**Mini Project Report on**



**BUILD A CHATBOT**



**Submitted in partial fulfillment of the requirement for the award of the degree of**

**BACHELOR OF TECHNOLOGY**

**IN**

**COMPUTER SCIENCE & ENGINEERING**

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**CANDIDATE’S DECLARATION**

I hereby certify that the work which is being presented in the project report entitled **“Build a Chatbot ”** in partial fulfillment of the requirements for the award of the Degree of Bachelor of Technology in Computer Science and Engineeringof the Graphic Era (Deemed to be University), Dehradun shall be carried out by the under the mentorship of **Mr. Vivek Tomar, Assistant Professor**, Department of Computer Science and Engineering, Graphic Era (Deemed to be University), Dehradun.

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***Chapter 1***

***INTRODUCTION***

* 1. **Introduction**

Chatbots are often used to help customers find information, complete transactions, or provide customer service. Chatbots can be built using a variety of programming languages and tools like machine learning and natural language processing(NLP) to deliver near-human conversational experiences.

A chatbot is a brand-new conversational agent in the high-speed changing technology world. With the advance of Artificial Intelligence and machine learning, chatbots are becoming more and more popular.Many chatbots have been developed that provide a multitude of services through a wide range of methods. A chatbot is an extension of human interface mediums such as the phone and social platforms. Similarly, Cryptocurrency is a new extension of digital or virtual currency designed to work as a medium of exchange. In the current digital exchange world, investors and interested parties are eager to know more information about, and the capabilities of, this new type of currency. One can convinentaly retrieve the info automatically and quickly is through a chatbot.

The interaction in the format of speech or text between humans and computers is gaining more and more in popularity nowadays. Chatbots gives an similar experience as the human interaction itself. To provide suitable responses based on phrases or keywords taken from questions, a program is needed, which is often called a chatbot or a chatterbot. The chatbot is a computer program that can communicate with people by providing answers to questions. People input the natural language speech or text, while the program provides the most feasible intelligent response in the form of text or speech.

Diagram, schematic

Description automatically generated

Fig 1.1 Working of a Chatbot

## **Chatbot Classifications**

Chatbots are a relatively recent concept and despite having a huge number of programs and NLP tools, we have just two different categories of chatbots based on the NLP technology that they utilize. These two types of chatbots are as follows:

* + - **Scripted chatbots-** Scripted chatbots are classified as chatbots that work on pre-determined scripts that are created and stored in their library. Whenever a user types a query or speaks a query (in the case of chatbots equipped with speech-to-text conversion modules), the chatbot responds to this query according to the pre-determined script that is stored within its library. One of the cons of such a chatbot is the fact that user needs to provide their query in a very structured manner with comma-separated commands or other forms of a regular expression that makes it easier for the bot to perform string analysis and understand the query. This makes this kind of chatbot difficult to integrate with NLP-aided speech-to-text conversion modules. Hence, these chatbots can hardly ever be converted into smart virtual assistants.
    - **Artificially Intelligent Chatbots-**Artificially intelligent chatbots, as the name suggests, are created to mimic human-like traits and responses. NLP or Natural Language Processing is hugely responsible for enabling such chatbots to understand the dialects and undertones of human conversation. NLP combined with artificial intelligence creates a truly intelligent chatbot that can respond to nuanced questions and learn from every interaction to create better-suited responses the next time. AI chatbots have been developed to assist human users on different platforms such as automated chat support or virtual assistants helping with a song or restaurant selection.

***Chapter 2***

***NATURAL LANGUAGE PROCESSING***

**2.1 What is natural language processing?**

Natural Language Processing (NLP) is an interdisciplinary area of research aimed at making machines understand and process human languages. It is an evolving field, with a rapid increase in its acceptability and adoption in the industry, and its growth is projected to continue. NLP-based applications are everywhere, and chances are that you already interact with an NLP-enabled application regularly (Alexa, Google Translate, chatbots, and so on).

**Natural Language Processing ( NLP** )is the technology that is used by machines to understand, analyze, manipulate, and interpret human languages. It helps developers to organize knowledge for performing tasks such as **translation, automatic summarization, Named Entity Recognition (NER), speech recognition, relationship extraction,** and **topic segmentation**.

Using NLP technology, you can help a machine understand human speech and spoken words. NLP combines computational linguistics which is the rule-based modeling of the human spoken language with intelligent algorithms such as statistical, machine, and deep learning algorithms. These technologies together create the smart voice assistants and chatbots that you may be used in everyday life.

## **2.2Components of NLP**

There are the following two components of NLP -

**1. Natural Language Understanding (NLU)**

Natural Language Understanding (NLU) helps the machine to understand and analyze human language by extracting the metadata from content such as concepts, entities, keywords, emotions, relations, and semantic roles.

NLU is mainly used in Business applications to understand the customer's problem in both spoken and written language. NLU involves the following tasks -

* It is used to map the given input into useful representation.
* It is used to analyze different aspects of the language.

**2. Natural Language Generation (NLG)**

Natural Language Generation (NLG) acts as a translator that converts the computerized data into natural language representation. It mainly involves Text planning, Sentence planning, and Text Realization.

Diagram

Description automatically generated

Fig 2.2

***Chapter 3***

***METHODOLOGY***

We develop a deep learning-based model so we need to train our model. We are not going to gather or download any large dataset since this is a simple chatbot. We just create our dataset to train a model. To create a dataset, understand what are the intents that we are going to train.

An ‘Intent’ is the intention of the user interacting with a chatbot or the intention behind each message that the chatbot receives from a particular user. The strategy is to define different intents and make training samples for those intents and train your chatbot model with those training sample data as model training data (X) and intents as model training categories (Y).

**3.1 Implementation**

**3.1.1 Libraries Required**

*We have used the following python libraries:-*

1. Tensorflow
2. Nltk
3. Numpy
4. Datetime
5. Requests
6. Scikit-learn

**3.1.2 Define Intents**

We create a JSON file named ‘intents.json’, in which we define a few simple intents and a bunch of messages that correspond to those intents and also map some responses according to each intent category.

**3.1.3 Data Preparation**

* We import all the required packages, load the JSON file, and extract the required data.
* We use LabelEncoder() function provided by scikit-learn to convert the target labels into a model-understandable form.
* We vectorize our text data corpus by using the ‘Tokenizer’ class which allows us to limit our vocabulary size up to some defined number. When we use this class for the text pre-processing task, by default all punctuations will be removed, turning the texts into space-separated sequences of words, and these sequences are then split into lists of tokens.
* We use the ‘Sequential’ model class of Keras, to define our Neural Network architecture for the proposed model.
* We fit the training data and labels. After training, it is better to save all the required files in order to use them at inference time. So that we save the trained model, fitted tokenizer object, and fitted label encoder object.

**3.2 Neural Network**

A neural network is either a system of software or hardware that works similarly to the tasks performed by neurons of the human brain. Neural networks include various technologies like deep learning, and machine learning as a part of Artificial Intelligence.

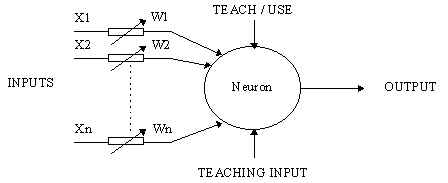


Fig 3.1 Basic structure of a neuron

Artificial neural networks (ANNs) are comprised of node layers, containing an input layer, one or more hidden layers, and an output layer. Each node, or artificial neuron, connects to another and has an associated weight and threshold. If the output of any individual node is above the specified threshold value, that node is activated, sending data to the next layer of the network. Otherwise, no data is passed along to the next layer of the network.

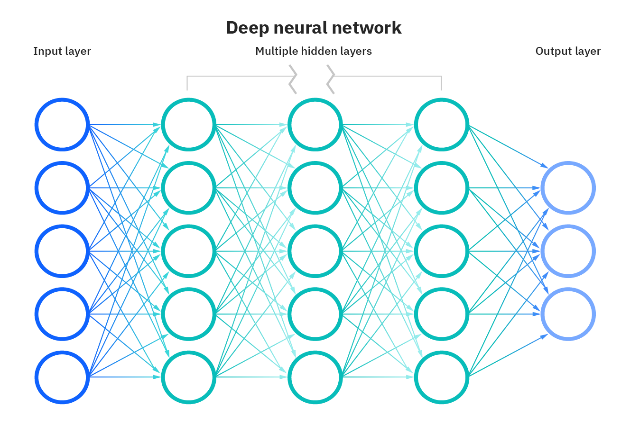


Fig 3.2

***Chapter 4***

***RESULT AND DISCUSSION***

In this project, we discussed how to develop a chatbot model using deep learning from scratch and how we can use it to engage with real users. We use neural networks and natural language processing for the implementation of a chatbot.

We implement a chat function to engage with a real user. When a new message is received, the chatbot calculates the similarity between the new text sequence and training data. Considering the confidence scores got for each category, it categorizes the user message as intent with the highest confidence score.

Text

Description automatically generated with low confidence

Fig 4.1 Model Architecture

Some features of our chatbot are telling us the weather in our city, telling us a joke, opening any application, taking a screenshot, and even sending emails.

Graphical user interface, text, application, email

Description automatically generated

Fig 4.2Working of the chatbot

***Chapter 5***

***Ways To Enhance The Performance***

Below mentioned ways can help increase the accuracy of the chatbot to get a more real human like experience.

1. **Use more data to train** – You can add more data to the training dataset. A large dataset with a good number of intents can lead to making a powerful chatbot solution.
2. **Apply different NLP techniques –** We can add more NLP solutions to your chatbot solution like NER(Named entity recognition) in order to add more features to your chatbot. With a NER model along with your chatbot, you can easily find out any entity that appeared in user chat messages and use it for further conversations. And also you can add a **Sentiment** **Analysis** model to identify different sentiment tones behind user messages and it will exactly give some additional colours to your chatbot.
3. **Try different neural network architectures:** You can also try different neural network architectures with different hyperparameters.
4. **Upgrade the pre-existing features-** Features like weather forecasting, we can make use of the current location of the device to predict the weather instead of manually asking for the city name.
5. **Integrate chat applications –** We can integrate our chatbot with other chat applications such as WhatsApp.

***Chapter 6***

***Future Scope***

* ***Sales & Marketing***

By using chat-bots, business will connect with customers efficiently and effectively, which means increased customer satisfaction which can lead to higher revenue. When business use chat-bots to send messages for abandoned carts can help increase sales up to 25% for e- commerce brands.

* **Content Marketing**

So, how can chatbots help with content marketing? First, chatbots can help collect valuable information from people interested in your brand. Chatbots can organize, store this information, and segment consumers for future marketing campaigns. This can be incredibly useful for creating more accurate target marketing. Based on the information from dialogue with chatbots, marketers can use this info to help with personalizing brand content.

* **Social Media & Lead Generation**

Business can also use social media chabots for updates and send mass messages. Keep customers informed with daily or weekly announcements about deals, events, and promotions. It can even prompt a customer to book a service, make an appointment, take orders, or share new content through social media chatbots.

* **Customer Support**

Reports show that 40% of customers prefer messaging chatbots over a virtual agent. Chatbots can do more than answer simple questions. For example, they can provide updates on any order, help customers select and buy a product, give a tracking update, and process returns or exchange products. It’s also shown by reports that Chatbots can cut Customer service cost by 30%, with potential in the U.S. to save overall brands $23billion.

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