



# International Journal of DATA SCIENCE AND IOT MANAGEMENT SYSTEM

Peer Reviewed, Referred & Indexed Journal

ISSN: 3068-272X

www.ijdim.com

Original Research Paper

## Ran LLM Driven Chatbot In Higher Education For Databases And Information Systems

<sup>1</sup>B. Prashant,<sup>2</sup>Simhadri Baby Siva Chandrika,<sup>3</sup>Pujari Sri Harshitha,<sup>4</sup>Mallela Manikanta,<sup>5</sup>Javvaji Pavan Ganesh

<sup>1</sup>Associate professor & Head Of Department, Department of CSE-DATASCIENCE, Eluru College of Engineering and Technology

<sup>2,3,4,5</sup>B. Tech Student, Department of CSE-DATASCIENCE, Eluru College of Engineering and Technology

### ABSTRACT

The integration of large language model (LLM) chatbots into Learning Management Systems (LMS) has the potential to enhance the teaching and learning experience in higher education. This study investigates the development, deployment, and evaluation of an LLM-based chatbot named MoodleBot designed for computer science classroom environments. The chatbot aims to support self-regulated learning (SRL) and assist students in seeking academic help through an interactive platform integrated with the Moodle LMS. Despite challenges associated with artificial intelligence technologies, such as bias, hallucinations, and resistance from educators toward adopting new tools, this research addresses two key questions: the level of student acceptance of Moodle Bot as a learning support tool and the accuracy of its responses in relation to course content. The chatbot was developed using a Retrieval-Augmented Generation (RAG) approach to ensure that responses are generated based on relevant course materials. The Technology Acceptance Model (TAM) was employed to evaluate user acceptance, focusing on perceived usefulness and ease of use. A total of 46 students participated in the study, with 30 completing the TAM questionnaire. The results indicate that Moodle Bot achieved an accuracy rate of approximately 88% in providing course-related assistance. The findings suggest that AI-driven educational chatbots can improve personalized learning experiences and reduce instructors' administrative workload, although further improvements in automated fact checking are necessary to enhance reliability.

**Keywords:** Large Language Models (LLMs), Educational Chatbots, Database Education, Information Systems Learning, Natural Language Processing, Conversational Artificial Intelligence, Intelligent Tutoring Systems, Higher Education Technology.



## I. INTRODUCTION

The rapid advancement of Artificial Intelligence (AI) and Machine Learning (ML) has transformed multiple domains, including education. In higher education, students face an increasing need for personalized, interactive, and immediate support while learning complex subjects like Databases and Information Systems. Traditional LMSs, such as Moodle, provide a structured framework for course content delivery, assignments, and assessments. However, they often rely on static resources and instructor availability for queries, which limits the scope for self-directed learning, feedback, and continuous engagement. Students may encounter difficulties when navigating course material independently or require clarification on specific concepts outside class hours. Similarly, instructors often experience a high administrative burden answering repetitive questions, monitoring student progress, and providing individualized support, which can reduce overall teaching efficiency.

To address these challenges, this project proposes MoodleBot, an AI-driven chatbot powered by LLM and enhanced using a (RAG) approach. MoodleBot is designed to integrate seamlessly into LMS platforms, providing real-time, context-aware, and personalized responses to students' questions. Unlike traditional rule-based chatbots or FAQ systems, MoodleBot can handle complex and unforeseen queries by leveraging both generative AI and curated course content. This allows students to interact naturally with the system, obtain immediate clarifications, and receive

guidance tailored to their learning progress. By offering dynamic explanations, hints, follow-up questions, and references to related concepts, MoodleBot encourages self-regulated learning, fosters critical thinking, and helps students develop autonomy in their educational journey.

From an instructor's perspective, MoodleBot reduces repetitive workload and provides valuable analytics on student queries, frequently misunderstood concepts, and overall engagement patterns. Teachers can use this data to adapt instructional strategies, identify knowledge gaps, and improve the quality of course material. Overall, the integration of an LLM-driven chatbot like MoodleBot into higher education represents a significant step toward interactive, personalized, and scalable learning experiences. It not only enhances the teaching-learning process but also prepares students for a digitalized, AI-driven educational environment, where independent learning and instant access to knowledge critical for success.

## II. LITERATURE SURVEY

**1. Title:** ChatGPT for Teaching and Learning: A Review of Applications in Higher Education

**Author:** Zhai, X., Chu, X., Chai, C. S., et al.

### **Abstract:**

This study investigates the potential applications of large language model-based conversational agents in higher education. The authors analyze how generative AI tools such as ChatGPT can support teaching, learning, assessment, and academic assistance. The paper highlights the



advantages of conversational AI in providing instant feedback, answering student queries, and improving engagement in online learning environments. It also discusses ethical considerations, including academic integrity and responsible AI use. The results indicate that LLM-powered systems can serve as intelligent assistants for both instructors and students when integrated appropriately into educational platforms.

**2. Title:** Conversational Agents in Education: A Systematic Review  
**Author:** Winkler, R., & Söllner, M.

**Abstract:**

This research presents a systematic review of conversational agents used in educational contexts. The study evaluates the design, implementation, and effectiveness of chatbots in supporting learning activities. The authors identify several benefits, including personalized learning support, automated tutoring, and improved accessibility to educational resources. The paper also categorizes chatbot applications across different domains and highlights challenges such as limited contextual understanding and scalability. The findings suggest that conversational agents can significantly enhance student interaction and learning outcomes when properly designed.

**3. Title:** Artificial Intelligence in Education: Promises and Implications for Teaching and Learning

**Author:** Holmes, W., Bialik, M., & Fadel, C.

**Abstract:**

This work explores the impact of artificial

intelligence technologies on modern educational systems. The authors discuss how AI-driven tools, including intelligent tutoring systems and chatbots, can support personalized learning experiences. The paper outlines the potential of AI to analyze learner behavior, provide adaptive content, and offer continuous academic support. The study also emphasizes the need for responsible implementation and the development of ethical frameworks to guide AI adoption in educational institutions.

**4. Title:** Intelligent Tutoring Systems and Their Role in Personalized Learning  
**Author:** Woolf, B. P.

**Abstract:**

This paper examines the design and application of intelligent tutoring systems (ITS) that provide personalized educational assistance to learners. The study explains how AI techniques can model student knowledge, identify learning gaps, and deliver customized feedback. The author highlights the ability of tutoring systems to simulate human-like teaching interactions and support self-paced learning. The findings demonstrate that AI-based tutoring systems improve student understanding and performance across multiple academic disciplines.

**5. Title:** Applications of Natural Language Processing in Educational Chatbots

**Author:** Pérez, J. Q., Daradoumis, T., & Puig, J. M.

**Abstract:**

This research focuses on the integration of natural language processing techniques in the development of educational chatbots.

The authors describe how NLP enables chatbots to interpret user queries, maintain conversation context, and generate relevant responses. The paper presents case studies where educational chatbots assist students in answering questions, providing explanations, and guiding them through course materials. The results indicate that NLP-based chatbots can significantly improve accessibility and interaction in digital learning environments.

### III. EXISTING SYSTEM

Traditional computer science classrooms typically utilize learning management systems (LMSs) such as Moodle to manage course content, assignments, and assessments. Students have relied primarily on static materials or the instructor via direct contact for assistance. Some existing digital tools include rule-based chatbots or FAQ systems that provide scripted responses to common questions. However, these systems are limited in ability, cannot carry on dynamic, context-aware conversations, and cannot adapt to the individual learning needs of students. A reliance on human instructors typically leads to greater instructor workload and limited personalized interaction to assist the individual students.

### IV. PROPOSED SYSTEM

Moodle Bot is an AI-powered chatbot that can be embedded in LMS platforms, including Moodle. It is built on large language models (LLMs), and uses a retrieval-augmented generation (RAG) approach to generate dynamic and context-aware responses to students' questions. MoodleBot encourages self-regulated

learning as it can serve as a guide for students while they navigate course material, provide explanations, and support help-seeking behavior. It is personalized to students' individual needs, while also relieving some burden from instructors' administrative responsibilities. Using AI, it aims to enhance the teaching and learning experience by providing accurate, timely, and interactive support for students' academic needs.

### V. SYSTEM ARCHITECTURE

The system architecture of the proposed LLM-powered chatbot framework for database and information systems learning is designed to provide an interactive and intelligent educational support system. The architecture consists of several interconnected components, including the user interface, query processing module, large language model (LLM) engine, knowledge base, and response generation module. These components work together to process student queries, analyze the context, and generate accurate responses related to database and information systems concepts. The architecture ensures smooth communication between the user and the AI-driven system while maintaining efficiency and scalability.

The process begins with the user interface, where students interact with the chatbot through a web-based or application-based platform. Students can enter their questions related to database topics such as SQL queries, database normalization, data modeling, and information system concepts using natural language. The input query is then forwarded to the query processing module, which performs preprocessing tasks

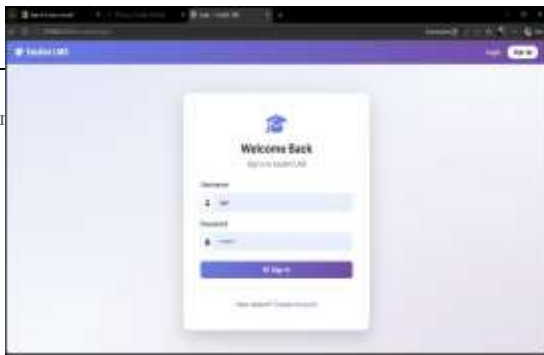
such as tokenization, intent detection, and query interpretation. This module ensures that the user query is properly structured before being sent to the language model for further analysis.

After preprocessing, the query is passed to the large language model engine, which acts as the core intelligence of the system. The LLM analyzes the input query, identifies its context, and retrieves relevant information from the domain-specific knowledge base, which contains academic resources, database examples, lecture notes, and SQL query references. Using advanced natural language processing capabilities, the model generates meaningful and context-aware responses that help students understand the requested topic.

Finally, the response generation module formats the generated output into a clear and understandable response before delivering it back to the student through the chatbot interface. The system may also maintain a contextual memory of previous interactions to provide more coherent and personalized responses during ongoing conversations. Through this architecture, the chatbot can effectively support students in learning database and information systems concepts by providing real-time explanations, examples, and academic guidance.



**Fig 5.1:** Structure of the Proposed System



## VI. IMPLEMENTATION

**Fig 1:** User Login



**Fig 2:** User Conversation Page

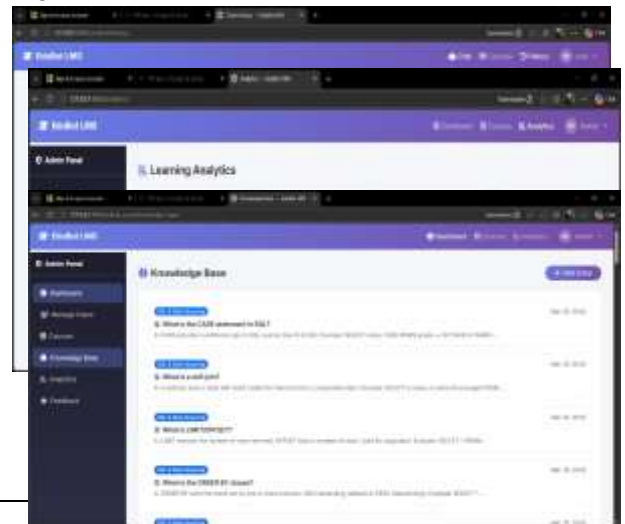
**Fig 3:** User Conversation History

**Fig 4:** Learning Analytics

**Fig 5:** Knowledge Base

## VII. CONCLUSION

This study presented an LLM-powered chatbot framework designed to support the learning of database and information



systems in higher education. The proposed system leverages the capabilities of large language models and natural language processing to provide an intelligent conversational interface that assists students in understanding complex database concepts. By enabling students to interact with the chatbot using natural language, the system offers real-time explanations, SQL query examples, and conceptual guidance related to database design, normalization, indexing, and other core information system topics.

The architecture of the framework integrates a user interface, query processing module, large language model engine, and a domain-specific knowledge base to ensure accurate and context-aware responses. Through this integration, the chatbot functions as an intelligent virtual assistant that enhances accessibility to learning resources and supports self-paced learning. The system also improves student engagement by providing immediate feedback and personalized explanations, which are often not available in traditional learning environments.

Overall, the proposed LLM-driven chatbot demonstrates significant potential in improving the effectiveness of digital learning platforms in higher education. It reduces dependency on manual academic support while helping students gain a better understanding of database and information systems concepts. Future work can focus on expanding the knowledge base, integrating the system with learning management systems, and incorporating adaptive learning mechanisms to further enhance the educational experience.

### **VIII. FUTURE SCOPE**

The proposed LLM-powered chatbot framework for database and information systems learning can be further enhanced in several ways to improve its effectiveness and applicability in educational environments. One potential direction is the integration of the chatbot with Learning Management Systems (LMS) used by universities and colleges. By connecting the chatbot with platforms such as online course portals, the system can provide personalized academic assistance based on course materials, assignments, and student progress.

Another important future enhancement involves incorporating adaptive learning capabilities. By analyzing student interactions, learning patterns, and frequently asked questions, the chatbot can tailor responses according to the individual needs and knowledge levels of students. This would enable the system to provide more personalized explanations, recommend learning resources, and guide students through complex topics in databases and information systems.

The system can also be expanded to support multimodal learning, including diagrams, interactive examples, and visual explanations for database concepts such as entity-relationship modeling and query optimization. Additionally, integrating speech-based interaction and multilingual support would make the chatbot more accessible to a wider range of students from different educational backgrounds.

Furthermore, future research can focus on improving the accuracy, security, and reliability of the chatbot by incorporating



advanced fine-tuning techniques and domain-specific datasets related to database management systems. The framework could also be extended to support other computer science subjects such as data structures, operating systems, and software engineering. These improvements would transform the chatbot into a comprehensive intelligent tutoring system capable of supporting a broader range of educational applications in higher education.

## IX. REFERENCES

- [1] X. Zhai, X. Chu, C. S. Chai, et al., "ChatGPT for education: Opportunities and challenges," *Computers and Education: Artificial Intelligence*, vol. 4, 2023, Art. no. 100138.  
DOI: <https://doi.org/10.1016/j.caeai.2023.100138>
- [2] R. Winkler and M. Söllner, "Unleashing the potential of chatbots in education: A state-of-the-art analysis," *Proceedings of the Academy of Management Annual Meeting*, 2018.  
DOI: <https://doi.org/10.5465/AMBPP.2018.15903abstract>
- [3] W. Holmes, M. Bialik, and C. Fadel, *Artificial Intelligence in Education: Promises and Implications for Teaching and Learning*, Boston, MA, USA: Center for Curriculum Redesign, 2019.  
DOI: <https://doi.org/10.13140/RG.2.2.18403.04646>
- [4] B. P. Woolf, *Building Intelligent Interactive Tutors: Student-Centered Strategies for Revolutionizing E-Learning*, Morgan Kaufmann, 2010.  
DOI: <https://doi.org/10.1016/C2009-0-20118-8>
- [5] J. Q. Pérez, T. Daradoumis, and J. M. Puig, "Rediscovering the use of chatbots in education: A systematic literature review,"

*Computer Applications in Engineering Education*, vol. 28, no. 6, pp. 1549–1565, 2020.

DOI: <https://doi.org/10.1002/cae.22326>

[6] T. Brown et al., "Language models are few-shot learners," *Advances in Neural Information Processing Systems*, vol. 33, pp. 1877–1901, 2020.

DOI:

<https://doi.org/10.48550/arXiv.2005.14165>

[7] J. Devlin, M. Chang, K. Lee, and K. Toutanova, "BERT: Pre-training of deep bidirectional transformers for language understanding," *Proceedings of NAACL-HLT*, 2019, pp. 4171–4186.

DOI: <https://doi.org/10.18653/v1/N19-1423>

[8] A. Vaswani et al., "Attention is all you need," *Advances in Neural Information Processing Systems*, vol. 30, 2017.

DOI:

<https://doi.org/10.48550/arXiv.1706.03762>

[9] S. Adamopoulou and L. Moussiades, "Chatbots: History, technology, and applications," *Machine Learning with Applications*, vol. 2, 2020, Art. no. 100006.

DOI:

<https://doi.org/10.1016/j.mlwa.2020.100006>

[10] M. Okonkwo and A. Ade-Ibijola, "Chatbots applications in education: A systematic review," *Computers and Education: Artificial Intelligence*, vol. 2, 2021, Art. no. 100033.

DOI:

<https://doi.org/10.1016/j.caeai.2021.100033>

[11] K. F. Hew, C. K. Lo, G. S. Tang, and C. M. Huang, "Using chatbots to support student learning: A systematic review," *Educational Research Review*, vol. 27, pp. 1–16, 2019.

DOI:

<https://doi.org/10.1016/j.edurev.2019.100289>

[12] D. K. Elson, N. Dames, and K. McKeown, "Extracting social networks from literary fiction," *Proceedings of ACL*, 2010.

DOI:

<https://doi.org/10.3115/1858681.1858687>



# International Journal of DATA SCIENCE AND IOT MANAGEMENT SYSTEM

Peer Reviewed, Referred & Indexed Journal

ISSN: 3068-272X

www.ijdim.com

Original Research Paper

---

[13] I. Goodfellow, Y. Bengio, and A. Courville, *Deep Learning*, Cambridge, MA, USA: MIT Press, 2016.

DOI:

<https://doi.org/10.7551/mitpress/10243.001.0001>

[14] J. L. Kolodner, "Case-based reasoning in education," *The Knowledge Engineering Review*, vol. 11, no. 3, pp. 1–27, 1996.

DOI:

<https://doi.org/10.1017/S0269888900001204>

[15] R. Dale, "The return of the chatbots," *Natural Language Engineering*, vol. 22, no. 5, pp. 811–817, 2016.

DOI:

<https://doi.org/10.1017/S1351324916000243>