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Artificial Intelligence in Higher Education: An Analysis of Usage Patterns, Academic Outcomes, Behavioural Changes, and Privacy Concerns among College Students in Coimbatore City

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Abstract: ***This study examines the usage patterns of Artificial Intelligence (AI) tools among college students and their impact on academic outcomes, behavioural changes, and privacy concerns in Coimbatore city. The research adopts a descriptive and analytical design using a quantitative approach, with data collected from 140 respondents through structured questionnaires. The findings reveals that a majority of students frequently use AI tools, particularly ChatGPT, for academic purposes such as personal learning, assignments, and research. The study highlights that AI usage enhances critical thinking, problem-solving skills, and productivity among students. It also indicates a growing dependence on AI tools, influencing study habits and learning behaviour, with many students preferring AI-assisted self-learning methods.***

The analysis shows that students actively verify AI-generated information through online sources and peer discussions, reflecting a balanced learning approach. Despite the benefits, concerns regarding data privacy and security are significant, as many students are aware of risks but lack proper understanding of privacy policies. Statistical tools such as Chi-square, correlation and ANOVA reveal that while AI usage is significantly associated with educational qualification and tool preference, it does not significantly impact academic outcomes.

The study concludes that AI plays a transformative role in higher education (HE), offering both opportunities and challenges. It emphasizes the need for responsible AI integration, improved digital literacy, and stronger awareness of ethical and privacy issues to maximize benefits while minimizing risks.

Keywords: AI – Artificial Intelligence, HE – Higher Education, ANOVA – Analysis of variance.

I. INTRODUCTION

Artificial Intelligence (AI) has revolutionized higher education in recent years with technologies like automated grading systems, intelligent tutoring systems, and generative programs like ChatGPT, Gemini, and Claude, changing the way students learn, approach assignments, and interact with academic material. Although AI improves access to knowledge, efficiency, and individualized learning, it also raises worries about its effects on academic achievement, since an overreliance on it may impair critical thinking and independent problem-solving abilities. Furthermore, by encouraging beneficial changes like self-directed learning and time management, as well as detrimental tendencies like less participation in conventional learning techniques, AI has an impact on student behavior. Additionally, the widespread use of AI technologies poses serious risks to data privacy and security since students could unintentionally share sensitive information, underscoring the need for increased awareness, ethical use, and responsible integration of AI in postsecondary education.

A. Statement of The Problem

The rapid integration of Artificial Intelligence (AI) tools in higher education has transformed the way college students learn, complete academic tasks, and engage with educational content. Although AI applications such as chatbots, content generators, and intelligent learning systems offer benefits like improved efficiency, personalized learning, and easy access to information, their increasing use raises important concerns regarding their impact on students' academic performance and learning outcomes. There is limited empirical evidence on how students use these tools and whether such usage positively or negatively influences their academic success.

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Despite the expanding role of AI in higher education, there is a lack of comprehensive research examining AI usage patterns alongside academic outcomes, behavioural changes, and privacy concerns. Therefore, this study aims to bridge this gap by analysing students' use of AI tools and their impact on academic performance, behaviour, and awareness of privacy risks, thereby contributing to the responsible and effective integration of AI in education.

B. Objectives Of The Study

- To examine the usage patterns of AI tools and their academic outcomes of college students.
- To identify the behavioral changes associated with the adoption of Artificial Intelligence tools among college students.
- To assess the level of privacy concerns among college students while using Artificial Intelligence platforms.

C. Research Methodology

1) Research Design

The study uses a descriptive and analytical research design to examine college students' use of AI tools and their effects on academics, behaviour, and privacy. A quantitative approach is applied, using structured questionnaires with closed-ended and Likert-scale questions. Undergraduate and postgraduate students are selected through convenience sampling, and data is collected via online surveys. AI usage is treated as the independent variable, while academic outcomes, behaviour, and privacy concerns are dependent variables. Ethical principles like confidentiality, informed consent, and voluntary participation are strictly followed.

2) Area of the Study

The area of study for this research is higher education, with a specific focus on college students in Coimbatore and their interaction with Artificial Intelligence (AI) tools in academic settings. The study is confined to students enrolled in undergraduate and postgraduate programs across various disciplines, examining how they use AI technologies for learning, assignments, and academic support.

3) Data Collection

The study is based on both primary and secondary data. Primary data is collected through structured questionnaires using Google Forms, while secondary data is collected from journals, articles, and websites. This combination helps in gaining both practical and theoretical insights. It ensures better understanding and reliability of the research.

4) Sampling Technique

The study adopts a non-probability sampling technique, specifically convenience sampling, to select respondents. Under this method, college students who are easily accessible and willing to participate in Coimbatore are included in the study. This approach is suitable due to time and resource constraints and allows for quick data collection from a diverse group of undergraduate and postgraduate students across various disciplines.

5) Sample Size

A total of 140 respondents are selected for the study. The sample includes Higher education who is studying Undergraduate, Postgraduate, PhD etc in Coimbatore city. This helps in collecting diverse opinions and responses. A suitable sample size improves the accuracy of the study.

6) Research Instrument

A structured questionnaire is used as the research instrument. It includes both closed-ended questions for easy analysis and a few open-ended questions to gather opinions. The questionnaire is designed to be simple and clear for respondents.

7) Tools for Data Analysis

The collected data is analysed using statistical tools such as Simple Percentage, Chi-Square Test, Friedman Ranking, Descriptive statistics, correlation and ANOVA. These tools help in interpreting the data effectively. They are useful in identifying relationships and comparing different variables.

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8) Limitations of the study

- The conclusions drawn from the study is only applicable to the Coimbatore city and may not fluctuate with any other cities.
- .The process of collecting data was a real challenge and it has taken more time for the respondents to respond in detail manner. However, the adequate care has been exercised to collect the unbiased data.

9) Research gap

Many studies on AI in higher education focus either on improving teaching and learning or on ethical and privacy issues, but rarely both together. There is a lack of empirical research examining students' AI usage patterns, academic outcomes, behavioural changes, and privacy concerns in an integrated way. Most research is limited to a specific region, nation, or AI technology, reducing generalizability. Few studies consider the college student perspective on AI adoption and its academic or behavioural effects. There is also a shortage of quantitative studies linking AI usage with outcomes and risks. This highlights the need for a holistic research study addressing AI adoption and its impact on students.

II. REVIEW OF LITERATURE

Dong Yu Long (2025) "Artificial intelligence in higher education: a systematic review of its impact on student engagement and the mediating role of teaching methods" The study examined the growing integration of Artificial Intelligence (AI) in higher education, with a particular focus on the mediating role of teaching methods in enhancing student engagement. A systematic review of 73 peer-reviewed articles published between 2015 and early 2025 was conducted using PRISMA guidelines, analysing AI types, engagement outcomes, and instructional strategies. It also indicated that AI tools, including chatbots, adaptive systems, and predictive analytics, were most effective when combined with interactive pedagogies such as flipped classrooms, project-based learning, and scaffolded feedback. PMAISE model was also brought to illustrate the alignment between AI technologies, teaching strategies, and cognitive, behavioural, and affective dimensions of engagement. It also highlighted ethical concerns, data privacy issues, and barriers to equitable adoption. The study concluded by emphasizing the importance of pedagogical mediation in ensuring effective, context-sensitive, and meaningful integration of AI in higher education.

Cormac McGrath et al (2023) "University teachers' perceptions of responsibility and artificial intelligence in higher education - An experimental philosophical study" The study said that university teachers' engagement with artificial intelligence (AI) in higher education, focusing on their perceptions, responsibilities, and willingness to adopt AI tools. Using an experimental philosophy approach, 194 teachers responded to case-based online surveys exploring equitable AI use for diverse student groups. Teachers generally support AI adoption to promote fairness, particularly for first-generation students and those with learning disabilities. Differences emerged in attitudes based on gender, age, faculty, and academic position, highlighting contextual influences on AI acceptance. It also highlighted gaps in knowledge and available resources for integrating AI into teaching practices. Results suggested that professional development and institutional support are critical for responsible AI implementation.

III. OVERVIEW OF THE STUDY

A. Artificial Intelligence and Technological Advancements

Over the past few decades, rapid advancements in digital computing, the internet, and mobile technologies have transformed human life significantly. One of the transformation is Artificial Intelligence (AI). Initially developed in the 1950s with a focus on symbolic reasoning and problem-solving, AI has evolved into a sophisticated field encompassing machine learning, deep learning, natural language processing, and computer vision. The growth of computational power, availability of large datasets, and advancements in algorithms have enabled AI to expand into everyday applications such as virtual assistants, recommendation systems, healthcare diagnostics, autonomous vehicles, and education. Technologies like cloud computing, big data, and open-source platforms have further accelerated AI development, making it accessible and scalable. Today, AI plays a crucial role in enhancing decision-making, automating routine tasks, and fostering innovation across economic, social, and educational domains.

B. History of Artificial Intelligence

Artificial Intelligence, a branch of computer science, aims to develop machines capable of performing tasks requiring human intelligence, including personal learning, critical thinking, and decision-making. The concept formally emerged during the Dartmouth Conference in 1956.

Early AI research focused on rule-based systems and symbolic reasoning, leading to expert systems in the 1960s and 1970s. The 1980s witnessed the rise of knowledge-based systems, while the 1990s and early 2000s marked the transition to machine learning. In recent years, advancements in deep learning and generative AI have significantly expanded AI capabilities.

C. Important Aspects of AI Usage in Higher Education

AI has significantly reshaped higher education by improving teaching, learning, and administrative processes. Personalized learning, intelligent tutoring systems, automated grading, and learning analytics are key contributions. AI also supports skill development, collaboration, and lifelong learning, while raising ethical and privacy concerns.

D. AI Applications in Higher Education

AI tools such as ChatGPT, Gemini, GitHub Copilot, Grammarly, Quill-Bot, Turnitin, Socratic, Notion AI, Elicit, Jasper AI, Quizlet, and Miro AI enhance learning, writing, coding, research, and collaboration, making education more efficient and interactive.

E. Advantages & Disadvantages of Artificial Intelligence Technology

AI helps in improving efficiency, productivity, and decision-making. It automates routine tasks, enhances problem-solving, supports personalization, and promotes innovation. AI systems can operate continuously, making them valuable for real-time applications.
AI involves high costs, job displacement risks, data privacy issues, and algorithmic bias. It lacks human judgment and ethical reasoning, and over-reliance on AI may reduce critical thinking skills. Responsible use and human oversight are essential.

IV. DATA ANALYSIS AND INTERPRETATION

A. Percentage Analysis

Percentage analysis is a technique used in data analysis to express the relationship between two or more variables as a percentage. It involves calculating the proportion of a particular variable relative to a base value and expressing it as a percentage.

TABLE 1.1
AI TOOL USED FREQUENTLY
The table describes the AI tool that is used frequently by respondents for the study

AI Tools	Frequency	Percentage
ChatGPT	86	61
Gemini	40	29
Copilot	8	6
Grammarly	6	4
Total	140	100

INTERPRETATION

The above table 1.1, 61% of the respondents use ChatGPT, 29% of the respondents use Gemini, 6% of the respondents use Copilot and remaining 4% of the respondents use Grammarly.

Majority (61%) of the respondents use ChatGPT frequently.

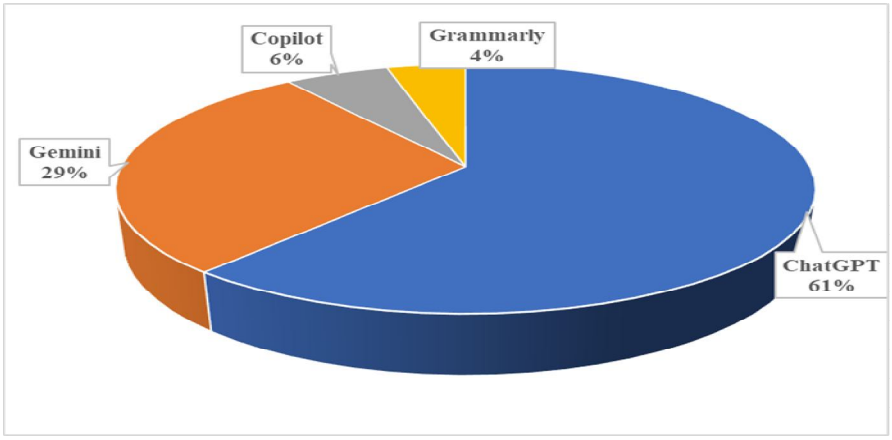


TABLE 1.2
ACADEMIC OUTCOME

The table describes the academic outcome that is experienced by using the AI tools by the respondents in the study

Outcome	Frequency	Percentage
Enhanced critical thinking and problem-solving skills	48	34
Increased productivity in academic tasks	33	24
More creative ideas for assignments or projects	27	19
Better exam preparation and revision	27	19
Increased motivation to study	5	4
Total	140	100

INTERPRETATION

The table 1.2, exhibits that 34% of the respondents has Enhanced critical thinking and problem-solving skills, 24% of the respondents helped in increased productivity in academic tasks, 19% of the respondents used for More creative ideas for assignments or projects, 19% of the respondents where AI helped for better exam preparation and revision and remaining 4% of respondents where AI motivated to study.

Most (34%) of the respondents have said that usage of AI helps in Enhanced critical thinking and problem-solving skills

Chart shows the Academic outcome experienced through usage of AI tools

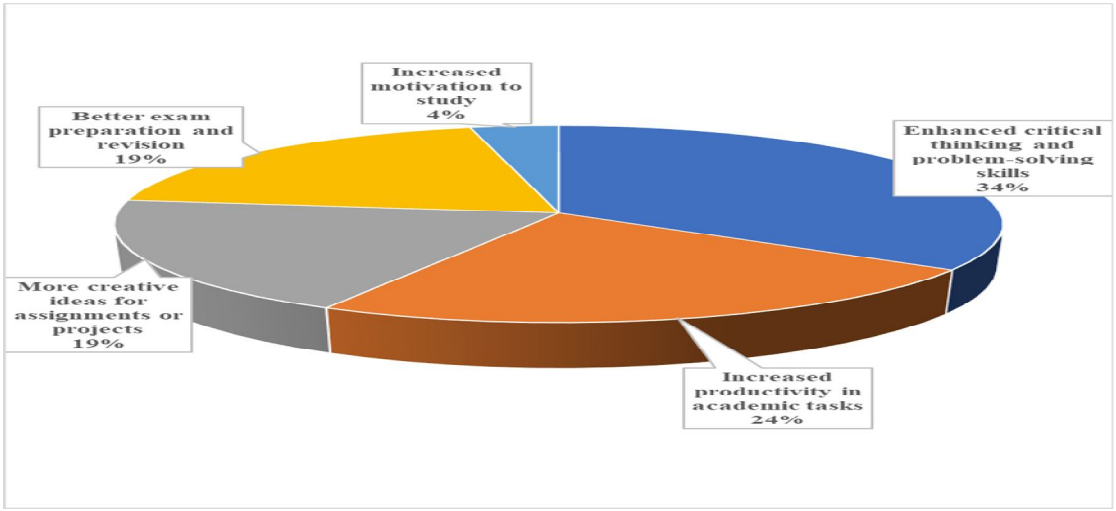


TABLE 1.3
SOURCES INFLUENCING PRIVACY RISK

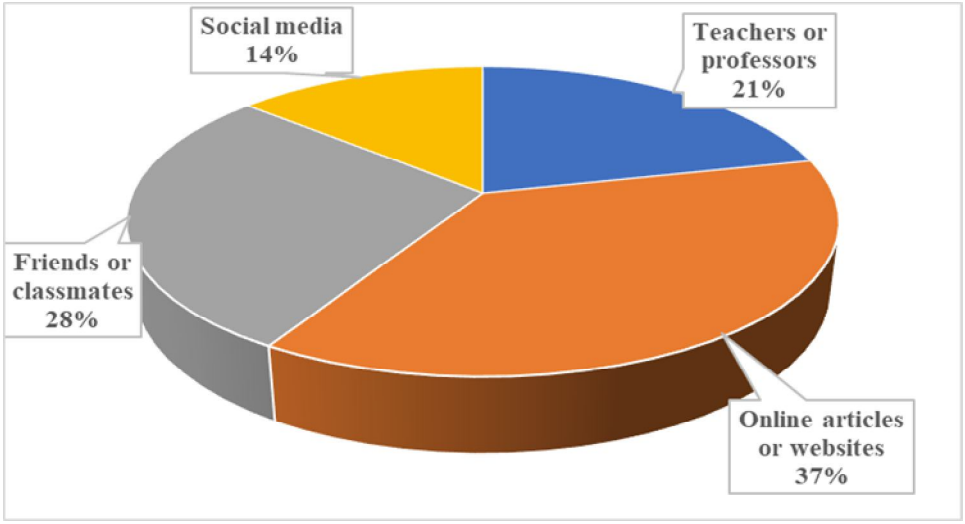
The table describes sources through which respondents got awareness about the privacy concerns while using AI platforms

Sources	Frequency	Percent
Teachers or professors	30	21
Online articles or websites	52	37
Friends or classmates	39	28
Social media	19	14
Total	140	100

INTERPRETATION

The table 1.3, 21% of the respondents got influenced through teachers or professors, 37% of the respondents got influenced through online articles or websites, 28% of the respondents got influenced through friends or classmates and 14% of the respondents got influenced through social media.

Most (37%) of the respondents got influenced through online articles or websites about the privacy concerns.



B. Rank Analysis

Rank analysis is a statistical technique used to analyse data by assigning ranks to observations in a dataset. It involves sorting the data and assigning a rank to each observation based on its position in the sorted list.

TABLE 1.4

Table showing the characteristics of AI that has been ranked based on the respondents priority level

Factor	Mean Rank	Rank
Saves times	1.67	5th
Effectiveness	2.54	4th
Independent learning	2.87	3rd
Decision making	3.61	2nd
Critical thinking	4.31	1st

INTERPRETATION

The table shows that critical thinking is ranked 1st, indicating it is the most preferred AI characteristic among respondents. Decision making is ranked 2nd, followed by independent learning in 3rd place. Effectiveness holds the 4th rank, while saving time is ranked 5th, making it the least preferred.

Respondents prioritize advanced cognitive / Critical thinking abilities over basic time-saving benefits in AI.

C. Chi-Square Analysis

Chi-square analysis is a statistical technique used to test the relationship between two categorical variables. It involves organizing data into a contingency table and calculating the chi-square test statistic by comparing the expected frequencies to the observed frequencies.

TABLE 1.5

Table showing the relationship between Educational Qualification and Usage of AI Tools

Qualification	daily	weekly	occasionally	rarely	never	total
Undergraduate	18	12	3	1	1	35
Postgraduate	44	22	9	0	0	75
PhD	2	1	3	0	0	6
Diploma	6	4	8	0	0	18
other	2	1	2	1	0	6
Total	72	40	25	2	1	140

HYPOTHESIS

H0: There is no significant relationship between educational qualification and Usage of AI tools.

H1: There is significant relationship between educational qualification and Usage of AI tools.

Type	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	33.138[a]	16	0.007
Likelihood Ratio	25.059	16	0.069
Linear-by-Linear Association	6.604	1	0.01
N of Valid Cases	140		

RESULT

A chi-square test was conducted to examine whether educational qualification influences how frequently respondents use AI tools. The analysis resulted in a p-value of 0.007, which is clearly less than the standard significance level of 0.05. This indicates that the variation in usage patterns across different educational groups is statistically significant. It can also be observed from the table that respondents with higher qualifications, particularly postgraduates, tend to use AI tools more frequently than others.

Since the p-value (0.007) is less than 0.05, the null hypothesis (H0) is rejected and the alternative hypothesis (H1) is accepted. Therefore, there is a significant relationship between educational qualification and the usage of AI tools.

D. Descriptive Statistics

Descriptive statistics in research refers to methods used to summarize and present data in a meaningful way. It includes measures like mean, median, mode, percentage, and standard deviation. These tools help to simplify large amounts of data into understandable forms such as tables, charts, and graphs.

TABLE 1.6

Table showing the Mean and standard deviation for the given factors

Factors	No.	Minimum	Maximum	Mean	Std. Deviation
Saves time	140	1	5	1.57	1.139
understand	140	1	5	2.14	0.85
interaction	140	1	5	3.01	0.933
trust	140	1	5	3.83	1.052
overall quality	140	1	5	3.67	1.354

INTERPRETATION

The table shows that saving time (mean 1.57) and understanding (2.14) have lower levels of agreement among respondents. Interaction (3.01) is rated at a moderate level. Trust (3.83) and overall quality (3.67) have higher mean values, indicating a more positive perception. The standard deviation values suggest moderate variation in responses.

E. Correlation

Correlation is a statistical measure that shows the relationship between two variables. It indicates whether variables move in the same direction (positive) or opposite direction (negative). The value of correlation ranges from -1 to +1. Correlation is needed in research to identify and measure the relationship between two variables.

TABLE 1.7

Table showing comparison between usage of AI tools and Hours per day spent using AI tools

Variables		usage of Artificial Intelligence (AI) tools	Hours per day spent using AI tools
usage of Artificial Intelligence (AI) tools	Pearson Correlation	1	0.284**
	Sig. (2-tailed)	-	0.001
	N	140	140
hours per day spent using AI tools	Pearson Correlation	0.284**	1
	Sig. (2-tailed)	0.001	-
	N	140	140
**. Correlation is significant at the 0.01 level (2-tailed).			

RESULT

The correlation analysis shows a positive relationship between the usage of AI tools and the number of hours spent using them (r = 0.284). This indicates that as the usage of AI tools increases, the time spent on them also tends to increase. The correlation is statistically significant at the 0.01 level (p = 0.001), confirming that the relationship is meaningful and not due to chance.

The strength of the correlation is moderate, suggesting that other factors may also influence usage time. Overall, there is a significant but moderate association between AI usage and time spent.

F. Anova

Analysis of Variance is a statistical method used to compare the means of three or more groups. It helps to determine whether there is a significant difference among group averages. ANOVA works by analysing the variation within groups and between groups. If the variation between groups is higher, it indicates a significant difference.

TABLE 1.8

Comparison of AI tool usage with the academic outcome experienced

Frequency	N	Mean	Std. Deviation	Std. Error
daily	72	2.47	1.289	0.152
weekly	40	2.18	1.152	0.182
occasionally	25	2.28	1.242	0.248
rarely	2	1.5	0.707	0.5
never	1	3	-	-
Total	140	2.34	1.234	0.104

RESULT

The ANOVA results indicate whether there is a significant difference in academic outcomes based on the frequency of AI tool usage (daily, weekly, occasionally, rarely, never). If the significance value (p-value) is less than 0.05, it shows that there is a statistically significant difference among the groups. This means that the level of AI usage has an impact on academic outcomes. However, if the p-value is greater than 0.05, it indicates that there is no significant difference among the groups.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.283	5	1.071	0.698	0.595
Within Groups	207.259	135	1.535	-	-
Total	211.543	140	-	-	-

RESULT

The ANOVA results show that the significance value (p = 0.595) is greater than 0.05, indicating that there is no statistically significant difference in academic outcomes among different levels of AI tool usage. Although there are slight variations in mean scores, these differences are not meaningful.

It can be concluded that the frequency of AI tool usage does not have a significant impact on academic outcomes among the respondents.

V. FINDINGS AND CONCLUSION

A. Findings

The objective of the study was to analyse the AI usage, Academic outcomes, Behavioural changes and privacy concerns among college students. The study has been carefully analysed using the techniques of percentage analysis, rank analysis, chi-square analysis, descriptive analysis, Analysis of variance and correlation. The final chapter is an attempt to summarize the findings of the study.

B. Percentage Analysis

- Majority (61%) of the respondents use ChatGPT frequently.
- Most (34%) of the respondents have said that usage of AI helps in Enhanced critical thinking and problem-solving skills.
- Most (37%) of the respondents got influenced through online articles or websites about the privacy concerns.

C. Rank Analysis

The Ranking analysis shows that critical thinking is ranked 1st, indicating it is the most preferred. Decision making is ranked 2nd, followed by independent learning in 3rd place. Effectiveness holds the 4th rank, while saving time is ranked 5th, making it the least preferred.

D. Chi-Square Analysis

Since the p-value (0.007) is less than 0.05, the null hypothesis (H0) is rejected and the alternative hypothesis (H1) is accepted. Therefore, there is a significant relationship between educational qualification and the usage of AI tools.

E. Descriptive Statistics

The table shows that saving time (mean 1.57) and understanding (2.14) have lower levels of agreement among respondents. Interaction (3.01) is rated at a moderate level. Trust (3.83) and overall quality (3.67) have higher mean values, indicating a more positive perception. The standard deviation values suggest moderate variation in responses.

F. Correlation

The correlation analysis shows a positive relationship between the usage of AI tools and the number of hours spent using them ($r = 0.284$). This indicates that as the usage of AI tools increases, the time spent on them also tends to increase. The correlation is statistically significant at the 0.01 level ($p = 0.001$), confirming that the relationship is meaningful and not due to chance.

G. Anova

The ANOVA results show that the significance value ($p = 0.595$) is greater than 0.05, indicating that there is no statistically significant difference in academic outcomes among different levels of AI tool usage. Although there are slight variations in mean scores, these differences are not meaningful.

VI. CONCLUSION

It is concluded that Artificial Intelligence (AI) has become a significant component of higher education, with a majority of college students in Coimbatore city actively using AI tools such as ChatGPT for academic purposes. The findings reveal that students primarily utilize AI for personal learning, research, and problem-solving, which enhances critical thinking, productivity, and self-directed learning. While traditional resources like class notes and textbooks remain important, AI-assisted learning is gaining prominence, influencing students' study habits and encouraging a shift toward more technology-driven learning approaches. Students demonstrate a balanced learning behaviour by verifying AI-generated information through online sources and peer discussions, reflecting a level of awareness and responsibility in usage.

The study also highlights the widespread use of AI tools, there is no significant impact on academic outcomes, suggesting that AI serves more as a supportive tool rather than a direct determinant of academic success. Behavioural changes such as increased dependence on AI and reduced engagement in traditional learning methods are observed, raising concerns of learning effectiveness in long term. Furthermore, issues related to data privacy and security remain critical, as many students lack a clear understanding of privacy policies and potential risks. The study emphasizes the need for responsible AI integration, enhanced digital literacy, and greater awareness of ethical and privacy considerations to maximize the benefits of AI while minimizing its associated challenges in higher education.

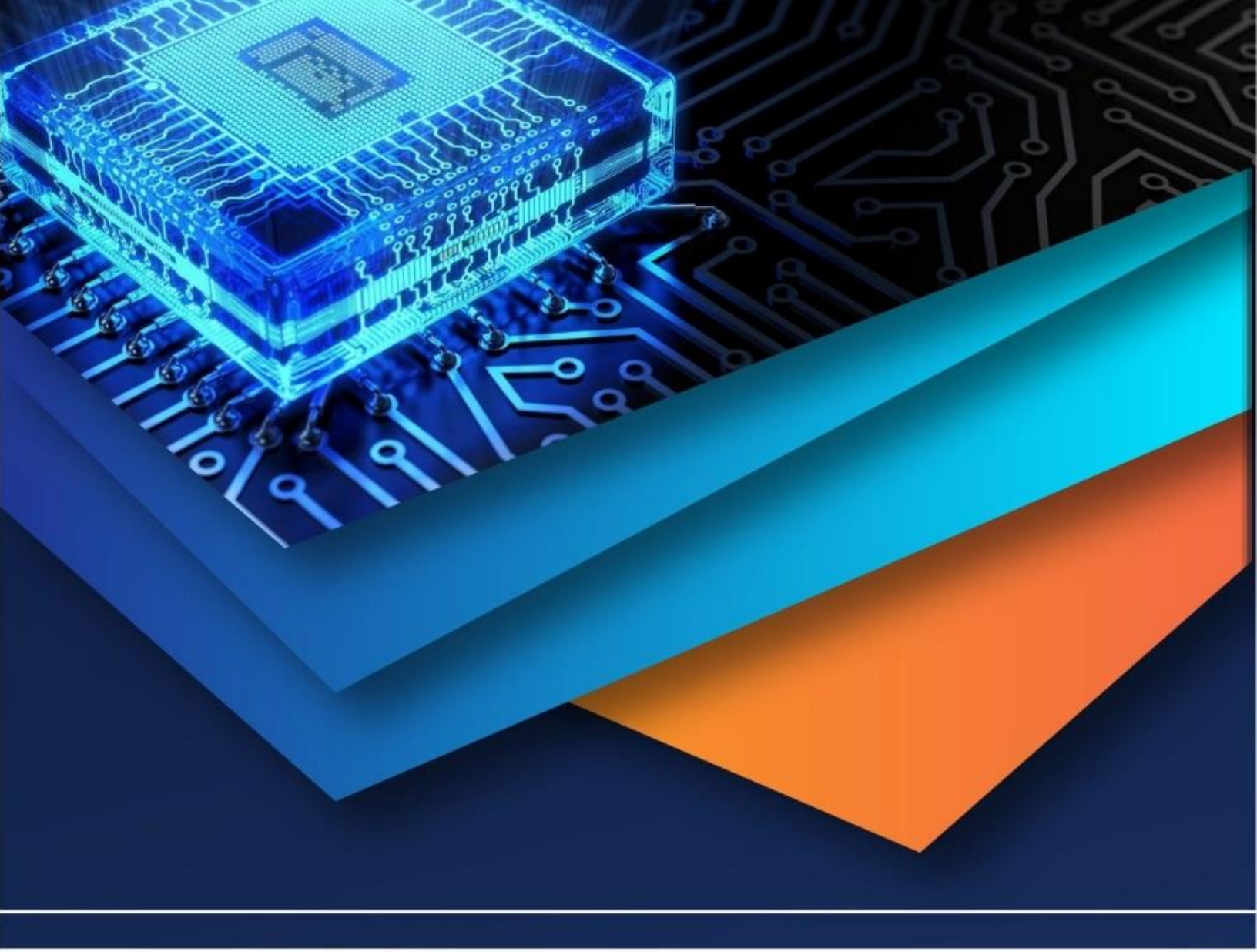
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