# ChatBot For College Website

T.E. Mini-Project 2B project report submitted in partial

fulfilment of the requirements of the degree

of

**Bachelor of Engineering (B.E.)**

in

**COMPUTER ENGINEERING**

by


| | |
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**University of Mumbai**


2021–2022

# CERTIFICATE

This is to certify that the T.E. Mini-Project 2A/2B entitled **"Chatbot For College Website"** is a bonafide work of **"Tanaya Dasharath Patil" (EU1192008), "Vaishnavi Nanasaheb Jadhav" (EU1192032), "Priti Prem Ghodke" (EU1192025),** and **"Anushka Vilas Wagh" (EU1192007)**submitted to University of Mumbai in partial fulfilment of the requirement for the award of the degree of **"Bachelor of Engineering"** in **"Computer Engineering"** during the academic year 2021–2022.

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Principal

# T.E. Mini-Project 2A/2B Report Approval

This project report entitled ***ChatBot for College Website*** by **Tanaya Dasharath Patil, Vaishnavi Nanasaheb Jadhav, Priti Prem Ghodke, Anushka Vilas Wagh** is approved for the degree of ***Bachelor of Engineering*** in ***Computer Engineering*** from ***University of Mumbai***.

**Examiners**

1._____

2._____

Date:

Place: Palghar

# Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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# Abstract

*A ChatBot is a computer program that reenacts the conversation between humans and machines. They are driven by the technologies such as Machine Learning, NLP (Natural language Processing), AI and Automated tools to process the user's query and deliver responses to requests. NLP helps the chatbot to understand and prioritize the user query and respond accordingly. ML aids the system to learn from the experience and improve the ability of decision making. A ChatBot allows the business to interact with multiple customers in a personal way. The proposed system is implemented to solve the queries of students as well as parents. The system provides a text-based user interface, allowing the user to type their commands plus receive the text. The question could be related to the college. It will save user's loads of time for checking the relevant information. Integrating ChatBot with the website improves user engagement. In addition, ChatBots are proving useful as an alternative to FAQs. It can be used to provide service and utilize securely by larger audience.*

***Keywords—*** *Artificial Intelligence, ChatBot, Human Computer Interaction, ML(Machine learning), Natural language Processing*

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# List of Abbreviations

| | |
|---|---|
| **AI** | Artificial Intelligence |
| **API** | Application Program Interface |
| **CSS3** | Cascading Style Sheets 3 |
| **DFD** | Data flow Diagram |
| **DIET** | Dual Intent Entity Transformer |
| **FAQ** | Frequently Asked Questions |
| **GUI** | Graphical User Interface |
| **HTML5** | Hyper Text Markup Language 5 |
| **ML** | Machine Learning |
| **NLP** | Natural Language Processing |
| **NLU** | Natural Language Understanding |

# Chapter 1

# Introduction

Chatbot for college website will answer the query of user (student / parent) about the college. Chatbot first analyze the user's input and according to its knowledge database it will respond to user's query. If at any time the chatbot is introduced to conversation which is not programmed it will deflect the conversation. Students/Parents can ask the queries related to the admission process, placements, faculty details, fee structure, etc. Users won't have to personally visit the college for inquiry.

Chatbots provide user with easy access to college related information, and the heaps of information housed on a website.Chatbots are meant to provide user with immediate answers and repetitive tasks. Chatbots makes use of AI driven ML and NLP. AI aids the chatbot to learn from customer inputs, understand the complexity, prioritize and respond accordingly. Chatbot use NLP to understand user's intent and entity in user's utterance. Intent is a crucial feature of the conversation that defines the aim of the user while entity is a modifier which aims to describe the user's issue.

The proposed system can be integrated to the website.The system will reply to the user with the help of effective graphical user interface (GUI). The user can ask college related question through web integrated chatbot.

## 1.1 Motivation

Automation is the key of this new era of technology. Any field that encounters repetitive tasks needs automation.Now-a-day every sector are using AI, ML, NLP equipped tools to automate routine tasks. NLP facilitate computers to understand human language. It make sense of human language to carry out the automated tasks. Chatbots serves as an automated conversational programs that personalize the way one interact with the system.

Students are tend to gain the knowledge concerning their college. Obtaining these details often causes inconvenience and prolonged. As a Computer Engineering student we try to solve these problem by implementing the technologies we learn. This is where we thought of using an intelligent bot for delivering information. Not only students it will also save the officials from going through tedious process. It will save the time required in such drawn out process. All we have to do is just ask the question and get immediate response. It will be convenient to both students as well as faculty and officials.

## 1.2 Problem Statement

Current college enquiry system is based on human-to-human interaction. Students needs to go through tedious process to gain information. It is not always possible for the enquiry officials to attend huge number of queriers. Chatbots on other hand can handle multiple user's and attend their queries effectively and efficiently. Hence the following system aims to create an interactive chat-bot that efficiently responds to the user's query and replies with appropriate answers using machine learning and natural language processing techniques.

## 1.3 Objectives

The objectives are as follows:

- To implement a bot frame work that helps the users to get the college related data from anyplace with a web application
- To lessen the task at hand of college organization.
- To automate traditional human-to-human interaction.
- To save time of students as well as organization required in traditional process.

## 1.4 Scope

ChatBots effectively stimulates the conversation. It is primitive form of AI that mimic humans. Chatbots can be developed and improved. They have large scope in fields like education, business, chatting, etc. [6]Chatbots are going to explode and can be really dominating in future. Chatbots can provide a new and flexible way for users. Chatbot hold a strong grip in automated future. Such systems can prove to be a great alternative when situations are not in human control, current pandemic is an example when peoples are restricted to their homes. The proposed system will help to personalize the interaction. It will help the user to get relevant information at the click of button.

# Chapter 2

# Review of Literature

**2.1** [4] **Chatbot for university related FAQs:** Chatbots are meant to interact with humans using natural language. The user can provide their query in text or voice format. The chatbot has been proposed and design for mental health counseling using interactive graphics. The college enquiry chatbot is developed using artificial algorithms and machine learning algorithms. Student can get the answers of their queries and at any time with the help of such chatbot. The student can interact with the chatbot to get information about the placements, salary, status of the company. It can also serve as an guide for students.

**2.2** [8] **Chatbot for College enquiry:** Through this application users can raise any college connected activities through the system. The customary system of chatbot pattern is Artificial Intelligence markup language . The intention behinds this project is to develop an algorithm that will help to find the answers of users queries.

**2.3** [2] **College Enquiry Chatbot:** This is a proposed system in that people or users can ask a question only and they will get answer just like we do for chatting. There is no need to visit the college personally to get the information about the college. If the answer of query to is not found in the database in that case we will give a message to the user that we will contact you as soon as possible, and according to the feedback of customer software will implemented. This application need Continues internet connection.

**2.4** [3] **Chatbot based College Information System** The chatbot is designed in this way that users can have conversation with it by voice message or in textual method as well. It feels like man to man conversation although users are asking the question to the system. This system has different types of module like Notice board , chatbot , users module. Students pay off their numerous time on social media so if the Distance Education can be revolutionized

with the use of AI based chatbot tutor then students can save their lots of time by using it.

**2.5** [7] **Web Based College Enquiry Chatbot with Results Chat-bot** aims to make a conversion between to human and machine. It's conducts the conversion via auditory or textual methods. It is system is a web application and answers to users query very efficiently. In this project will answer to student questions this is related to college i.e admission, faculty details, etc. Chatbot also known as a talk bot , chatterbox ,bot, IM Bot or Artificial conversational. Its can play an effective role to reach the users 24/7.The main motive of the project is to reduce the work load on the college office staff and reduce the response time to a user query.

**2.6** [6] **A Tool of Conversation: Chatbot:** :Chatbot is widely used today. In this application can be seen in various field in the future. This Chatbot is very user friendly. The working of the chatbot is implied and easily understood by any person. It is use in various field such as education , business, online chatting etc. It can be used in the field of education as a learning and teaching aid. It can provide a new and flexible way for users.

The system makes is android based and made use of Artificial intelligence knowledge base . This system is to help the student to stay updated with their college activities.

# Chapter 3

# Requirements Gathering and Planning

## 3.1 Requirement Elicitation:

Requirement elicitation is a practice of discovering the requirement of the system from users, customers and other stakeholders.

### 3.1.1 Use Case Diagram:

Use case diagram is a behavioral diagram. It is the graphical representation of a user's possible interaction.

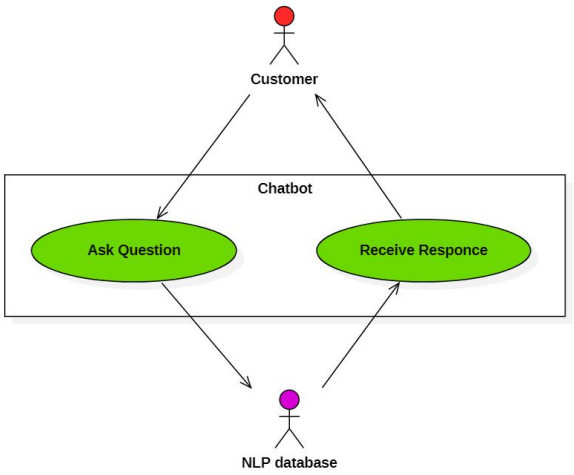


**Fig. 3.1**

### 3.1.2 Class Diagram:

Class diagram of the system show the basic structure of the chatbot. It involves attributes and operation used in the actual implementation of the system.

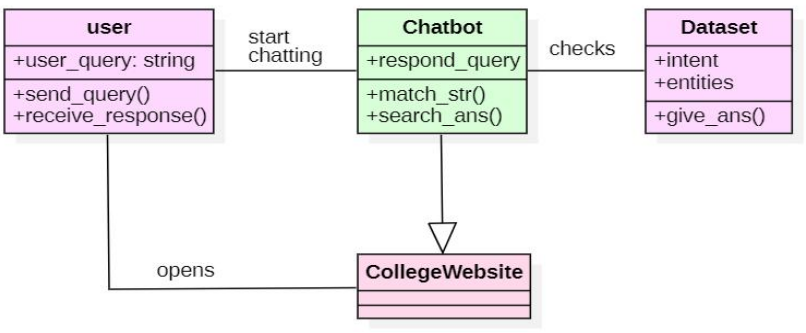


**Fig. 3.2**

### 3.1.3 Activity diagram:

Activity Diagram is basically a flowchart diagram that represents the dynamic aspects of the system. Activity diagram consist of all activities, constraints, decisions, conditions present in the system.

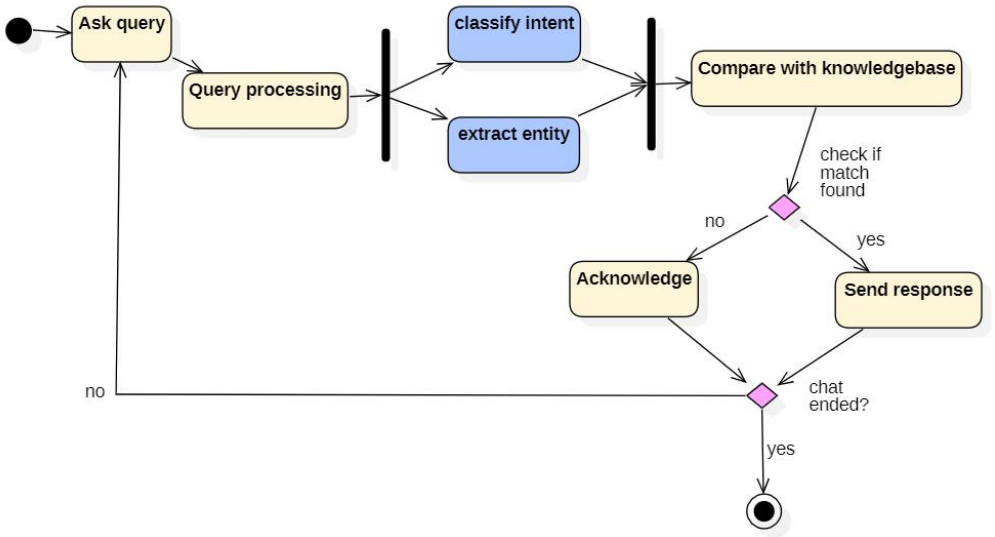


**Fig. 3.3**

### 3.1.4 Sequence diagram:

Sequence diagram also referred as scenario diagram represents in what order and how the work is carried out by different modules of the system. Following is the sequence diagram of proposed system.

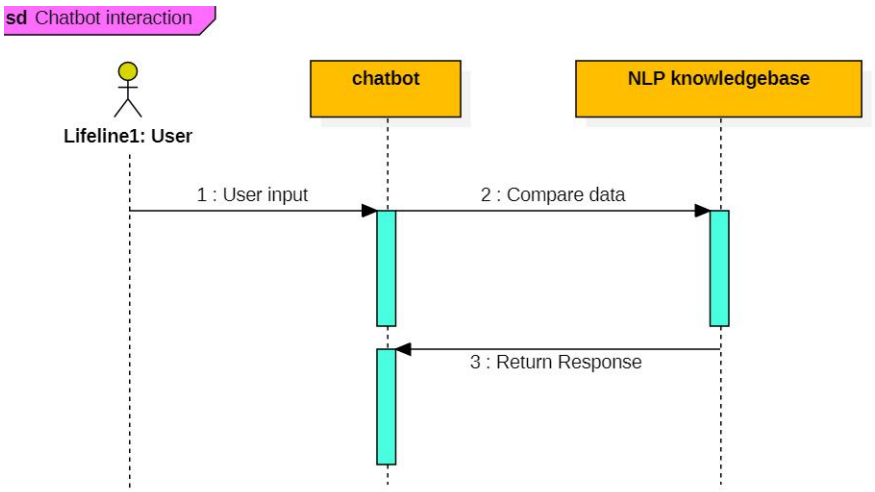


**Fig. 3.4**

## 3.2 Data Flow Diagrams (DFD):

Data flow diagram or DFD is the graphical representation of how the information flows in the

system. It consists of inputs, outputs, data stores and sub processes. According to the levels DFD is classified as :

Level 0 DFD

Level 1 DFD

### 3.2.1 Level 0 DFD:

It is also known as context diagram. Following DFD provides the broadview of how chatbot is connected to user and NLP knowledge base.

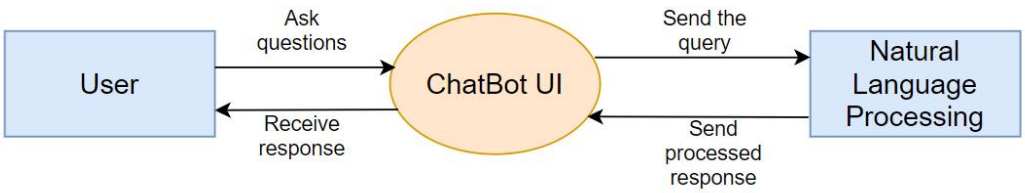


**Fig. 3.5**

### 3.2.2 Level 1 DFD:

Level 1 DFD is slightly more detailed than level 0 DFD. It represents the general idea about how the information in NLP module is processed. The user type the query and feed it to the chatbot then chatbot checks for the data inside knowledge base .Later it stores data to the database and give response to the user.

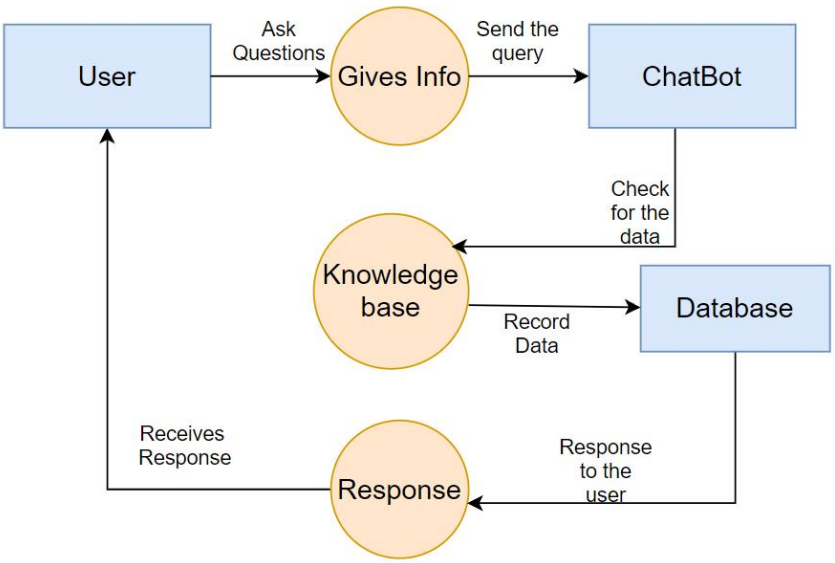


**Fig. 3.6**

## 3.3 Feasibility Study:

The important outcome of preliminary investigation is to determine whether the requested system is feasible or not. Feasibility study is helps determines the potentiality of the project by identifying the factors which will lead to success of the project. It also shows the potential return on the investment and risk of the project.

The key consideration involves in feasibility analysis are:

- Technical feasibility
- Economic feasibility

### 3.3.1 Technical Feasibility:

The initial step of feasibility study, Technical feasibility, is the process of proving that the proposed system is technically feasible. It demonstrates that the working model is functional and producible. The proposed system will be developed with the help of free open source Rasa Framework. It supports python language. Python is simple and easy with readable syntax reduces the cost of program maintenance. Tensorflow is free open source library use for machine learning and AI.

#### 3.3.1.1 Hardware requirement:

| Hardware Requirement | |
|---|---|
| **RAM** | 4GB (8GB recommended) |
| **Processor** | i3, i5 or similar |
| **Mouse** | - |

**Fig 3.7**

#### 3.3.1.2 Software requirement:

| Software Requirement | | |
|---|---|---|
| **Programming language** | Python<br>Python libraries:Tensorflow | 3.7 or above |

| | | |
|---|---|---|
| **Other software** | Anaconda | 4.9.2 |
| | Visual Studio | 16.9.3 |

**Fig. 3.8**

### 3.3.2 Economic feasibility:

The purpose of economic feasibility is to demonstrate cost-benefit and logistics of the project. Most of the system and technologies used for the development of the proposed system is well within the budget boundary it is possible because they are freely available and open source.

## 3.4 Timeline / Gantt chart:

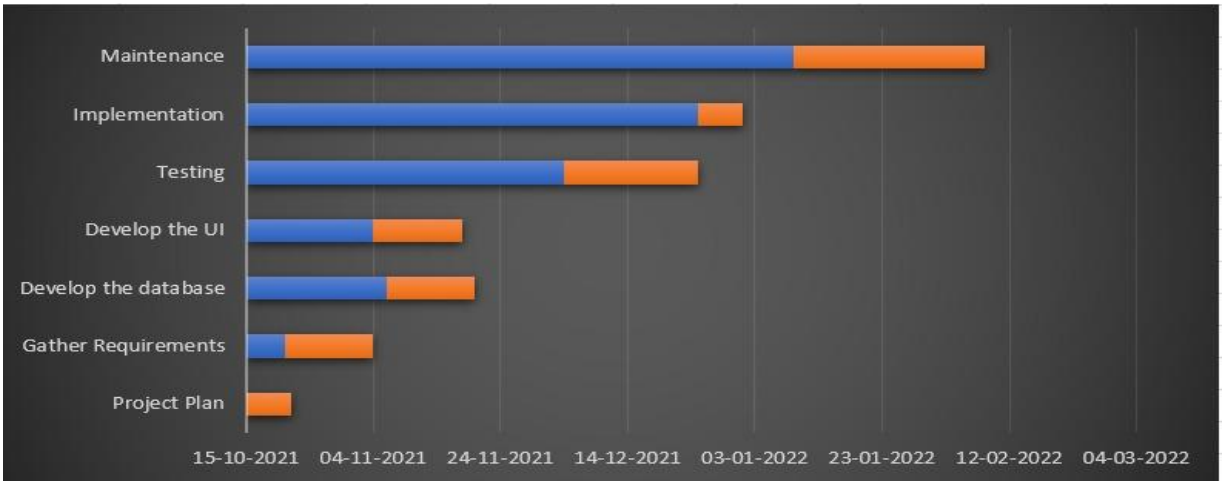


**Fig 3.9**

## 3.5 Work Breakdown Structure(WBS) Chart:

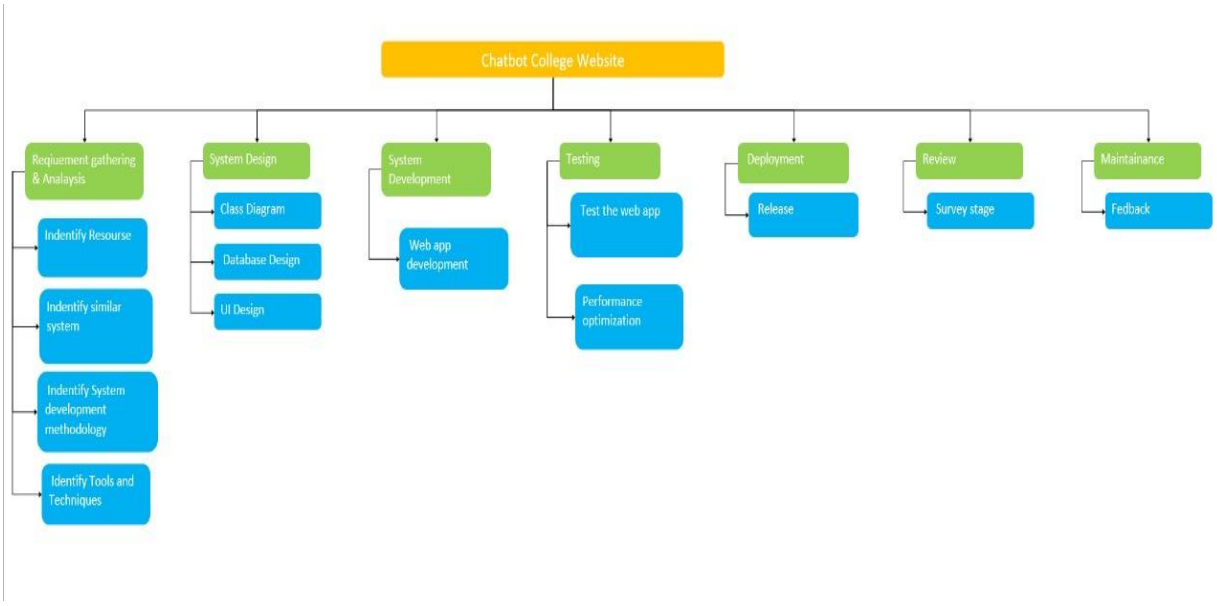


**Fig 3.10**

# Chapter 4

# Report on Present Investigation

## 4.1 Proposed System

Chatbots are supposed to have an interactive conversation with the user and personalize the way one interacts with the website. Chatbots are of various kinds ranging from command-line bots, websites, text-based, even OCR, and voice-based. Most of the chatbots are graphical and web-based. Chatbots are alternative to traditional FAQs. Many websites are opting for chatbots to increase user engagement and handle multiple users at a given time.

Chatbots typically serve as an interface where user can input their queries or commands. Then they process the query compare it with the database provided and answer the command or give the desired output.

- The proposed system is built using AI algorithms that analyze the query/command and answer accordingly.
- It is a text-based synergistic interaction between the user and college administration.
- The chatbot is a web application that will answer students/parent queries effectively.
- There will be no specific format to be followed by the user for chat.
- The system uses the built-in NLP algorithms to process the query and classify intents and extract entities. One classified it will make a decision and send the response to the user.
- If at any point it encounters with the intent that is not having any matches the system will simply acknowledge and move forward.
- Students/Parents do not need to visit the college for inquiry.
- It will lessen the burden on college officials to attend to queries of students.
- The system will be helpful to keep students updated about college activities.

**Features:**

1) **User :**

Users can enquire about college-related queries and receive the relevant answer.

2) **ChatBot:**

A chatbot will take the input to perform query processing and if a match is found it will send the response to the user. If it failed to found the match it will acknowledge the user by sending the message “no data found” or “Try some other keywords”.

### 4.1.1 Block diagram

The proposed system is implemented using Rasa framework. The following diagram depicts how Rasa process the user’s query with the help of RASA NLU and RASA Core.

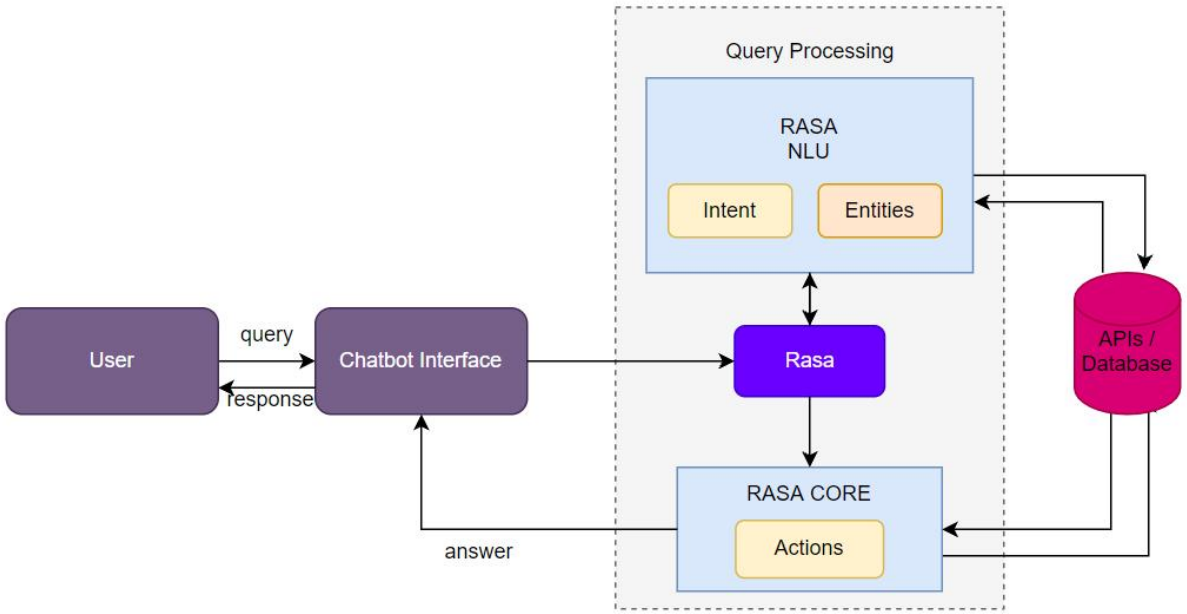


**Fig. 4.1**

**Rasa NLU:** It is an NLP Processing tool for classification of intent and extraction of entity

**Rasa Core:** [11] It takes structured input from rasa NLU and predicts the best action using probability.

## 4.2 Implementation

- User visit the website open the chatbot and start the conversation.
- User input the query related to college activities.
- Chatbot accepts the query and perform query processing.
- Inside query processing with the help of ML and NLP algorithm chatbot classify the words inputted by user into intents and extract the entities.
- Intents are the aim of the user and entities are modifiers which describes the intent. It make certain pattern/string matching and comparisons are made.
- If the given input is found in database the chatbot make the decision and send the most appropriate answer to the user.
- If the given input is not found chatbot will acknowledge the user that given input is found in database.
- User can terminate the conversation at any time or else continue chatting.

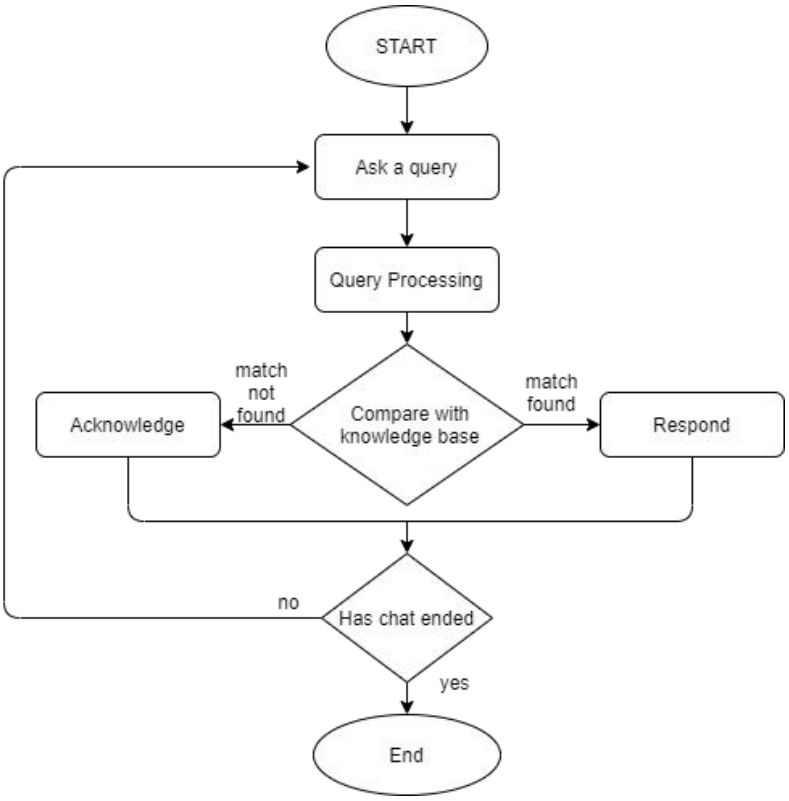


**Fig. 4.2**

**DIET Algorithm:**

DIET (Dual Intent and Entity Transformer) algorithm handles both Intent classification and Entity extraction. The algorithm interprets the input string as the list of tokens. For eg. User input “play ping pong” will be deciphered as [“play”, “ping”, “pong”]. Each token will be handled by two paths. The first path is the pre-trained path. The path will accept a pre-trained neural network. This network accepts a token and outputs a numeric vector. The second path will generate sparse features and eventually give rise to a numeric vector mostly of zeros. Then feed forward is performed. Feed forward implies that the flow of information is unidirectional. The information will not flow backward once feed forward. Both of the paths are then concatenated and once again feed forward is performed. A similar process is to be carried out on every token.

Class tokens (__cls__) summarize the entire utterance. The mean of pre-trained data and the sparse features of every token are summarized. Mask (Tensorflow token ) is used to predict the utterance. The goal of the algorithm is to predict which word is being uttered. Similarities are calculated between the mask and the uttered token that is passed through the embedding layer and mask loss is determined.

The class token passes through the embedding layer. Similarities between the summarized class token and the intent we are trying to fit on are calculated. And hence Intent loss is determined.

The remaining token vectors are fed to the transformer. The transformer uses an attention mechanism where recurrence relations are substituted. The number of input vectors and output vectors is the same. The output vectors of the transformer are passed to CRF (conditional random field) where entities are feed. Entity loss is calculated against the tokens.

Total loss is the summation of entity loss, intent loss, and mask loss.

**Total loss = Entity loss + Intent loss + Mask loss**

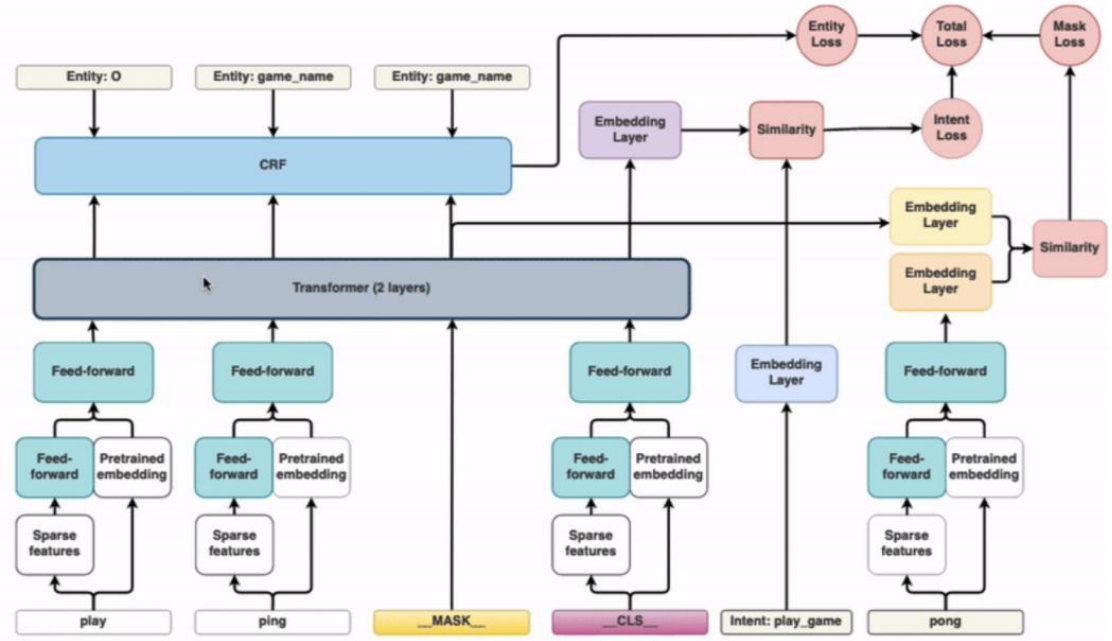


**Fig. 4.3**

**NLU pipeline:**

NLU pipeline is defined in config.yml file. The show the step required to break down the input query into intents and entities. There are four important components of NLU pipeline.

- Tokenizer
- Featurizers
- Intent Classifier
- Entity Extraction

In order to use DIET algorithm, 'DietClassifier' is included in config.yml file of project.

# Chapter 5

## 5.1 Technologies Used:

A chatbot is Machine Learning based software that can simulate a conversation or a chat with a user in natural language through messaging applications, websites, mobile apps or through the telephone. Natural Language Processing is at the heart of the chatbot which helps in recognizing user's intent.

**Programming language:**

**Python:**We used Python Language for coding in chatbot

**Version: 3.8.5**

**Python libraries used in project:**

**Tensorflow:** TensorFlow is a Python library for fast numerical computing created and released by Google. It is used in our project as it is used to easily build and deploy ML powered application.

**Scripting Language:**

**Javascript :** Javascript is used to make UI of chatbot Interactive.

**Markup languages:**

**HTML5 and CSS3 :** HTML5 and CSS3 are used to make the UI of chat bot.

Also we have used Materialize.css to make the UI more attractive.

**Framework:**

**RASA Framework**

[11] It is a Python based framework. Rasa is a tool for Conversation-Driven Development (CDD) i.e. the process of listening to your users and using those insights to improve chat assistant. It's a chatbot framework with machine learning-based dialogue management which takes the structured input from the NLU and predicts the next best action using a probabilistic model

**Recent technology:**

**Machine learning and Natural Language Processing**

**Machine Learning:** As Rasa Framework is ML based the data is fed to the bot and it is trained.

**Natural Language processing:** The NLP is used to understand what is the query of user and accordingly responses are given by chatbot.

**Other Softwares Used:**

**Anaconda:** For running the Rasa framework

**Version: 4.9.2**

**Microsoft Visual C++ :** For coding

**Version: 16.9.3**

# Chapter 6

# Results and Discussion

College chatbot has been implemented using Rasa Framework.The chatbot has been designed to provide students feel like talking to the staff from college and their queries are addressed through the conversational text.

Following are the results of implemented system:

- Initializing and Training initial model of chatbot:

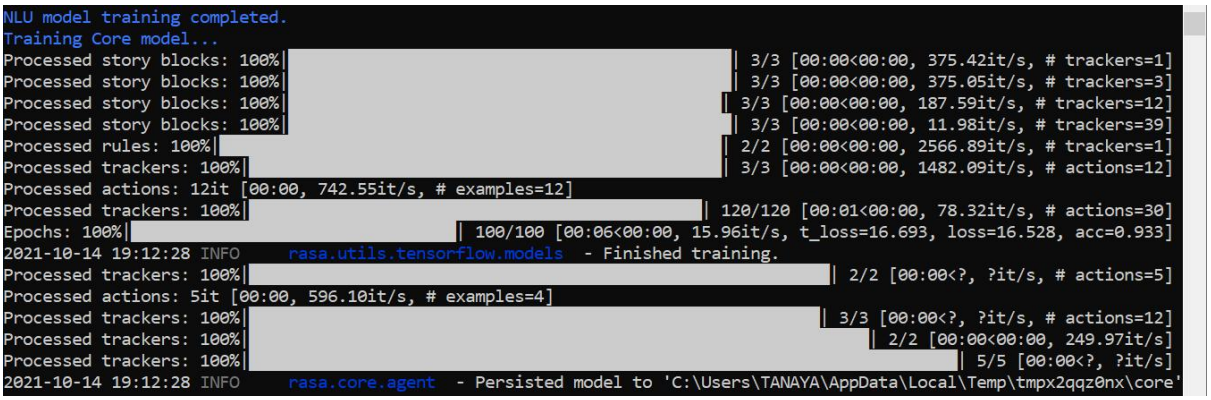


**Fig 6.1**


**Fig 6.2**

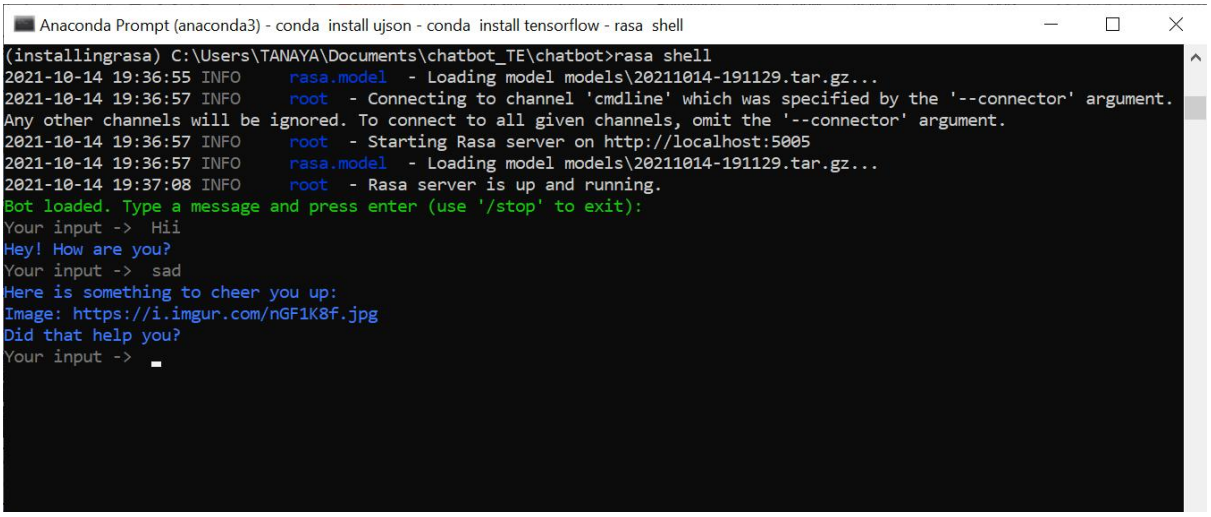


**Fig 6.3**

➢ User Interface of the chatbot:


**Fig 6.4**

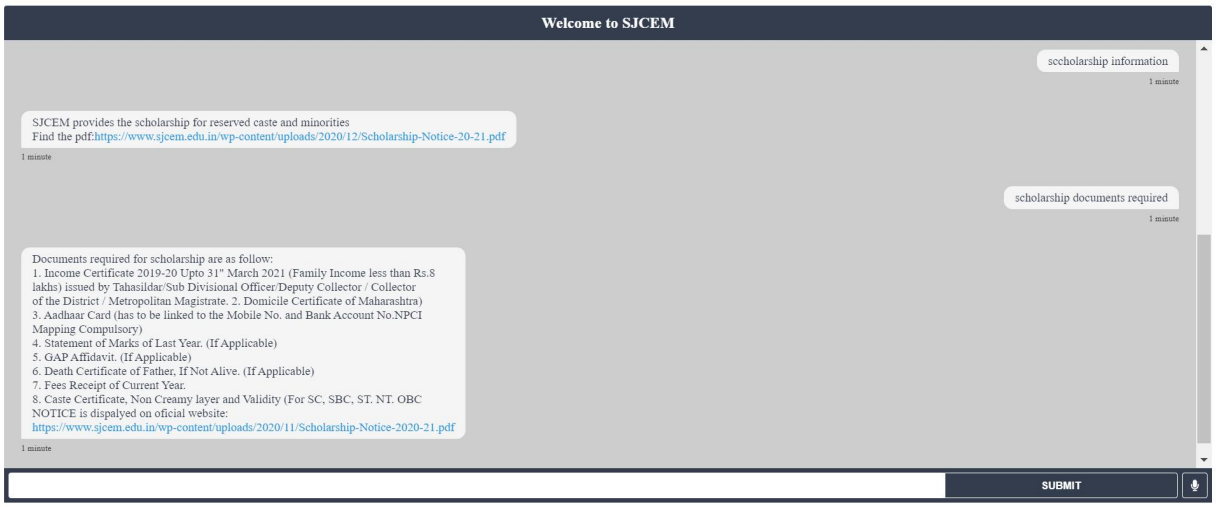


**Fig 6.5**


**Fig 6.6**


**Fig 6.7**

We have define the performance of the DIETClassifier using confusion matrix. As the confusion matrix generate, most of the time the value outputted is correct.

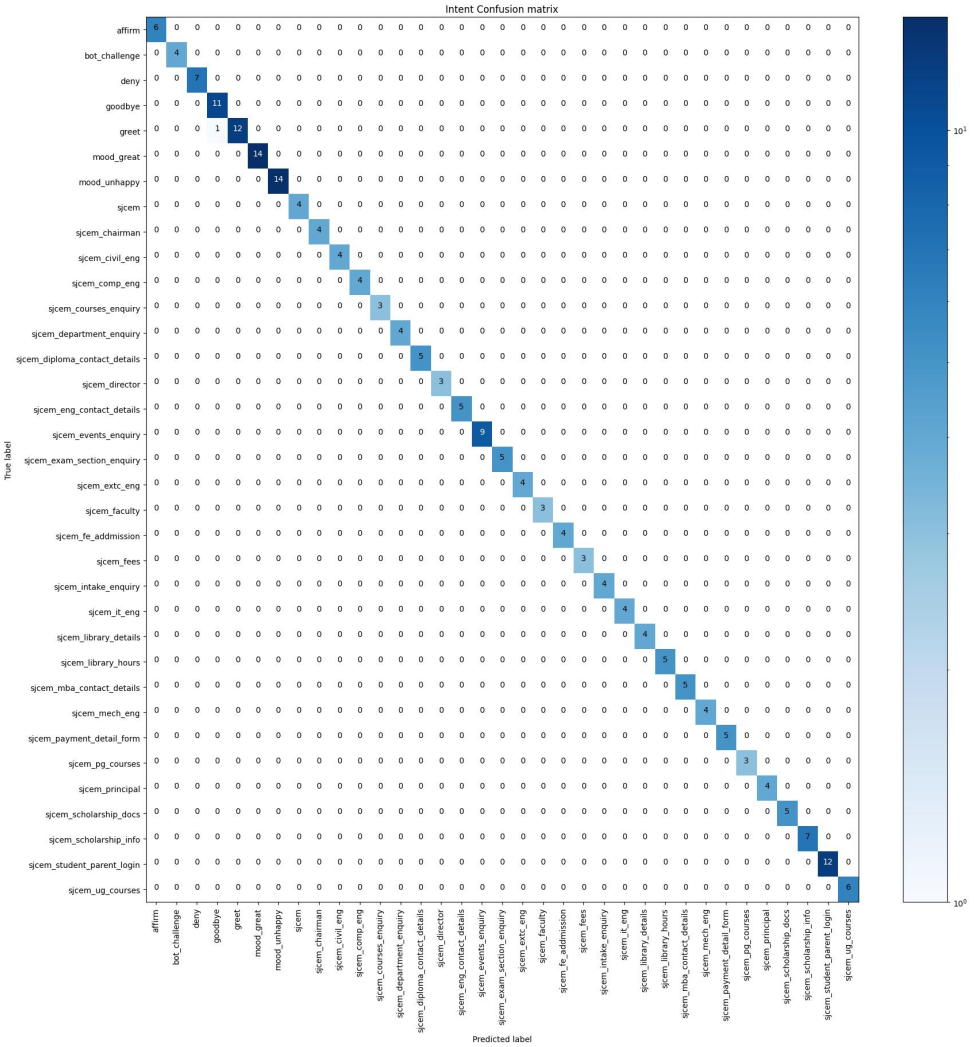


**Fig 6.8**

As per report generated by rasa test the accuracy of the model is upto 99.5%

1. **The precision** is the ratio tp / (tp + fp) where tp is the number of true positives and fp the number of false positives = **0.99**
2. **The recall** is the ratio tp / (tp + fn) where tp is the number of true positives and fn the number of false negatives = **0.99**
3. **F1_score** : F1 = 2 * (precision * recall) / (precision + recall) = **0.99**


```
"accuracy": 0.9950248756218906,
"macro avg": {
  "precision": 0.9976190476190475,
  "recall": 0.9978021978021977,
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  "f1-score": 0.9950335280121133,
  "support": 201
}
```


**Fig 6.9**

**Histogram:** We have summarize discrete intents data that are measured on an interval scale using histogram.

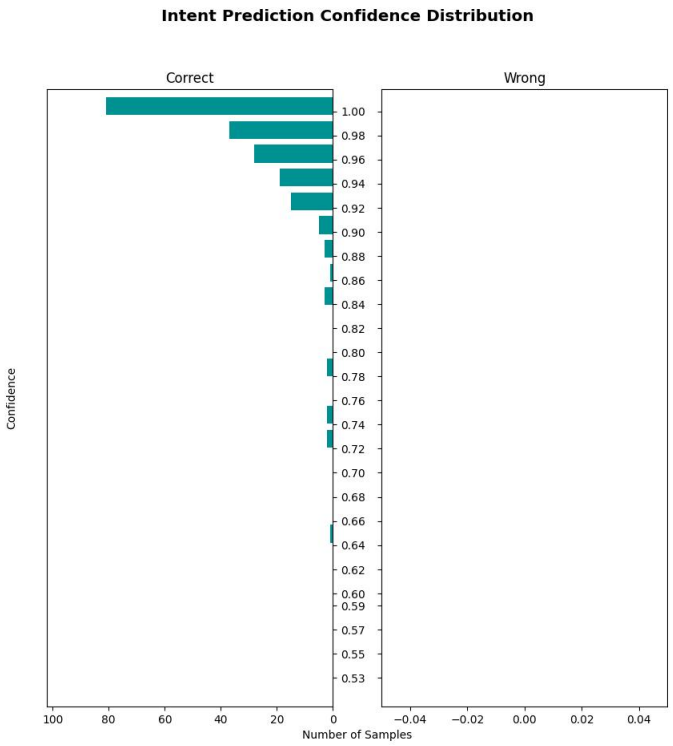


**Fig 6.10**

# Chapter 7

# Conclusion and Future Work

Chatbots are lately gaining importance in every field of life whether for marketing, business or even assisting. Such technologies are getting rooted and proving themselves useful. More effective human conversation will take place if chatbots are integrated with website.

The main objective of this project is to develop a system capable to handle multiple users queries effectively. To create a system that will accurately identify the questions and respond accordingly. It aims to develop a dataset were all the information regarding college is stored and to develop a GUI where user can interact. A dataset is developed to store the keywords, utterance, intents, entities,etc. Integrating chatbot with website proves to be a stateful service.

Hence the proposed system can effectively answer the question asked by user with the help of interactive GUI.

**Future Enhancement:**

1. Increasing efficiency
2. Make to learn the pattern on its own.
3. Add Role Based Access
4. Add more intents and entities

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