

# Smart-Bot Assistant for College Information System

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**Abstract**— A chatbot is a software application that facilitates online conversation through text or speech. Our proposed chatbot for college enquiry is a simple web application that aims to provide information regarding college. This chatbot provides information like admission procedure, courses offered, fee structure, placement statistics, and contact details of the college. This proposed chatbot uses natural language processing libraries to understand customer questions and automate responses to them, simulating human conversation and AIML (Artificial Intelligence Markup Language) to write rules which are used by chatbot response systems.

**Keywords**—Chatbot, Artificial Intelligence Markup Language, Natural Language Processing, Query Analysis, Response, Artificial Intelligence, Database.

## I. INTRODUCTION

A chatbot is a computer program that uses Artificial Intelligence and natural language processing to understand customer questions and automate responses to them simulating human conversation. Chatbot technology is used in many applications like smart speakers at home to messaging applications at the workplace. Chatbots uses Machine learning along with AI mechanism to understand the question and to give a proper response. These chatbots can be developed using natural language processing combined with artificial intelligence to provide an interacting environment to the user. It consists of software made up using python and can help users to talk with a machine. The proposed chatbot is intellectual which will provide necessary information regarding admission details, fee structures of various courses, timetables, and important activities of the college. This chatbot makes it easier for students to clarify their doubts in very little time.

### A. Problem Statement

Usually, if a student or a parent needs to get any kind of information regarding courses, admissions, and so on they are required to visit the college website or enquire through telephone. Navigating through various links on the college

website to find appropriate information is time-consuming. Some common queries of parents and students can be solved with the help of an online chatbot. Any questions on college-related activities can be enquired through the chatbot. The design should meet the following needs:

- The chatbot for the college enquiry system is required to have conversations with humans. The bot must possess the Artificial Intelligence to provide the above facility.
- The algorithm adopted in the design must be optimal and provide a quick response while processing the query.
- The framework must support multiple languages and simplify man-machine communication.

### B. Theoretical Background

Eliza is considered the first Chatbot. It is developed in 1964 by Joseph Weizenbaum. It works on the basis of a pattern matching system. It assigns a value to each word present in the user input query and uses this value to reorder the words in the form of a question. This value is determined by finding its importance in the sentence.

ALICE (Artificial Linguistic Internet Computer Entity) is a rule-based chatbot based on the Artificial Intelligence Markup Language (AIML). This chatbot has more than 40,000 categories, where each category has a combination of pattern and its response. Md. Shahriare Satu and Shamim-AI-Mamun developed a Chatbot using the AIML scripts, saying the AIML based chatbots are easy to implement, they are lightweight and efficient to work. Thomas and Amrita Vishwa designed a chatbot based on AIML and LSA to provide customer care services and E-commerce websites. Rushabh and Burhanuddin Lokhandwala developed an Android-based chatbot. [11] Chatbots are developed using a keyword-based system that provides a human-computer dialog system in natural language i.e., in English. [15] Latent Semantic Analysis (LSA) can be used to develop efficient chatbots that can mimic the conversation between humans and machines and act as a virtual assistants. [2] A chatbot is a proxy that

contains embedded information and the queries are interpreted and analyzed using exploitation algorithms. [5] A chatbot is an intelligence-oriented machine in which a response system is developed using database information that analyzes and responds to user queries. [12] Many chatbots are developed using LUIS.ai, MongoDB, and Microsoft Bot Builder. The response system is based on LUIS.ai. [10] Chatbot is an intelligence agent which can initiate a conversation with humans and give responses using Artificial Intelligence Markup Language. [4] Chatbots are stateful services that can be integrated with web services and provide text or speech-based user interfaces. [3] Vedika Patel developed an advanced customized chatbot from an open-source Rasa framework using Rasa NLU and Rasa core. [6] Chatbots are built using Chatterbot, Flask and ChatterbotCorpus using python and efficiency can be achieved using Natural Language Processing (NLP). [7] Chatbots are developed using iterative models and stop words-based human-PC framework. [8] Eliza and Cleverbot are a web-based application that provides a response system using AI terminology and processing libraries. [1] AI-based chatbots and chatbots based on the web can be created using AI terminologies and tongue processing libraries. [9],[13] Chatbots are developed using embedded knowledge units that help in simulating conversation. [14] Efficient chatbots are developed based on the feedback-feedforward technique and are used to improve exactness.

### C. Rule based Chatbots

In this Rule-based approach, a chatbot is associated with some defined rules which can be simple to very complex. These rules train the chatbots and develop a response system and are required for the chatbot to get an idea about the types of questions asked and their corresponding solutions. This kind of chatbot developed is known as a decision-tree bot. In this rule-based chatbots, the question of the user is mapped to the corresponding response and is given as output to the user. These rule-based chatbots can handle their use cases with high flexibility.

*Advantages:* Rule-based chatbots can be developed within very little time and are highly secured. They can also include interactive elements and website links. They can be integrated with othersystems easily.

*Limitations:* These chatbots fails in handling complex queries and cannot learn on their own. These bots will give responses only to the trained queries. The improvements in chatbot can be done only manually. It also cannot capture spelling mistakes which can lead to incorrect responses or no response from chatbot.

### D. Self-learning Chatbots

Self-learning chatbots use machine learning algorithms. They are highly efficient when compared to rule-based chatbots. These are further subcategorized into two types. They are retrieval-based models and self-learning bots. In a retrieval-based model, the chatbot fetches the best answer from the existing responses. Generative models are

intelligent models which come up with an answer rather than searching from a given list.

*Limitations:* It requires too much data for training and takes huge data for training, which makes the implementation process longer and complex. If the chatbot is given wrong information, it will consume more time for correction. Pre-defined structures are required for providing predictable responses, which makes it even more complicated.

### E. Existing System

In existing system, the college information and information related to fees, exams and admissions are provided through college website, WhatsApp groups or notice board. In some cases, students' needs to visit college to solve the queries.

*Limitations:* These existing methods are time-consuming and not efficient. These methods cannot be used for clarifying all the doubts from the user. Non-college members will find it difficult to collect information about the college. Thus, the proposed system is developed in such a way that queries of students and their parents are solved through conversation with a chatbot. There is a great scope for developing this college information related chatbot.

## II. PROPOSED APPROACH

The proposed approach is developed on Windows-10 Operating System with 4GB RAM in Python programming language, however, it can also be developed in Windows-7 or above and Linux operating systems.

Our proposed approach for developing a chatbot for college enquiry includes AIML files which contain .aiml extension. AIML files contain Artificial Intelligence Markup Language. This markup language is based on pattern matching recognition. It is based on a stimulus-response approach used to start a conversation between a bot and a human using natural language processing capability. It is a tag-based and XML-based markup language. These .aiml files hold the bulk of the code and are used to define the personality of a chatbot and specify the heuristic conversation rules for a chatbot.

This approach also contains usage and implementation of Natural Language Processing. Natural Language Processing is a branch of informatics, mathematical linguistics, machine learning, and artificial intelligence which deals with human languages. NLP is the key that makes the chatbots to accept input questions, analyze and respond to input queries by generating the output text. NLP helps chatbots in prioritizing the questions according to the complexity and makes chatbots to respond to user queries faster than a human being. It uses machine learning and artificial intelligence that makes chat bots smart with time.

Natural Language processing includes following components:

1. *Natural Language Understanding:* This process consists of flexible rules. It is mostly used to map

inputs to useful representations so that computer algorithms can understand the input data. It is also helpful in analyzing different aspects of the language.

2. *Natural language Generation:* Text planning, sentence planning and text realization are used in generating natural language. Here the machine generates a logical response then it is converted to a natural language response so that user can easily understand.

#### A. Proposed Modules

The proposed approach consists of the following modules:

1) *Context Identification:* Context Identification is process of breaking down the user input query to identify the theme and intent of the user. First the input query is accepted from the user. Thus, the query is standardized using pre-processing. The keywords used in this input query can be used to find the appropriate context. Context allows users to identify intent in a query. The identified context is carried forward across multiple messages. This context identification helps in establishing the conversation between user and chatbot by identifying various factors. It also helps to shape the response system based on environment.

2) *Natural Language Processing System:* Natural language processing helps the chatbot to understand user's query given in informal way by using various NLP tools. The input given by the user in natural language is processed using Google speech-to-text and translator to generate a generalize query which is then pre-processed to identify tokens.

3) *Pattern Matching System:* Given text is processed using NLP algorithm, to generate a series of tokens which are mapped with various patterns or regular expressions in the database to identify an established pattern. If there is no matching pattern is identified among sequence of tokens, the query is sent for AIML Response System. Chatbots uses knowledge base which contains documents of <pattern> and <template> tags for implementing pattern matching. When the input text received by the chatbot, it is compared with the text present in all the <pattern> tags. If there is a match, then the response will be generated.

4) *AIML based Response System:* Artificial Intelligence Markup Language is used to map the input to an appropriate pattern. If the response for that pattern is available inside the files, then it is formatted as output to the user. AIML files contains different <category> tags which further contain <pattern> and <template> tags. The input keyword is compared with all the keywords present in <pattern> tags and if the given input keyword matches with the keyword in one of the <pattern> tag, then the content present in the corresponding <template> tag is given as output.

5) *Query Analysis and Response System:* If the input pattern is not present in aiml files then the response is given by searching in the database. The database information is retrieved by converting text to SQL. For converting the text to SQL, the input text is accepted from the user and tokens in the text are identified and nouns are mapped to corresponding attributes, these are mapped to corresponding

table names and column names. Words other than nouns are mapped to SQL clauses. In this way, sub-clauses and queries are composed. These queries are given as input to the database and the required information is retrieved from the database, which is accepted by the bot, formatted as output and is given to the user. In this way these queries are used in obtaining data from the database.

#### B. System architecture

Fig.1 shows the system architecture of the proposed approach. It shows the entire view of the physical deployment of the system. Input is taken from the user; it is processed using a pattern matching algorithm. If the keywords are matched with AIML files the response present in AIML files is given to the user. If the query is present in a rule-based system then the respective result is shown.

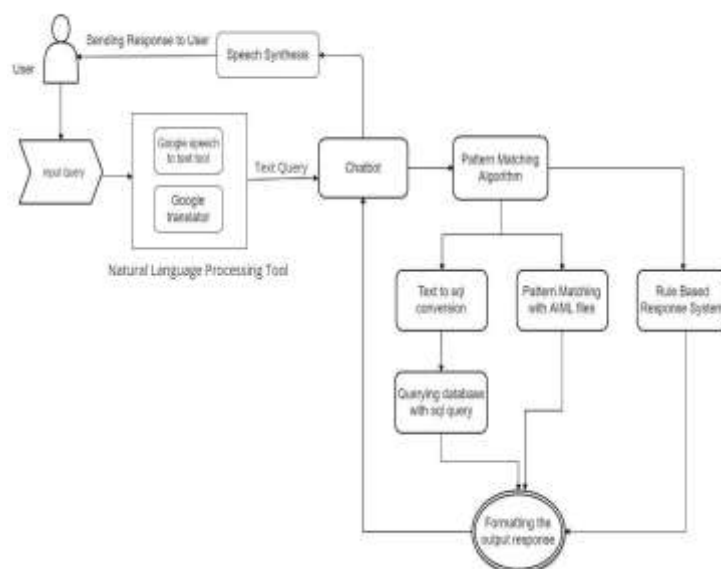


Fig. 1. System architecture

#### C. Algorithm

- Step-1: Start.
- Step-2: User Login Page, if user does not have account do step-3; else goto step-4.
- Step-3: Register as new user and repeat step-2.
- Step-4: Validate User Credentials.
- Step-5: Take User's Query.
- Step-6: Using NLP to convert query into English.
- Step-7: Search for any rule defined as same as given user query, if any rule is found goto step-13; else goto step-8.
- Step-8: Pre-process the query to extract keywords and identify the user's context.
- Step-9: Search for pattern in extracted keywords using pattern matching algorithm, if not found goto step-10 else goto step-13.
- Step-10: Search keywords pattern in .aiml files, if not found goto step 11; else goto step-13.
- Step-11: Convert the given query to SQL, to search in Database; if not found goto step-12 else goto step13.
- Step-12: System will prompt "Invalid Message" as it is not defined in chatbot scope.

*Step-13* Convert the appropriate response from the system and display it on chat bot interface.

*Step-14:* Repeat step-5 to step-13 for another user's query.

*Step-15:* End.

### III. IMPLEMENTATION AND TESTING

#### A. Implementation

Implementation of proposed approach consists of following 6 steps:

##### 1) Creating .aiml files:

We are creating 5 .aiml files for 5 different contexts like admission, department, academics, results and casual conversation. Each .aiml file has different patterns and corresponding responses. If the user query matches with one of the patterns in .aiml file, the corresponding template will be shown to the user.

##### 2) Developing Rule Based Response System:

Set of rules are declared statically that tells what to do or what to conclude in different situations. It uses the rules as the knowledge representation for knowledge coded into the system.

##### 3) Creating Dataset:

A dataset is created in json which includes Meta data regarding college information. We can serialize and de-serialize the data into any programming language.

##### 4) Including Translators and Speech synthesis:

We have included the Google translator and Google text-to-speech modules in chatbot which converts messages given in other languages to English and a speech synthesis module to understand the user input.

##### 5) Training the chatbot:

The dataset that is prepared using json, aiml are trained using Chatterbot class and are evaluated based on accuracy.

##### 6) Deploying chatbot using flask app:

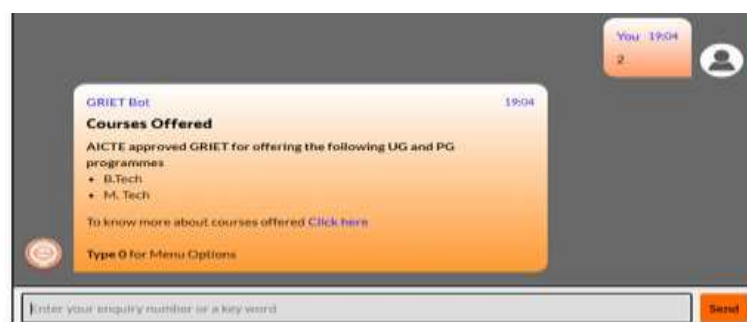
The trained chatbot is deployed using flask framework, which provides tools, libraries to deploy web applications. This flask app consists of following web pages.

#### B. Results



**Fig. 2.** Menu Options

Fig. 2. Shows the menu options that are displayed when a user opens the chatbot. The user can view menu options by giving input as "0"



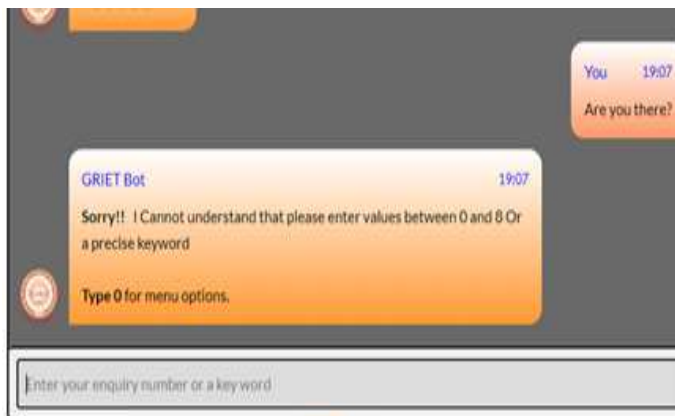
**Fig. 3.** Rule Based Response

Fig. 3. shows a basic rule-based response, when the user message is based on any rule then the system gives a message according to the rule.



**Fig. 4.** AIML Response

When the user query is matched with any pattern given in the aiml files, then the corresponding response is given as output as shown in Fig.4.



**Fig. 5.** Invalid response

When the user query is not matched with any pattern and not following any rule specified, then the above message is prompted to the user.

#### IV. CONCLUSION AND FUTURE SCOPE

##### A. Conclusion

The main aim of this chatbot is to facilitate students and parents to stay updated on college activities. This chatbot combines AI and a knowledgeable database to provide maximum accurate responses. This proposed chatbot will make human-like conversation.

##### B. Future Scope

In this approach, we have included database associated with AIML files but including relational databases increases the human readability and response time for queries. Future work can include training the chatbot with varied data to provide accurate and fast results. Integrating with multiple channels of communication like WhatsApp, Facebook, and SMS etc. will increase the scope of the proposed system.

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