trends in AI adoption.

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I. Introduction

According to Nelson Mandela, "Education is the most powerful weapon which you can use to change the world." Education serves as a fundamental pillar for national development by imparting knowledge, skills, and capabilities to individuals. In today's technology-driven society, education's goal extends beyond knowledge transmission to the development of vital skills that enable students to innovate, solve problems, and contribute meaningfully to society (Alshahrani et al., 2024; Deep et al., 2023).

Artificial Intelligence (AI) represents one of the most significant technological innovations shaping this tech-enhanced world. Interest in AI has surged recently, with society recognizing how AI will transform daily living, learning, and working. It is no longer limited to future speculation or specialized labs but is integrated into daily life and social institutions globally (Joyce & Cruz, 2024). The National Education Policy (NEP) 2020 highlights the role of scientific and technological advancements, such as AI and machine learning, in revolutionizing skill requirements—emphasizing the increasing demand for a workforce skilled in mathematics, computer science, data science, and interdisciplinary knowledge spanning sciences, social sciences, and humanities (NEP 2020).

Artificial Intelligence in the educational context (AIED) specifically refers to integrating AI technologies—such as intelligent systems and machine learning algorithms—into teaching and learning processes to enhance educational outcomes by personalizing learning, automating administrative tasks, and innovating instructional methods (Alshahrani et al., 2024; Ayyash, 2020; Crompton, 2021; Maphosa et al., 2023; Zhang, 2021).

From a sociological viewpoint, AI is understood as a socio-technical system that intertwines social and technical elements, where human actors interface with technologies, and data emerge from specific social conditions (Joyce & Cruz, 2024). Sartori and Theodorou (2022) emphasize that sociology offers valuable insights into the social implications of AI. The concept of the "urban social" embraces globalization, trans-local influences, and non-human technology's impact within urban societies, interlinked with issues like social trust, economic equality, education, healthcare, and labor markets (Amin, 2007; Kolesnichenko et al., 2021; Rothstein & Uslaner, 2005; Sotnik, 2021). Developing advanced societies requires adhering to citizens' needs and aspirations, where the smart city concept plays a crucial role—leveraging technology such as high-speed internet, urban cybernetics, AI-driven health care, and robotics to enhance urban well-being and sustainability

Author α: Assistant Professor in Education, Department of Extension Education, Regional Institute of Education, NCERT, Mysore.
e-mail: itsdineshsatapathy@gmail.com
ORCID: 0009-0001-2461-212X
Author σ: Department of Education, Ravenshaw University, Cuttack.
e-mail: paridadeepti007@gmail.com
Author ρ: Department of Education, Fakir Mohan University, Balasore, Odisha. e-mail: sonisonalijena@gmail.com
Author ω: Assistant Professor in Education, Department of Education, Regional Insititute of Education, NCERT, Mysore.
e-mail: deepakedn2013@gmail.com
ORCID: 0009-0001-3255-3350

(National Academies of Sciences, Engineering, and Medicine, 2016; Thompson, 2016; World Economic Forum, 2018). In this light, AI applications are essential for uplifting modern society.

Higher education is pivotal for national development through economic, social, and technological transformation—recognized as a "sunrise sector" for its role in producing a skilled workforce (Bera & Pramanik). In the era of globalization and digitalization, embracing advanced technologies like AI empowers individuals and organizations to navigate interconnected contexts effectively (Schiff, 2022). Therefore, studying AI use among higher education students in Odisha is vital, as this group significantly contributes to national progress.

This study seeks to address this context by examining AI adoption patterns among urban higher education students in Odisha—a region where limited research exists despite the growing higher education sector. This research fills a critical knowledge gap by exploring AI usage in this specific socio-educational and geographical setting, contributing to the understanding of AI's role in education within an Indian context.

II. Need and Significance

Artificial intelligence (AI) is defined as the capability of a computer or machine to perform tasks that involve higher cognitive processes such as reasoning, inference, generalization, and learning from past experiences—functions traditionally associated with human intelligence (Nabiyev, 2005). In education, Artificial Intelligence in Education (AIED) holds transformative potential across all stages of learning by enabling personalized learning experiences and enhancing student engagement and success (Crompton & Burke, 2023; Holmes & Tuomi, 2022; Zawacki et al., 2019).

Higher education serves as a catalyst for economic development, research advancement, cultural preservation, and technological innovation. It plays a vital role in advancing nations and contributing significantly to global economic growth (Jongbloed et al., 2008). Consequently, higher education forms the foundation of the present study, focusing on how AI impacts this sector.

Perceptions significantly influence technology acceptance (Davis, 1989). Within education, students' perceptions critically affect the successful integration of technology into learning activities (Sumakul, 2022). Therefore, before incorporating artificial intelligence tools into higher education, it is essential to understand how students perceive and engage with AI.

Despite numerous studies on AI adoption conducted globally and within other regions of India, there is a notable contextual gap concerning AI use among higher education students in Odisha (Joyce & Cruz, 2024; Keles & Aydın, 2021; Ladda & Saraf, 2019; Sharawy, 2023; Sumakul, 2021). Recognizing this gap, this study intentionally focuses on urban higher education students in Odisha, addressing an underexplored setting to contribute valuable insights into regional AI adoption trends.

III. Conceptual Framework

Artificial intelligence (AI) is increasingly significant in our daily lives, subtly changing our ways of thinking, behaving, and interacting (Chen et al., 2020a). AI refers to the ability of digital machines to perform tasks typically requiring human intelligence, supported by technologies such as computer vision, speech-to-text, and natural language processing (Chiu et al., 2023). It is an interdisciplinary field involving informatics, logic, cognition, systems science, and biology (Hon, 2019). Practical AI applications include knowledge processing, pattern recognition, machine learning, expert systems, and intelligent robots (Jackson, 2019).

The rapid adoption of AI technologies in education is transforming classroom instruction and higher education institutions (Zhang & Aslan, 2021). AI has the potential to revolutionize higher education by helping universities adapt to the digital age, preparing students for the job market, and ensuring graduates remain competitive (Alshahrani et al., 2023).

The adoption of Artificial Intelligence in Education presents impressive opportunities for enhancing the higher education system. However, its integration required a holistic understanding of the perception of a wide range of stakeholders, beyond educators and students, to ensure its successful and inclusive implementation (Choi et, al 2022, Chan et, al 2023) Additionally, assessing and improving the readiness of educational institutions for AI integration is crucial. The collaborative effort among stakeholders is key to realizing AIED's transformative potential responsibly and equitably (Asirit et, al 2023).

Application of Artificial Intelligence

1. Automation

Process automation by AI can be implemented relatively quickly and to good effect in companies (Davenport & Ronanki, 2018), and HEIs can also use AI to automate routine processes currently carried out by academic and administrative staff, such as updating records, collating information, and sending mass communications (Rodway & Schepman, 2023). In addition to saving staff time, automated communication systems can help students feel motivated, recognized for their work, and connected to the teaching team (Broadbent, 2020).

2. Transformative Impact

The technologies that have been developed include intelligent tutoring systems such as chatbots

(Chocarro et al., 2021; Nye, 2015; Smutny & Schreiberova, 2020), which are able to provide individualized teaching support and coaching (Yang & Evans, 2019) and feedback (Dawson et al., 2018; see also Følstad, Skjuve, & Brandtzaeg, 2019, for a chatbot typology). Intelligent tutor chatbots can be embedded in learning management systems (LMS) (e.g. Moodle, Blackboard), as part of the management of a course or module, or they can exist alongside the LMS as a personal tutoring coach (Luckin et al., 2016).

3. Multiple Assessments Procedures

AIEd technologies can be used for student assessment, including the automated grading of coursework and formative assessments (Dumelle, 2020; Hsu et al., 2021) and the proctoring of online exams, with the use of biometrics, such as face recognition, to detect cheating (Swauger, 2020).

4. Enhancing Skills

AI can also enhance immersive virtual reality systems, where the AI enables students to practise key skills in realistic settings, such as the learning of languages (Hannan & Liu, 2021; Luan et al., 2020; McKenzie, 2018), or the acquisition of surgical skills (e.g. Fazlollahi et al., 2022).

5. Flexible Learning Experience

Artificial intelligence provides flexible learning experiences to the higher education students through multiple ways like personalized learning path, virtual and augmented reality integration, collaboration & interactive learning tools serving as teaching assistants for courses (Kim et al., 2020). Further, chatbots can provide 24/7 academic advice to students, serving as a source of information for many aspects of university life, including timetabling and module organization (Rouhiainen, 2019).

6. Enhance Services and Cost Effective

AIEd technologies are expected to enhance services and provide cost savings (Kim et al., 2020; Luckin et al., 2016). AI automation can free members of staff from routine tasks so they can spend more time on high value tasks such as curriculum development, designing teaching materials, and research along with also provide the students free intelligent tutoring systems for their individualized upliftment.

7. Promote Distance Learning

Application of artificial intelligence in distance education aims to study the use of computers to make up the gap between students and educators (Kose, 2014). In distance education, artificial intelligence technology has been used to support distance education. Different intelligent tools have been developed to provide education to all in an affordable way.

IV. Research Questions

Using the study the researchers intend to answer the following research questions:

1) How do university students of Odisha belonging to urban areas, use AI for general and academic purpose?
2) How do university students of Odisha belonging to urban areas vary in terms of their uses of AI based on demographic variables (Gender, Age, University, Family Type, Academic level, & Field of study)?

V. Hypotheses

$H_{01} – H_{05}$: There is no significant difference in the use of AI for general purposes among university students from urban areas in Odisha based on their gender, age groups, family type, academic level and field of study

$H_{06} – H_{10}$: There is no significant difference in the use of AI for academic purposes among university students from urban areas in Odisha based on their gender, age groups, family type, academic level and field of study

VI. Methodology

Research Design, Population and Sample: The present study aimed to examine the general and academic use of artificial intelligence (AI) among urban university students in Odisha, considering their demographic variables such as gender, age, academic background, and level of qualifications. To achieve this objective, a quantitative survey method was employed. The target population comprised all higher education students from urban areas studying at different universities across Odisha. However, due to accessibility, the accessible population was limited to urban students from four major universities in Odisha: Ravenshaw University, Ramadevi Women's University, Maharaja Sriram Chandra Bhanjadeo University, and Utkal University. To represent this population, a convenience sampling method was used to select 100 students from these universities. While convenience sampling facilitated data collection within practical constraints, it is acknowledged as a limitation that may affect the generalizability of findings. Future research could adopt stratified or random sampling techniques to enhance representativeness.

Tool Description: In view of the study's focus on the use of artificial intelligence among university students, the researcher reviewed catalogues of various AI assessment tools published by established academic sources. A thorough literature review revealed that existing scales did not adequately align with the objectives of this study. Recognizing this gap, the researcher developed and standardized a self-constructed Artificial Intelligence Scale specifically tailored to assess university students' perceptions and

usage of AI in higher education contexts. The item development process incorporated significant considerations from the recommendations of various educational committees and commissions regarding AI's role and impact. The resulting scale was administered via Google Forms and comprised three distinct sections. The first section gathered demographic information, including age, gender, religion, course of study, family type, academic level, and residential area. The second section contained five statements addressing the general use of artificial intelligence. The third section included fifteen statements focusing on the academic use of AI within higher education. The scale employed a five-point Likert response format, with categories ranging from "Strongly Agree" to "Strongly Disagree." To ensure the instrument's scientific rigor, face validity and construct validity were established through expert evaluation prior to data collection. Although reporting reliability metrics such as internal consistency coefficients (e.g., Cronbach's alpha and omega) would have further strengthened the scale's psychometric robustness before administration, this preliminary validation process provides a foundational basis supporting the tool's suitability for addressing the study's objectives.

The study specifically focuses on the general and academic uses of artificial intelligence among urban higher education students, emphasizing observable and measurable AI interaction in both daily and educational contexts. The scope intentionally centres on these dimensions to maintain clarity and depth within the research objectives. While other dimensions of AI usage such as ethical considerations, accessibility, equity, and student readiness are recognized as important factors influencing AI usage, these were not included in the current instrument to preserve focus and feasibility given the constraints of the research design, sample size, and data collection procedure. This focused approach allowed for detailed examination of primary usage patterns, providing a strong foundation for understanding AI integration in this context. Subsequent studies may build on this framework to explore additional dimensions, including ethical implications, equitable access, and readiness factors, thereby expanding the comprehensive understanding of AI's impact in higher education.

Procedure of Data Collection: Data for the present study were collected using an online survey method. The self-constructed Artificial Intelligence Scale was administered through Google Forms, which was distributed to participants via digital platforms such as WhatsApp to ensure wide reach and ease of access. This approach facilitated convenient and timely data collection from the targeted sample of 100 urban higher education students across four universities in Odisha. Prior to data collection, the purpose and ethical considerations of the study were communicated to participants, and informed consent was obtained. Although the online data collection method ensured accessibility, it is acknowledged that it may have excluded potential participants with limited internet access.

Data Analysis: The raw data were exported from Google Sheets linked to Google Forms and analyzed using the Statistical Package for Social Sciences (SPSS). Descriptive statistics, including frequencies and percentages, were computed to summarize participants' demographic profiles and their patterns of general and academic use of artificial intelligence. To assess the suitability of parametric tests, the distribution of the AI usage data was examined for normality. The coefficient of skewness for general AI use was -1.329, and the coefficient of kurtosis was 0.833. For academic AI use, the skewness was -1.739, and kurtosis was 2.661. These values indicate deviation from normal distribution due to significant negative skewness and elevated kurtosis in academic AI use. Owing to this non-normality of data, the study employed the Mann-Whitney U test, a non-parametric alternative to the independent samples t-test, to test for significant differences in AI usage across demographic groups. This approach ensured robust inferential analysis while accommodating the observed data distribution characteristics.

VII. Analysis and Results

a) Demographic Profile of the Respondents

A sample of 100 higher education students was chosen from the population. The demographic profile of the respondents is mentioned in the table 1 below.

Table 1: Demographic Profile of the Respondents

Sl. No.	Demographic Variables	Categorical Division	Number	Percentage
1.	Gender	Female	60	60%
		Male	40	40%
2.	Age	17-22	66	66%
		22 & above	34	34%
3.	Type of family	Nuclear	59	59%
		Joint	41	41%
5.	Academic Level	Under-graduate	43	43%
		Post-graduate	57	57%
6.	Field of study	Sciences	48	48%
		Arts & Humanities	52	52%

b) Analysis of usage of AI for General Purposes

The five primary general purposes of using AI—convenient information access, language translation, idea generation, language improvement, and entertainment—were examined as percentages across demographic variables, including gender, age, family type, academic level, and field of study.

For **convenient information access,** both males and females showed similar agreement levels, with males (45%, n=18) and females (48.3%, n=29) primarily agreeing. Younger (47%, n=31) and older participants (47.1%, n=21) demonstrated nearly identical preferences, while individuals from joint families (47.5%, n=28) slightly outpaced those from nuclear families (46.3%, n=19). Postgraduates (52.6%, n=30) showed stronger reliance on AI compared to undergraduates (39.5%, n=17).

For **language translation,** males (52.5%, n=21) and females (50%, n=30) expressed comparable agreement. Younger participants (50%, n=33) showed similar preferences to older ones (52.9%, n=18). Family type revealed close agreement rates between nuclear (51.2%, n=21) and joint families (50.8%, n=30). Arts students (51.9%, n=27) showed slightly stronger agreement than Science students (50%, n=24). Postgraduates (54.4%, n=31) had a higher preference compared to undergraduates (46.5%, n=20).

For **idea generation,** males (55%, n=22) showed higher agreement than females (50%, n=30). Younger participants (51.5%, n=34) agreed more, while older participants (52.9%, n=18) reported stronger preferences. Joint families (57.6%, n=34) surpassed nuclear families (43.9%, n=18). Science students (56.3%, n=27) exhibited stronger preferences than Arts students (48.1%, n=25), with postgraduates (63.2%, n=36) showing significantly stronger agreement than undergraduates (37.2%, n=16).

For **language improvement,** females (43.3%, n=26) showed higher agreement than males (35%, n=14). Younger participants (42.4%, n=28) demonstrated slightly stronger preferences than older participants (35.3%, n=12). Joint families (42.4%, n=25) had higher agreement compared to nuclear families (36.6%, n=15). Arts students (44.2%, n=23) showed stronger preferences than Science students (35.4%, n=17), while postgraduates (42.1%, n=24) outpaced undergraduates (37.2%, n=16).

For **entertainment,** females (51.7%, n=31) agreed more than males (45%, n=18). Younger participants (51.5%, n=34) also showed higher preferences than older ones (44.1%, n=15). Nuclear families (51.2%, n=21) slightly exceeded joint families (47.5%, n=28). Arts students (51.9%, n=27) demonstrated stronger preferences than Science students (45.8%, n=22). Postgraduates (54.4%, n=31) again showed the highest agreement compared to undergraduates (41.9%, n=18).

c) Analysis of usage of AI for Academic Purposes

Key usage of AI for academic purposes included generating research ideas, conducting quick literature surveys, data analysis, plagiarism detection, grammar correction, paraphrasing and summarizing, managing references and citations, exploring study content, writing assignments and Q&A, speech-to-text

and text-to-speech conversion, preparation for upcoming class, self-tutoring, exam preparation, presentation preparation, and lab-related tasks.

The data showed notable gender differences in **generating research ideas,** with females showing higher overall agreement (66% combining Agree and Strongly Agree) compared to males (38%). Age-wise, younger students (17-22) demonstrate more enthusiasm, with 65% showing agreement compared to 58% for those over 22. Nuclear families showed particularly strong engagement, with 73% agreeing or strongly agreeing, compared to 56% in joint families. In terms of academic streams, humanities students showed stronger inclination (65% combined agreement) versus sciences (61%). The most striking difference appeared at the academic level, where undergraduates showed notably higher strong agreement (49%) compared to postgraduates (21%).

The pattern for **quick literature survey** showed interesting variations across demographics. Gender-wise, females showed higher combined agreement (55%) compared to males (53%). The age group analysis revealed similar patterns between younger and older students, though 17-22 year olds showed slightly higher strong agreement (32% vs 24%). Nuclear families demonstrate stronger engagement (58% combined agreement) compared to joint families (50%). The streams showed minimal difference in overall agreement, though humanities students showed slightly lower strong agreement (31%) compared to science students (27%). Undergraduate students showed notably higher strong agreement (37%) compared to postgraduates (23%).

Data analysis showed strong agreement across all demographics, with particularly high combined agreement rates. Both genders showed strong positive response, with females showing slightly higher combined agreement (83%) compared to males (70%). The age groups showed similar patterns, with both showing about 82% combined agreement. Family type showed some variation, with nuclear families showing higher strong agreement (32%) compared to joint families (25%). Both streams showed strong engagement, though humanities showed slightly higher combined agreement (83%) versus sciences (73%). Academic levels showed similar patterns of high agreement, though undergraduates showed slightly higher strong agreement.

For **plagiarism detection,** the data showed consistent patterns across demographics but with some notable variations. Females showed slightly higher combined agreement (61%) compared to males (70%). The age analysis showed higher agreement among older students (76%) compared to younger ones (59%). Joint family students showed higher combined agreement (71%) versus nuclear family students (56%). Science stream students showed notably higher strong agreement (27%) compared to humanities students (10%). Postgraduate students showed higher combined agreement (71%) compared to undergraduates (58%).

Grammar correction showed consistent patterns of high agreement across demographics, though with some notable variations. Females showed slightly lower strong agreement (17%) compared to males (18%) but higher overall agreement (70% vs 83%). Age groups showed similar patterns, with older students showing marginally higher combined agreement (86%) versus younger students (70%). Joint family students demonstrate higher combined agreement (82%) compared to nuclear family students (66%). Science stream students showed notably higher combined agreement (82%) versus humanities students (69%). Postgraduates showed higher combined agreement (83%) compared to undergraduates (66%).

The use of **paraphrasing and summarizing** tools showed moderate agreement across demographics. Gender analysis revealed similar patterns between males (65% combined agreement) and females (53%). Younger students (17-22) showed slightly lower strong agreement (12%) compared to older students (24%). Nuclear family students showed slightly higher combined agreement (54%) versus joint family students (61%). Science stream students demonstrated higher strong agreement (25%) compared to humanities students (8%). Postgraduates showed higher combined agreement (63%) compared to undergraduates (51%).

Referencing and citation management showed strong agreement across most demographics. Females showed slightly higher combined agreement (66%) compared to males (71%). Age groups showed similar patterns, though older students demonstrated slightly higher strong agreement (26% vs. 20%). Nuclear family students showed higher combined agreement (69%) compared to joint family students (68%). Science stream students showed higher strong agreement (29%) versus humanities students (15%). Postgraduates demonstrated higher combined agreement (75%) compared to undergraduates (58%).

Exploring study content showed consistently high agreement across all demographics. Males and females showed similar patterns of agreement (88% and 80% combined agreement respectively). Both age groups demonstrated high agreement, with older students showing slightly higher combined agreement (89% vs 80%). Joint and nuclear families showed similar patterns, though nuclear families showed slightly higher strong agreement (32% vs 27%). Both streams showed strong engagement, with sciences showing slightly higher combined agreement (85% vs 81%). Postgraduates showed marginally higher combined agreement (84%) compared to undergraduates (82%).

The patterns for **writing assignment and Q&A** showed moderate to high agreement across demographics. Females show higher combined agreement (68%) compared to males (60%). Younger students demonstrated slightly higher strong agreement (29%) versus older students (18%). Nuclear family students showed higher combined agreement (69%) versus joint family students (62%). Humanities students showed slightly higher strong agreement (29%) compared to science students (21%). Undergraduate students showed higher strong agreement (33%) compared to postgraduates (19%).

Speech-to-text and text-to-speech conversion showed consistent patterns across demographics. Both genders showed similar combined agreement (71% for males, 72% for females). Age groups demonstrated similar patterns, though younger students showed slightly higher strong agreement (24% vs 18%). Nuclear family students showed slightly higher combined agreement (68%) versus joint family students (73%). Both streams showed similar patterns, though humanities students showed slightly higher strong agreement (25% vs 19%). Postgraduates showed higher combined agreement (74%) compared to undergraduates (68%).

Preparing for upcoming classes showed moderate to high agreement across demographics. Males showed slightly higher combined agreement (70%) compared to females (61%). Age groups showed similar patterns, though older students showed higher strong agreement (35% vs 24%). Joint and nuclear families showed similar patterns of agreement (67% and 63% respectively). Science stream students showed higher strong agreement (35%) compared to humanities students (21%). Postgraduates showed higher combined agreement (69%) versus undergraduates (60%).

Self-tutoring showed strong agreement across demographics. Males showed slightly higher combined agreement (78%) compared to females (67%). Older students showed notably higher strong agreement (41% vs 17%). Nuclear family students showed higher combined agreement (66%) versus joint family students (75%). Science stream students showed higher strong agreement (35%) compared to humanities students (15%). Postgraduates showed higher combined agreement (77%) versus undergraduates (63%).

Exam preparation showed consistently high agreement across demographics. Both genders showed similar patterns of agreement (76% males, 68% females). Older students showed higher combined agreement (74%) versus younger students (70%). Joint family students showed slightly higher combined agreement (73%) compared to nuclear family students (68%). Both streams showed similar patterns, though sciences showed slightly higher combined agreement (77% vs 65%). Postgraduates showed higher combined agreement (76%) compared to undergraduates (66%).

Presentation preparation showed strong agreement across demographics. Males and females show similar combined agreement (75% and 71% respectively). Both age groups showed similar patterns, though younger students showed slightly higher strong agreement (26% vs 21%). Nuclear and joint family students showed similar patterns of agreement (71% and 74% respectively). Both streams showed strong engagement, with sciences showing slightly higher combined agreement (77% vs 69%). Postgraduates showed higher combined agreement (75%) versus undergraduates (70%).

Lab activities showed moderate agreement across demographics. Males showed slightly higher combined agreement (63%) compared to females (60%). Older students show higher combined agreement (68%) versus younger students (57%). Joint family students showed slightly higher combined agreement (62%) compared to nuclear family students (59%). Science stream students showed higher combined agreement (65%) versus humanities students (58%). Postgraduates showed higher combined agreement (63%) compared to undergraduates (58%).

d) Testing of Hypotheses for General and Academic Purposes

The analysis of the data reveals that there is no significant difference in the general use of artificial intelligence among university students from urban areas in Odisha across various demographic variables. The calculated "p" value for gender (male and female) is 0.450, for age groups (17–22 and 22 & above) is 0.718, for family type (nuclear and joint) is 0.952, for academic level (UG and PG) is 0.693, and for academic background (science and arts) is 0.815. All these values exceed the 0.05 level of significance ($p > 0.05$). Consequently, the null hypotheses—H_{01}, H_{02}, H_{03}, H_{04}, and H_{05}—stating no significant difference in the general use of AI among students based on gender, age group, family type, academic level, and academic background, respectively, are accepted. This indicates consistent usage patterns of AI for general purposes across these demographic groups. This also suggests that factors such as gender, age, family type, qualification level, and academic background do not significantly influence the general use of AI among university students in urban areas of Odisha.

Furthermore, the analysis also reveals no significant difference in the academic use of artificial intelligence among university students from urban areas in Odisha across various demographic variables. The calculated "p" value for gender (female and male) is 0.544, for age groups (17–22 and 22 & above) is 0.486, for family type (nuclear and joint) is 0.913, for academic

level (UG and PG) is 0.430, and for academic background (science and arts) is 0.216. All these values exceed the 0.05 level of significance ($p > 0.05$). Accordingly, the null hypotheses—H_{06}, H_{07}, H_{08}, H_{09}, and H_{010}—stating no significant difference in the academic use of AI among students based on gender, age group, family type, academic level, and academic background, respectively, are accepted. This suggests consistent patterns in the use of AI for academic purposes across these demographic groups also. Therefore, it can be concluded that factors such as gender, age, family structure, qualification level, and academic background do not significantly influence the academic use of AI among university students in urban areas of Odisha.

VIII. Major Findings

This study aimed to examine the general and academic use of artificial intelligence (AI) among urban higher education students in Odisha and to compare AI use based on demographic variables such as gender, age, academic level, family type, and field of study. The findings are presented below in relation to these objectives.

The use of AI for general purposes among students was evident across various areas including information access, language translation, idea generation, language improvement, and entertainment. For information access, males (45%) and females (48.3%) showed similar engagement, with postgraduates (52.6%) using AI more than undergraduates (39.5%). Language translation exhibited high adoption across demographics (50-54%), again with postgraduates leading (54.4%). Idea generation saw postgraduates (63.2%) significantly surpass undergraduates (37.2%), with family type and gender differences also notable. Language improvement was more prevalent among females (43.3%) than males (35%) and more common among arts students (44.2%) than science students (35.4%). Younger students (42.4%) and postgraduates (54.4%) used AI more for entertainment compared to older students (35.3%) and undergraduates (41.9%).

For academic purpose, students used AI extensively for research idea generation, literature surveys, data analysis, plagiarism detection, grammar correction, paraphrasing, content exploration, writing, exam preparation, and lab tasks. Female students showed higher engagement than males in research idea generation (66% vs 38%), while consistent and high agreement was observed across demographics for key functions like data analysis (70-83%) and literature surveys (53-55%). Writing tools such as grammar checkers and plagiarism detectors were widely used, with agreement rates ranging from 61% to 83%. Study preparation activities similarly demonstrated strong adoption, with exam and presentation preparations registering high agreement. Supporting activities such as lab work, self-tutoring, and speech-to-text conversion also showed moderate to strong usage.

While descriptive percentages depict subtle demographic variations in AI use, none of these differences were statistically significant. The Mann-Whitney U tests confirmed no variation by gender, age, family type, academic level, or academic background for both general and academic AI use purposes (all p-values > 0.05). This outcome underscores that AI adoption among urban higher education students in Odisha transcends demographic boundaries, aligning with the research hypotheses stating no significant group differences.

IX. Discussion

The findings from this study provide important insights into the adoption of artificial intelligence (AI) among urban higher education students in Odisha, highlighting both the widespread integration of AI tools and nuanced demographic patterns. (Ayeni et al., 2024; Chetry 2024; Jackson & Jackson, 2024; Javvaji & Raghavulu, 2024; Ou, 2024). As our results revealed subtle yet notable variations (statistically isignificant) in AI use across gender, academic level, family type, and age, this raises important considerations about how these demographic differences might influence educational experiences around creativity, autonomy, and student-teacher relationships.

AI! Weakening connection or empowering learners? Our findings show higher agreement in AI use for self-tutoring, study content exploration, and exam preparation, especially among postgraduates and female students. This supports the perspective that AI fosters learner autonomy and self-directed learning (Banerjee & Bhattacharya, 2024; Lukianets & Lukianets, 2023; Ma et al., 2024;) allowing students greater control over knowledge acquisition. However, the demographic trends also raise concerns about a potential weakening of traditional student-teacher interactions, as increased reliance on AI might reduce opportunities for mentorship and collaborative learning. The balance between AI-enabled independence and preserving meaningful human engagement remains critical.

Threat to Originality and Creativity: The significant use of AI in research idea generation and data analysis, particularly among postgraduates, foregrounds the ongoing debate about AI's impact on creativity. While some studies suggest that AI automates and homogenizes creative processes, potentially undermining originality (Habib et al., 2024; Liu et al., 2024; Sarkar, 2023), others argue that AI can augment creativity by providing novel insights and freeing cognitive resources (Agarwal, 2024; Hassan et al., 2024). Our findings indicate that students' adoption of AI tools is nuanced

and context-dependent, suggesting that students might strategically use AI to aid creativity without fully substituting human ideation.

Awareness of AI Limitations: Interestingly, AI usage for literature surveys and related academic tasks was moderate compared to other applications, which may reflect students' awareness of AI's potential limitations, such as hallucinations or inaccuracies (Bolaños, 2024; Mozelius & Humble, 2024; Zybaczynska et al., 2024). This cautious adoption underscores a critical awareness necessary for maintaining academic integrity, signaling that students differentiate between tasks where AI assistance is beneficial and those requiring higher scrutiny and human judgment.

Rethinking Educational Practices in the AI Era: The prevalence of AI-enabled writing, Q&A, and presentation preparation indicates that traditional pedagogical assessments may need revisiting to accommodate AI's capabilities (Shishavan, 2024; Fonkam et al., 2024). Educators should design assignments that foster critical thinking and creativity, ensuring that AI serves as a tool rather than a crutch. Additionally, hybrid assessment models combining conventional and AI-informed approaches could help maintain rigor while embracing innovation (Lukianenko & Kornieva, 2024).

Practical and Policy Implications: Aligned with the National Education Policy (NEP) 2020's emphasis on multidisciplinary and skill-based education, our study highlights the need for universities in Odisha to implement AI literacy and ethical training programs. Such initiatives can help students harness AI's benefits while navigating its challenges responsibly. Additionally, faculty development programs should focus on integrating AI into curricula thoughtfully to preserve creativity and interpersonal engagement. Institutions must also develop policies to safeguard academic originality and mitigate potential over-reliance on AI technologies. Collaborative frameworks involving educators, technologists, and policymakers are essential to create balanced, inclusive approaches to AI integration that reflect the needs and aspirations of Odisha's diverse student population.

X. Conclusion

In conclusion, the adoption of AI for general and academic purposes among urban higher education students in Odisha presents a dynamic yet inclusive landscape. Despite the observable variations in percentage analysis across demographic groups, inferential statistical analysis underscores a key insight: AI usage is largely independent of demographic factors, signifying its universal appeal and utility across diverse student populations. This demographic neutrality affirms the broader adaptability of AI tools, transcending barriers of age, academic level, or other socio-demographic variables.

The paradoxical findings between percentage variations and statistical insignificance further illustrate the importance of delving deeper into individual preferences and behaviors. While undergraduate and postgraduate students exhibit distinct usage patterns, these differences lack statistical significance, pointing to personal choices rather than systematic academic-level contrasts. Similarly, the widespread adoption of AI for academic purposes—such as content exploration, data analysis, and language improvement—reveals its pivotal role in enriching the learning experience for students across varied educational pursuits.

Methodologically, this study underscores the need for a dual-approach analysis that integrates both descriptive statistics and inferential methods. Such an approach offers nuanced insights, cautioning against hasty generalizations based solely on percentage-based observations. This calls for a shift toward user-centric frameworks that prioritize understanding individual motivations, preferences, and behaviors over demographic categorizations.

Looking ahead, future research should expand the horizons of AI adoption studies by examining non-demographic factors influencing tool preferences and usage patterns. Qualitative investigations could shed light on the subjective experiences shaping AI engagement, while longitudinal studies could provide valuable insights into evolving trends over time. Additionally, targeted research on high-adoption tools can inform strategies for optimizing their design and integration into academic settings. Ultimately, the findings highlight a promising trajectory for AI in higher education, demonstrating its widespread acceptance and potential to democratize learning. By leveraging AI's universal appeal and refining its application to suit individual needs, urban higher education institutions in Odisha can continue to foster an innovative, inclusive, and forward-looking academic environment.

References Références Referencias

1. Alshahrani, B. T.; Pileggi, S .F.; Karimi, F.(2024) A Social Perspective on AI in the Higher Education System: A Semisystematic Literature Reviews Electronics 2024, 13, 1572. https://doi.org/10.3390/electronics13081572
2. Ahmad, K.; Qadir, J.; Al-Fuqaha, A.; Iqbal, W.; El-Hassan, A.; Benhaddou, D.; Ayyash, M. Data-Driven Artificial Intelligence in Education: A Comprehensive Review. IEEE Trans. Learn. Technol. 2020, 17, 12–31.
3. Amin A (2007) Re-thinking the urban social. City 11(1):100–114. https://doi.org/10.1080/13604810701201096

4. Asirit, L. B. L.; Hua, J. H.(2023) Converging perspectives: Assessing AI readiness and utilization in Philippine higher education. Polaris Glob. J. Sch. Res. Trends 2023, 2, 1–50.
5. Asmi Agarwal, A. A. (2024). Is AI the end of Human Creativity. *Journal of Advances in Science and Technology*.
6. Ayeni, O. O., Al Hamad, N. M., Chisom, O. N., Osawaru, B., & Adewusi, O. E. (2024). AI in education: A review of personalized learning and educational technology. *GSC Advanced Research and Reviews*, 18(2), 261–271. https://doi.org/10.30574/gscarr.2024.18.2.0062
7. Banerjee, P., & Bhattacharya, D. (2024). Transforming the world of education through ai-enabled learning – a new normal. *The Business and Management Review*.
8. Bolaños, F., Salatino, A., Osborne, F., & Motta, E. (2024). Artificial intelligence for literature reviews: Opportunities and challenges. *Artificial Intelligence Review, 57*, 259. https://doi.org/10.1007/s10462-024-10902-3
9. Broadbent, J. (2020). Am I Just Another Number? Using Online Education Innovations to Personalise and Improve the Student Experience in Online Learning. In: McKenzie, S., Garivaldis, F., Dyer, K.R. (eds) Tertiary Online Teaching and Learning. Springer, Singapore. https://doi.org/10.1007/978-981-15-8928-7_2
10. Choi, S., Jang, Y., & Kim, H. (2022). Influence of Pedagogical Beliefs and Perceived Trust on Teachers' Acceptance of Educational Artificial Intelligence Tools. *International Journal of Human–Computer Interaction, 39*, 910 - 922.
11. Chiu TKF, Ismailov M, Zhou X-Y, Xia Q, Au D, Chai CS. Using Self-Determination Theory to explain how community-based learning fosters student interest and identity in integrated STEM education. Int J Sci Math Educ 2023; 21:109–30. https://doi.org/10.1007/s10763-023-10382-x.
12. Chan, C. K. Y(2023). A comprehensive AI policy education framework for university teaching and learning. Int. J. Educ. Technol. High.Educ. 2023, 20, 38.
13. Chen, H. R., & Tseng, H. F. (2012). Factors that infuence acceptance of web-based e-learning systems for the in service education of junior high school teachers in Taiwan. Evaluation and Program Planning, 35(3), 398–406. https://doi.org/10.1016/j.evalprogplan.2011.11.007
14. Chetry, K. K. (2024). Transforming education: How AI is revolutionizing the learning experience. *International Journal of Research Publication and Reviews*, 5(5), 6352–6356. https://doi.org/10.55248/gengpi.5.0524.1277
15. Crompton, H.; Song, D.(2021) The Potential of Artificial Intelligence in Higher Education. Rev. Virtual Univ. Católica Norte 2021, 62, 1–4.
16. Crompton, H.; Burke, D.(2023) Artificial intelligence in higher education: The state of the field. Int. J. Educ. Technol. High. Educ. 2023, 20, 22.
17. Deep, K., & Kumar, S. (2023). NEP-2020 and technology-enabled learning: A step towards coordinating relevance and excellence in Indian higher education. International Journal of Creative Research Thoughts (IJCRT), 11(4), h161.
18. Davenport, T. H., & Ronanki, R. (2018). Artificial intelligence for the real world. Harvard Business Review, 96(1), 108–116.
19. Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. MIS Quarterly, 13(3), 319–340. https://doi.org/10.5962/bhl.title.33621
20. Dumelle, K. (2020). "Grading exams: How gradescope revealed deeper insights into our teaching". www.facultyfocus.com/articles/educational-assessment/grading-examshowgradescope-revealed-deeper-insights-into-our-teaching.Hannan, E., & Liu, S. (2021). AI: New source of competitiveness in higher education. Competitiveness Review. https://doi.org/10.1108/CR-03-2021-0045.
21. Fazlollahi, A. M., Bakhaidar, M., Alsayegh, A., Yilmaz, R., Winkler-Schwartz, A., Mirchi, N., Langleben, I., Ledwos, N., Sabbagh, A. J., Bajunaid, K., Harley, J. M., & Del Maestro, R. F. (2022). Effect of artificial intelligence tutoring vs expert instruction on learning simulated surgical skills among medical students: A Randomized clinical trial. JAMA Network Open, 5(2), Article e2149008. https://doi.org/10.1001/jamanetworkopen.2021.49008
22. Fonkam, M. M., Çela, E., & Potluri, R. M. (2024). Risks of AI-assisted learning on student critical thinking: A case study of Albania. *International Journal of Risk and Contingency Management, 12*(1), 1–19. https://doi.org/10.4018/IJRCM.350185
23. Habib, S., Vogel, T., Anli, X., & Thorne, E. (2024). How does generative artificial intelligence impact student creativity? *Journal of Creativity, 34*(1), 100072. https://doi.org/10.1016/j.yjoc.2023.100072
24. Hannan, E., & Liu, S. (2021). AI: New source of competitiveness in higher education. Competitiveness Review. https://doi.org/10.1108/CR-03-2021-0045
25. Hassan, Mohammed Salah & Abdelfattah, Fadi & Al Halbusi, Hussam & Mohammed,. (2024). Beyond the "Death of Research": Reimagining the Human-AI Collaboration in Scientific Research. Changing Societies & Personalities. 7. 31-46. 10.15826/csp.2023.7.4.250.

26. Hon, H. W. (2019). A Brief History of Intelligence. In 2019 International Conference on Multimodal Interaction (pp. 1-1). ACM.
27. Jackson, E.A., & Jackson, H.F. (2024). Enhancing Human Knowledge and Capabilities with Artificial Intelligence Tools for Education. *Educational Challenges*.
28. Jackson, P. C. (2019). Introduction to artificial intelligence. Courier Dover Publications.
29. Javvaji, V. R., & Raghavulu, P. V. (2024). The transformative impact of artificial intelligence on education. *International Journal of For Multi-disciplinary Research*, 6(4). DOI: 10.36948/ijfmr.2024.v06i04.24987
30. Jongbloed, B.; Enders, J.; Salerno, C (2008). Higher education and its communities: Interconnections, interdependencies and a research agenda. High. Educ. 2008, 56, 303–324.
31. Joyce, K., & Cruz, T. M. (2024). A Sociology of Artificial Intelligence: Inequalities, Power, and Data Justice. Socius: Sociological Research for a Dynamic World, 10, 1-6. SAGE Publications. https://doi.org/10.1177/2378023124725933
32. Keleş, Pınar Ural, and Suleyman Aydın (2021) "University Students' Perceptions About Artificial Intelligence." Shanlax International Journal of Education, vol. 9, no. S1, 2021, pp. 212–220.
33. Kim, J., Merrill, K., Xu, K., & Sellnow, D. D. (2020). My teacher is a machine: Understanding students' perceptions of AI teaching assistants in online education. International Journal of Human-Computer Interaction, 36(20), 1902–1911. https://doi.org/10.1080/10447318.2020.1801227
34. Kose, U. (Ed.). (2014). Artificial Intelligence applications in distance education. IGI Global.
35. Li, T.W., Hsu, S., Fowler, M., Zhang, Z., Zilles, C.B., & Karahalios, K. (2023). Am I Wrong, or Is the Autograder Wrong? Effects of AI Grading Mistakes on Learning. *Proceedings of the 2023 ACM Conference on International Computing Education Research - Volume 1*.
36. Liu, Y., Chen, S., Cheng, H., Yu, M., Ran, X., Mo, A., Tang, Y., & Huang, Y. (2024). How AI processing delays foster creativity: Exploring research question co-creation with an LLM-based agent. In *Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems* (Article No. 17, pp. 1–25). Association for Computing Machinery. https://doi.org/10.1145/3613904.3642698
37. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). Intelligence unleashed: An argument for AI in education. Pearson Education. http://oro.open.ac.uk/50104/1/Luckin%20et%20al.%20-%202016%20%20Intelligence%20Unleashed.%20An%20argument%20for%20AI%0in%20Educ.pdf
38. Lukianenko, V., & Kornieva, Z. (2024). Generative AI in student essays: English teachers' perspectives on effective assessment methods. *XLinguae, 17*(4), 14. DOI: 10.18355/XL.2024.17.04.14
39. Lukianets, Halyna & Lukianets, Tetiana. (2023). Promises and Perils of AI Use on the Tertiary Educational Level. *Grail of Science*. 306-311. 10.36074/grail-of-science.17.03.2023.053.
40. Ma, C., Lan, T., Xue, H., Xu, L., Wang, C., & Hong, Z. (2024). Reshaping the Teacher-Student Relationship in Higher Education Through ChatGPT. *Journal of Education and Educational Research*.
41. Maphosa, V.; Maphosa, M. Artificial intelligence in higher education: A bibliometric analysis and topic modeling approach. Appl.Artif. Intell. 2023, 37, 2261730.
42. McKenzie, L. (2018). Pushing the boundaries of learning with AI. www.insidehighered.com/digital-learning/article/2018/09/26/academics-push-expand-use-aihigher-edteaching-and-learning
43. Mozelius, Peter & Humble, Niklas. (2024). On the Use of Generative AI for Literature Reviews: An Exploration of Tools and Techniques. European Conference on Research Methodology for Business and Management Studies. 23. 161-168. 10.34190/ecrm.23.1.2528
44. Nabiyev, Vasif Vagifoglu. Yapay Zekâ: Problemler Yöntemler- Algoritma. Seçkin Yayıncılık, 2005
45. National Academies of Sciences, Engineering, and Medicine (2016) Building Smart communities for the future. In: Proceedings of a Workshop–in Brief. The National Academies Press, USA, Washington. https://doi.org/10.17226/23663
46. Ou, S. (2024). Transforming Education: The Evolving Role of Artificial Intelligence in The Students Academic Performance. *International Journal of Education and Humanities*.
47. Rothstein B, Uslaner EM (2005) All for all: equality, corruption, and social trust. World Polit 58(01):41–72. https://doi.org/10.1353/wp.2006.0022
48. Rouhiainen, L. (2019). How AI data could personalize higher education. Harvard Business Review, 14. October https://hbr.org/2019/10/how-ai-and-data-could-personalize-higher-education
49. Sarkar, A. (2023). Exploring perspectives on the impact of artificial intelligence on the creativity of knowledge work: Beyond mechanised plagiarism and stochastic parrots. In *Annual Symposium on Human-Computer Interaction for Work 2023 (CHIWORK 2023)*, June 13–16, 2023, Oldenburg, Germany (pp. 1–17). Association for Computing Machinery. https://doi.org/10.1145/3596671.3597650
50. Sartori, L., & Theodorou, A. (2022). A sociotechnical perspective for the future of AI: Narratives,

inequalities, and human control. Ethics and Information Technology, 24(1). https://doi.org/10.1007/s10676-022-09624-3
51. Schiff, D. Education for AI, not AI for Education: The Role of Education and Ethics in National AI Policy Strategies. Int. J. Artif.Intell. Educ. 2022, 32, 527–563.
52. Sharawy, F. S. (2023).The Use of Artificial Intelligence in Higher Education: A Study on Faculty Perspectives in Universities in Egypt [Master's Thesis, the American University in Cairo]. AUC Knowledge Fountain. https://fount.aucegypt.edu/etds/2095
53. Shishavan, H. B. (2024). AI in higher education: Guidelines on assessment design from Australian universities. *ASCILITE 2024 Conference Proceedings*. https://doi.org/10.14742/apubs.2024.1205
54. Sumakul, D. T. Y. G., Hamied, F. A., & Sukyadi, D. (2022). Students' Perceptions of the Use of AI in a Writing Class. Advances in Social Science, Education and Humanities Research, 624, 52-57. Atlantis Press. Presented at the 67th TEFLIN International Virtual Conference & the 9th ICOELT 2021 (TEFLIN ICOELT 2021).
55. Swauger, S. (2020). Our bodies encoded: Algorithmic test proctoring in higher education. In J. Stommel, C. Friend, & S. M. Morris (Eds.), Critical Digital Pedagogy. https://pressbooks.pub/cdpcollection/chapter/our-bodies-encoded-algorithmic-test-proctoring-In-higher-education/
56. Thompson EM (2016) What makes a city “smart”? Int J Arch Comput 14(4):358–371. https://doi.org/10.1177/1478077116670744
57. World Economic Forum (2018) future scenarios and implications for the industry, Report. Switzerland. Retrieved July 1, 2020, from https://www.weforum.org/reports/future-scenarios-andimplications-for-the-industry
58. Yeh, S. C., Wu, A. W., Yu, H. C., Wu, H. C.,Kuo, Y. P., & Chen, P. X. (2021). Public perception of artificial intelligence and its connections to the sustainable development goals. Sustainability, 13 (16), 9165. https://doi.org/10.3390/su13169165
59. Zawacki-Richter, O.; Marín, V.I.; Bond, M.; Gouverneur, F. Systematic review of research on artificial intelligence applications in higher education – where are the educators? Int. J. Educ. Technol. High. Educ. 2019, 16, 39.
60. Zhang, C.; Lu, Y. Study on artificial intelligence: The state of the art and future prospects. J. Ind. Inf. Integr. 2021, 23, 100224.
61. Zhang, K., & Aslan, A. B. (2021). AI technologies for education: Recent research & future directions. Computers and Education Artifcial Intelligence, 2, 100025. https://doi.org/10.1016/j.caeai.2021.100025
62. Zybaczynska, J., Norris, M., Modi, S., Brennan, J., Jhaveri, P., Craig, T. J., & Al-Shaikhly, T. (2024). Artificial Intelligence-Generated Scientific Literature: A Critical Appraisal. *The journal of allergy and clinical immunology. In practice*, *12*(1), 106–110. https://doi.org/10.1016/j.jaip.2023.10.010