International Journal for Modern Trends in Science and Technology
Volume 11, Issue 04, pages 704-7093.
ISSN: 2455-3778 online
Available online at: http://www.ijmtst.com/vol11issue04.html
DOI: https://doi.org/10.5281/zenodo.15220128

Q-Module-Bot: A Q&A Based Bot for Module Learning

Sd Athika Sultana, K.V.Bhumisree, M.Navya, SK.Ishrath Habeeba, Y.Dedeepya

Department of Electronics and Communication Engineering, Narayana Engineering College, Nellore, Andhra Pradesh, India.

To Cite this Article
Sd Athika Sultana, K.V.Bhumisree, M.Navya, SK.Ishrath Habeeba & Y.Dedeepya (2025). Q-Module-Bot: A Q&A Based Bot for Module Learning. International Journal for Modern Trends in Science and Technology, 11(04), 704-709. https://doi.org/10.5281/zenodo.15220128

Article Info
Received: 16 March 2025; Accepted: 08 April 2025; Published: 14 April 2025.

KEYWORDS

Chat-bot System , Voice-Based Query processing , FAQ's Database , AI-Powered Response Generation.

ABSTRACT

Students often face difficulties in quickly finding relevant answers to their academic queries, leading to inefficiencies in learning. A chat-bot system that provides accurate responses through text and voice-based interactions can enhance the student experience. The goal of this project is to develop a chat-bot that allows students to ask questions and receive answers from a structured database of teacher-provided FAQs.This system consists of a homepage displaying the college brochure, an admin panel for managing FAQs, and a user authentication module for student sign-up and login. The admin can add, modify, and track FAQs, while students can query the chat-bot using text input or voice recording. The chat-bot processes the query and retrieves the most relevant response from the database. The system follows key steps: database setup, server deployment, user authentication, admin panel management, and chat-bot interaction. Voice-based query processing allows students to record their questions and receive appropriate responses. However, the current implementation limits the admin panel to three-line responses for each answer. By integrating voice recognition with a structured database, this chat-bot system enhances information access and student engagement. Future enhancements may include AI-powered response generation, multimedia-supported answers, and an improved response limit to further optimize learning efficiency.

1. INTRODUCTION

The rapid advancement of Artificial Intelligence (AI) has transformed various industries, including education. With an increasing demand for digital learning, institutions are adopting innovative technologies to enhance the teaching and learning experience. However, one of the biggest challenges in online and blended education is the lack of immediate, personalized academic support. Students often struggle to find quick, accurate answers to their queries related to specific modules, leading to gaps in understanding and reduced engagement.To address this challenge, we propose

Q-Module-Bot, an AI-powered generative chat-bot designed specifically for module-based teaching support. The chat-bot acts as a virtual tutor, assisting students by answering their academic questions in real-time. It uses state-of-the-art Natural Language Processing (NLP) and deep learning techniques to generate relevant and contextually appropriate answers.

II. LITERATURE REVIEW

The application of artificial intelligence (AI) in various domains has grown significantly, particularly in education and interactive learning systems [1][2]. AIpowered chat-bots have revolutionized information retrieval, providing instant, structured, and interactive responses to user queries [3][4]. In the education sector, chat-bots serve as virtual assistants, helping students with academic inquiries, reducing dependency on instructors, and improving learning efficiency [5]. Traditional methods of seeking academic assistance, such as referring to textbooks or online searches, often result in information overload and lack precise responses. AI-driven chat-bots, particularly those leveraging Natural Language Processing (NLP) and machine learning (ML) techniques, have demonstrated significant potential in addressing these challenges [6][7]. With the integration of voice recognition, chat-bots further enhance accessibility by allowing users to interact using voice commands instead of text input [8][9]. This chapter explores the evolution of chat-bot technology, its application in educational support systems, and previous research on AI-powered virtual assistants. The review focuses on the role of NLP, machine learning methodologies, challenges in chat-bot development, and recent advancements in voice-enabled chat-bot systems.Artificial Intelligence (AI) has significantly evolved over the years, leading to advancements in various fields, including education [10][11]. Early AI-based tutoring systems relied on rule-based algorithms, which used predefined responses for student queries [12]. However, the introduction of machine learning (ML) and deep learning (DL) has enabled AI models to learn from vast datasets, improving chat-bot intelligence and response accuracy [13]. Some notable advancements in AI for education include: AI-powered adaptive learning platforms that personalize student experiences [14]. Virtual teaching assistants used in online education [15].

AI-based plagiarism detection and content recommendations for students [16]. Deep learning, especially techniques such as Natural Language Processing (NLP) and Transformer models, has significantly improved chat-bot interactions [17][18]. Some key applications include:

- Text-based query handling using NLP for precise response generation[19].
- Speech recognition systems that allow students to ask questions via voice input.
- Context-aware responses, improving chatbot accuracy and engagement.

Deep learning models outperform traditional rule-based chatbots by understanding user
intent, handling complex queries, and improving interactions over time[22].

Natural Language Processing (NLP) plays a crucial role in chat-bot-based education
systems. It enables chatbots to:

- Interpret and process student queries accurately.
- Generate contextually appropriate responses.
- Support multilingual queries, broadening accessibility for global users.

Transfer learning allows chat-bot models to leverage pre-trained NLP models, enhancing
their ability to process and generate meaningful responses. Some widely used models
include:

- BERT (Bidirectional Encoder Representations from Transformers) for text
comprehension.
- GPT (Generative Pre-trained Transformer) for generating conversational
responses.
- T5 (Text-to-Text Transfer Transformer) for summation and translation tasks.
- Pre-trained models significantly reduce training time while improving chatbot
performance

III. EXISTING SYSTEM

The traditional approach to resolving student academic queries relies on textbooks, online searches, and direct interaction with instructors. However, these methods come with several challenges that limit their efficiency:

- *Dependence on Faculty:*Students must wait for teachers to respond to their

queries, causing delays in learning.

• *Information Overload:*Online searches provide vast amounts of data, making it
difficult to filter relevant answers.

•*Lack of Personalization:*Traditional methods do not tailor responses based on
individual student needs.

•*Manual FAQ Handling:*Teachers manually handle frequently asked questions (FAQs), leading to redundancy and inefficiency.

• *Limited Availability:*Human resources are not available 24/7, restricting students from accessing information at any time.

Additionally, existing educational chat-bots often rely on rule-based models that follow pre-defined question-answer mappings, making them ineffective for handling complex or varied queries. Moreover, many traditional chat-bots lack voice interaction, which limits accessibility for students who prefer verbal communication. Another major drawback of existing systems is that they lack the ability to adapt dynamically. Most chat-bots operate on static databases, meaning that once programmed, they cannot learn from new interactions. This leads to repetitive answers and an inability to provide context-aware responses. Furthermore, existing systems do not integrate well
with Learning Management Systems (LMS), which makes it difficult for students to access educational materials efficiently within a single platform.11

Security is another concern in existing educational chat-bots. Many chatbots do not implement role-based access, meaning any user can access and modify data without authentication. This leads to data integrity issues and unauthorized modifications, which can affect the reliability of the responses. The lack of multi-modal support is another limitation of existing systems. Many
chat-bots rely only on text-based interactions, making them less accessible for students who prefer visual or auditory learning. The absence of data analytic and tracking features further restricts the ability of educators to monitor student engagement and chat-bot performance.

IV. PROPOSED SYSTEM

To overcome the limitations of the existing system, this project proposes a voiceenabled chat-bot designed to assist students in retrieving academic information efficiently.

The proposed system offers the following advantages:

• *AI-Powered Response Generation:*The chatbot utilizes NLP techniques to process student queries and fetch relevant answers from a structured FAQ
database.

•*Voice Recognition Integration:* Students can interact using voice commands, enhancing accessibility and engagement.

• *Automated FAQ Management:* Teachers can update and manage FAQs dynamically through an admin panel, reducing manual workload.

• *Real-Time Assistance:*The chat-bot operates 24/7, allowing students to access academic help at any time.

• *Structured and Concise Responses:*Answers are limited to three lines to maintain clarity and focus.

• *Scalability:*The system can be expanded with AI-based response generation and multimedia support for an enriched learning experience.

The proposed system ensures secure authentication mechanisms, where only registered users can access chat-bot functionalities. It implements role-based access, meaning that students can only query information while administrators and faculty can modify the FAQ database. Additionally, integration with Learning Management Systems (LMS) ensures students can seamlessly access study materials, assignments, and quizzes directly through the chat-bot interface.

A major enhancement in this system is the use of machine learning algorithms that allow the chat-bot to learn from interactions and improve responses over time. Unlike static rule-based chat-bots, this system continuously updates itself with new queries and frequently asked questions, making it more adaptable to students' evolving needs. Moreover, the chat-bot is designed with data encryption and security protocols to ensure the integrity of stored information. Unlike traditional systems, this chat-bot prevents unauthorized access and maintains a secure log of all queries and responses. Teachers can review chat-bot activity logs to analyse student engagement and refine FAQs accordingly. This system also introduces multi-modal learning, where responses can be enhanced with images, audio, and video explanations for better student comprehension.

Additionally, data analyticS and tracking features enable educators to monitor chat-bot interactions, frequently asked questions, and overall student engagement levels. By implementing Django (back-end), MySQL (database), HTML/CSS, JavaScript (front-end), and speech-to-text APIs, the proposed chat-bot provides an interactive and efficient solution for academic query resolution.The system is future-ready, allowing for easy integration of AI-powered enhancements, such as sentiment analysis for personalized responses, image-based learning modules, and multimedia support for a richer learning experience.

V. RESULTS

To add teacher FAQs to the database, open the database file (.sql or text file with SQL commands), copy its contents into Notepad, and paste it into the MySQL client server to execute the commands. This inserts the FAQs into the faq table of the AIChatbot database. A more efficient method is using MySQL Workbench or the source command

for direct import. Ensure the database and tables exist before running insert commands. To run the Django server, navigate to the project directory where manage.py is located, open the command prompt, and execute python manage.py runserver. This starts the development server and generates a local URL (e.g., http://127.0.0.1:8000/). Opening

this link in a web browser and appending /index.HTML loads the homepage. Django typically serves templates dynamically through views.py, so verify that urls.py correctly maps the homepage view. The render() function in views.py should be properly implemented to load index.HTML. Once on the homepage, users see a college brochure (either static or dynamically generated). The admin login page allows authentication with a username and password. After logging in, the admin can add questions and answers to the chatbot's FAQ database. The admin panel also allows viewing registered users and tracking who added specific

FAQs. To ensure smooth functionality, register the faq and register models in admin.py. Including timestamp fields like created_at and updated_at improves tracking and data management. For user interaction, new users can sign up by entering their username, password, email, and address. Once registered, they log in with their credentials and are redirected to the chat-bot homepage displaying "Welcome to Chat-bot." Implement password hashing for security, and consider using Django's built-in User model for authentication.

The chat-bot supports text and voice interactions. Clicking the voice chat-bot button opens a voice recorder UI. Users record their questions, click stop, and wait for the chat-bot to process the input. The chat-bot extracts speech content, applies TF-IDF vectorization and cosine similarity, and returns the most relevant answer from the database. Ensuring noise filtering and supporting different accents are crucial for voice input accuracy. If no matching FAQ is found, a fallback response mechanism should be implemented.

FIG 1: Home Page

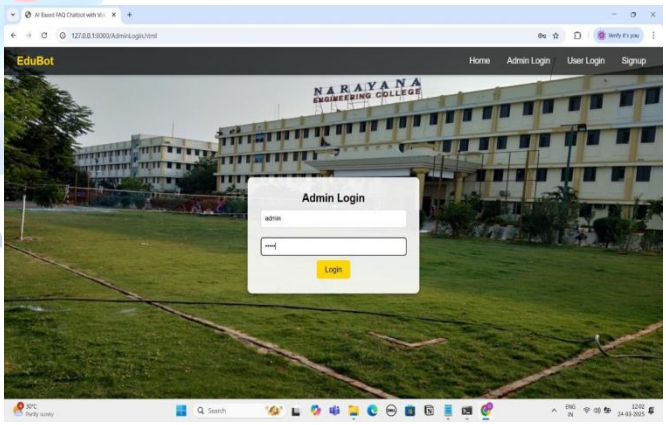

FIG 2: Admin Login Page

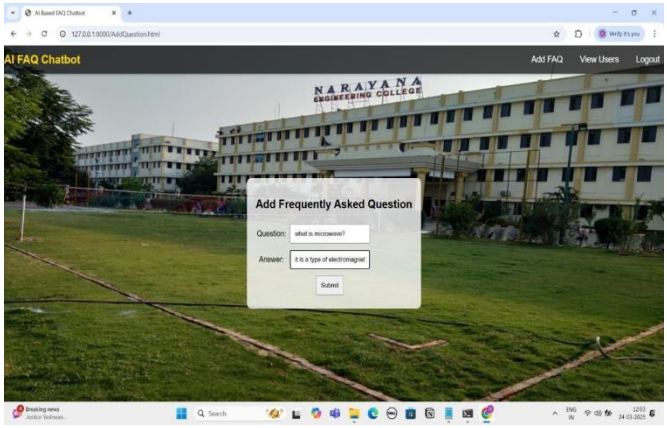

FIG 3:Adding FAQ's To Database

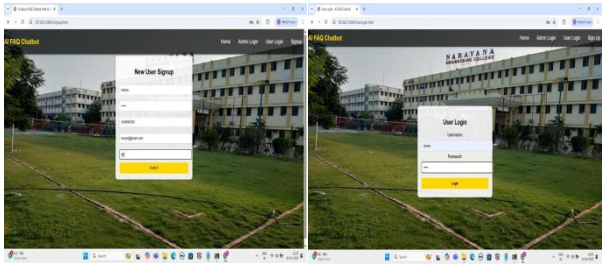

FIG 4: User signup and login pages

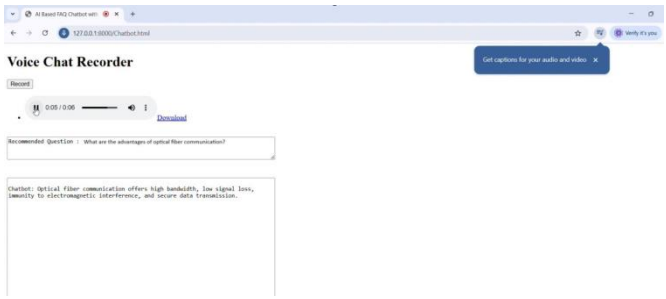

FIG 5: Chatbot interface

VI. CONCLUSION

This project successfully developed a Q&A-based chat-bot designed to enhance module learning through interactive and intelligent responses. By integrating Artificial Intelligence (AI), Natural Language Processing (NLP), and a structured database, the chat-bot provides an efficient way for students to access academic information without
delays. The system ensures real-time query resolution, reducing dependency on faculty members while offering a user-friendly and scalable learning solution. The chat-bot is built using Python, HTML, CSS, and MySQL, ensuring a robust and dynamic architecture. The use of Django for back-end processing and MySQL for database management enables structured data retrieval, making responses accurate and reliable. The catboat's speech recognition and text processing capabilities allow students to interact using both voice and text, improving accessibility and engagement. Throughout the development, key steps included:

- Data preprocessing and structuring for effective query handling.
- Integration of NLP models to enhance query understanding and response
generation.
- User-friendly web interface to provide seamless interaction.
- Testing and evaluation to optimize chatbot performance.

The results demonstrate that the chat-bot effectively assists students in learning by answering academic queries instantly. The chatbot's admin panel allows instructors to manage FAQs, update content, and track student interactions, ensuring that the knowledge base remains up-to-date.While the chat-bot performs well in its current form, improvements can be made
by integrating machine learning algorithms to enhance query understanding and enable adaptive learning. Future enhancements may include multi-language support, voice-based learning features, and AI-driven recommendations to further personalize the learning experience. In conclusion, this chatbot serves as a powerful academic assistant, offering efficient, accurate, and scalable learning support. By bridging the gap between students and educational resources, it represents a significant advancement in AI-driven education technology

VII. FUTURE SCOPE

As artificial intelligence continues to evolve, there are numerous possibilities for enhancing the capabilities of AI-powered educational chatbots. The chat-bot system developed in this project has proven to be efficient in assisting students with academic queries; however, there is considerable potential for further improvement and expansion.

By integrating advanced AI techniques, cloud computing, and real-time analytics, the chat-bot can be transformed into a comprehensive digital learning assistant, providing personalized educational support and an interactive learning experience for students across various disciplines.

One of the most promising areas for improvement is the enhancement of AI capabilities. Current chat-bot models rely on pre-trained language models, but implementing advanced deep learning techniques such as Transformers and Reinforcement Learning can significantly improve response accuracy. These models enable the chat-bot to learn from previous interactions, adapt to user preferences, and generate more precise, context-aware responses. Additionally, continuous training on diverse academic datasets will further refine the chatbot's ability to understand complex

queries and provide reliable information. Another major advancement would be the integration of the chat-bot with external learning systems, particularly Learning Management Systems (LMS) such as Moodle, Google Classroom, and Blackboard. By linking the chatbot to these platforms, students can access assignments, track their academic progress, and receive personalized study recommendations. This integration would create a seamless learning experience by
reducing the need to switch between multiple platforms while enhancing productivity and engagement.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

REFERENCES

[1] S. S. Gill, U. Naeem, S. Fuller, Y. Chen, and S. Uhlig, "How Covid-19changed computer science education," I tnow, vol. 64, no. 2, pp. 60–61,Jun. 2022.

[2] S. S. Gill et al., "Transformative effects of ChatGPT on modern education: Emerging Era of AI Chatbots," Internet Things Cyber-Phys. Syst., vol. 4, pp. 19–23, Jan. 2024.

[3] B. R. Ranoliya, N. Raghuwanshi, and S. Singh, "Chatbot for university related FAQs," in Proc. Int. Conf. Adv. Comput., Commun. Informat. (ICACCI), 2017, pp. 1525–1530.

[4] S. Cunningham-Nelson, W. Boles, L. Trouton, and E. Margerison, "Are view of chatbots in education: Practical steps forward," in Proc. 30th Annu. Conf. Australas. Assoc. Eng. Educ. (AAEE) Educ. Becoming Agents Change Innov., Integr., Motiv., 2019, pp. 299–306.

[5] V. P. Dennen, A. A. Darabi, and L. J. Smith, "Instructor-learner interaction in online courses: The relative perceived importance of particular instructor actions on performance and satisfaction," Distance Educ., vol. 28, no. 1, pp. 65–79, 2007.

[6] K. Swan, "Learning effectiveness: What the research tells us," in Elements of Quality Online Education: Practice and Direction, J. Bourne and J. C. Moore, Eds., Needham, MA, USA: Sloan Consortium, 2003, pp. 13–45.

[7] K. El azhari, I. Hilal, N. Daoudi, and R. Ajhoun, "Smart learning using autonomous Chatbot based on NLP techniques," in Proc. Int. Conf. Artif. Intell. Smart Environ., 2022,
pp. 723–728.

[8] D. Feng, E. Shaw, J. Kim, and E. Hovy, "An intelligent discussion-bot for answering student queries in threaded discussions," in Proc. 11th Int. Conf. Intell. User Interfaces, 2006, pp. 171–177.

[9] D. Kaczorowska-Spychalska, "How chatbots influence marketing," Management, vol. 5152 23, no. 1, pp. 251–270, 2019.

[10] L. Benotti, M. C. Martnez, and F. Schapachnik, "A tool for introducing computer science with automatic formative assessment," IEEE Trans. Learn. Technol., vol. 11, no. 2, pp. 179–192, Apr.–Jun. 2018.

[11] C. W. Okonkwo and A. Ade-Ibijola, "Chatbots applications in education: A systematic review," Comput. Educ. Artif. Intell., vol. 2, Jan. 2021,Art. no. 100033.

[12] S. S. Gill and R. Buyya, "Transforming research with quantum computing," J. Econ. Technol., vol. 2, pp. 1–8, Jul. 2024.

[13] P. L. Rogers, "Barriers to adopting emerging technologies in education," J. Educ. Comput. Res., vol. 22, no. 4, pp. 455–472, 2000.

[14] A. Schmulian and S. A. Coetzee, "The development of messenger bot's for teaching and learning and accounting students' experience of the use there of," Brit. J. Educ. Technol., vol. 50, no. 6, pp. 2751–2777, 2019.

[15] J. L. Shackelford and M. Maxwell, "Contribution of learner–instructor interaction to
sense of community in graduate online education," J. Online Learn. Teach., vol. 8, no. 4, pp. 248–260, 2012.

[16] S. Sinha, S. Basak, Y. Dey, and A. Mondal, "An educational chatbot for answering queries," in Proc. Emerg. Technol. Model. Graph. (IEM),2020, pp. 55–60.

[17] D. W. Surry, D. C. Ensminger, and M. Haab, "A model for integrating instructional technology into higher education," Brit. J. Educ. Technol., vol. 36, no. 2, pp. 327–329, 2005.

[18] S. Yang and K. Stansfield, "AI chatbot for educational service improvement in the post pandemic era: A case study prototype for supporting digital reading list," in Proc. 13th Int. Conf. E-Educ., E-Bus., E-Manag., E- Learn. (IC4E), 2022, pp. 24–29.53

[19] D. Mhlanga, "Open AI in education, the responsible and ethical use of ChatGPT towards lifelong learning," in FinTech and Artificial Intelligence for Sustainable Development: The Role of Smart Technologies in Achieving Development Goals. Cham:
Switzerland, Springer Nat., 2023, pp. 387–409.

[20] K. Hu, (Reuters News Agency Co., London, U.K.). ChatGPT Sets Record for Fastest Growing User Base: Analyst Note. (2023). [Online]. Available:
https://www.reuters.com/technology/chatgpt-setsrecord-fastest-growing-user-base
analyst note-2023-02-01/

[21] D. A. Abrahams, "Technology adoption in higher education: A framework for identifying and prioritising issues and barriers to adoption of instructional technology," J. Appl. Res. Higher Educ., vol. 2, pp. 34–49, Dec. 2010.

[22] P. Brand setter and S. Schmutz, "Conversational AI for corporate e-learning," in
Proc. 21st Int. Conf. Inf. Integr. Web- Based Appl. Services (iiWAS), 2019, pp. 674–678.

[23] S. S. Gill and R. Kaur, "ChatGPT: Vision and challenges," Internet Things CyberPhys. Syst., vol. 3, pp. 262–271, Jan. 2023.

[24] A. ElSayary, "An investigation of teachers' perceptions of using ChatGPT as a supporting tool for teaching and learning in the digital era," J. Comput. Assist. Learn., vol. 40, no. 3, pp. 931–945, 2024.