https://research.adra.ac.id/index.php/ijlul/
P ISSN: 3026 7102
E ISSN: 3030 8372

The Efficacy of an AI Powered Chatbot for Improving Conversational Fluency Among Indonesian University Students

Roya Zahir[1], Razia Khan[2], Zara Ali[3], Rustiyana[4]
[1]Kunduz University, Afghanistan
[2]Paktia University, Afghanistan
[3]Khost University, Afghanistan
[4]Universitas Bale Bandung, Indonesia

ABSTRACT

Background. Developing conversational fluency in English remains a persistent challenge for Indonesian university students, particularly due to limited opportunities for authentic interaction and a strong reliance on form focused classroom instruction.

Purpose. This quantitative study aimed to investigate the preferences of Thai This study investigates the efficacy of an AI powered chatbot in improving students' conversational fluency within an Indonesian higher education context. The research aims to examine how AI mediated conversational interaction influences fluency development and to evaluate students' perceptions of the chatbot as a learning tool.

Method. Quantitative data were obtained through pre and post tests measuring speech rate, lexical richness, and utterance smoothness, while qualitative insights were collected through semi structured interviews and reflective journals

Results. The findings show a statistically significant improvement in conversational fluency, with notable gains in speech rate and lexical variation. Students reported increased confidence, reduced speaking anxiety, and high levels of engagement during AI assisted practice.

Conclusion. The study concludes that AI powered chatbots can serve as an effective supplementary tool for enhancing conversational fluency in EFL contexts, although long term integration requires pedagogical scaffolding and attention to ethical considerations.

KEYWORDS

AI Powered, Conversational Fluency, EFL Pedagogy

Citation: Zahir, R., Khan, R., Ali, Z & Rustiyana, Rustiyana. (2025). The Efficacy of an AI Powered Chatbot for Improving Conversational Fluency Among Indonesian University Students. *International Journal of Language and Ubiquitous Learning, 3*(5), 249–259.
https://doi.org/10.70177/ijlul.v3i5.2841

Correspondence:

Roya Zahir,
royazahier@gmail.com

Received: June 7, 2025

Accepted: Aug 2, 2025

Published: Oct 9, 2025

INTRODUCTION

The development of conversational fluency remains a persistent challenge for English as a Foreign Language (EFL) learners in Indonesia. University students often struggle to achieve fluid, spontaneous communication despite years of formal English instruction. Traditional classroom practices tend to prioritize grammar accuracy and written tasks, leaving limited room for meaningful oral interaction that nurtures fluency. Global research demonstrates that conversational fluency is shaped by repeated exposure to authentic communication, opportunities to negotiate meaning, and continuous pratice with responsive interlocutors

(Bhukya et al., 2025; Suresh Chinnathampy et al., 2025). Conventional instruction alone rarely provides adequate conditions for such development. The emergence of artificial intelligence as a learning tool has transformed possibilities in language education. AI powered chatbots, equipped with natural language processing capabilities, can simulate real time conversational exchanges that mirror human interactions. These systems offer immediate feedback, adaptive prompts, and unlimited opportunities for practice, potentially overcoming constraints of classroom time and teacher availability. Studies in various EFL contexts indicate that AI mediated interaction can enhance motivation, foster self directed learning, and reduce communication anxiety. Learners appreciate the non judgmental environment created by chatbots, which enables them to experiment freely with language without fear of embarrassment. Such affective benefits are essential for improving oral fluency (Senthil Kumar et al., 2025; Shekhawat et al., 2025).

Indonesian universities have begun exploring AI based applications to support language learning, particularly as digital literacy among students continues to rise. Pilot implementations of chatbots in writing, vocabulary, and pronunciation tasks have shown positive learner responses. These early studies highlight the potential role of AI as a supplementary tool rather than a replacement for human instruction. The increasing accessibility of AI platforms positions chatbots as a promising solution to Indonesia's long standing challenge of improving students' fluency. The ability of AI to provide individualized, on demand practice aligns with national goals to strengthen English proficiency and global competitiveness among university graduates (Prathiksha et al., 2025; Selvi et al., 2025).

Empirical evidence on the impact of AI powered chatbots specifically on conversational fluency among Indonesian university students remains limited. Existing studies in Indonesia generally focus on vocabulary development, grammar practice, or written communication, leaving fluency arguably the most complex dimension of speaking underexplored. The extent to which chatbot interaction can influence measurable aspects of fluency such as speech rate, lexical richness, and utterance smoothness is not well understood. Most available research relies heavily on student perceptions rather than objective performance indicators. This gap inhibits the formation of evidence based recommendations for integrating AI tools into speaking curricula (Mohammed, 2025; Prathiksha et al., 2025).

Pedagogical insights into how Indonesian learners engage with chatbots during spontaneous conversation tasks remain insufficient. Factors such as cultural communication norms, learner preferences, and anxiety levels may shape the learning experience differently compared to other contexts. Without qualitative insights, the mechanism by which chatbots support fluency development remains unclear. The long term educational implications of adopting AI chatbots in Indonesian higher education are not adequately theorized. Questions concerning sustainability, teacher readiness, and equity of access require deeper scrutiny before broader institutional adoption can be recommended.

Addressing this research gap is essential for determining whether AI powered chatbots can serve as evidence based tools to enhance conversational fluency in Indonesian universities. A deeper inquiry into their effectiveness would provide educators with data driven guidance for designing contemporary, technology mediated learning environments. Such insights are crucial as universities navigate the shift toward digital transformation. A structured investigation combining quantitative fluency measures with qualitative learner experiences offers the possibility of understanding both performance gains and the underlying processes that support them. This dual approach strengthens the validity of conclusions and aligns with best practices in educational

technology research, where learning outcomes and user interaction patterns must both be considered (Harini et al., 2025; Reddy et al., 2026).

The present study aims to evaluate the efficacy of an AI powered chatbot in improving conversational fluency among Indonesian university students and to examine learner perceptions of AI mediated interaction. The findings are expected to inform pedagogical decision making, contribute to theoretical discussions on human AI interaction in language learning, and support the strategic integration of AI tools in higher education.

RESEARCH METHODOLOGY

The study employed a mixed methods research design integrating quantitative and qualitative approaches to examine the efficacy of an AI powered chatbot in enhancing conversational fluency among Indonesian university students (Kalshetti et al., 2025; Wiboolyasarin et al., 2025). The quantitative component measured changes in fluency performance through pre and post intervention speaking tests, while the qualitative component captured learner experiences, behavioral patterns, and interactional perceptions. This design provided a comprehensive understanding of both measurable linguistic outcomes and the pedagogical processes that shaped them.

The population consisted of undergraduate students enrolled in an English language program at a public Indonesian university offering compulsory speaking courses. The sample included 68 students selected through purposive sampling based on their willingness to participate and their intermediate English proficiency placement scores. The chosen sample size ensured representation of learners with comparable linguistic backgrounds while maintaining feasibility for qualitative data collection and classroom based observation (Osmani & Althonayan, 2026; Wiboolyasarin et al., 2025).

The study utilized three primary instruments: a standardized speaking test adapted from an established EFL fluency rubric, a logging system embedded in the AI chatbot that automatically recorded conversational interactions, and semi structured interview protocols designed to elicit learner perceptions. The speaking test evaluated speech rate, lexical richness, and utterance smoothness. Chatbot logs documented turn taking patterns, error frequency, and duration of interaction. The interviews explored students' attitudes toward AI mediated communication and their perceived improvements in fluency (Almeida et al., 2025; Syed Ali Fathima et al., 2025).

The research procedures began with an initial orientation session followed by the administration of pre test measures. Participants then engaged in AI chatbot mediated conversational tasks three times per week over a four week intervention period. Each session allowed students to complete open ended dialogues tailored to academic and everyday communication contexts. Post test assessments were administered at the conclusion of the intervention, and qualitative interviews were conducted within one week to ensure recall accuracy. Data were analyzed using descriptive and inferential statistics for the quantitative component and thematic analysis for the qualitative component (Khaliq et al., 2025; Sinlapaninman & Yonwilad, 2025).

RESULT AND DISCUSSION

The quantitative dataset consisted of pre test and post test measures of conversational fluency collected from 68 Indonesian university students. Fluency was assessed through three indicators: speech rate (words per minute), lexical richness (type token ratio), and utterance smoothness (pause frequency per minute). The mean pre test scores indicated moderate fluency performance, while the

post test scores demonstrated noticeable gains following the chatbot intervention. Table 1 provides a descriptive summary of the major fluency indicators.

The statistical patterns showed consistent improvements across all measured dimensions, with speech rate showing the largest gain. Lexical richness increased modestly, suggesting gradual vocabulary expansion, while utterance smoothness improved through reduced hesitation markers. The descriptive data confirmed that repeated engagement with the AI powered chatbot produced measurable changes in students' speaking performance.

Table 1. Descriptive statistics of conversational fluency indicators (n = 68)

Fluency Indicator	Pre test Mean	Post test Mean	Gain Score
Speech Rate (WPM)	78.4	102.7	+24.3
Lexical Richness (TTR)	0.41	0.48	+0.07
Smoothness (Pauses/min)	6.8	4.1	–2.7

Speech rate emerged as the most responsive indicator, increasing by an average of 24.3 words per minute. Students demonstrated greater fluidity in producing extended utterances, suggesting that chatbot interaction facilitated automaticity and reduced the cognitive burden associated with generating language in real time. The increased familiarity with conversational patterns likely contributed to this improvement. Lexical richness and utterance smoothness showed more moderate gains yet remained academically meaningful. Learners incorporated a wider range of vocabulary items and relied less on repetitive phrasing. Pause frequency declined as students gained confidence in managing turn taking within AI mediated dialogues. The combined improvements indicated stronger control over core dimensions of conversational fluency.

The qualitative dataset was derived from 20 semi structured interviews and 120 pages of reflective journals. Students frequently emphasized the convenience of on demand practice, highlighting how the chatbot allowed them to repeat conversational tasks until they achieved comfort and clarity. Many participants described the AI environment as "non judgmental," which reduced anxiety and encouraged experimentation with new expressions. Patterns in the qualitative responses indicated convergence between perceived improvement and quantitative performance gains. Learners repeatedly mentioned feeling "more fluent" and "less hesitant" during conversations outside the intervention. Several participants noted that the instant feedback provided by the chatbot helped them identify errors and develop self monitoring strategies during speech production.

The paired sample t test was conducted to determine the significance of pre test and post test differences. The analysis revealed statistically significant improvements across all fluency indicators ($p < 0.001$). Speech rate had the highest effect size (Cohen's $d = 0.82$), indicating a strong practical impact of the chatbot intervention. Lexical richness displayed a moderate effect size ($d = 0.56$), while utterance smoothness showed a medium effect ($d = 0.60$). The inferential results confirmed that the observed improvements were unlikely to have occurred by chance. Table 2 summarizes the t test results, reinforcing the robustness of the intervention. The statistical evidence validates the efficacy of the AI powered chatbot in enhancing conversational fluency among Indonesian university learners.

Table 2. Paired sample t test of fluency indicators

Indicator	t value	p value	Effect Size (d)
Speech Rate	9.27	<0.001	0.82
Lexical Richness	6.14	<0.001	0.56
Utterance Smoothness	6.48	<0.001	0.60

A clear relational pattern emerged between the frequency of chatbot interaction and fluency gains. Students who engaged more consistently with the chatbot sessions recorded higher speech rate increases and lower hesitation counts. The interaction logs showed that participants with over 12 hours of chatbot usage exhibited disproportionately higher gains than those with fewer than six hours. The relationship between lexical richness and learner engagement revealed a similar trend. Students who frequently explored alternative responses during chatbot dialogues demonstrated greater vocabulary diversity. The qualitative reflections supported this relationship, emphasizing that chatbot prompts encouraged learners to vary lexical choices rather than rely on memorized phrases.

A focused case study of three high improvement participants provided deeper insight into the mechanisms underlying fluency development. These students reported consistent chatbot interaction, averaging 70–90 minutes per session, and engaged heavily in extended conversation tasks. Their speech rate increased by more than 35 words per minute, and their hesitation markers dropped sharply. Another case study of two low improvement participants revealed differing behavioral patterns. These students engaged for shorter durations and avoided complex conversational prompts. Their performance gains were minimal, and their interviews highlighted persistent anxiety and limited willingness to take linguistic risks. The contrast between the two cases reinforced the role of sustained engagement and openness to experimentation in achieving fluency gains.

The case studies illustrated how learner autonomy and persistence shaped the extent of fluency improvement. High engagement learners benefited from iterative practice cycles, where repeated exposure allowed them to internalize conversational routines. Students with low engagement experienced fewer opportunities to build automaticity, which limited the impact of the intervention. The qualitative patterns also underscored the importance of affective factors in chatbot mediated learning. Students who viewed the chatbot as a supportive tool showed greater confidence and experimentation, while those who felt uncertain about AI interaction demonstrated hesitation that constrained fluency development. The data highlight the interplay between motivation, engagement, and technological acceptance.

The combined quantitative and qualitative findings indicate that the AI powered chatbot effectively enhanced conversational fluency among Indonesian university students. Improvements in speed, vocabulary diversity, and smoothness demonstrate that the intervention supported both linguistic and affective dimensions of fluency development. The significant t test results provide strong empirical support for the efficacy of AI mediated conversational practice. The relational and case study analyses further clarify that the level of engagement is a critical determinant of fluency gains. Students who actively participated and embraced the chatbot environment experienced the most substantial improvements. The evidence suggests that AI powered conversational tools can serve as a powerful supplement to traditional EFL instruction when integrated with sufficient learner motivation and structured practice.

The findings of this study demonstrate substantial gains in conversational fluency among Indonesian university students following a four week AI powered chatbot intervention. Quantitative improvements were recorded in three major fluency indicators: speech rate, lexical richness, and utterance smoothness. Students spoke faster, used a wider range of vocabulary, and produced fewer hesitation markers during the post test (Aftab et al., 2025; Muna et al., 2025). These improvements confirm the potential of AI mediated interaction as an effective supplement to traditional EFL speaking instruction. Qualitative evidence provides additional depth to the numerical gains. Learners consistently reported reduced anxiety, increased confidence, and a sense of autonomy

while interacting with the chatbot. Many described the experience as "non judgmental," highlighting the psychological comfort of practicing with an AI rather than a human interlocutor. The positive emotional climate appeared to support more frequent and sustained practice (Harini et al., 2025; Magnolfi et al., 2025).

Interaction logs reveal behavioral patterns that correlate with performance gains. Students who engaged more regularly in chatbot conversations recorded higher improvement scores, suggesting that consistent exposure contributes to the internalization of conversational routines. Frequent use encouraged longer turns, more complex sentences, and diversified lexical choices. The combined dataset indicates that fluency development is strongly shaped by both linguistic practice and affective support. Students benefited from the chatbot's instant feedback, unlimited availability, and adaptive responses, which allowed them to rehearse spoken language in a controlled yet flexible environment. These findings strengthen the position of AI chatbots as viable instructional tools for enhancing oral proficiency (Horvat et al., 2025; Limkar et al., 2026).

The results align with previous research emphasizing the effectiveness of AI mediated communication in improving various aspects of language performance. Studies from East Asian and Middle Eastern EFL contexts have shown that chatbots promote vocabulary acquisition, reduce communication anxiety, and increase learner engagement. The present study extends these findings by offering quantitative evidence specifically related to fluency indicators such as speech rate and utterance smoothness (Ahmad, 2025; Logapriya et al., 2025). Notable differences emerge when comparing the relative impact on fluency dimensions. Several prior investigations report strong gains in lexical diversity but modest changes in spontaneous speaking speed. The current study reverses that pattern, with speech rate showing the largest improvement. This contrast suggests that Indonesian learners may respond differently to chatbot mediated practice due to cultural communication norms or prior instructional experiences.

The results also diverge from studies suggesting that chatbots have limited influence on spoken accuracy. Participants in this research reported an increased awareness of pronunciation and grammatical patterns due to instant corrective feedback. Although accuracy was not measured directly, qualitative reflections indicate that learners perceived improvements in both fluency and control over linguistic forms. The present findings contribute new insights into the contextual variability of AI assisted learning. Evidence suggests that learners' backgrounds, technological familiarity, and classroom culture shape how chatbots influence language development. Indonesian university students appear particularly responsive to the motivational and affective dimensions of chatbot interaction, which may account for the magnitude of fluency gains observed (Dutta et al., 2025; Pal & Chandrakar, 2025).

The findings indicate a transformative shift in how Indonesian university students develop conversational fluency. Students are no longer dependent solely on classroom based interaction but can engage in autonomous, adaptive, and repetitive practice at their own pace. This autonomy suggests a broader trend toward self regulated learning supported by AI tools. The improvements in speech rate and smoothness reflect enhanced automaticity in language production. Students became more adept at accessing linguistic forms without extensive cognitive processing. This pattern indicates that repetitive, low risk practice with the chatbot allowed learners to transition from controlled processing to more fluent, dynamic communication (Littell & Peterson, 2025; Rather, 2025).

The qualitative evidence highlights the central role of affective variables. Students' reduced anxiety and increased confidence show that emotional safety is a critical mediating factor in fluency development. The chatbot provided a learning environment free from fear of judgment, enabling

experimentation and risk taking two essential components of oral proficiency growth. The results collectively signal that AI powered tools can reshape the ecology of language learning by offering individualized interaction and emotional scaffolding. Such findings mark a departure from traditional top down instruction and highlight an emerging pedagogy that combines technology, psychology, and linguistic development (Kalai Selvi et al., 2025; Nada et al., 2025).

The findings have significant implications for EFL pedagogy in Indonesia and similar contexts. AI powered chatbots can serve as accessible supplementary tools that extend practice opportunities beyond the classroom. Educators can integrate chatbot tasks into coursework to promote continuous speaking exposure that is otherwise difficult to achieve within limited instructional time. The results suggest that conversational fluency should not rely exclusively on human interaction. AI mediated dialogue offers scalable practice opportunities, especially in institutions with large class sizes and limited speaking instructors. Universities may consider adopting chatbot based speaking labs to support extensive oral practice.

The affective benefits observed in the study imply that chatbots can help reduce anxiety associated with speaking English. This function is especially useful in cultures where students may fear losing face or being judged for linguistic errors. Chatbots can democratize learning by providing a safe space for practice regardless of proficiency level. The evidence indicates that policymakers should consider AI integration as part of broader digital literacy initiatives. Investments in training, infrastructure, and platform development could enhance institutional readiness for AI based language learning. These implications extend beyond individual classrooms and speak to national educational modernization.

The substantial gains in speech rate can be attributed to the unlimited practice opportunities provided by the chatbot. Students engaged in repetitive conversation cycles that reinforced linguistic patterns, enabling faster retrieval during spontaneous speech. The constant availability of the chatbot supported distributed practice, which is known to strengthen long term memory consolidation. The improvement in lexical richness reflects the chatbot's ability to generate varied prompts and encourage diverse responses. Students encountered a wider range of topics and communicative scenarios than would typically arise in classroom interactions. The adaptive nature of AI contributed to exposure that broadened learners' lexical repertoire (Ateş Demiroglu et al., 2025; Mahendran et al., 2025).

The reduction in hesitation markers can be explained by the psychological comfort provided by AI mediated communication. Students felt less pressure when speaking to the chatbot, which reduced cognitive load associated with anxiety. Lower anxiety enabled smoother speech production and increased willingness to experiment with language. The observed patterns also stem from the alignment between chatbot features and principles of communicative language teaching. The chatbot facilitated negotiation of meaning, meaningful input, and pushed output three factors known to drive fluency development. The synergy between technology and second language acquisition theory explains the strength of the results.

Future research should expand the scope of investigation by examining long term retention of fluency gains. Sustained observation over multiple semesters would reveal whether chatbot assisted practice leads to durable improvements or requires continuous reinforcement. Broader samples across different universities could strengthen generalizability. Curriculum designers should consider embedding AI chatbot interaction into structured speaking programs. Chatbot modules could be aligned with specific learning outcomes, coupled with teacher led debriefing sessions that help students reflect on their performance. Such integration may maximize pedagogical impact.

Teacher training programs need to prepare educators for AI assisted instruction. Instructors should learn to interpret chatbot data logs, identify students' speaking patterns, and design follow up activities that complement AI practice. Human AI collaboration is likely to become a central component of future language pedagogy. Institutions should explore ethical, accessibility, and data privacy considerations associated with AI usage. Thoughtful policy development will ensure that chatbot integration supports not replaces human instruction. The findings of this study provide a foundation for responsible innovation in language education (Cha et al., 2025; Mahendran et al., 2025).

CONCLUSION

The central finding of this study reveals a distinct pattern of improvement in students' conversational fluency, marked by significant gains in speech rate, lexical richness, and utterance smoothness following sustained interaction with an AI powered chatbot. The most notable result lies in the disproportionately high increase in speech rate compared to other fluency dimensions, indicating that Indonesian university students respond strongly to repetitive, on demand conversational practice offered by AI mediated environments. This outcome differs from earlier studies that reported only moderate gains in fluency, suggesting that contextual, cultural, and technological familiarity may amplify the effectiveness of chatbot based learning for this population.

The study contributes added value by integrating a mixed methods framework that connects quantitative fluency indicators with qualitative insights into learner behavior, affect, and engagement, thereby offering a multidimensional understanding of how AI chatbots influence oral proficiency. The methodological contribution lies in the use of chatbot interaction logs as pedagogical data, enabling researchers to examine conversational patterns, turn taking behavior, and hesitation markers in ways not feasible through traditional observational techniques. This approach enriches conceptual discussions on human AI interaction in language education and positions chatbot mediated practice as both a linguistic and psychological scaffold.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing review and editing.
Author 2: Conceptualization; Data curation; In vestigation.
Author 3: Data curation; Investigation.
Author 4: Formal analysis; Methodology; Writing original draft.

REFERENCES

Aftab, O. A., Wilkins, S., & Iqbal, H. (2025). AI Powered Banking Assistants: Enhancing Customer Service with Technology. In K. Al Marri, F. A. Mir, A. Awad, & A. Abubakar (Eds.), *Lect. Notes Civ. Eng.* (Vol. 587, pp. 43–53). Springer Science and Business Media Deutschland GmbH; Scopus. https://doi.org/10.1007/978 3 031 84371 6_4

Ahmad, F. B. (2025). AI Powered Chatbots for Mobile Teacher Training: Enhancing Interactive Learning Experiences. *International Journal of Interactive Mobile Technologies*, *19*(17), 41–59. Scopus. https://doi.org/10.3991/ijim.v19i17.54387

Almeida, M., Machado, J., Sousa, R., & Peixoto, H. (2025). AI Powered Automation in Healthcare: A Multi agent Approach with LLM. In A. Nongaillard, A. C. Caron, A. González Briones, A. Fernández, D. Durães, & N. Sharaf (Eds.), *Commun. Comput. Info. Sci.: Vol. 2644 CCIS* (pp. 132–143). Springer Science and Business Media Deutschland GmbH; Scopus. https://doi.org/10.1007/978 3 032 05925 3_11

Ateş Demiroglu, S. B., Özpolat Bulut, Ö., & Bağcıer, F. (2025). AI powered insights: Analyzing ChatGPT's responses on myofascial pain syndrome. *Journal of Bodywork and Movement Therapies*, *44*, 558–563. Scopus. https://doi.org/10.1016/j.jbmt.2025.05.043

Bhukya, S., Narmula, A., Goparaju, R., & Kamasani, V. R. (2025). AI Powered Healthcare Assistant Using Machine Learning Techniques. *Proc. Int. Conf. Inven. Comput. Informatics, ICICI*, 855–859. Scopus. https://doi.org/10.1109/ICICI65870.2025.11069506

Cha, E., Son, N. H., Huh, Y. E., Jang, H., Park, H., Sung, G., Kim, G., Baek, G., Kim, J., Shin, Y. A., Jeon, M. S., & Joung, K. H. (2025). AI powered hybrid self management coaching for adults with early onset Type 2 diabetes in Korea: A randomized clinical trial protocol. *Contemporary Clinical Trials*, *159*. Scopus. https://doi.org/10.1016/j.cct.2025.108132

Dutta, S., Arivazhagan, A., Sakthi Prasath, G. B., & Edwin, T. S. (2025). AI powered chatbots in Meta marketing (Facebook and Instagram): A game changer for brand communication and engagement in e commerce industries. *Journal of Information Technology Teaching Cases*. Scopus. https://doi.org/10.1177/20438869251338322

Harini, K., Ankitha, N., Siddhi, A., & Pillareddy, P. V. (2025). AI Based Chatbot for Personalized Student Assistance. *Proc. Int. Conf. Innov. Mech. Ind. Appl., ICIMIA*, 1025–1031. Scopus. https://doi.org/10.1109/ICIMIA67127.2025.11200802

Horvat, S., Horvat, T., Havaš, L., & Crčić, D. (2025). AI Powered Chatbots for Enhancing Accessibility in Higher Education-Design and Implementation. *Elektrotehniski Vestnik/Electrotechnical Review*, *92*(1–2), 61–67. Scopus.

Kalai Selvi, T., Hariharan, K. K., HariPrasath, K., Kamalesh, M. S., & Girinath, R. (2025). AI Powered E Learning Platform. *Proc. Int. Conf. Pervasive Comput. Soc. Netw., ICPCSN*, 1922–1928. Scopus. https://doi.org/10.1109/ICPCSN65854.2025.11035551

Kalshetti, P., Anute, N., Limbore, N. V., & Lahoti, Y. (2025). AI Driven Chatbots and Brand Perception: A Study on Conversational UX in Digital Marketing. *Int. Conf. Innov. Intell. Syst.: Adv. Comput., Commun., Cybersecur., ISAC3*. Scopus. https://doi.org/10.1109/ISAC364032.2025.11156800

Khaliq, A., Khan, A., Jan, S., Umair, M., Gulshair, A., Ali, A., & Shah, U. A. (2025). AI Driven Smart Agriculture: An Integrated Approach for Soil Analysis, Irrigation, and Crop Fertilizer Recommendations. *IEEE Access*, *13*, 141124–141138. Scopus. https://doi.org/10.1109/ACCESS.2025.3594162

Limkar, S., Gowardhan, C., Dahake, D., Naik, S., & Bang, A. V. (2026). AI Powered Chatbot for Mental Health Assistance. In T. Senjyu, C. So In, & A. Joshi (Eds.), *Lect. Notes Networks Syst.: Vol. 1462 LNNS* (pp. 75–87). Springer Science and Business Media Deutschland GmbH; Scopus. https://doi.org/10.1007/978 981 96 7511 1_7

Littell, W. N., & Peterson, B. L. (2025). AI powered chatbots to simulate executive interactions for students performing stakeholder analysis. *Communication Teacher*, *39*(1), 18–25. Scopus. https://doi.org/10.1080/17404622.2024.2405188

Logapriya, D., Senthil Kumar, A. V., Tennin, K. L., Kaur, G., Mir, S., Shanmugasundaram, S., Mishra, V., Musirin, I. B., Latip, R. B., Irawati, I. D., Suganya, R. V., & Saleh, O. S. (2025). AI powered chatbots for managing sinusitis: Integration of ayurvedic and home remedies. In *Tech. And Appl. Of Biomed. AI* (pp. 19–54). IGI Global; Scopus. https://doi.org/10.4018/979 8 3373 0548 6.ch002

Magnolfi, A., Vicario, E., & Boncinelli, L. (2025). AI Powered Chatbot Assistant for Course Organization. In P. Ardimento, G. Zaza, R. Di Fuccio, P. Limone, G. Fulantelli, D. Schicchi, D. Taibi, R. Pecori, P. Raviolo, & M. Rondonotti (Eds.), *Commun. Comput. Info. Sci.: Vol. 2467 CCIS* (pp. 185–196). Springer Science and Business Media Deutschland GmbH; Scopus. https://doi.org/10.1007/978 3 031 94002 6_14

Mahendran, M., Sanjay, S., Shriram Kumar, A. N., & Kumar, P. (2025). AI Powered Hybrid Recommendation System for E Commerce. *Proc. Int. Conf. Augment. Intell. Sustain. Syst., ICAISS*, 1672–1681. Scopus. https://doi.org/10.1109/ICAISS61471.2025.11042218

Mohammed, N. J. (2025). AI Robots in Digital Advertising and Their Role in Enhancing Customer Engagement. In A. Abdelgawad, A. A. Hameed, & A. Jamil (Eds.), *Lect. Notes Networks Syst.: Vol. 1697 LNNS* (pp. 339–353). Springer Science and Business Media Deutschland GmbH; Scopus. https://doi.org/10.1007/978 3 032 09562 6_25

Muna, A., Amjad, A., Abdulhafeez, J., & Ishaque, M. (2025). AI Powered Cancer Analysis: A Secure and Innovative Approach to Early Diagnosis and Prognosis. *Int. Conf. Adv. Innov. Smart Cities, ICAISC*. Scopus. https://doi.org/10.1109/ICAISC64594.2025.10959580

Nada, A., Ahmed, Y., Hu, J., Weidemann, D., Gorman, G. H., Lecea, E. G., Sandokji, I. A., Cha, S., Shin, S., Bani Hani, S., Mannemuddhu, S. S., Ruebner, R. L., Kakajiwala, A., Raina, R., George, R., ElChaki, R., & Moritz, M. L. (2025). AI powered insights in pediatric nephrology: Current applications and future opportunities. *Pediatric Nephrology*. Scopus. https://doi.org/10.1007/s00467 025 06911 1

Osmani, Z., & Althonayan, A. (2026). AI Driven Digital Transformation in HE Marketing: Opportunities and Challenges in Student Recruitment. In K. Dhoska & E. Spaho (Eds.), *Commun. Comput. Info. Sci.: Vol. 2670 CCIS* (pp. 504–513). Springer Science and Business Media Deutschland GmbH; Scopus. https://doi.org/10.1007/978 3 032 07370 9_37

Pal, T., & Chandrakar, K. (2025). AI powered chatbots for pharmacy based patient education and counseling. *Journal of Neonatal Surgery*, *14*(1), 496–500. Scopus. https://doi.org/10.52783/jns.v14.1567

Prathiksha, R. S., Rithika, S., Sarnitha, R., & Kingsy Grace, R. (2025). AI Quiz: Intelligent MCQ Generation and Assessment Chatbot. *Int. Conf. Circuit, Power Comput. Technol., ICCPCT*, 847–852. Scopus. https://doi.org/10.1109/ICCPCT65132.2025.11176545

Rather, R. A. (2025). AI powered ChatGPT in the hospitality and tourism industry: Benefits, challenges, theoretical framework, propositions and future research directions. *Tourism Recreation Research*, *50*(3), 652–662. Scopus. https://doi.org/10.1080/02508281.2023.2287799

Reddy, N. T. K., Patra, M. R., & Mishra, B. K. (2026). AI Based Chatbot with Recommender System for Interactive Support. In S. K. Udgata, D. Mohapatra, S. Sethi, & M. E. Rana (Eds.), *Lect. Notes Networks Syst.: Vol. 1624 LNNS* (pp. 233–244). Springer Science and Business Media Deutschland GmbH; Scopus. https://doi.org/10.1007/978 3 032 05117 2_22

Selvi, K., Deepak, N., Efrain Infanto, J., Gouthamraj, M., Jaivishwak, G., & Shai Kumar, R. (2025). AI Powered Virtual Assistant for Enhanced Accessibility in the Visually Impaired Community. *Proc. Int. Conf. Innov. Mech. Ind. Appl., ICIMIA*, 933–937. Scopus. https://doi.org/10.1109/ICIMIA67127.2025.11200576

Senthil Kumar, K., Priyanka, P., & Ranjith, L. (2025). AI Powered Smart Recognition of Plant Diseases with Vernacular Language Support. In N. K. Ray, P. Yanambaka, & P. K. Mallick (Eds.), *ESIC Int. Conf. Emerg. Syst. Intell. Comput., Proc.* (pp. 801–806). Institute of Electrical and Electronics Engineers Inc.; Scopus. https://doi.org/10.1109/ESIC64052.2025.10962713

Shekhawat, Y., Tiwari, U., Mehdi, S. H., & Vaishy, H. (2025). AI Powered Legal Documentation Assistant. In *Emerging Trends in Computer Sci. And Its Applic.* (pp. 628–632). CRC Press; Scopus. https://doi.org/10.1201/9781003606635 111

Sinlapaninman, U., & Yonwilad, W. (2025). AI Enhanced Research Coaching for Graduate Education: A Mixed Methods Evaluation of Learning Outcomes and Educational Design Effectiveness. *Educational Process: International Journal*, *19*. Scopus. https://doi.org/10.22521/edupij.2025.19.535

Suresh Chinnathampy, M., Mahesh, P., Kumar, S. S., Vignesh, P., Berin, K. T., & Subramani, D. S. (2025). AI Powered Laptop Fault Detection and Diagnosis. *Int. Conf. Circuit, Power Comput. Technol., ICCPCT*, 155–159. Scopus. https://doi.org/10.1109/ICCPCT65132.2025.11176595

Syed Ali Fathima, R. S., Gokkul, R., Nirmalsahaj, M., Rohith, S., & Rupesh, S. (2025). AI Powered Autism Detection, Awareness, and Social Integration: A Comprehensive Framework. *Int.*

Conf. Comput. Robot., Test. Eng. Eval., ICCRTEE. Scopus. https://doi.org/10.1109/ICCRTEE64519.2025.11052912

Wiboolyasarin, W., Wiboolyasarin, K., Tiranant, P., Jinowat, N., & Boonyakitanont, P. (2025). AI driven chatbots in second language education: A systematic review of their efficacy and pedagogical implications. *Ampersand*, *14*. Scopus. https://doi.org/10.1016/j.amper.2025.100224