

Integrating Mobile Gaming Behavior Analysis with AI-Driven Course Recommendation Systems: A Study on Student Cognitive Skills and Academic Performance

¹Kalokhe Anil Sopan, ²Phadtare Anjali Dnyaneshwar, ³Saste Payal Bhagwan, ⁴Kumbhar Vijaykumar Sambhajirao

¹Research Scholar, Department of Computer Science, Shivaji University, Kolhapur (MH), India

^{2,3}Research Student, Department of BBA (CA), Vidya Pratishthan's, Arts, Science and Commerce College, Baramati, (MH), India

⁴Research Guide, Department of Computer Science, Shivaji University, Kolhapur (MH), India

Abstract - The widespread use of mobile technology has transformed the way individuals interact, learn, and engage with digital platforms, raising new concerns about security awareness and academic implications. This study focuses on examining mobile usage patterns and their relevance to both security consciousness and educational practices. A structured survey-based methodology was adopted, emphasizing dimensions of mobile interaction, gaming involvement, and academic association. The analysis was conducted using descriptive statistical methods to provide a clear representation of observed trends. The study emphasizes the role of mobile security awareness as a crucial factor in shaping digital behavior and educational engagement. By addressing key aspects of mobile technology usage, the research establishes a foundation for integrating security awareness into academic learning environments. Furthermore, the insights gained from students' mobile usage and gaming behaviors can be leveraged to design adaptive course recommendation systems that personalize learning pathways based on cognitive skills and engagement patterns. This work contributes to bridging the gap between mobile security research and educational technology applications, offering a new perspective for future academic and practical exploration.

Keywords: Digital Behavior, Educational Practices, Mobile Gaming, Mobile Security Awareness, Smartphone Usage.

I. INTRODUCTION

Education is the cornerstone of societal development and personal advancement. In India, it has consistently been a key driver of cultural and intellectual growth [1]. Mobile technology has become a central part of modern life, influencing communication, learning, and entertainment while simultaneously raising concerns about security and responsible use. The widespread availability of smartphones and tablets has fueled a dramatic surge in mobile gaming across all age groups, especially among teenagers and young adults [2]. Social media are online platforms that enable users

to share, exchange information, and interact with content and comments within virtual communities and networks [3]. Education should aim not only to enhance a person's financial status but also to nurture their social values, moral principles, and spiritual development, ultimately contributing to the betterment of human life [4]. Smartphones not only support academic and professional tasks but also expose users to risks such as data breaches and unauthorized access. Although security measures exist, awareness and adoption often remain inconsistent, highlighting the need for deeper study. With the easy availability of smartphones and high-speed internet, mobile gaming has become one of the most popular forms of entertainment for students. [5].

In today's rapidly changing educational environment, continuous learning and skill enhancement are essential for growth and success [6]. Mobile gaming, as a widespread activity, presents both challenges and opportunities potentially affecting study habits while also enhancing skills like problem-solving and multitasking. Incorporating mobile games into educational settings present certain challenges. Teachers need to make sure that the games align with curriculum goals and support learning, rather than serving as a source of distraction [7].

As mobile gaming continues to grow in popularity, it is important to examine its effects. The specific conditions of mobile gaming such as limited screen size, different ergonomic factors, and prolonged usage make it essential to explore its possible influence on eye health [8]. In recent times, assessing student performance has become vital for teachers, policymakers, and employers, as precise performance data is essential for driving educational and societal progress [9]. Students' perceptions of gaming addiction are influenced by factors such as their field of study, how often they play, and the number of hours they spend gaming each day [10]. The rising popularity of mobile gaming, especially Mobile Legends, has sparked discussions about its effect on students' academic performance. Parents and teachers worry that spending more time gaming may result in lower academic achievement, reduced focus, and less

time devoted to studying [11]. Moreover, excessive involvement in online gaming can have an adverse impact on students' overall way of life [12]. Evaluating students' academic progress has become an essential duty for educators throughout the academic year [13].

This study addresses these dynamics by examining mobile usage patterns, emphasizing security awareness, and exploring their implications for education. The findings further provide a basis for integrating behavioral insights into adaptive course recommendation systems, thereby linking mobile security research with educational technology applications. The behavioral data derived from mobile gaming activities such as problem-solving tendencies, multitasking ability, and engagement duration can be utilized to develop AI-based course recommendation systems. These systems can help students identify suitable academic programs or skill-based courses that align with their cognitive strengths and digital habits. Integrating such adaptive mechanisms bridges mobile interaction analysis with personalized learning technologies. Smartphone addiction refers to the uncontrolled overuse of smartphones, which interferes with essential daily activities and results in harmful consequences [14].

The issue of mobile security remains central in this context, as increasing dependence on smartphones exposes users to potential threats such as hacking, data breaches, and unauthorized access. Despite the availability of protective measures like authentication systems and security applications, user adoption and awareness often remain inconsistent. This gap between awareness and practice underscores the need for deeper investigation into mobile behavior and its implications. By examining how users interact with mobile technologies, researchers can identify both vulnerabilities and opportunities for promoting responsible and secure usage.

Furthermore, the educational domain is directly influenced by mobile technology trends, with both risks and benefits coexisting. On one hand, excessive or unregulated gaming habits may affect study routines and academic focus; on the other, mobile platforms can also foster problem-solving, multitasking, and creativity. Exploring these dual aspects provides valuable insights into the integration of mobile security awareness within educational frameworks. This research seeks to add to this discussion by connecting mobile usage patterns with academic practices and extending its relevance to the development of course recommendation systems that can adapt to learners' digital behaviors.

II. LITERATURE REVIEW

Kalokhe Anil Sopan, Kumbhar Vijaykumar Sambhajirao [1], discussed that the transformation of India's education system from the traditional Gurukul approach to today's technology-based methods reflects a continuous process of growth and adaptation. By combining the moral values and practical learning of ancient traditions with the creativity and adaptability of modern education, India can build a progressive and inclusive model for the future.

Dino T. Agraviador, Clint B. Clarido, Kristine T. Soberano [2], observed that although internet gaming remains a topic of debate, it has largely become one of the most popular and easily accessible forms of entertainment today. When played in moderation, online games can serve as a source of enjoyment; however, this study revealed a negative relationship between the average time spent on electronic gaming and students' academic performance.

III. RESEARCH METHODOLOGY

This research employed a quantitative method with a cross-sectional survey design to examine mobile usage behavior, security awareness, and their educational implications. A structured questionnaire was developed to capture information across multiple dimensions, including mobile interaction, gaming activities, and academic associations. The survey was administered online via Google Forms to ensure accessibility and wide participation across diverse user groups.

The gathered data was mainly categorical and was examined through descriptive statistical techniques. Frequency distributions and percentage figures were calculated to systematically present the responses across ten charts. This methodology enabled a structured examination of observed patterns, highlighting trends in mobile technology usage while maintaining objectivity in presentation. The approach provided a reliable framework for understanding user practices and their potential linkage with security awareness and course recommendation systems in education. Future extensions of this framework may involve applying data mining or machine learning techniques to the collected behavioral data. This could enable the development of a prototype recommendation model capable of suggesting relevant courses based on students' gaming behavior, cognitive patterns, and academic performance trends.

IV. OBJECTIVES OF THE STUDY

1. To analyze and characterize students' mobile gaming patterns and habits, including the frequency, duration of engagement, and the preferred genres of games played

- To examine how students perceive the impact of mobile gaming on their daily activities, study patterns, and overall academic achievement.
- To assess the perceived cognitive benefits attributed to mobile gaming, specifically evaluating its role in improving skills such as problem-solving, logical/analytical thinking, and the ability to handle multiple tasks
- To examine the current state of mobile security awareness among students and its relevance to shaping their digital behavior and educational engagement.
- To explore the potential of integrating behavioral insights from mobile gaming into an adaptive course recommendation system that supports personalized academic guidance.

V. RESULT AND DISCUSSIONS

Mobile gaming is a common but generally casual habit among students, who predominantly favor Puzzle games. While most acknowledge that gaming affects their daily routine, they successfully manage their time and largely perceive a positive impact on their academic performance. Respondents strongly believe mobile games enhance cognitive abilities, specifically boosting problem-solving skills, analytical thinking, and the speed of decision-making. This positive perception aligns with the overall high self-assessment of academic success reported by the participants.

Discussion

Question 1: The first question in the questionnaire asks whether you play mobile games regularly, offering options such as daily, weekly, monthly, rarely, and never.

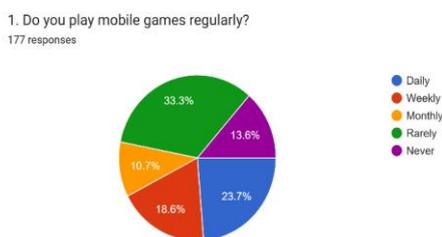


Figure 1: The result about playing games regularly

The results indicate that mobile gaming behavior varies widely among respondents. A majority (33.3%) reported playing rarely, whereas 23.7% engaged in daily gaming, highlighting a significant portion of highly active users. Weekly (18.6%) and monthly (10.7%) players represent moderate engagement levels, while 13.6% reported never playing. These results indicate that although mobile gaming is a popular recreational activity, the level of engagement varies

significantly, highlighting differences in individual habits and preferences.

Question 2: The next question from questionnaire is that how many hours per day do you spend on mobile gaming with multiple options in hour's format.

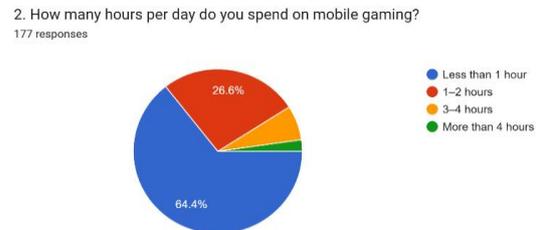


Figure 2: The result about hours per day spend on mobile gaming

The chart shows the average time spent per day on mobile gaming among 177 respondents. A majority, 64.4%, reported playing for less than 1 hour daily, while 26.6% spend 1–2 hours. Only 6.2% of participants indicated playing for 3–4 hours, and a minimal 2.8% spend more than 4 hours. These findings suggest that most users engage in mobile gaming casually, with only a small proportion showing extended daily usage.

Question 3: The next question asks which types of mobile games you typically play, with options including action, puzzle, strategy, sports, and others.

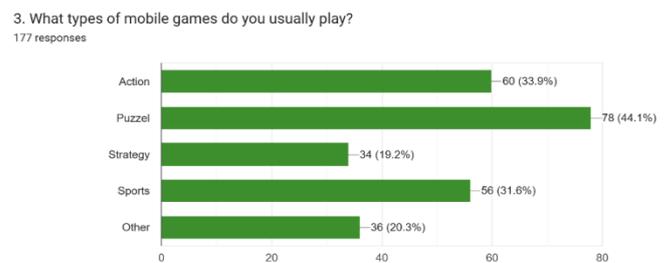


Figure 3: The results about types of mobile games usually play

Figure 3 illustrates mobile game preferences, Puzzle games are the most popular genre, selected by 44.1% (78 respondents). Action games follow as the second most preferred, played by 33.9% (60 respondents), with Sports games close behind at 31.6% (56 respondents). Strategy (19.2%) and Other (20.3%) genres were selected by the fewest respondents, indicating a stronger preference for casual or fast-paced gaming experiences. The percentages total more than 100%, suggesting that respondents were able to select multiple types of games.

Question 4: The next questions is that do you think mobile gaming affects your daily routine or study habits with options yes or no.

4. Do you think mobile gaming affects your daily routine or study habits?
177 responses

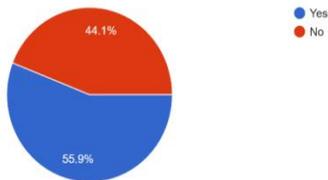


Figure 4: The results about mobile gaming affect your daily routine or study habits

The pie chart summarizing 177 responses, addresses the question of whether mobile gaming affects participants' daily routines or study habits. A majority of respondents, 55.9% (approximately 99 individuals), believe that mobile gaming does affect their routines or habits. Conversely, 44.1% (approximately 78 individuals) of the participants reported that mobile gaming does not impact their daily or study routines. This suggests a general perception among over half the survey group that mobile gaming has a noticeable influence on their personal schedules.

Question 5: The next question is that in your opinion, does mobile gaming affect your academic performance? With option positively and negatively.

5. In your opinion, does mobile gaming affect your academic performance?
177 responses

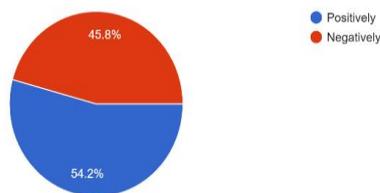


Figure 5: Result about mobile gaming affects your academic performance

Out of 177 responses about the perceived influence of mobile gaming on academic performance, a small majority of participants indicated a positive impact. Specifically, 54.2% (approximately 96 respondents) indicated that mobile gaming affects their academic performance positively. Conversely, 45.8% (approximately 81 respondents) reported that it affects their performance negatively. This outcome suggests that over half of the respondents believe their gaming habits either aid or do not hinder their studies.

Question 6: The next questions is that have you ever delayed or skipped studying because of mobile gaming with options yes or no.

6. Have you ever delayed or skipped studying because of mobile gaming?
177 responses

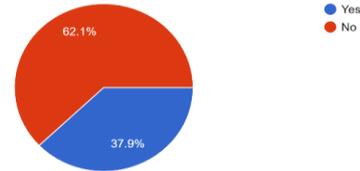


Figure 6: The results about delayed or skipped studying because of mobile gaming

The pie chart, summarizing 177 responses, addresses whether mobile gaming has caused participants to delay or skip studying. A significant majority of respondents, 62.1% (approximately 110 individuals), indicated No, meaning they have not delayed or skipped studying due to mobile gaming. In contrast, 37.9% (approximately 67 individuals) of participants reported Yes, confirming that they have delayed or skipped studies because of gaming. This shows that while a substantial number of students are affected, most respondents report not compromising their study time for mobile games.

Question 7: The next questions is that do mobile games helps to improve your problem solving skills with option always, often, sometimes and never.

7. Do mobile games helps to improve your problem-solving skills?
177 responses

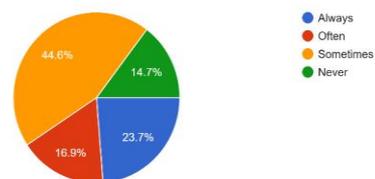


Figure 7: The results about mobile games helps to improve your problem solving skills

The chart, summarizing 177 responses, assesses the perceived impact of mobile games on problem-solving skills. A large majority of respondents (85.3%) believe mobile games help their skills at least "Sometimes" (44.6%), "Always" (23.7%), or "Often" (16.9%). Only a small fraction, 14.7%, reported that games "Never" help, with "Sometimes" being the most common answer. This indicates a widespread perception that mobile gaming offers some level of cognitive benefit.

Question 8: The next question is that do you feel mobile gaming has improved your ability to handle multiple tasks as the same time with multiple options.

8. Do you feel mobile gaming has improved your ability to handle multiple task at the same time?
177 responses

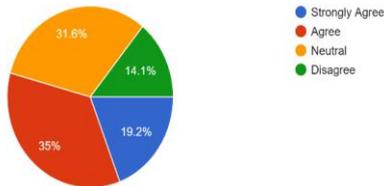


Figure 8: The results about mobile gaming has improved your ability to handle multiple task

The chart, based on 177 responses, gauges the perception that mobile gaming improves the ability to handle multiple tasks. The majority of respondents expressed positive agreement: 35.0% Agree and 19.2% Strongly Agree, totaling 54.2% who believe in a positive effect. A significant portion, 31.6%, remained Neutral. Only 14.1% Disagreed with the statement. This indicates that over half of the participants perceive an enhancement in their multitasking skills due to mobile gaming.

Question 9: The next question is that which skills you think most improved by mobile gaming with multiple options.

9. Which skill do you think is most improved by mobile gaming?
177 responses

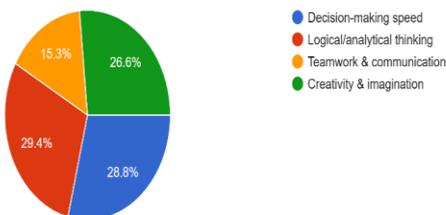


Figure 9: The results about skills do you think most improved by mobile gaming

The chart, summarizing 177 responses, identifies which skill is perceived to be most improved by mobile gaming. The top three responses are very closely clustered: Logical/analytical thinking at 29.4%, Decision-making speed at 28.8%, and Creativity & imagination at 26.6%. Teamwork & communication was cited as the least improved skill, at 15.3%. This indicates a strong and relatively balanced perception that mobile gaming primarily enhances cognitive skills related to thinking and decision-making.

Question 10: The following question asks you to evaluate your current academic performance, with response options of excellent, good, average, and below average.

10. How would you rate your current academic performance?
177 responses

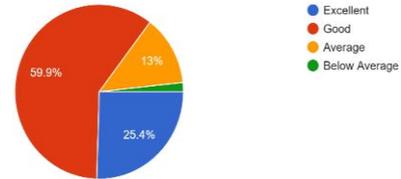


Figure 10: The results about rate your current academic performance

The chart based on 177 responses, illustrates participants' self-rating of their current academic performance. The vast majority of respondents rated their performance positively, with 59.9% reporting Good and 25.4% rating it as Excellent, totaling 85.3%. Only a small fraction rated their performance as Average (13.0%) or Below Average (1.7%). This suggests a highly positive self-assessment of academic success among the survey participants.

The behavioral insights revealed through this study can also serve as foundational parameters for building course recommendation systems. By analyzing factors such as gaming frequency, cognitive skill development and time management patterns an adaptive CRS can personalize educational pathways. This integration not only enhances student engagement but also promotes data-driven academic decision-making.

VI. CONCLUSION

This study concludes that mobile gaming is a common yet largely casual activity among students, requiring a balanced perspective within education. Most students manage their time efficiently, indicating that gaming seldom disrupts their studies. Participants perceive notable cognitive benefits from gaming, including improved problem solving, analytical thinking, and decision making speed skills essential for academic success. These findings suggest that mobile gaming, when balanced, can enhance learning rather than hinder it. The research also emphasizes the need to incorporate mobile security education to encourage responsible digital practices. Additionally, the behavioral findings from this study can help shape AI-based course recommendation systems, allowing for tailored academic guidance. By aligning students' cognitive strengths and digital habits with tailored learning opportunities, such integration fosters both secure technology use and individualized educational development.

ACKNOWLEDGEMENT

The authors would like to express their sincere gratitude to all individuals and institutions who contributed to the successful completion of this research work. We extend our heartfelt thanks to our research guide for his constant guidance, encouragement, and valuable insights throughout the study. We are also grateful to the respondents who participated in the survey and shared their valuable time and perspectives, which formed the foundation of this research. Finally, we acknowledge the support of our peers, family members, and well-wishers for their motivation and cooperation during the preparation of this paper.

REFERENCES

- [1] Kalokhe Anil Sopan, Kumbhar Vijaykumar Sambhajirao, "Comparative Analysis of the Evolution and Integration of Traditional and Modern Education Systems in India," *International Journal of Advanced Research in Science, Communication and Technology*, Volume 5, Issue 2, pp. 46-52, May 2025.
- [2] Dino T. Agraviador, Clint B. Clarido, Kristine T. Soberano, "The Effect of Mobile Gaming in Academic Performance of Secondary Education Students," *International Journal of Research in Engineering and Science*, Volume 11, Issue 11, pp.245-249, November 2023.
- [3] Kalokhe Anil Sopan, Phadtare Siddhi Dnyaneshwar, Kale Samiksha Santaram, Pawar Mahesh Dattatray, "Exploring the Role of Social Media in Education through Web Mining: Insights into Student Engagement and Behavioral Trends," *International Journal of Advance and Applied Research*, Volume 6, Issue 22, pp 304-309, March- April 2025.
- [4] Kalokhe Anil Sopan, Kumbhar Vijaykumar Sambhajirao, "A Comprehensive Evolution and Impact of the Indian Education System: From Ancient Wisdom to Modern Innovation," *Journal of Nonlinear Analysis and Optimization: Theory and Applications*, Volume 16, Issue 1, pp 144-151, December 2025.
- [5] C.Sneha, Dr.M.Dinesh Kumar, "A Study on the Impact of Online Mobile Games on College Students in Madurai City," *International Education Scientific Research Journal*, Volume 11, Issue 3, pp. 223-226, March 2025.
- [6] Kalokhe Anil Sopan, Kumbhar Vijaykumar Sambhajirao, "A Personalized Course Recommendation System for Students Using Machine Learning Techniques," *Journal of Technology*, Volume 12, Issue 12, pp. 903-912, December 2025.
- [7] Lim Seong Pek, Rita Wong Mee Mee, Fatim Syamilah Che Yob, Walton Wider, Cathy Mae Toquero, Karen Joy Brillo Talidong, "Mapping the intellectual structure of mobile gaming in education: insights from bibliometric methods," *International Journal of Evaluation and Research in Education*, Volume 14, Issue 4, pp. 2956-2965, August 2025.
- [8] Sushant Kumar Shah, Simran Rajan Shet Parkar, "The Impact of Mobile Gaming on Health – A Comprehensive Overview," *Medicon Medical Sciences*, Volume 7, Issue 4, pp. 28-32, October 2024.
- [9] Kalokhe Anil Sopan, Kumbhar Vijaykumar Sambhajirao, "Intelligent Course Recommendation for Students using Machine Learning Models," *International Journal of All Research Education and Scientific Methods*, Volume 12, Issue 12, pp. 2397-2402, December 2024.
- [10] Supphachai Kaeoyotkao, Chawapong Nui-suk, Wilasini Rattanasan, Wongsapat Ketyai, Nutthapat Meepian, "Screen Time and Student Life: Analyzing Mobile Gaming in a University Setting," *TEM Journal*, Volume 14, Issue 2, pp. 1420-1428, May 2025.
- [11] Jan Angelo G. Morata, Kelvin Carl D. Fulay, "The Impact of Playing Mobile Legends on Academic Performance in Mathematics of Junior and Senior High School Students," *Psychology and Education: A Multidisciplinary Journal*, Volume 28, Issue 10, pp. 1094-1105, November 2024.
- [12] Ricky C. Gabrito, Roger Y. Ibanez, Jacob Frederick P. Velza, "Impact of Online Gaming on the Academic Performance of DEBESMSCAT-Cawayan Campus Students," *Scientific Journal of Informatics*, Volume 10, Issue 4, pp. 423-434, November 2023.
- [13] Anil Sopan Kalokhe, Vijaykumar Sambhajirao Kumbhar, "A Review on Course Recommendation System in Higher Education using Machine Learning," *International Research Journal of Humanities and Interdisciplinary Studies*, pp. 47-55, January 2024.
- [14] Oluwafemi J. Sunday, Olusola O. Adesope, Patricia L. Maarhuis, "The effects of smartphone addiction on learning: A meta-analysis," *Computers in Human Behavior Reports*, June 2021, <https://doi.org/10.1016/j.chbr.2021.100114>.

AUTHORS BIOGRAPHY



Kalokhe Anil Sopan holds a M.Sc. in Computer Science has qualified the SET examination and is currently pursuing his Ph.D. in the Department of Computer Science at Shivaji University, Kolhapur. His academic contributions include the publication of 16 research papers in reputed international Journals. He has the authorship of a Textbook on E-Commerce for BBA (CA), B. Com (CA), and BCA students of Savitribai Phule Pune University. His professional journey reflects a strong commitment to teaching, research, and academic development.



Phadtare Anjali Dnyaneshwar is Research Students in the Department of BBA (CA) at Vidya Pratishthan's Arts, Science and Commerce College, Baramati, focusing on data analytics and mobile behavior studies.



Saste Payal Bhagwan is Research Students in the Department of BBA (CA) at Vidya Pratishthan's Arts, Science and Commerce College, Baramati, focusing on data analytics and mobile behavior studies.



Dr. Vijaykumar S. Kumbhar is an Associate Professor in the Department of Computer Science, Shivaji University, Kolhapur. He holds an M.C.A. in Computer Science and qualified NET exam in 2004. He also pursued Ph.D. in Computer Science from Shivaji University. His research interests include Data Mining, Artificial Intelligence, Natural Language Processing and Deep Learning. He has published more than 40 research papers in reputed international journals and conference proceedings. He has completed 3 research projects. He has also authored and co-authored books and contributed chapters in edited volumes. He has served as a resource person and chaired sessions at various academic events across India. In addition, he has filed a patent and continues to work actively on funded research projects in emerging technologies.

Citation of this Article:

Kalokhe Anil Sopan, Phadtare Anjali Dnyaneshwar, Saste Payal Bhagwan, & Kumbhar Vijaykumar Sambhajirao. (2025). Integrating Mobile Gaming Behavior Analysis with AI-Driven Course Recommendation Systems: A Study on Student Cognitive Skills and Academic Performance. *International Research Journal of Innovations in Engineering and Technology - IRJIET*, 9(11), 50-56. Article DOI <https://doi.org/10.47001/IRJIET/2025.911004>
