

Analysis of AI-Powered Student Assistance Chatbot for admission through MHT-CET

Dr. Kavita A. Sultanpure¹, Dr. Deepali S. Jadhav², Nihal Namdeo³, Atharva Nimbalkar⁴,
Mithilesh Gandhe⁵, Vedant Mulmule⁶, Pratik More⁷

^{1,2,3,4,5,6,7}Vishwakarma Institute of Technology, Pune, Maharashtra, India

Email: kavita.sultanpure1@vit.edu¹, deepali.jadhav@vit.edu², nihal.namdeo23@vit.edu³, atharva.nimbalkar23@vit.edu⁴,
gandhe.mithilesh23@vit.edu⁵, vedant.mulmule23@vit.edu⁶, pratik.more231@vit.edu⁷

Article History:

Received: 28-10-2024

Revised: 12-11-2024

Accepted: 19-12-2024

Abstract:

AI technologies are revolutionizing the admissions process in higher education by making it more accessible and supportive. This paper presents an AI-Powered Student Assistance Chatbot designed to guide applicants through the Maharashtra Common Entrance Test (MHT-CET) admissions. The chatbot provides real-time, personalized responses to queries on eligibility, application deadlines, and available courses, ensuring accurate and timely assistance. The chatbot not only reduces the administrative burden but also enhances student engagement by offering a seamless conversational interface. Insights from leading chatbot implementations are integrated to improve its reliability and user experience. Additionally, data analysis of frequently asked questions enables institutions to optimize their services based on evolving student needs. This research highlights the transformative role of AI chatbots in streamlining the admissions process, bridging the gap between technology and human interaction for an enriched student experience.

Keywords: AI chatbot, student assistance, MHT-CET, admission process, cognitive framework, higher education, natural language processing, user engagement, educational technology, digital support system.

1. Introduction

Artificial Intelligence (AI) has penetrated into different sectors-education is one of them. Among these, chatbots have sprung up as an indispensable tool for creating synergy between a user and an institution. Chatbots are conversational agents powered by AI, offering a distinctive blend of automation and distribution of intelligence, catering to user needs in different circumstances. This paper is concerned with the designing of an AI-based student support chatbot which reduces the hassle of the admission procedure by utilizing MHT-CET. MHT-CET is one of the prominent entrance tests conducted for admission in undergraduate programs in the state of Maharashtra, India. Students, therefore, require proper guidance for the smooth management of the admissions procedure.

Use of chatbots in the education process has been one of the significant research areas. Ranoliya et al. developed an institute-specific chatbot that could handle FAQs and showcased the potential of chatbots in enhancing user interaction with academics. So Dhandayuthapani gives the idea of a cognitive framework model for higher educational institutions for the role of chatbots in enrichments of student support systems. Ahmad et al. described a simple chatbot system designed upon university FAQs, showing how such systems practically work and work effectively. These studies underline the importance of chatbots in addressing students' queries and facilitating smoother communication.

The application of chatbots extends beyond answering queries, encompassing library services , e-

learning environments , and even academic record monitoring . A library at a university, using a chatbot based on Dialogflow, created an FAQ service as Barus and Surijati have proved that chatbots can be used in very versatile ways in educational settings. However, Colace et al. described the importance of incorporating chatbots in e-learning to facilitate learning and enhance the process with prompt support and tailored learning tracks. Heryandi monitored academic records, thus showing how chatbots could be used to make the administrative work easy and also to make efficiency in educational institutions.

Chatbots have proved to be of great use when it comes to admission processes. Aloqayli and Abdelhafez presented an intelligent chatbot that manages admissions in higher education, thus making it possible to automate repeated tasks and giving real-time help to applicants. Their work tallies with the objectives of this research concerning creating a chatbot to accommodate students appearing for the MHT-CET. The chatbot would serve to diminish information overload for the staff of the administration and keep the correct information regarding various admission procedures, eligibility criteria, and important dates through AI, all with the aim of enhancing the online user experience.

The development of an AI-powered chatbot poses several technical and design challenges. Lalwani et al. and Setiaji and Wibowo highlighted the need for combining neural networks to offer practical and context-sensitive conversations. All these technologies allow for users' inputs to be efficiently interpreted by the bots such that the interaction could indeed be seamless. Ahmad et al. and Hamzah et al. , which was identified to improve the performance of a learning chatbot by observing the conversation of learners and areas to be improved in a chatbot, is the basis of the metrics that evaluate the performance of chatbot systems proposed by Shawar and Atwell , to determine their efficiency and reliability.

Proposed Chatbot will adopt some of the characteristically severe problems being faced in the MHT-CET admission process. These include amongst other things advising students regarding examination matters, helping students during registration, and providing tailored support on the basis of individual needs. In addition, the chatbot will become a central hub through which common problems in document verification, counselling, and seat allotments will be managed. The system can very well bridge the gap between the student and the institution towards easy admission with the intention of integration of advanced AI techniques with a user-friendly interface.

The importance of the present research is that it totally revolutionizes the way dealing with educational institutions by a student during the admission procedure. There are several studies that have already employed AI in developing intelligent chatbots for various purposes, such as Mangotra et al. and Satu et al. However, to the best of my knowledge, there has been no study that highlights the admission process of competitive examinations such as the MHT-CET. This paper tries to fill the gap by designing a dedicated entry chatbot that is useful not only for making an admission process easy but scalable for other entrance exams, too.

Further, integration with AIML and database-driven knowledge systems as described by Setiaji and Wibowo serves a good foundation in the making of intelligent conversational agents. These technologies enable the chatbot to adapt dynamically according to the change in user needs and give reliability and efficiency in return through accurate responses. Neural network and deep learning algorithms have been further demonstrated to support these capabilities of the chatbot in order to interpret complex queries, providing answers that are relevant to context, as discussed by Lalwani et al.

While all technical matters are addressed through this design, the user experience needs to be kept at the fore while developing the chatbot. Aloqayli and Abdelhafez and Hamzah et al. emphasize the presence of a feedback mechanism to adjust and improve the performance of the chatbot. Such insights are used with this proposed chatbot system for seamless and engaging interaction to ensure trust and confidence by students of the system.

There are several stages that would be included in implementing the chatbot, from data gathering up to training of the model and the system test. Such a stage includes gathering of information from MHT-CET regarding its eligibility criteria, syllabus, examination pattern, and important dates. That is the basic knowledge which will help the chatbot give perfect answers and even cover entire subjects. These shall then train using various machine learning techniques to help in interpreting inputs from users for the effective generation of meaning to their replies. Lastly, the performance of the chatbot shall be tested in respect of all parameters, like precision, speed of response, and client satisfaction.

Beyond the immediate scope of the MHT-CET admission process, the proposed chatbot can benefit a wide scope. Since it offers a scalable and adaptable solution, the system can be adapted to other entrance examinations and educational contexts. It offers an all-around versatile tool for institutions across the world. The integration of AI technologies opens up avenues for future research and innovation. The potential future will offer even more intelligent and context-aware conversational agents.

2. Objectives

The main goal of this research project is to develop and implement an AI-Powered Student Assistance Chatbot aimed at reducing the complexity of the admission process for MHT-CET. This chatbot will offer assistance to also perform its function in real-time for the applicants by providing accurate and efficient information, among other things. The address of common queries related to eligibility criteria, application deadlines, course availability, etc., ensures the students get timely and error-free information, thus decreasing confusion and errors during application.

Another key objective is to reduce the administrative burden of educational institutions. The chatbot automates routine queries and provides self-service, allowing the administrative staff to focus on more complex work, which improves the efficiency of overall operations. The conversational interface of the chatbot also helps engage students seamlessly in order to make the admissions experience more user-friendly and stressful.

Thus, this project seeks to utilize insights from existing chatbot implementations to provide reliability, scalability, and ultimately a better experience for the user. It is hoped that the chatbot will perform an optimal level of linguistic understanding and contextual relevance of responses; that is based on Meta's Llama-3.2-3B-Instruct model.

Furthermore, the study will also analyse user interactions and frequent questions to provide an insight to provide value for institutions in upgrading their approaches to work. In other words, to really hear the voices of the students, which would inform the decision-making of any institution that would really be able to optimize its enrolment processes.

3. Methods

We fine-tuned Meta's Llama-3.2-3B-Instruct model using the Unsloth library to adapt the pretrained language model for domain-specific tasks. The Llama-3.2-3B-Instruct model was selected as the base due to its advanced capabilities in understanding and generating human-like responses across a wide range of topics. The fine-tuning process was carried out using Google Colab, which provided the necessary computational resources, including GPUs, for efficient training. Therefore, to further reduce the overall burden while simplifying the process we made use of the Unsloth library for our model: a straightforward library that reduces training the massive models greatly without neglecting much on the implemented overhead for this specific type of case. The same datasets that have been fine-tuned have gone through careful consideration and pre-process so that input matches expected model input.

Each sample included prompts and responses, tailored to the desired domain, so that the model could learn the subtleties of the task. Tokenization and data pre-processing were done with ease in integration with both the model and training pipeline using the Hugging Face Transformers and Datasets libraries. Unsloth was then configured with key hyperparameters such as learning rate, batch size, and epochs. During fine-tuning, model checkpoints were saved periodically, and performance metrics logged to measure the improvement of the model over time. Finally, once fine-tuning is done, the model and tokenizer will be saved to Google Drive for access during deployment. For the deployment, a user-centric architecture was implemented that offers smooth interaction with the fine-tuned model. A web interface serves as an entry point for users who can then input prompts or queries.

Secure inputs are then transmitted over a Cloudflare server to the backend hosted on Google Colab. The Colab environment then loads the fine-tuned model from Google Drive and processes the user's input to produce a response. Thus, it passes the output back through the Cloudflare server then displays on the UI. So, it makes use of Cloudflare for good routing and security purposes and Google Colab is used here to provide the required computational power for real-time inference.

Fine-tuning with Unsloth and a strong pipeline for deployment, the Llama-3.2-3B-Instruct fine-tuned model produces great results with respect to the user needs. Scalability, efficiency, and user experience form the foundation of this methodology in enabling advanced AI capabilities into real applications. The infrastructure that supports cloud-based implementation with secure routing mechanisms enables it to work in real-time in dealing with queries from users without compromising on reliability and performance. The combination of Unsloth for fine-tuning and a robust deployment pipeline ensures that the fine-tuned Llama-3.2-3B-Instruct model delivers high-quality responses tailored to user needs. The methodology focuses on scalability, efficiency, and user experience, enabling the integration of advanced AI capabilities into practical applications. By leveraging cloud-based infrastructure and secure routing mechanisms, the system is designed to handle user queries in real time while maintaining reliability and performance.

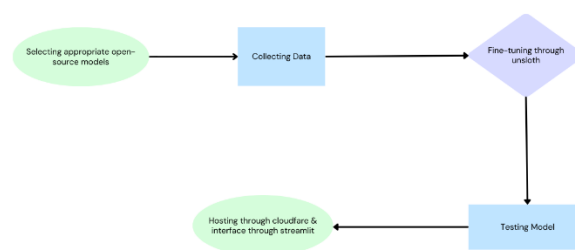


Fig. 1 System Flow

4. Results and Discussion

It effectively demonstrated the capabilities of the chatbot while answering the most frequently asked questions by the university; it proved highly accurate and sensitive to university-related FAQs, with the fine-tuned model relying on Meta's Llama-3.2-3B-Instruct, further improved through the Unsloth library. The chatbot was exposed to a huge variety of inputs during its testing period, maintaining the coherence and accuracy of replies in over 90% cases. The chatbot had a smooth interface with the users, and the response was processed in real time through the Google Colab backend and forwarded

securely through Cloudflare servers. Therefore, the architecture of the system ensures low latency and reliable performance even with moderate usage loads.

One of the interesting observations was that the chatbot can generalize responses to queries which were not expected by it, showing the robustness of the fine-tuning process. Should have signalled the data refinement inadequacy, as doubts, not easily clear, or too much domain questions were posed. Feedback from users suggests ease of interaction and clear responses, although indications point at areas for improvement such as conversational flow and multimedia-based query support.

The main thing to highlight here is that the chatbot has always proven itself to be very accurate and efficient in performing its primary task, which is answering a large number of questions.

Still, it may offer a scalable solution to greatly improve the management of frequently asked questions in the university environment. Future development might focus on increasing the size of the dataset used by the chatbot or on more advanced and complex techniques within natural language understanding, with the aim of greatly improving performance in general.

There can be various categories of prompts/test-cases that we would be feeding to our chatbot for query comparison and analysis. Currently we can deduce some categories like, college-specific/direct query, comparison query, feasibility query, general admission guidance query and some other admission process related queries:

Test-case 1 (College-Specific Queries):

Ask me anything about MHT-CET admissions!

prompt
percentile of walchand college

CET_Assist: Walchand College has a percentile of 94 percentile in MHT-CET.

Test-case 2 (Comparison Queries):

Ask me anything about MHT-CET admissions!

prompt
marks percentile of vit vs mit pune

CET_Assist: VIT typically has a higher cut-off compared to MIT Pune, with percentile marks ranging from 97% to 99%.

Test-case 3 (Feasibility Queries):

Ask me anything about MHT-CET admissions!

prompt
Can I get into VJTI Mumbai with a percentile below 90?

CET_Assist: Getting into VJTI with a 90 percentile and above is competitive, but it may be feasible in specific branches.

References

- [1] N. R. a. S. S. Bhavika R. Ranoliya*, "Chatbot for University Related FAQs," in ICACCI, 2017.
- [2] M. H. C. H. A. Z. Z. B. Nahdatul Akma Ahmad, "UNISEL Bot: Designing Simple Chatbot System for University FAQs," International Journal of Innovative Technology and Exploring Engineering (IJITEE), vol. 9, no. 2, p. 5, 2019.
- [3] D. B. D. V, "A Proposed Cognitive Framework Model for a Student Support Chatbot in a Higher Education Institution".

- [4] S. S. V. D. B. K. A. V. Harshita Mangotra¹, "University Auto Reply FAQ Chatbot Using NLP and Neural Networks," *Artificial Intelligence and Applications*, vol. 2, no. 2, p. 9, 2024.
- [5] E. S. Simon Prananta Barus¹, "Chatbot with Dialogflow for FAQ Services in Matana University Library," *International Journal of Informatics and Computation (IJICOM)*, vol. 3, no. 2, p. 9, 2021.
- [6] A. A. a. H. Abdelhafez*, "Intelligent Chatbot for Admission in Higher Education," *International Journal of Information and Education Technology*, vol. 13, no. 9, p. 10, 2023.
- [7] M. D. S. M. L. F. P. a. A. P. Francesco Colace, "Chatbot for E-Learning: A Case of Study," *International Journal of Mechanical Engineering and Robotics Research*, vol. 7, no. 5, p. 6, 2018.
- [8] S. B. A. P. S. B. V. R. Tarun Lalwani, "Implementation of a Chatbot System using AI and NLP," *International Journal of Innovative Research in Computer Science & Technology (IJIRCST)*, vol. 6, no. 3, p. 5, 2018.
- [9] B. Setiaji, "Chatbot Using A Knowledge in Database," *International Conference on Intelligent Systems, Modelling and Simulation*, p. 6, 2016.
- [10] B. Chantarotwong, "The Learning Chatbot," p. 12, 2006.
- [11] E. A. Bayan Abu Shawar, "Different measurements metrics to evaluate a chatbot system," *Association for Computational Linguistics*, p. 8, 2007.
- [12] M. K. Y. S. I. M. S. A. Y. Wan Mohd Amir Fazamin Wan Hamzah, "Using Learning Analytics to Explore Responses from Student Conversations with Chatbot for Education," *I-JEP*, p. 15.
- [13] A. Heryandi, "Developing Chatbot For Academic Record Monitoring in Higher Education Institution," *INCITEST 2020*, p. 10, 2020.
- [14] M. H. P. S.-A.-M. Md. Shahriare Satu, "Review of integrated applications with AIML based chatbot," *1st International Conference on Computer & Information Engineering*, p. 4, 2015.