

Mentoring Chatbot using Artificial Intelligence Framework

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Abstract

Mentors know only what is verbally said by the students, they are unaware of many problems and struggles that are faced by most of their students who hesitate to talk directly, so to come up with solution combining new technology, we came up with AI Mentoring Chatbot that can easily communicate with students and help them to solve their academic as well as personal problems where students can feel completely secure and anonymous, as well as confident about finding the information they need. The proposed system uses an open source Conversational AI framework. The student will type his/her query in the text box of the Chatbot. The chatbot will then answer the question according to the database. A weekly report will be sent to the respective mentor. The mentor can then evaluate the student's problem, if any, accordingly. The proposed system can provide an alternative for one to one mentoring sessions.

1. INTRODUCTION

In higher education, academic mentoring plays a key role in student support services. Student mentoring usually talks about providing facilities such as supporting program choice, general counseling, individual problems, and professional development. A student's evolution, confinement, and graduation can be certainly impacted by giving the college students suitable and appropriate guidance. There are various benefits of academic mentoring that includes current student's loyalty and help in future student enrollment. In the traditional academic mentoring method, the student has to schedule a session with their mentor, who is aware of the student's program and a possible track a student experiences. College Professors have many other roles and responsibilities that have to be given more priority than mentoring a student's performance. All these phenomena express the problem intensity and the issues that one can face if a suitable solution is not found. Thus, we are putting forward a technical solution as a constructive mean of reducing the issues faced in student mentoring.

A chatbot is "A computer program designed to simulate conversation with human users, especially over the Internet". Mentoring Chatbot using AI framework is an artificial intelligence-enabled chatbot that acts as a virtual mentor, helping students with their academic as well as

personal problems to achieve the highest level of results, with the limited time and resources that they have. The appropriate technical solution can help not only the students' mentoring processes, but will also help the professors to prioritize their time towards additional important matters and responsibilities.

2. LITERATURE REVIEW

"Chun Ho Chan, Ho Lam Lee" et al (2018)[1] developed Programme Advisement chatbot for students that can provide appropriate replies to the user's doubts about course information. The development of chatbot was done in two steps. Initially in order to provide accurate course information via chatbot interface to the students, they investigated other effectual approaches. Two issues were investigated during development that comprise how students will be able to specify their intent while interacting with chatbot and the way to present information of courses to the students. Next, they investigated more analysis and recommendation functions for building chatbot. As per students' preferences, chatbot recommended various suitable set of courses.

"MenalDahiya" (2017)[2] explained what is chatbot, implementation of the chatbot and information about the design. This paper presented the methodology for building chatbots and their application in several domains. Also, they have explained the comparison between different

chatbots. This paper presented a survey, according to which it can be inferred that due to variety of techniques and methodologies used for designing chatbots, the development and enhancement of chatbot designing increase at an uncertain rate.

“Archana Parab, Siddhesh Palkar” et al (2017)[3] proposed an intelligent chatbot system for career counseling, which will help user in selecting the right career by giving an proper response to user’s query. To accept the user’s input and analyze user’s queries, they used algorithms of artificial intelligence for career counseling project. It provides some valid solutions to the users’ queries. This bot is an intelligent system that will think like humans. Due to an appropriate knowledge base, bot provides quick answer to user. ICCB system take both voice or text as an input.

“Jordan J. Bird, Diego R. Faria” et al (2018)[4] suggested an approach where human-bot and bot-bot communication via text messaging can be learned by a chatbot software. The chatbot takes input from users and checks if it can respond to users’ messages correctly on the basis of current stored knowledge, if not it is programmed to study a significant replies to text messages using pattern matching. The algorithm had a significant advancement in chatbot’s performance, after adding an innovative method of message simplification to the chatbot’s architecture.

“Luke Fryer, Kaori Nakao” et al (2019)[5] examined inspirational implications of chatbots along with learning techniques, for language learners. While explaining how chatbots can be more successful language learning partners, they compared the interest that students experienced while communicating with chatbot and a human partner. In this paper, they have examined a complex communication between strengths and shortcomings of existing chatbot technologies, abilities of language learners and their interest to connect with software. This study results in pointing right path to educators for using various existing chatbots available on internet.

“Fabio Clarizia, Francesco Colace” (2018)[6] suggested a chatbot as an educational support system which is a demonstration of chatbot model in education domain. In this paper, they have presented a designing of chatbot’s architecture, methods and techniques used for interaction with users as well as for providing accurate responses to the students using natural language processing algorithms and ontologies of domain. Once the implementation of chatbot, they carried out an experimental campaign to determine the utility of chatbot.

“Leon Ciechanowska, Aleksandra Przegalinska” et al (2019)[7] shows the study of human-chatbot communication where human interact with different types of chatbot interfaces and how they response to these interfaces of chatbot. The research contain users’ level of

psycho-physiological reactions and a detailed questionnaire that can evaluate the communication and their interest to communicate with a chatbot. Major findings confirm that stronger negative effect, emotional arousal, and increased uncanny valley effect (“weirdness” or discomfort) while communicating with the chatbot which is enriched with animated avatar and sound.

“Asbjørn Følstad, Marita Skjuve” et al (2019)[8] presented four different chatbot purposes for the analysis of complex chatbot interaction methodology that may be supported by topology which will study the helpfulness of the typology. Furthermore, based on topology dimension, they analyzed 57 chatbots. They also explained the significance of topology for developers and service providers. They have presented the usefulness of topology as a guide for detailed analysis as well as a guide for interaction design of chatbot for content sorting, education, customer support and personal assistance.

“Juanan Pereira” et al (2018)[9] presented an primitive script-based communicational abilities but there are other more important dimensions: interaction, integration, testing and analysis. The paper discuss the activities arranged along these four dimensions. They reported on chatbots with three different purposes: online regular teaching, massive online teaching and health related subjects. The takeaway message is that in chatbot development there is more than Natural Language Processing. The paper states that before initiating chatbot development, developers should take into consideration various dimension that chatbot development contain.

“Heung-Yeung Shum, Xiaodong He” (2018)[10] discussed fundamental technologies in building chatbots from basic flow of chat to visual alertness to expertise, Using XiaoIce. In addition, they have shown the methodology used by XiaoIce to recognize emotions and how it engages users by chatting with proper and engage the user throughout long conversations with proper responses. They explained that social chatbots has the ability to reply to users’ varied requests as well as to connect with users emotionally. The chatbot can serve users’ need for interaction, fondness and social belonging.

A thorough review of literature revealed that there are many applications of chatbot such as programme advisement chatbot, career counseling chatbot. These paper provides the consciousness for need of a Mentoring Chatbot using AI framework which is an artificial intelligence enabled chatbot that will act as a virtual mentor, helping students with their academic as well as personal problems to achieve highest level of results, with the limited time and resources that they have. Students will be able to communicate with Mentoring Chatbot as if they are having conversation with real mentor. It is very challenging to take decisions for

students' queries but that will be easier with the intelligent system like a chatbot. It will be more beneficial than the traditional faculty mentors in the prospect of availability presumably because they are not as promptly available as online services and website.

3. PROPOSED METHODOLOGY

Mentoring chatbot will be developed using an open source Conventional AI framework. The Chatbot will first receive input from the student. Here NLU component will take this input, understand the intent of the user and find the entities. The input will then be matched with the Bot Database. The second component will generate the reply message for the chatbot. It takes the output and applies AI models to generate a reply. Based on this, a weekly report will be generated which will be sent to the respective mentor forevaluation. Moreover, mentors will be able to view questions that the chatbot was unable to answer efficiently, and then they will personally contact the individual student to provide a more precise or thorough solution to the query. The proposed methodology Figure 1 is:

- The Chatbot will accept the input from the students in the form of text. The inputs may include queries about academic stress or personal problems.
- The input from the student will be processed according to the Bot database.
- One of the methods used in this application is to match the pattern (using a pattern-matching algorithm). The bot would match the input sentence from the user with the database of the framework.
- Then according to the database, Chatbot will suggest the appropriate solution for student's problems and help them achieve goals.
- According to the student's chat history, the mentor can do the analysis of problems as well as help in the improvement of the student.

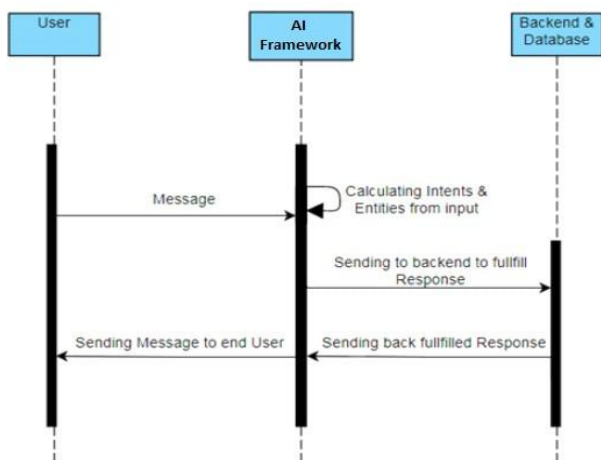


Figure 1: Sequence Diagram

3.1. Advantages

The AI Mentoring Chatbot to be presented for resolving the problem regarding academic mentoring. Since mentoring is compulsorily practiced in all schools and colleges, this Mentoring Chatbot will be very well anticipated in the market.

The AI Mentoring Chatbot can help students to make decisions and offer different aspects of information and recommendations. Bots are basically virtual robots and can attend more than one students 24/7. Our Mentoring Chatbot will provide official information as well as faculty opinions.

4. IMPLEMENTATION

The framework we have used for AI mentoring chatbot is Flowxo, which has further been integrated with dialogue flow which is an NLP toolkit from google used for creating a rich conversational experience for users. Dialogflow consists of three basic concepts:

- Intent Detection – used to predict what a user is typing without matching the user's inputs exactly.
- Entity Recognition – Uses ML to extract precise sections of data.
- Slot Filling – Ensures that the data requested by users are fulfilled.

We have used Dialogflow with Flow XO by setting up a Catch-All trigger in Flow XO that passes the message typed by the user to Dialogflow's Detect Intent method. Dialogflow will interpret the input, determine the user's intent, extract any entities, decide whether or not the conversation is complete or requires follow up information, and pass all of this information back to Flow XO Figure 2:

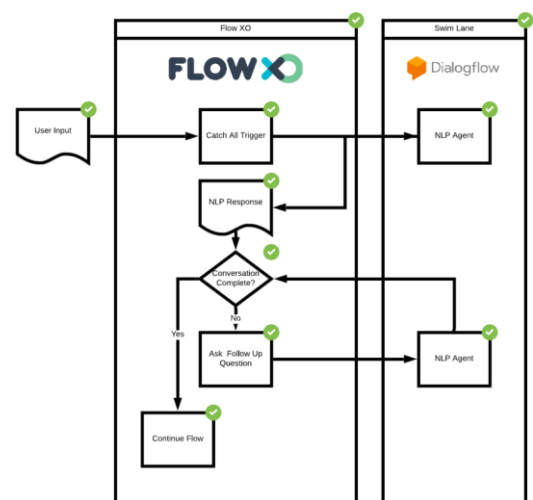


Figure 2: Implementation Flowchart

We used Flowxo to construct the basic layout of the Chatbot by designing the flow. Each flow leads to different conditions where each condition successively triggers another flow. The conditions are applied according to the response or reply given by the users as input. Flowxo uses word and phrase matching algorithm on keywords from user input to find an appropriate response message from the database. If an exact match for the word or phrase is found, it is considered a hit else a miss. If a miss occurs it searches

for words or phrases against the message for approximate similarity. One of the advantages of Flowxo is that it is case insensitive, thus making it more efficient for users to use.

5. RESULT ANALYSIS

The Chatbot starts the conversation by taking general information about the student as input which includes name, branch and semester (As shown in Figure 3a.). The Bot then asks a trigger question with different condition –For Example: CGPA? Less than 7/ Between 7 & 8/ 8 and above, where each condition will trigger another flow with a different set of questions (As shown in Figure 3b.).The further flow is also designed in the same manner with

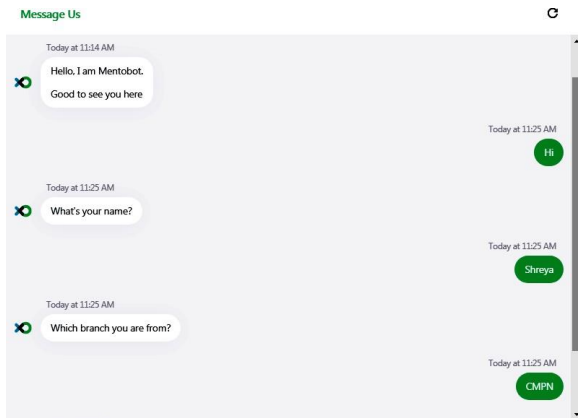


Figure 3a.: User Interface(1)

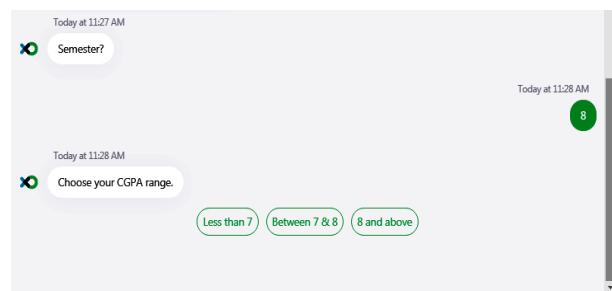


Figure 3b.: User Interface(2)

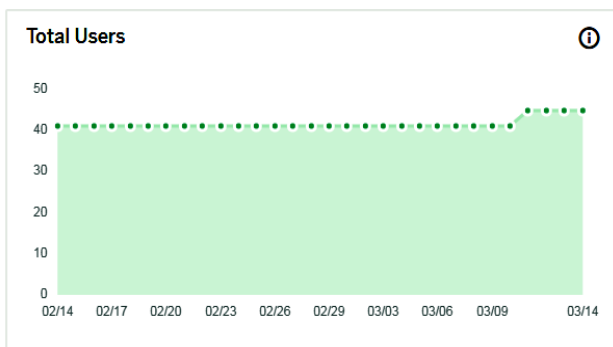


Figure 3c.: Total Users

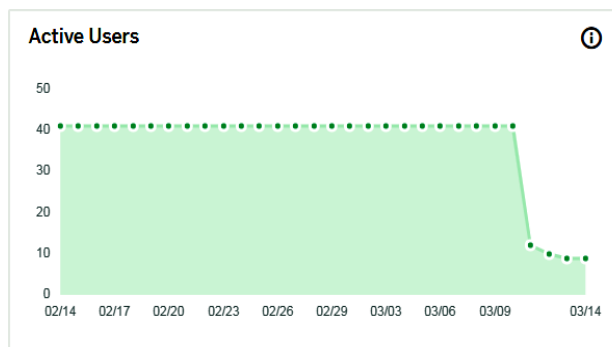


Figure 3d.: Active Users

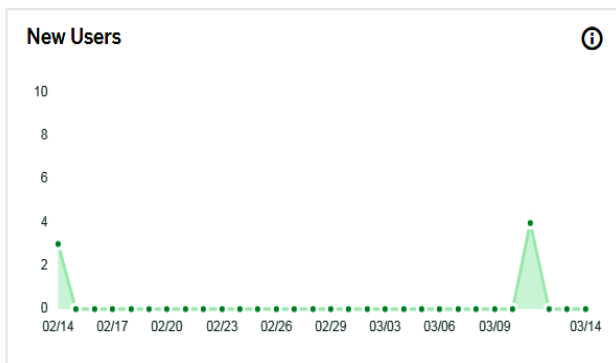


Figure 3e.: New Users

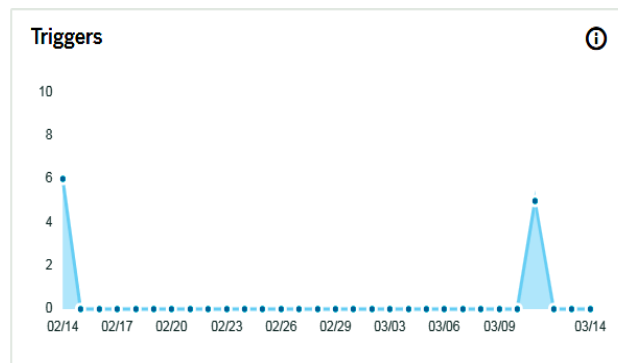


Figure 3f.: Triggers Used

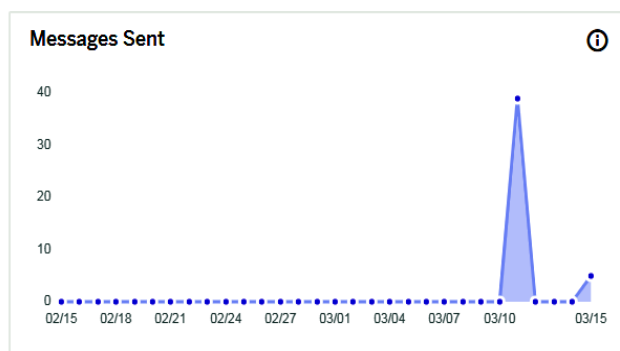


Figure 3g.: Message Sent

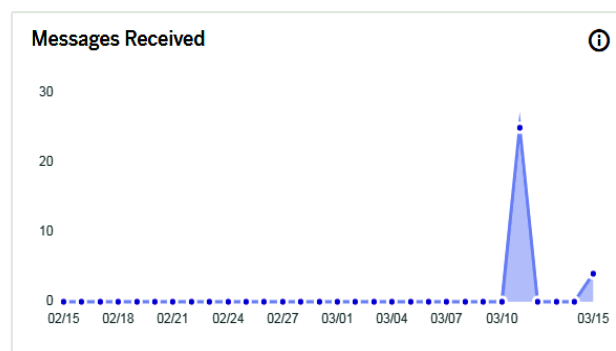


Figure 3h.: Message Received

Table 1: Results

Context of Conversation	Satisfactory	Unsatisfactory
CGPA related	85%	15%
Exam, Viva, Internships	95%	5%
Placements and Higher Studies	90%	10%

different trigger questions and their conditions leading to different flow.

Given below are the graphs showing the statistics of the number of users using the mentoring chatbot (Figure 3c.), active users (Figure 3d.), new users (Figure 3e.), total number of triggers used in the conversation (Figure 3f.), number of messages sent (Figure 3g.) and Number of messages received (Figure 3h.).

5.1. Accuracy

For checking the accuracy of this chatbot, we conducted a survey among a group of students. We asked the students to interact with the chatbot and told them to focus on the context such as CGPA related, Exam- Viva – Internships, Placements and Higher Studies. The students interacted with the Chatbot by asking questions on each sub-topic and after complete interaction they were provided a feedback form and had to mark a response as either satisfactory or unsatisfactory. After the successful completion of the survey, we observed all the responses and the results are as Table 1.

6. SCOPE

The AI Mentoring Chatbot can be referred as ‘Virtual Mentor’, is a elementary type of artificial intelligence software that can imitate human conversation particularly a teacher or mentor. The AI Mentoring Chatbot can be examined and enhanced which will be used in a variety of domains such as learning, corporation, training sessions, distant learning programs, offices, etc. Mentoring Chatbot can be used in the field of education as a paramount tool since AI (Artificial Intelligence) is a vast area of study and

the technologies are developing enormously in this field.

The FUTURE SCOPE may include addition of the voice recognition system so as to extend the Mentoring Chatbot system with voice command acceptance system.

7. CONCLUSION

Mentoring is considered as prime component of student support. An academic mentor, who is typically a faculty member, can be viewed as essential factor in improving student engagement.

The AI Mentoring Chatbot could be an innovative and a much-needed tool for both – mentors and students, which is available anytime and every time at any place with a guarantee of privacy. It will be better than the traditional faculty mentors in the prospect of availability presumably because they are not as promptly available as online services and website. AI Mentoring Chatbot will have an innate appeal to students who might be reluctant to pay a visit to the mentors. With this technology, every student can own a virtual mentor in their own hands without much of an effort.

This further helps by allowing the students to talk their minds out without being uncomfortable. It will help students to overcome stress, depression & anxiety by answering to many of their doubts and problems for which they tend to turn to a faculty mentor. It will act as coach & help change one’s behavior which include motivating students and helping them to cope up with academic issues. It will decrease the time a mentor spends in maintaining the documentation.

The development of AI Mentoring Chatbot would be an important endeavor to accomplish such an unique mode of comprehensive student mentoring. The student

mentoring services will be provided by the Mentoring Chatbot, mentors and counselors along with each of their uniqueness.

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