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Deep Neural Network Based Conversational Chatbot

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Abstract
Chabot on WhatsApp are a fun alternative to regular websites. Conversations, particularly those conducted via chat, provide prospects with a degree of involvement that traditional websites cannot match. Here, some chatbots gives different replies to the same input given by the user in a current conversation scenario. So, we aim to develop such a Chatbot for Specific College Department, so that it can solve student queries. A chatbot is software that can have intelligent live conversations with humans. It uses NLP and dense neural networks to interact with computers. Chatbot answers in the same language. Business chatbots are popular because they handle multiple users and reduce customer costs. In this project, the chatbot uses natural language processing and Dense neural network to find a dataset of general college department information and answers to related questions. Chatbots respond differently to user input. We want a chatbot to answer student questions.

Keywords: *Chatbot, Dense neural network, Natural language processing, Business.*

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I. INTRODUCTION

A chatbot is a computer programme that simulates human conversation, or chatter," through text. Chatbots interact with humans and solve their problems. The bot will respond to any question or statement from a user. The chatbot era has arrived. Google, Facebook, Microsoft, and others are working on this cutting-edge user experience technology. Instant messaging-like chatbots interact. If you asked Amazon's Alexa, Apple's Siri, or Microsoft's Cortana, "What's the weather?" they would respond with the latest weather reports. The sophistication of a chatbot's software and data determine its complexity. Chatbots use conversational artificial intelligence (AI) to simulate natural language conversations with users via messaging apps, websites, mobile apps, or the phone. One of the most promising forms of human-machine interaction is a chatbot. These digital assistants simplify customer service interactions. Chatbots send automatic messages, synthesize voices, or offer decision buttons to simulate conversations. Some chatbot software understands user intent and provides predefined responses. Chatbots look fun. WhatsApp chatbots are AI-powered software that run on WhatsApp. WhatsApp chatbots are chatted with like humans. It simulates real-time WhatsApp conversations with automated replies. WhatsApp lets you send text, photos, and videos over the internet. It is the most popular worldwide. Chatbots are everywhere now. Messenger chatbots were overused in 2016. Businesses will develop chatbots to benefit from them.

II. JUSTIFICATION

Chatbots converse to provide information via a lightweight messaging app. Most people use WhatsApp for messaging. WhatsApp is now the most comfortable platform. Instead of forcing them to download another app, it makes more sense for them to interact with business owners or service providers on WhatsApp. WhatsApp engagement improves the customer experience.
Two types of chatbots exist:

- Rule-based chatbot These are interactive FAQs. They recognize terms and patterns and respond with pre-programmed answers.

- AI chatbots: These artificial brains use cognitive and natural language processing. It understands requests, context, intent, and emotion, and learns from user conversations to get smarter.

Chatbots alleviate industry pain. Chatbots help business teams scale customer relations. It could be in Facebook Messenger, Slack, Telegram, text messages, etc. According to the Global Web Index, 75% of internet users use one or more messenger platforms, including chatbots. Although research shows that each user uses an average of 24 apps a month, 80% of the time is spent in just 5 apps. Facebook Messenger, Snapchat, WhatsApp, WeChat, etc. AI and machine learning can deliver business insights, automate tasks, and improve system capabilities from massive data sets. AI and ML can improve customer satisfaction, differentiated digital services, existing business services, automation, revenue, and costs. Amazing capabilities, detailed analytics, and smooth user/customer experiences at the lowest price Thus, we are creating a WhatsApp chatbot for a college department to engage students and provide useful information.

We aim to integrate our chatbot model with WhatsApp using the Twilio WhatsApp Business API.

III. MODULE DESCRIPTION

Code modules are simple. This project's libraries and modules are described below.

1. Twilio WhatsApp Business API: Twilio's WhatsApp Business API integrates our chatbot with WhatsApp. Thus, we use WhatsApp for messaging. WhatsApp Business API helped medium- and large-sized companies communicate with multiple customers at scale using WhatsApp. WhatsApp Business API automates communications with chatbots, automated replies, and interactive messages.

2. TensorFlow: It simplifies data acquisition, model training, prediction, and result refinement in machine learning. TensorFlow uses metaphors to study machine learning and deep learning models and algorithms.

3. Natural Language Processing: Natural Language Processing analyses, understands, and generates human languages for written and spoken computer interaction. NLTK: Python libraries and programmes for symbolic and statistical NLP for writing English. NLTK uses graphics and sample data. NLTK supports NLP and AI/ML research and education. It has been used to teach, study, and prototype models and research systems. NLTK supports classification, tokenization, stemming, tagging, parsing, and semantic reasoning.

4. Classification: Classification involves assigning an input's class label. Classification involves predefined labels and independent inputs. Identifying spam emails

1. Tokenization: Text is tokenized. Paragraphs, sentences, and words are tokens. The tokenize module has many NLTK tokenizers. Tokenizing the text into sentences precedes further processing. Stemming: Stemming organizes words from their root forms by mapping a group of words to the same stem, even if the stem is not a valid word.

2. Tagging: Most NLP models are bag-of-words-based. Such models failed to determine word syntactic relations. Based on context and definition, POS tagging assigns words to speech tags. Lancaster sturgeon is aggressive. When implemented using the NLTK package, we can add our own custom rules to this algorithm, giving it an advantage over other stemming methods. This can cause abrupt results.

3. Parsing: Parsing involves deconstructing a sentence to understand its meaning. Readers note sentence elements and parts of speech while parsing.

4. JSON (JavaScript Object Notation) JSON is an open standard file format and data interchange format that stores and transmits attribute-value pairs and array data types (or any other related value) in human-readable text. It replaces XML in AJAX systems and has many uses. JSON is format-free. From JavaScript. The JSON file extension is "intents.json".
5. NumPy: Python's NumPy library supports large multidimensional arrays and matrices and integrates high-level mathematical functions for their operation. Python's mathematical algorithms are slower than compiled ones. It detects slowness in NumPy by providing multidimensional arrays, functions, and operators that efficiently work on arrays without requiring code rewrites or inner loops. Core functionality is an n-dimensional array data structure. These arrays display memory sequentially.
6. Network Density Dense neural networks have densely connected layers. All neurons in a layer receive input from the previous layer, so they are densely connected. Densely connected layers create learning features from previous layer combinations. Convolutional layers use congruous features with small repetitive fields.

III. METHODOLOGY

Here, to build a chatbot model, we are using Python and AI&ML techniques like NLP and DNN to respond to input. We built a neural network using tflearn and natural language processing. "Intents.json" for model training. Intents.json contains chat examples and chat blocks under "tags". The dataset includes college inquiry chats, different question patterns, and a standard response. This file was used to train the model using tflearn fit() and saved as "model.tflearn". "Training_data" holds all training data and provides the answer. Twilio's WhatsApp API provides Chatbot's phone number. Twilio's API sends input to the Python back-end. Twilio sends this response to WhatsApp. Twilio API delivers messages based on WhatsApp user input. The AIML model then sends a response to the user via the Twillio API. Thus, we want to use the Twilio API in order to integrate our model with WhatsApp. We have two functionality role which comes into play, a user, and an admin. An admin simply does the operations like add, delete or modifying of data in dataset file as per the requirements. A user is the one who sends message to chatbot and receives response from the chatbot according to the given input message. A user will receive different responses each time to the question asked to chatbot. For Example: if user send "hi" message then the chatbot may reply "Hello! Nice to meet you!" and again if user send message as "hi", the chatbot may reply "Hey there!" or "Hi, Good to see you". Based on the dataset that has been trained the chatbot would reply. The model code can be executed in system or local server by using ngork and flask API. The data flow and working are as shown below:

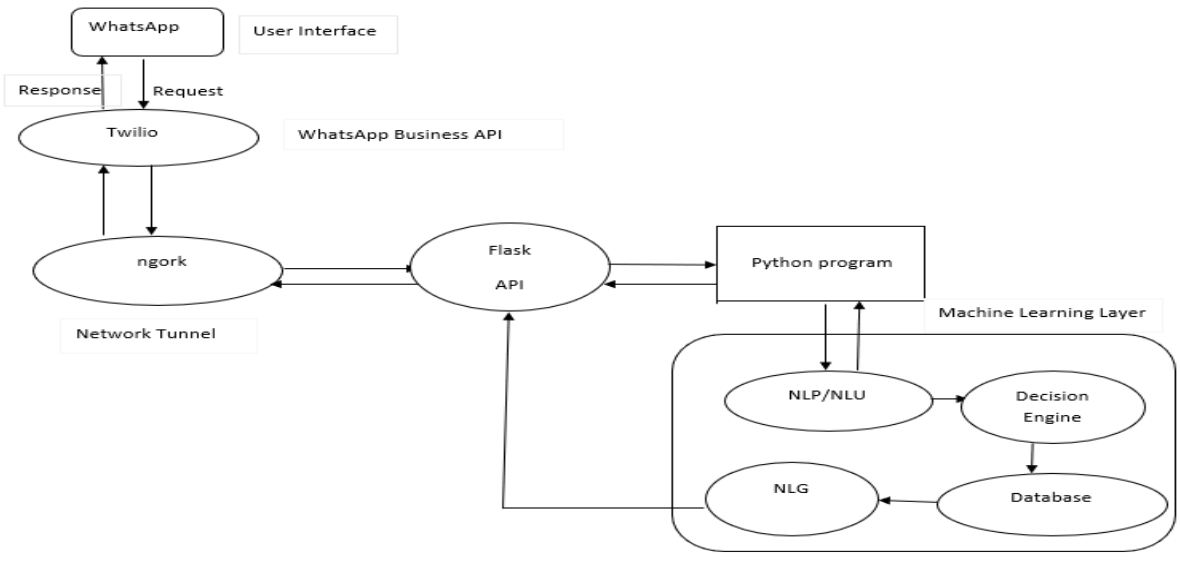


Fig 3.1: Working and Flow of data using ngrok and flask API

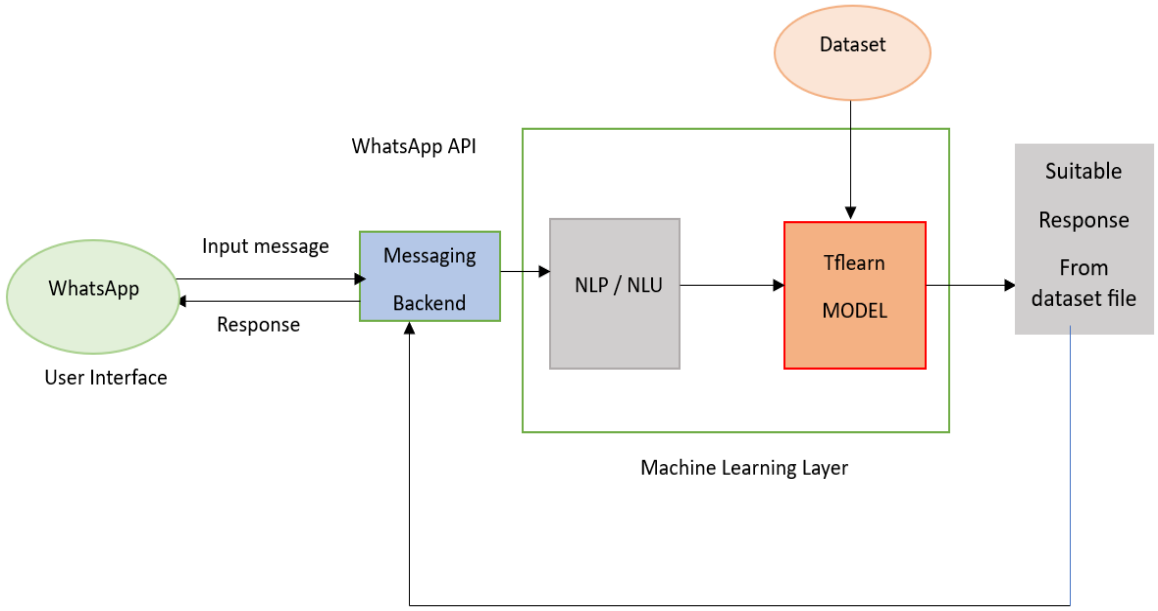


Figure 3.2: System Architecture

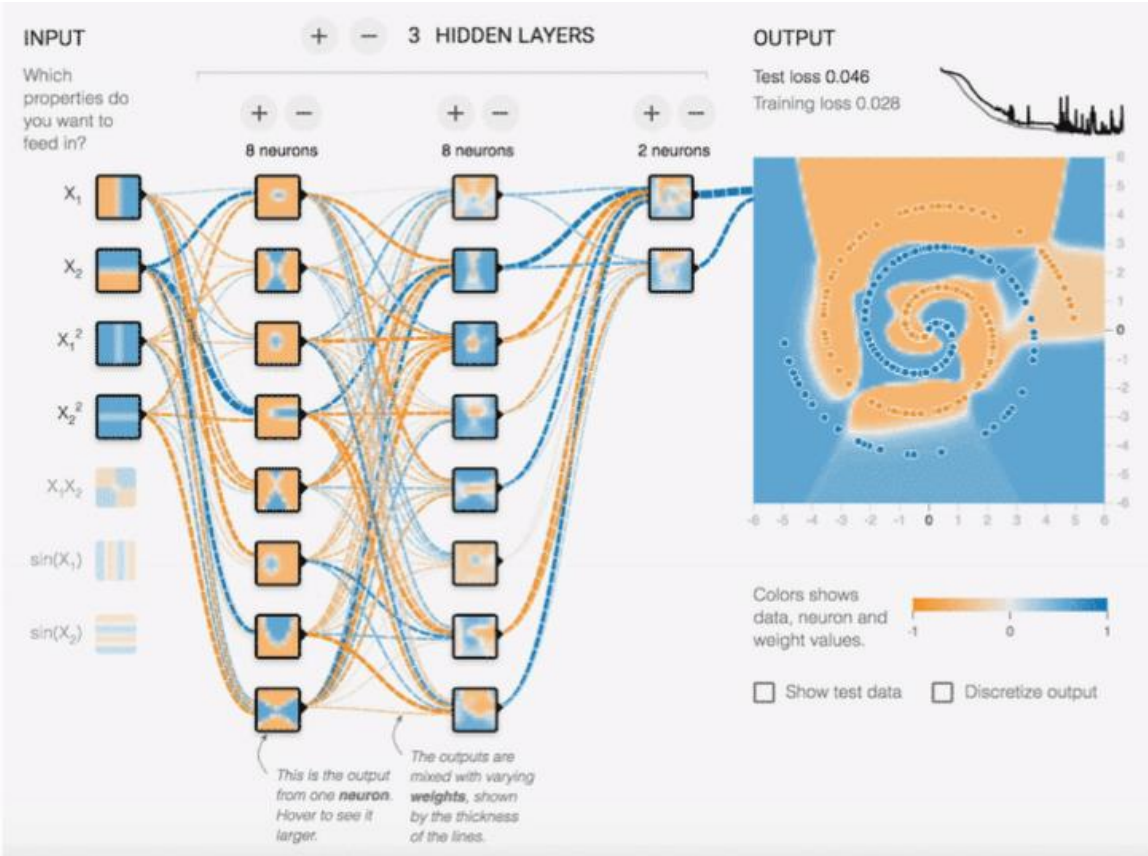
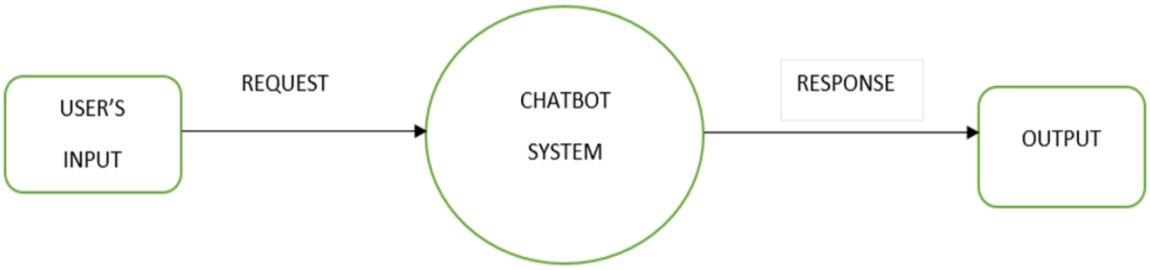
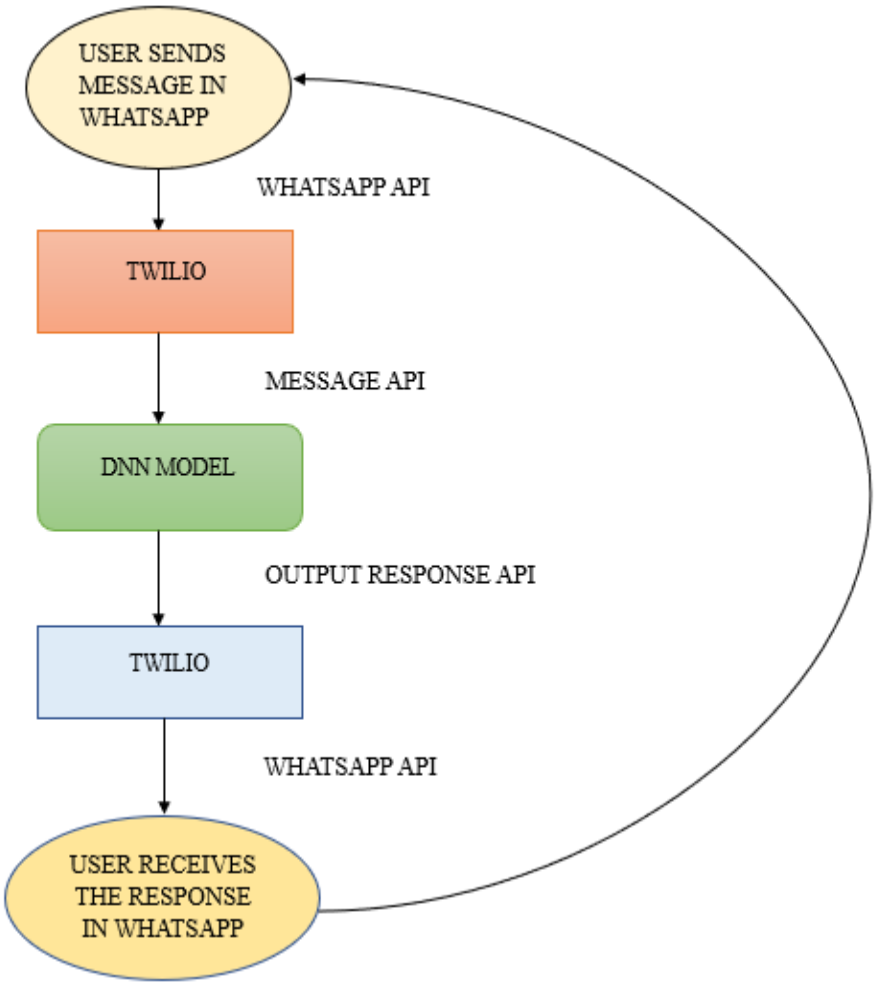


Figure 3.3: Sample Working of DNN Model

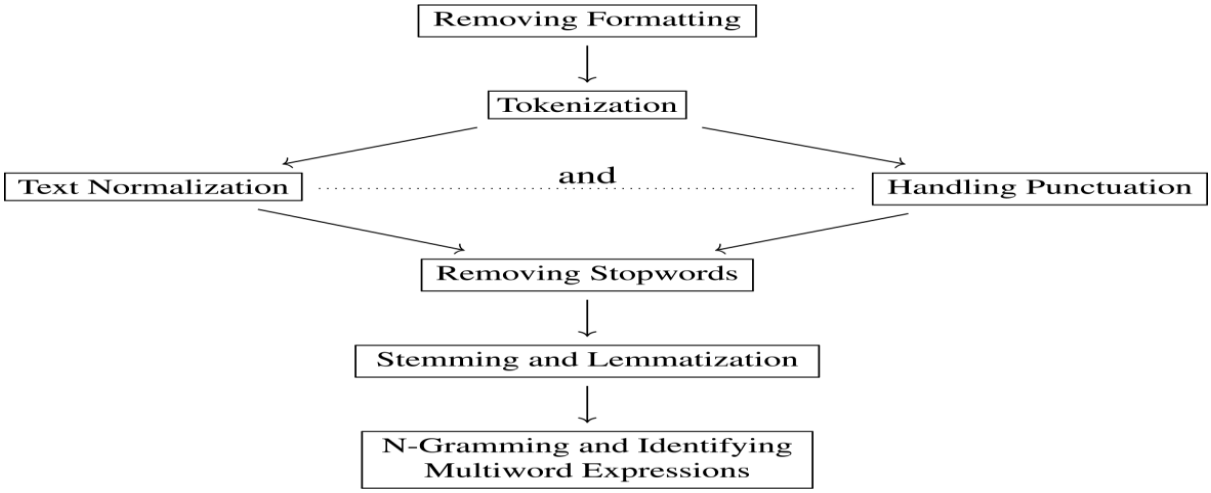
Data Flow Diagrams: Level 0:



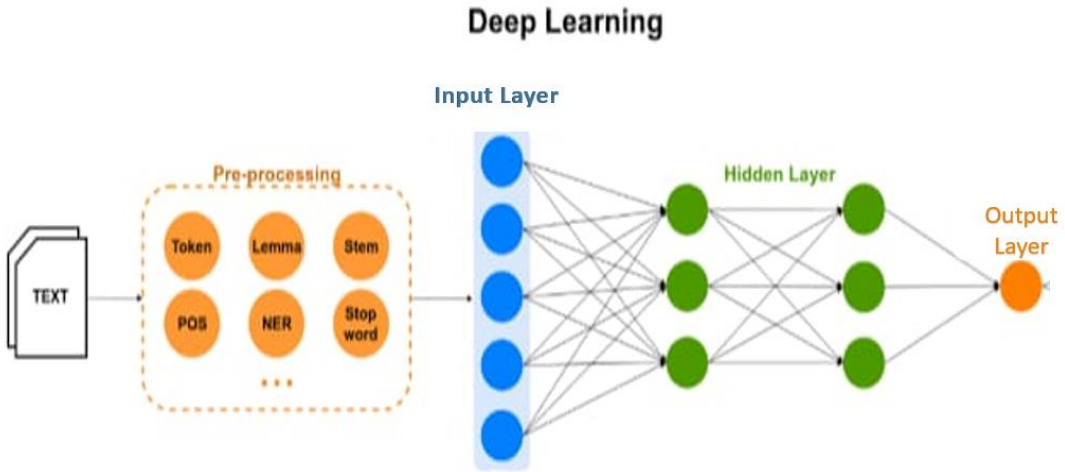
Level 1:



Level 2:



Level 3:



Level 4:

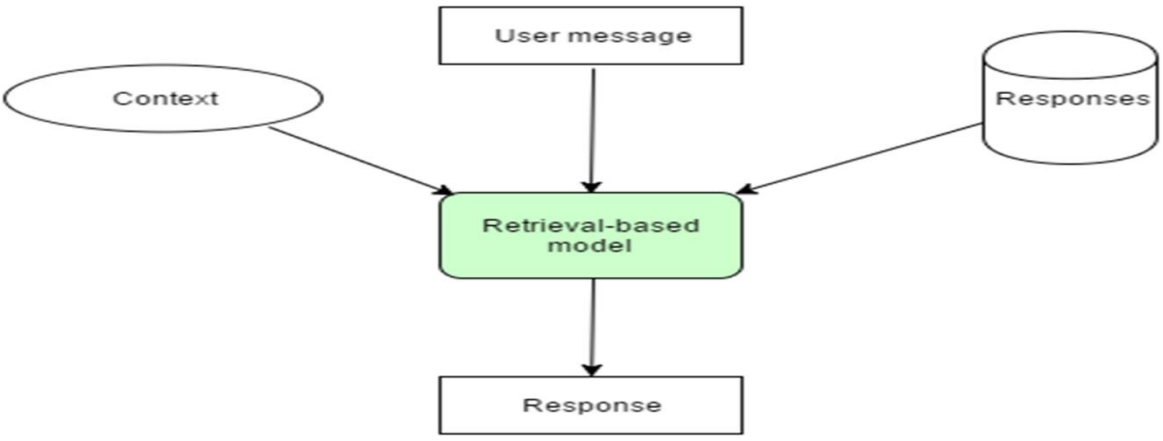


Fig 3.4: Data Flow Diagrams from level 0 to level 4.

DNN Model Architecture:

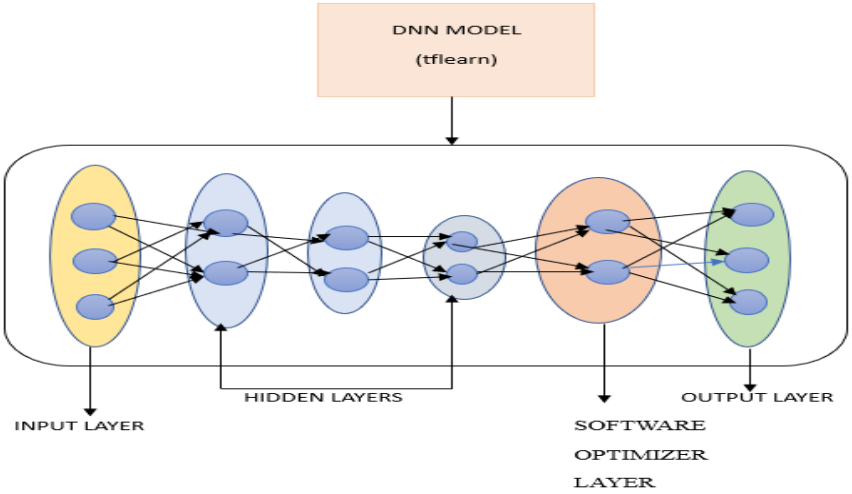


Fig 3.5 Structure of DNN Model using tflearn library

Use Case Diagram:

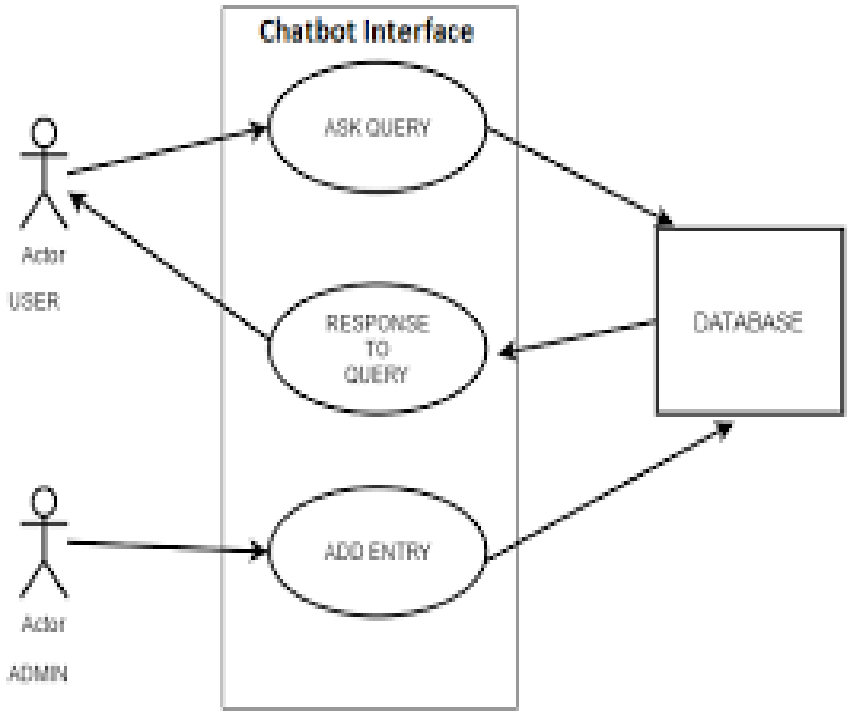


Fig 3.6: This depicts the workflow of overall usage of chatbot

Sample Dataset File

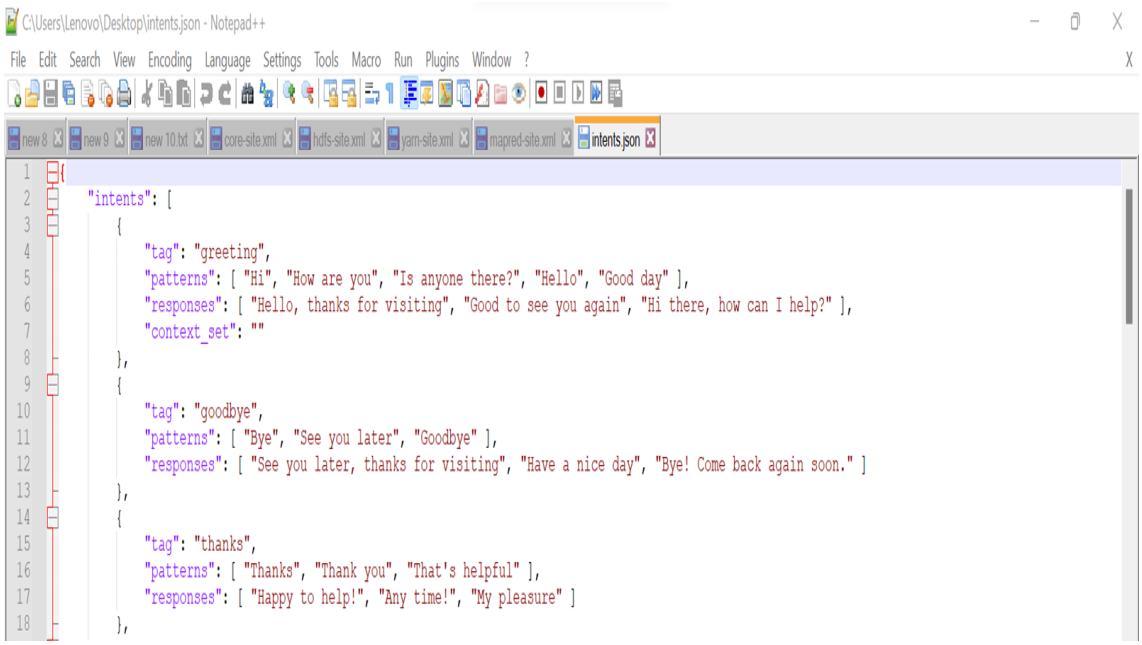


Fig 3.7: A glimpse of dataset file (. json)

IV. RESULT

After successful compilation of tflearn model code in Google colab/Jupyter Notebook, the model gets trained in 900 epochs with 100% accuracy.

Fig 4.1: Output response of the Model

Fig 4.2: The above 2 pictures depicts that the chatbot model is responding differently to the same input given.

Expected Result: After the integration of twilio API with our chatbot model we expect the result to appear like this.

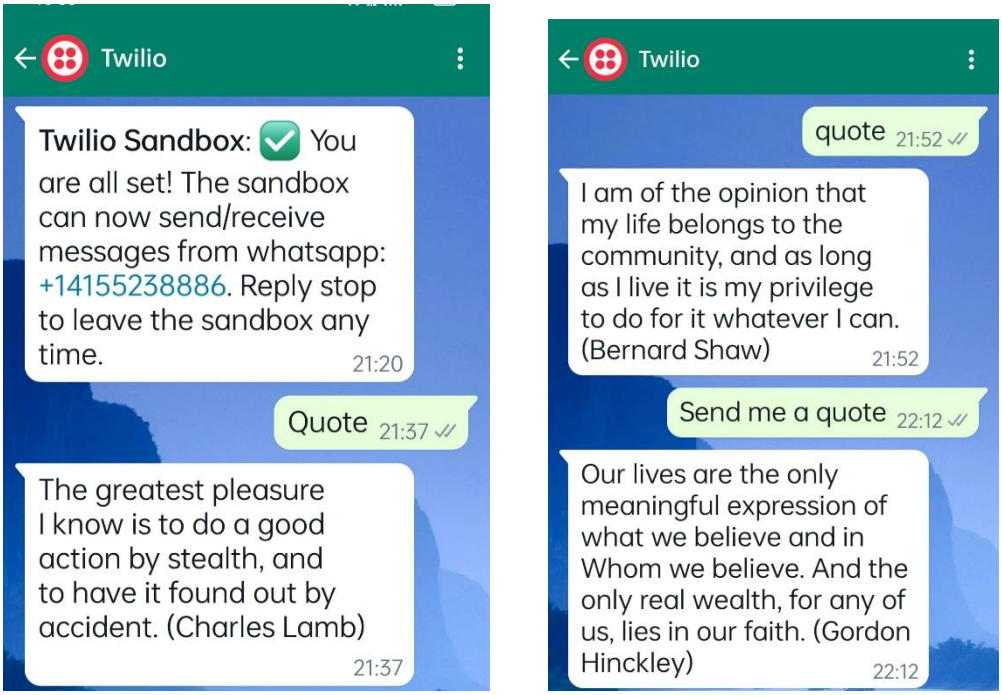


Fig 4.3: Chatbot Response to the input after Twilio Whatsapp API integration with model

V. ADVANTAGES

- Easy and quick access to information.
- Reduces manual work and time usage.
- Easy to use.
- Provides security and privacy.

VI. APPLICATION

- To get general information about academics and college department.

VII. CONCLUSION

We conclude that a chatbot developed using deep neural network with TensorFlow works better than simple machine learning based chatbots and rule-based chatbots. Also, the overall code gets significantly reduced using libraries. We want to use WhatsApp as User Interface by using Twilio WhatsApp API so that everyone can easily access it. As future work, with the advances in AI development will impact Chatbots with AI making iterations fast, voice interactions, etc. Our work on chatbot does not get over with this. We shall continue to make it better and take it to the advancement.

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