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RESEARCH ARTICLE

Demographic Factors Shaping Artificial Intelligence (AI) Perspectives: Exploring Their Impact on University Students' academic performance

Ting Tin Tin[1*], Koh Yi Chor[2], Wong Jing Hui[3], Wong Yan Cheng[4], Chaw Jun Kit[5], Wan Nor Al-Ashekin Wan Husin[6], Ali Aitizaz[7], Lee Kuok Tiung[8*], Sunday A. Afolalu[9], Umar Farooq Khattak[10]

[1,6,9]Faculty of Data Science and Information Technology, INTI International University, Nilai 71800, Malaysia
[2-4]Faculty of Computing and Information Technology, Tunku Abdul Rahman University of Management and Technology, Kuala Lumpur, Malaysia
[5]Institute of Visual Informatics, Universiti Kebangsaan Malaysia, Bangi 43600, Malaysia
[7]School of technology, Asia Pacific University, Malaysia
[8]Faculty of Social Science and Humanities, 88400 Kota Kinabalu, Universiti Malaysia Sabah, Malaysia
[9]Department of Mechanical and Mechatronics Engineering, Afe Babalola University, Ado-Ekiti, 360101, Nigeria
[9]Department of Mechanical Engineering Science, University of Johannesburg, 2092, South Africa
[10]School of IT, Unitar International University, Malaysia

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***Corresponding Author:**

tintin.ting@newinti.edu.my

ABSTRACT

Undergraduate students in Malaysia have shown increasing usage of AI in their studies, notably ChatGPT, prompting a need to examine its effects on their academic outcomes. This research studies the impact of demographic factors of students' understanding of AI knowledge and their attitudes towards AI and their overall academic performance. The study scrutinizes the role of ages, gender, and program study on student's AI knowledge and attitude towards AI, aiming to comprehend their implication on academic performance. Data was gathered from a varied group of undergraduates via questionnaires, a sample size of 107 students and analyzed using statistical software such as SPSS and the Pearson correlation method. The PROCESS macro examines the mediation effect of AI knowledge and on the relationship between demographic elements and attitudes towards AI, while the path analysis method using AMOS software is employed to study sequential relationships among these variables. The study confirms a positive correlation between age and both AI knowledge and attitude towards AI. However, no significant correlations were observed between gender or program study and AI knowledge and attitudes towards AI. This research provides valuable insight into the impact of demographic elements on AI knowledge and attitude towards AI, and academic performance, potentially influencing student;s future academic and career trajectories in the AI era.

INTRODUCTION

In an era defined by rapid technological advancement, artificial intelligence (AI) stands as a beacon of innovation reshaping the landscape of various industries, with education emerging as a primary arena of transformation. The term AI has a number of definitions depending on context, a rather general definition is "intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans and other animals" (Visvikis et al. 2019). A more appropriate and specific definition of AI is "a system's ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation" (Kaplan and Haenlein 2019). As AI brings convenience to our daily life in every aspect, more and more students use AI in their study. A survey against 6300 students across Germany, found that almost two-thirds

of students use or have used AI-based tools as part of their studies. 24.3% students use AI-based tools for research and literature study, 21.9% students use translation and 25.4% students use AI-based tools in text analysis, text processing and text creation. Students studying engineering sciences, mathematics and natural sciences use AI-based tools most frequently (von Garrel and Mayer 2023). Will the usage of AI-based tools affect the students' performance? The answer is no. García-Martínez et al. (2023) found that the AI and computational sciences had brought a positive impact to students' performance especially in the STEM (Science, Technology, Engineering, and Mathematics) fields, leaping up their attitude towards AI and their motivation.

However, the studies above are not focusing on Malaysian students and may lead to inaccuracies or misinterpretations. Without delving into the nuances of Malaysia's educational system, cultural norms, socioeconomic conditions, and technological infrastructure, the study may overlook important contextual factors that influence the relationship between demographic factors, AI perspectives, and academic performance among Malaysian students. This could result in findings that lack depth and fail to capture the complexities specific to the Malaysian context. To solve the gap, a study is carried out. This study focuses on exploring the attitude towards AI and AI knowledge level among university students with different demographics and explores the relationship between attitude towards AI and academic performance.

1.1 Problem Statement

The academic success of university students is subject to a multitude of factors, ranging from individual characteristics to environmental influence. As competitiveness increases across all fields of work, expectations of students themselves have risen along with the stress they are dealing with exponentially (Deng et al, 2022)(Mohammad Mofatteh, 2021). Demographic elements, such as age, program of study, and gender, have been identified as potential contributors to the complex factor of academic performance (Aishah Alasfour, 2014)(Mutuku et al, 2016). Age, for instance, may bring varying levels of life experience and maturity, impacting study habits and views towards certain subjects. Gender may contribute to different learning styles and societal expectations (Jerica et al, 2023)(Christopher, 2016). Program of study can influence the academic demands placed on students with distinct majors requiring different cognitive skills and approaches (Arthur et al, 2017). Understanding the unique interplay of these factors is essential for creating targeted interventions that address the specific needs and challenges faced by university students.

Recent studies suggest a growing significance and usage of Artificial Intelligence (AI) in the academic landscape (Firaina, R., & Sulisworo, D, 2023). This research acknowledges the potential impact of AI on student's academic performance, recognizing the need to delve deeper into how AI knowledge and attitudes towards AI might shape the learning experiences of university students. As technological advancements continue to spread across the field of education (Norman et al, 2023), this research seeks to uncover how students' understanding of AI, coupled with their attitudes towards this technology, have become imperative for understanding how student's perceptions and understanding of AI impact their academic performance.

Despite the increasing recognition of AI's role in education, there's a critical need for comprehensive research on how demographics interact with AI-related variables to impact students' academic performance. By untangling these complex relationships, our research aims to provide insights into the ways demographic factors influence students' understanding of AI and their attitudes, ultimately affecting their academic achievements. Through a clearer understanding of these connections, we hope to contribute to the development of targeted support systems that cater to the diverse needs of students, fostering an inclusive learning environment that enhances academic outcomes for everyone.

2.0 LITERATURE REVIEW

The influence of students' demographic backgrounds on their understanding and attitudes towards Artificial Intelligence (AI), and how these factors subsequently impact academic performance, is an emerging area of research. Age, program of study and gender have been identified as influential determinants shaping individuals' AI knowledge and attitudes towards AI. For instance, one study investigating gender disparities in AI-related fields (Christopher et al, 2016)(Yeonju Jang et al, 2022). This could indicate that younger students, with potentially less established academic foundations,

might exhibit varying levels of acceptance and interest in AI concepts. This suggests a potential link between pre-existing academic performance and AI knowledge. Regarding age, younger students may exhibit higher familiarity and comfort with technology, potentially influencing their receptiveness to AI concepts (Oksana Nikolenko et al, 2023). Other research highlights the influence of a student's program of study. Students enrolled in STEM fields often demonstrate a stronger foundation in AI due to their curriculum (Trina, 2022). Further research is needed to fully understand how these demographic factors interact to shape students' AI knowledge, attitudes, and ultimately, their academic performance.

2.1 Programme study and attitude towards AI

There are several studies that have found that students in different programme studies have different attitudes toward AI. In the major of radiology, a questionnaire survey has been carried out among medical students and the results showed that the majority agreed that AI will revolutionize and improve radiology (revolutionize radiology - 77%, improve radiology - 86%) but disagreeing that AI will replace human radiologists (71%). The research concluded that undergraduate medical students are not concerned about AI replacing human radiologists but the potential application and implication of AI in radiology and medicine. They also recommend that the radiology department should educate students about these technologies (Pinto dos Santos et al. 2019).

Besides that, a Google Form survey is conducted against the students in 19 UK medical schools. As a result, most students see AI as crucial in healthcare (88%), value AI education for career advancement (89%), and advocate for AI training within medical degrees (78%). For the medical students in the UK, they recognize AI's significance and are eager to participate, necessitating enhanced training in medical schools. Presenting realistic AI use cases and limitations will prevent discouragement among students interested in pursuing radiology (Sit et al. 2020).

In the aspect of dentistry and dental students, medical students have more trust in AI's potential for dentistry compared to dentists (dental students - 72.01%, dentists - 62.60%). They opine that dental education must prioritize AI instruction for students and practitioners to leverage AI's potential benefit in this field, while an integrated PhD program could drive transformative discoveries and enhance global patient care, positioning dental professionals at the forefront of technological advancement (Dashti et al. 2024).

From research against Pakistan's medical students and doctors, 27.4% of medical students and doctors strongly agree that AI is important in the medical field and 47% agree that AI is important in the medical field (Ahmed et al. 2022). Furthermore, from the research by Truong et al (2023), most Vietnamese students who enrolled in medicine and pharmacy programs believe that AI would benefit their career (890 individuals or 77.9%) and 882 individuals or 77.2%, envisioned AI being deployed to oversee public health and epidemic prevention initiatives.

These studies above are specifically against one field which is healthcare. Besides that, these studies above are against the students in Pakistan, Vietnam, and the UK. To explore other fields' students' attitude towards AI, we carry out study against the Malaysian students' who study in two major fields, STEM field and non-STEM field.

2.2 Program study and AI knowledge

In today's rapidly evolving technological landscape, the level of AI knowledge among individuals often varies significantly depending on the specific academic programs they enroll in. A review against the dental students and dentists showed that the average basic AI knowledge dental students gained was 58.62% and dentists was 71.25% (Dashti et al. 2024). Besides that, Ahmed et al. (2022) found that out of 470 individuals which formed with 223 doctors and 247 medical students in Pakistan have basic understanding on the concept of AI (71.28%) but few understanding on AI 's applications (23.2%) and machine learning and deep learning (35.3%). Moreover, out of 1142 Vietnamese students who enrolled in medicine and pharmacy programs, 1053 or 92.2% had no understanding of AI in healthcare (Truong et al. 2023). Opposite to these studies which focus on the healthcare field, we will further explore the relationship between the AI knowledge and STEM field and non-STEM field.

2.3 Age, AI knowledge, and attitude towards AI

Age plays a significant role in shaping AI knowledge and attitudes towards AI, with distinct perspectives emerging among younger and older generations. Williams, Park, and Breazeal (2019) have carried out an experiment among the preschool children by developing a novel early childhood AI platform, PopBots for preschool children to interact with PopBots and learn about three AI concepts: knowledge-based systems, supervised machine learning, and generative AI. Then, Williams, Park, and Breazeal evaluate how much preschool children learn using AI assessments they developed and their perception towards PopBots. As a result, Assessment of children's learning showed a median score of 70%, with the best understanding in knowledge-based systems. While older children saw robots more as less intelligent people, younger children tended to regard them as sophisticated toys. This study investigated the interplay between the different aged children and AI knowledge and their attitude towards AI and the result proved that there is a correlation between age and AI knowledge and attitude towards AI. In this study, we explore this relationship among undergraduates.

2.4 Gender and attitude towards AI

In recent years, studies have delved into nuanced relationship between gender and attitudes towards AI, uncovering intriguing differences in perception and interaction. There is a study investigating Swedish women's perception of AI in mammography. The study, which involved 16 participants from Capio S:t Görans Hospital and involved interviews, discovered that women viewed AI as a useful addition to radiologists rather than as a replacement. They underlined that to trust AI, there must be a comprehensive assessment, openness, and involvement from radiologists. Overall, the results point to a favorable attitude toward artificial intelligence in mammography, assuming that its role and limitations are understood, and that communication is transparent (Johansson et al. 2024).

Besides that, there is another study assessing women's attitudes towards AI-based technologies in mental healthcare, focusing on bioethical considerations. Researchers discovered that while most respondents to a cross-sectional online poll of American people who were assigned female at birth and were stratified by prior pregnancy were open to the idea of AI-based mental health solutions, they did voice worries about potential medical harm and inappropriate data sharing. They made different parties responsible for resolving these issues. Most respondents believed that understanding AI output was essential, with those who had previously been pregnant placing a larger value on clarity on AI's involvement in mental healthcare. The study indicates that patient comprehension of AI predictions, maintenance of the patient-clinician relationship, transparency in data utilization, and safety precautions can all help to increase women's trust in AI-based mental health solutions (Reading Turchioe et al. 2023). Furthermore, there is research showing that male students (59.9) had a higher mean rank than female students (45.9) in the perception of learning with AI-based tool, ChatGPT (Odekeye: et al. n.d.). These studies give a conclusion that females and males hold different attitudes towards AI and promote gender as a consideration factor while doing research regarding AI.

2.5 AI knowledge and Attitude towards AI

The relationship between AI knowledge and attitude towards AI has been a topic of interest in this literature. The intention of using AI has greatly depended on one's perceived knowledge. Perceived knowledge is defined as the level of understanding or awareness that an individual has about a particular subject or topic. This knowledge does not necessarily reflect the student's actual knowledge but her perceived experience and expertise regarding AI. The report's descriptive statistic indicated the perceived subjective knowledge regarding AI shows only 7% of participants responded having advanced knowledge regarding AI. The measurement between the perceived knowledge regarding AI compared to the knowledge of the participants showed 20% that they had more knowledge than others. This paper concludes with a conclusion where perceived knowledge was not a significant predictor for attitude but intention to use AI (Sabrina et al, 2021).

Moreover, Another study has been conducted in Europe to investigate the existing knowledge and general attitude towards AI among international radiologists and residents, and to explore their associations. A web-based survey was conducted using Google Forms consisting of 39 questions on demographics such as background social media use awareness and existing knowledge, attitudes, Ai

willingness to actively engage, AI integration in radiology training, and anticipated hurdles to Ai implementations. The survey collected a total of 1041 respondents from 54 countries completing the survey. Regarding AI-specific knowledge, 21% of respondents (n = 221) had only heard of AI but without much knowledge regarding it. 16% of participants displayed advanced knowledge or were actively involved in AI research or development. Regarding attitude towards AI, 79% of radiologists expressed willingness to lead AI technology advancement in the medical field. Additionally, 85% of respondents expressed readiness to utilize AI in clinical practice which negatively correlated with a fear of being replaced by AI. Positive predictors for interest to learn about AI (n = 780, 75%) were having heard of AI as well as having intermediate or advanced AI specific knowledge, irrespective of demographic factors. Nearly half of the participants exhibited positive attitudes toward AI, with predictors including gender (predominantly male), age, professional use of social media, scientific background, familiarity with statistics, and AI-specific knowledge. The survey highlighted that residents with intermediate to advanced AI-specific knowledge tended to hold positive attitudes toward AI. Fear of job displacement by AI emerged as a significant predictor of attitudes toward AI, particularly among those with basic AI knowledge. Approximately 42% of respondents anticipated a decrease in job opportunities, with 39% expressing fears of job displacement due to AI. The correlations discovered between knowledge and attitude were both significant and consistent across all stages of analysis, suggesting that these findings are likely applicable and reliable within the relevant domain (Merel Huisman et al, 2021, Yeonju Jang et al, 2022).

2.6 Gender and AI knowledge

Although there is research that supports the relation between program study and AI knowledge, there is no research to explore the relationship between gender and AI knowledge. In this research, we will explore the relationship between age or gender and AI knowledge in order to solve this gap.

2.7 Attitude towards AI and Academic performance(CGPA)

The relationship between attitude towards Artificial Intelligence (AI) and academic performance has been a topic of interest in recent literature. the findings of Emon et al. (2023), who investigated the relationship between attitude towards AI and the adoption intention of ChatGPT, emphasizing the impact of performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, trust, and actual use of AI technology. The literature suggests that attitudes towards AI play a crucial role in academic performance and the adoption of AI technologies in various contexts.

2.8 Gender with AI knowledge affect attitude towards AI

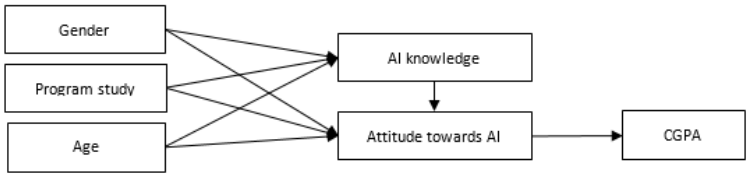
Gender with AI knowledge affects attitude towards AI Studies have shown that knowledge levels play a significant role in shaping attitudes towards artificial intelligence (AI). The impact of gender on attitudes towards AI has also been explored. While there is limited information specifically on the relationship between gender and AI knowledge affecting attitudes. This suggests that factors other than gender may play a more significant role in shaping attitudes towards AI in certain contexts. Moreover, a study on the perceptions of pharmacy students towards AI in medicine highlighted the importance of understanding how different demographic factors, including gender, may influence attitudes towards AI (Busch et al., 2023). This indicates the need for further research to explore the intersection of gender, AI knowledge, and attitudes towards AI to gain a more comprehensive understanding of how these factors interact.

Table 1: study finding

Study	Findings
(Pinto dos Santos et al. 2019)	Undergraduate medical students do not worry that AI will replace them in future, but they are aware of the possible applications and consequences of AI in radiology and medicine. AI based technologies training should be in the syllabus.
(Dashti et al. 2024)	AI education in dental schools and ongoing training programs for practitioners are necessary to optimize AI's potential advantages in dentistry. A unified PhD program could catalyze groundbreaking innovations and enhance patient care worldwide. Accepting AI with knowledgeable understanding and training will lead in technological advancements in dentistry.
(Sit et al. 2020)	UK students understand the significance of AI and are eager to participate. Training on AI in medical school should be improved and the use cases and constraints of AI need to be introduced to students to prevent them from being discouraged about pursuing radiology.
(Ahmed et al. 2022)	Most doctors and medical students in Pakistan has lack of AI knowledge and its applications, but have a positive attitude towards AI and are willing to adopt it.
(Truong et al. 2023)	Healthcare students in Vietnam have low AI knowledge. They are willing to work with AI and suggest that AI should be included in medical training programmes.
(Williams, Park, and Breazeal 2019)	Children can understand knowledge-based systems the best after early AI education. Younger children treat AI based robots as a toy while older children treat AI based robots as people not smarter than them.
(Johansson et al. 2024)	Women holding a good attitude towards the implementation of AI in mammography.
(Reading Turchioe et al. 2023)	Most of the women, especially women previously being pregnant, accept the implementation of AI based technologies in mental healthcare but they worry about the potential medical harm and data sharing.
(Odekeye: et al. n.d.)	Male students hold a positive attitude towards AI and accept to learn with ChatGPT compared to female students.
(Sabrina Gado et al. 2021)	The study developed and tested an AI acceptance model based on established technology acceptance models with a sample of 218 psychology students. Perceived usefulness and ease of use were most predictive for the students' attitude towards AI.Attitude itself, as well as perceived usefulness, social norm, and perceived knowledge, were predictors for the intention to use AI. The study identified relevant factors for designing AI training approaches in psychology curricula.
(Merel Huisman et al, 2019	The survey was completed bny 1041 respondents from 54 mostly European countries. Radiologists with basic AI-specific knowledge were associated with fear, mainly fear of losing job opportunity while advanced AI-specific knowledge was inversely associated with fear. The study still concludes that a positive attitude towards AI was observed in 48% or 501 out of 1041 respondents.

(Yeonju Jang et al, 2022)	The study developed and validated an instrument (AT-EAI) to assess undergraduate students' attitudes towards AI ethics. The study concluded that there were significant differences in attitudes towards AI ethics based on gender and prior experience with AI education. Specifically, there were gender differences in the dimensions of fairness, privacy, and non-maleficence. Additionally, students' attitudes towards fairness varied based on their prior experience with AI education.

Conceptual framework



3.0 RESEARCH METHODOLOGY

The study aims to figure out how demographic factors affect knowledge and attitudes towards AI, and their impact towards academic performance. The target group comprises 105 undergraduates enrolled in different universities, representing various stages of their academic journey. Considering students at different academic levels and with diverse backgrounds, the study seeks to understand how their attitudes towards AI and knowledge of AI changes or differ coming from different backgrounds such as ages, program study and gender that eventually affect their academic performance.

To gather a representative and insightful sample of participants, this study utilizes a strategic combination of two sampling techniques: simple random sampling and convenient sampling. Simple random sampling prioritizes unbiased selection. Each undergraduate student in Malaysia has an equal chance of being chosen, regardless of background or university. This method ensures the sample accurately reflects the broader population, minimizing the risk of skewed results due to favoritism or chance. The convenient sampling technique allows researchers to select participants who are readily accessible. This might be necessary due to logistical constraints or limited resources that could hinder a purely random selection process. For instance, reaching students from remote universities across Malaysia could be more feasible by leveraging existing networks or online communities.

The study utilized a questionnaire as its primary data collection tool to gather insights into the perspectives on AI among undergraduate students in Malaysia. The questionnaire was crafted using Google Forms to ensure clarity and ease of response for participants. Subsequently, it was spread among the undergraduate population in Malaysia on March 13, 2024, leveraging popular social media platforms such as WhatsApp, XiaoHongShu, and Instagram. Through this widespread distribution, the study aimed to obtain responses from a diverse pool of participants, capturing a comprehensive range of perspectives on AI from undergraduates across various demographics and academic backgrounds in Malaysia.

The questionnaire consists of 3 sections: demographics, knowledge of AI, and attitude toward AI. Section 1 consists of 5 multiple choice questions about demographics and 1 open-ended question about their CGPA which determine their academic performances. Section 2 assesses knowledge of AI (Q7 – Q19) (Table 1). Section 3 assesses attitude toward AI (Q20 – Q27) (Table 1). All the items in section 2 and section 3 are designed with a 5-point Likert scale ranging from 1 to 5. Most questions have scoring from 1 as Strongly Disagree to 5 as Strongly Agree. However, some questions have reversed scoring a low score of 1 indicates Strongly Agree and a high score of 2 indicates Strongly Disagree.

Table 1: Questionnaire item

Questionnaire items	Resources
Q1. What is your age? Q2. What is your gender? Q3. What is your ethnicity? Q4. What programme are you studying? Q5. What is your current study year? Q6. What is your current CGPA?	N/A
Q7. Are you familiar with or have you heard about AI? Q8. Do you use applications or tools with AI in your daily life? Q9. I believe that AI aids in the progress and efficiency of individuals. Q10. Are the outcomes and decisions generated by AI systems easily understandable and explainable? Q11. I am well-informed about how the AI models used in my field of study function. Q12. Measures should be taken to ensure that AI is used ethically and, in a manner, respectful of fundamental rights and values. Q13. The existing ethical principles and regulations that apply to the development and use of AI should be disseminated (spread throughout / made known) in my field of study. Q14. AI systems should respect my autonomy and allow me to have control over decisions that directly affect me. Q15. It is important to evaluate the benefits associated with the use of AI in my field of study. Q16. AI has allowed for process optimization and more efficient task completion in contexts where it has been implemented. Q17. AI enables me to achieve more accurate and reliable outcomes compared to traditional or previous methods. Q18. AI has been a useful tool in supporting decision-making in complex situations or with large data sets in my educational context.	Pacheco-Mendoza et al. 2023
Q20. AI will improve academic performance. Q21. AI enhances my creativity. Q22. AI favor my plagiarism. Q23. AI enhances the quality of knowledge attained by me. Q24. AI inhibits my critical thinking. Q25. AI should be integrated as a supplementary learning resource in my courses. Q26. AI is an unreliable source of knowledge - I do not trust it. Q27. AI will help develop my skills in asking good questions	Kamoun et al. 2023

The data collected were analyzed using SPSS (v.21.0; IBM, New York, USA) and AMOS (v.24.0; IBM, New York, USA) for Window. These tables will perform reliability analysis, demographic, Pearson correlation and multiple linear regression. The link between variables A and B is investigated, providing information about their linear relationship and the degree of their correlation. The path analysis method in AMOS software is employed to investigate the sequential relationships among variables A, B, C, and D. This comprehensive approach allows for a nuanced examination of the mediation effect of variable B between A and C, while also enabling the identification of both direct and indirect effects within the model. By leveraging both the PROCESS macro and path analysis, researchers can gain a deeper understanding of the complex interplay among these variables and elucidate the mechanisms underlying the relationships in their theoretical framework.

4.0 RESULTS AND DISCUSSIONS

4.1 Reliability analysis

Cronbach's alpha reliability coefficient was used to assess the reliability of the pilot test results (see Table 2). The alpha correlation coefficients for each aspect of the questionnaire ranged from 0.75 to

0.89. Therefore, all coefficients were significant, indicating that the reliability of the questionnaire falls under the category of acceptable to good.

Table 2 : Reliability level of questionnaire items

Questionnaire items section	Cronbach's alpha	Number of item
demographic	0.438	6
AI knowledge	0.89	13
Attitude towards AI	0.756	8
Overall	0.882	27

4.2 Demographic

A total of 107 undergraduates participated in this study with their demographics, as shown in Table 3. There is a total of 70.1% of female undergraduates with most of the age 19 to 21 (53.3%). 56.1% of undergraduates take a non-STEM field program and 51.4% of undergraduates are in the year 2 of bachelor degree.

Table 3: Demographic of participants

Characteristics	No of respondent	Percentage (%)
Gender		
Female	75	70.1
Male	32	29.9
Age		
18 or Below	3	2.8
19 - 21	57	53.3
22 - 24	41	38.3
25 - 27	4	3.7
28 or Above	2	1.9
Ethnicity		
Chinese	103	96.3
Malay	3	2.8
Indian	1	0.9
Other	0	0
Programs		
Non-STEM	60	56.1
STEM	47	43.9
Year of study		
Year 1	18	16.8
Year 2	55	51.4
Year 3	22	20.6
Year 4	12	11.2

Based on table 4, The result shows that H3,H6,H7 accepted(R_{H3} = 0.232*, R_{H6} = 0.216** ,R_{H7} = 0.570*), while H1,H2,H4,H5,H8 reject. The correlations reveal significant relationships between variables. Furthermore, gender and age show no significant correlation with CGPA implying that they do not directly impact academic achievement in this context.

Table 4: Pearson Correlation analysis result

	AI knowledge	Attitude towards AI	CGPA	Standard deviation
Age	.232*	.216**		.705
Gender	.120	.133		.460

Programme study	.051	.051		.499
Attitude towards AI			.124	.561
AI knowledge		.570**		.527

Note. **. Correlation is significant at the 0.01 level (2-tailed).

Table 5 shows that the Attitude towards AI partially mediates the relationship between Age on the AI knowledge with an indirect effect of 0.1013 and a 95% confidence interval value of [0.0229,0.2001]. Hence , the H11 is not true and rejected as the significant level is less than 0.05. Through mediation analysis, addiction was found to be the not significant mediator between the relationship of gender and attitude toward AI , showing a positive indirect effect(IE = 0.0823) and 95% confidence interval of [-0.0434, 0.2357]. AI knowledge concept is also shown to be the not significant mediator and is shown to have a positive indirect effect between the relationship of programme study and Attitude toward AI, showing a positive indirect effect(IE = 0.0327) and 95% confidence interval of [-0.0873,0.1645]. Hence, H9 and H10 are rejected. The results in the table also show that the mediating effect of attitude towards AI concept is not significant between gender and CGPA with an indirect effect of 0.0107 and a 95% confidence interval value of [-0.0086,0.0437]. This indicates that H12 is not true and rejected.Next, attitude towards AI did not significantly affect the relationship between programme study and CGPA, showing a positive indirect effect(IE = 0.0042) and 95% confidence interval of [-0.0156,0.0314]. Thus , H13 is rejected.Moreover, the Attitude towards AI partially mediates the relationship between Age on the CGPA with an indirect effect of 0.0128 and a 95% confidence interval value of [-0.0086,0.0437]. Hence , the H14 is not true and rejected.Last, Attitude toward AI being did not significantly affect the relationship between AI knowledge and CGPA ,showing a positive indirect effect (IE = 0.0353) and 95% confidence interval of [-0.0323,0.1077]. Thus, H15 is rejected.

Table 5 : Direct And Indirect Effects With Bootstrap 95% Confidence Interval For Mediation Analysis

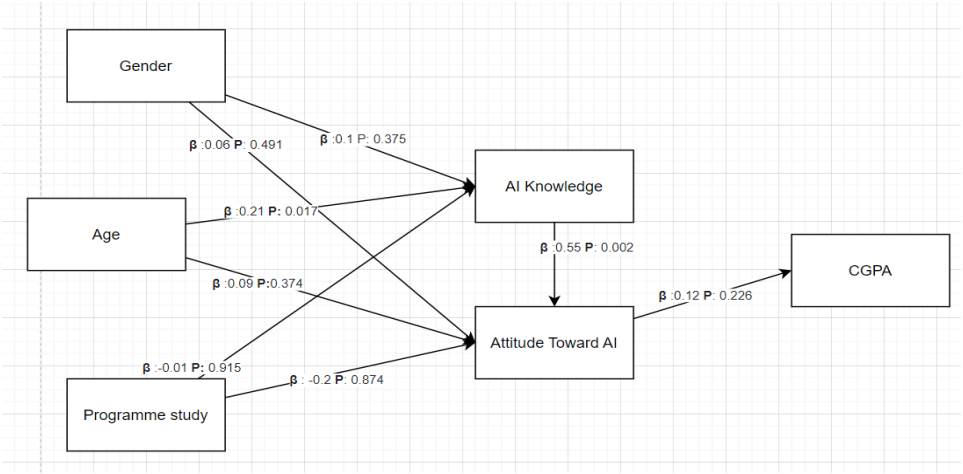
Predictor	**Mediator**	**Dependent variable**	**Direct effect**	**Indirect effect(95% CI)**
AGE	AKW	ATA	0.0708	0.1013(0.0229,0.2001)
GD	AKW	ATA	0.0799	0.0823(-0.0434,0.2357)
PS	AKW	ATA	0.0246	0.0327(-0.0873,0.1645)
AGE	ATA	CGPA	0.0047	0.0128(-0.0086,0.0437)
GD	ATA	CGPA	0.0875	0.0107(-0.0109,0.0458)
PS	ATA	CGPA	0.0567	0.0042(-0.0156,0.0314)
AKW	ATA	CGPA	0.0322	0.0353(-0.0323,0.1077)

Note : GD = Gender, PS =Programme study, AGE = Age, AKW = Ai Knowledge, ATA = Attitude Towards AI, CGPA = CGPA. Result based on 5000 bootstrap samples. CI: 95% confidence interval for bias for indirect effects. *p < 0.05.

Based on the Table 6, Age, Gender, program study were only patterns included in the path analysis. The partial mediates did not significantly affect the relationship between Age on the CGPA. Hence, the H18 is not true and rejected. In addition, AI knowledge concept and Attitude toward AI did not significantly affect the relationship between Gender and CGPA. Hence, H16 is rejected. Lastly, AI knowledge concept and Attitude towards AI being did not significantly affect programme study and CGPA. So, H17 is rejected.

Table 6 : Coefficients of the mediation model

	Estimate	SE	P	BootLCCI	BootULCI
Partial Indirect Effect					
AGE → AKW → ATA → CGPA	0.015	0.014	0.717	-0.004	0.060
GD → AKW → ATA → CGPA	0.007	0.012	0.264	-0.006	0.047
PS →AKW → ATA → CGPA	-0.001	0.009	0.108	-0.027	0.015
Total Indirect Effect					
AGE → CGPA	0.025	0.025	0.142	-0.009	0.093
GD → CGPA	0.015	0.020	0.170	-0.008	0.080
PS → CGPA	-0.004	0.017	0,545	-0.053	0.022



5.0 DISCUSSION

H1: There is a relationship between Gender and AI knowledge.

Based on Table 4, gender is not significantly correlated with AI knowledge (R_{H1} = 0.120), and therefore H1 is rejected.

H2: There is a relationship between programme study and AI knowledge.

Based on Table 4, the programme of study is not significantly correlated with AI knowledge (R_{H2} = 0.051), and therefore H2 is rejected. This result is inconsistent with previous research that has found the field of study to be a significant factor in AI knowledge(Dashti et al. 2024, Ahmed et al., 2022, Truong et al. 2023).

H3: There is a relationship between age and AI knowledge.

Based on Table 4, age is significantly correlated with AI knowledge (R_{H3}= 0.232*), and therefore H3 is accepted. This result is consistent with previous studies that have found age to be a significant factor in AI knowledge (Williams et al, 2019).

H4: There is a relationship between gender and Attitude towards AI.

Based on Table 4, gender is not significantly correlated with Attitude towards AI (R_{H4} = 0.133), and therefore H4 is rejected. This result is inconsistent with some previous studies that have found gender to be a significant factor in attitudes towards AI (Johansson et al., 2024, Turchioe et al. 2023, Odekeye: et al. n.d).

H5: There is a relationship between programme study and attitude towards AI.

Based on Table 4, the programme of study is not significantly correlated with attitude towards AI (R_{H5} = 0.051), and therefore H5 is rejected. This result is inconsistent with previous research that has found the field of study to be a significant factor in attitudes towards AI (Pinto dos Santos et al. 2019, Sit et al. 2020, Dashti et al. 2024, Truong et al ,2023).

H6: There is a relationship between age and attitude towards AI.

Based on Table 4, age is significantly correlated with attitude towards AI (R_{H6} = 0.216**), and therefore H6 is accepted. This result is consistent with previous studies that have found age to be a significant factor in attitudes towards AI (Williams et al.,2019).

H7: There is a relationship between AI knowledge and attitude towards AI.

Based on Table 4, AI knowledge is significantly correlated with attitude towards AI (R_{H7} = 0.570**), and therefore H7 is accepted. This result is consistent with previous research that has found AI knowledge to be a significant factor in shaping attitudes towards AI (Sabrina et al, 2021, Merel Huisman et al, 2021 , Yeonju Jang et al, 2022).

H8: There is a relationship between attitude towards AI and CGPA.

Based on Table 4, attitude towards is not significantly correlated with CGPA (R_{H8} = 0.124), and therefore H8 is rejected. This result is is inconsistent with previous research that has found the attitude towards AI to be a significant factor in CGPA (Emon et al., 2023).

H9: The mediating effect of AI knowledge concept is significant between gender and attitude towards AI. Based on Table 5, AI knowledge does not have a significant mediating effect in the relationship between gender and attitude towards AI (Indirect effect = 0.0823, 95% CI [-0.0434,0.2357]), and therefore H9 is rejected as p is not less than 0.05. This result is inconsistent with some previous studies that have found AI knowledge to be a significant mediator in the relationship between gender and attitudes towards AI (Busch et al., 2023).

H10: The mediating effect of AI knowledge concept is significant between programme study and attitude towards AI.

Based on Table 5, AI knowledge does not have a significant mediating effect in the relationship between programme study and attitude towards AI (Indirect effect = 0.0327, 95% CI [-0.0873,0.1645]), and therefore H10 is rejected as p is not less than 0.05.

H11: The mediating effect of AI knowledge concept is significant between age and attitude towards AI.

Based on Table 5, AI knowledge has a significant mediating effect in the relationship between age and attitude towards AI (Indirect effect = 0.1013, 95% CI [0.0229,0.2001]), and therefore H11 is rejected as p is not less than 0.05.

H12: The mediating effect of attitude towards AI concept is significant between gender and CGPA.

Based on Table 5, attitude towards AI does not have a significant mediating effect in the relationship between gender and CGPA (Indirect effect = 0.0107 CI [-0.0109,0.0458]), and therefore H12 is rejected as p is not less than 0.05.

H13: The mediating effect of attitude towards AI concept is significant between programme study and CGPA.
Based on Table 5, attitude towards AI does not have a significant mediating effect in the relationship between programme study and CGPA (Indirect effect = 0.0042 CI [-0.0156,0.0314]), and therefore H13 is rejected as p is not less than 0.05.

H14: The mediating effect of attitude towards AI concept is significant between age and CGPA. Based on Table 5, attitude towards AI does not have a significant mediating effect in the relationship between age and CGPA (Indirect effect = 0.0128, 95% CI [-0.0086,0.0437]), and therefore H14 is rejected as p is not less than 0.05.

H15: The mediating effect of attitude towards AI concept is significant between AI knowledge and CGPA.

Based on Table 5, attitude towards AI does not have a significant mediating effect in the relationship between AI knowledge and CGPA (Indirect effect = 0.0353, 95% CI [-0.0323,0.1077]), and therefore H15 is rejected as p is not less than 0.05.

H16: The mediating effect of Attitude toward AI and AI knowledge being are not significant in the relationship between Gender and Academic Performance.

Based on table 6, Attitude toward AI and AI knowledge being did not significantly affect the relationship between Gender and academic performance, showing a 95% confidence interval of [-0.009,0.093] and this relationship is not significantly acceptable as p is not less than 0.05. Thus, H16 is rejected. The H16 result shows that Attitude toward AI and AI knowledge Gender and Academic Performance.

H17 The mediating effect of Attitude toward AI and AI knowledge being are not significant in the relationship between Programme Study and Academic Performance

Based on Table 6, Attitude toward AI and AI knowledge does not have a significant mediating effect in the relationship between Programme Study and Academic Performance showing that a 95% CI [-0.053,0.022]), and therefore H17 is rejected as p is not less than 0.05.

H18 The mediating effect of attitude toward AI and AI knowledge being are not significant in the relationship between Age and Academic Performance

Based on table 6, attitude toward AI and AI knowledge being did not significantly affect the relationship betweenAge and Academic Performance, showing a 95% confidence interval of [-0.009,0.093] and this relationship is not significantly acceptable as p is not less than 0.05. Thus, H18 is rejected. The H18 result shows that attitude toward AI and AI knowledge well being mediated in the relationship between Age and Academic Performance is not correlated.

6.0 CONCLUSION

The findings from this study provide valuable insight into the complex relationships between demographic factors, AI knowledge, attitude towards AI, and academic performance(CGPA). The results highlight the significant influence of age on AI knowledge and attitudes towards AI, underscoring the importance of considering demographic factors in IA education and research. However, the study also reveals that not all demographic factors are significantly correlated with AI knowledge and attitude towards AI, suggesting the need for a more nuanced understanding of these relationships.

Despite its contribution, this study has several limitations that should be acknowledged. The sample size, while adequate for a preliminary investigation, is relatively small. This may limit the statistical power to detect small effects and the precision of the estimates. Furthermore, the sample is composed of undergraduates, which may limit the generalizability of the findings to other populations such as working professionals or older adults. The study also did not consider other potentially influential factors such as cultural background, socioeconomic status or previous exposure to AI. These factors could have nuanced effects on AI knowledge and attitudes towards AI. For instance, individuals from different cultural backgrounds or socioeconomic statuses may have varying access to AI-related resources, which could influence their AI knowledge and attitudes.

Future research could aim to address these limitations and extend the scope of this study. Studies could be conducted with larger and more diverse samples to enhance generalizability of the findings. This would not only increase the statistical power of the study but also provide a more comprehensive understanding of the factors influencing AI knowledge and attitudes towards AI. Researchers could also consider other potential influencing factors not included in this study. For example, cultural background could play a significant role in shaping attitudes towards AI. Similarly, socioeconomic status could influence access to AI-related resources, thereby affecting AI knowledge. Longitudinal studies could provide insights into how AI knowledge and attitudes towards AI evolve over time. Such studies could track changes in AI knowledge and attitudes over time and examine how these changes impact academic performance. This could provide valuable insights into the temporal dynamics of these relationships and help identify critical periods for intervention.

Experimental studies could also be conducted to examine the effects of interventions aimed at improving AI knowledge and attitudes towards AI. Such studies could test the effectiveness of various educational strategies or interventions in improving AI knowledge and attitudes. This could provide valuable information for educators and policymakers seeking to promote AI literacy.

Moreover, future research could explore the role of individual differences in shaping AI knowledge and attitudes towards AI. For instance, are individuals who are more open to new experiences or who have a higher need for cognition more likely to have positive attitudes towards AI? Understanding these individual differences could provide more personalized strategies for improving AI knowledge and attitudes towards AI.

In conclusion, this study contributes to the understanding of how demographic factors, AI knowledge, and attitudes towards AI interact and influence academic performance. The findings could have significant implications for educational strategies involving AI. However, as this study has shown, these relationships are complex and influenced by a multitude of factors. Therefore, further research is needed to explore these relationships in more depth and in different contexts. Artificial Intelligence technology is an exciting and rapidly evolving field of study with much potential for future research. The journey to fully understand the implications of AI on our society is just beginning, and hopefully this study serves as a stepping stone towards that goal.

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9.0 APPENDIX

9.1 Questionnaire questions

Section	Questionnaire items	Resources
Demographic	Q1. What is your age?	18 or below/19 - 21/22 - 24/25 - 27/ 28 or above
	Q2. What is your gender?	Female / Male
	Q3. What is your ethnicity?	Malay/Chinese/Indian/Other
	Q4. What programme are you studying?	STEM field/Non-STEM field
	Q5. What is your current study year?	Year 1/Year 2/Year 3/Year 4
	Q6. What is your current CGPA?	Short answer
AI knowledge	Q7. Are you familiar with or have you heard about AI?	Not Familiar 1 2 3 4 5 Familiar
	Q8. Do you use applications or tools with AI in your daily life?	Rarely 1 2 3 4 5 Often
	Q9. I believe that AI aids in the progress and efficiency of individuals. Q10. Are the outcomes and decisions generated by AI systems easily understandable and explainable? Q11. I am well-informed about how the AI models used in my field of study function. Q12. Measures should be taken to ensure that AI is used ethically and, in a manner, respectful of fundamental rights and values. Q13. The existing ethical principles and regulations that apply to the development and use of AI should be disseminated (spread throughout / made known) in my field of study. Q14. AI systems should respect my autonomy and allow me to have control over decisions that directly affect me. Q15. It is important to evaluate the benefits associated with the use of AI in my field of study.	Strongly Disagree 1 2 3 4 5 Strongly Agree

	Q16. AI has allowed for process optimization and more efficient task completion in contexts where it has been implemented. Q17. AI enables me to achieve more accurate and reliable outcomes compared to traditional or previous methods. Q18. AI has been a useful tool in supporting decision-making in complex situations or with large data sets in my educational context.	
Attitude towards AI	Q20. AI will improve academic performance. Q21. AI enhances my creativity. Q22. AI favor my plagiarism. Q23. AI enhances the quality of knowledge attained by me. Q24. AI inhibits my critical thinking. Q25. AI should be integrated as a supplementary learning resource in my courses. Q26. AI is an unreliable source of knowledge - I do not trust it. Q27. AI will help develop my skills in asking good questions	Strongly Disagree/Strongly Agree 1 2 3 4 5 Strongly Agree/Strongly Disagree