



e-ISSN: 2319-8753 | p-ISSN: 2320-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 6, June 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.512



9940 572 462



6381 907 438



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Text and Voice Chat Bot Natural Language Processing and Artificial Intelligence

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ABSTRACT: Chatbots are cleverly tools that get it user's common inquiries and react appropriately in a discussion. It is more like virtual partners, individuals feel like they are talking with a genuine individual. They talk same language we do, can reply answer reply questions. In college, at help/inquiry work areas, parents/students are deficiently and ordinarily take a long time to handle the single ask, which comes about in wastage of time conjointly decreases the quality of benefit. The essential objective of this chatbot is, parents/students can associated with saying their inquiries in plain English and the chatbot can resolve their questions with fitting and speedier reaction in return. In spite of numerous advancements in Natural Language Processing (NLP) and Artificial Intelligence (AI), making a great chatbot show remains a noteworthy challenge in this field indeed nowadays.

KEYWORDS: machine learning, chatbot, machine learning classification technique, Neural Networks, Deep Learning, Natural Language Processing.

I. INTRODUCTION

A chatbot is a laptop program that responds like an smart entity when conversed with. The conversation may also be via text or voice. Any chatbot application is familiar with one or more human voices by way of Natural Language Processing. Due to this, the system interprets human language input using data fed to it. A chatbot can also additionally perform some productive functions like calculations, setting up reminders, or alarms. The technology at the core of the upward thrust of the chatbot is natural language processing ("NLP"). Recent advances in Deep learning have substantially accelerated the accuracy and effectiveness of natural language processing, making chatbots a practicable choice for many organizations. This kind of chatbot can be used for college, for enquiring various details of college which will help consumer to get better statistics of the college.

Usually, Students/Parents are required to provide a go to faculties to get information. But these services can have some limitations like it be only replied in working hours and availability of replying person. In the common method, students have to visit a university and get information and if for any reason school is now not handy then they have to wait. Due to these reasons, their time and cash are also wasted. This gives us the motivation to build such an application which will save time and money for parent and their students. As chat-bots are just machine software that is learners, they are learning how to answer the questions so, there may be some problem in accuracy while learning. To make it more accurate requires a lot of data, for that we are required to put in physical work by visiting the college to get their requesting information replied by the institute help desk. The overall process takes a lot of money as well as time because creators can be very far from the institute.

II. METHODOLOGY

Problem statement:

Creating a speaking chatbot using Artificial Intelligence and Machine Learning for college enquiry which can interact with peoples with voice or text chat option.

- Ideal chatbot provides only the details of college in text format.
- Reality Existing chatbot works on website/webpage.
- Consequences The existing chatbot does not provide the facility of speaking search.
- Proposal So our proposal is to develop chatbot with speaking facility.

DATASET

The dataset is created by our team members for our college. It is a simple dataset with different tags, and each tag has patterns and responses. These patterns and responses take Question and Answer form. First, intents are mapped with tags, patterns, context, and responses, and then each of them is mapped with their queries and keywords

This is a small dataset, and training it over deep neural networks model leads to overfitting the model, to find the optimal learning rate appropriate precautions must be taken while building the model.

S. No	Attribute Name	Description
1.	Tags	Tags are keywords assigned to the patterns and responses for training the chatbot.
2.	Patterns	These are the types of queries asked by the user to the chatbot.
3.	Responses	Responses are the answers generated by the chatbot for the respective queries.
4.	Context	Context is given for which the queries require a search and find operation.

TABLE I. Dataset description

Architecture

In deep learning, a neural network with a couple of layers is constructed for processing the input information or training information so that the model can extract higher-level points of the data. The conversational bot is skilled on the dataset, which holds categories/classes intents, patterns, responses, and context. To classify in which class the user's message matches into, a great DNN is used, and then a random response from the list of responses is given. Natural Language Processing and Keras are used for developing Retrieval primarily based absolutely chatbot.

The core components of Deep Learning are successive layers of representations, which helps in studying the points from low- stage to high-level in a hierarchical manner, Deep Learning which is additionally regarded as a hierarchical illustration of learning invalidated the function engineering's higher-level dependence of shallow networks.

A feed-forward neural network kind structure is used in this model building in which the information moves solely forward path in the network. In every hidden layer, the input is transformed, and output is transferred to the following layers

Non-linear activation function ReLU is used in the hidden layers because of its computational efficiency and faster learning convergence over most of the different activation functions. The output layer of the network makes use of a SoftMax Non-linearity activation feature to furnish a probabilistic interpretation of the network's output".

The mastering of a deep neural community is to enhance the present performance of the neural network. In deep learning, cost-function is used for the model network with the best parameters. The model used is a classification type, so cross-entropy characteristic is used in the community.

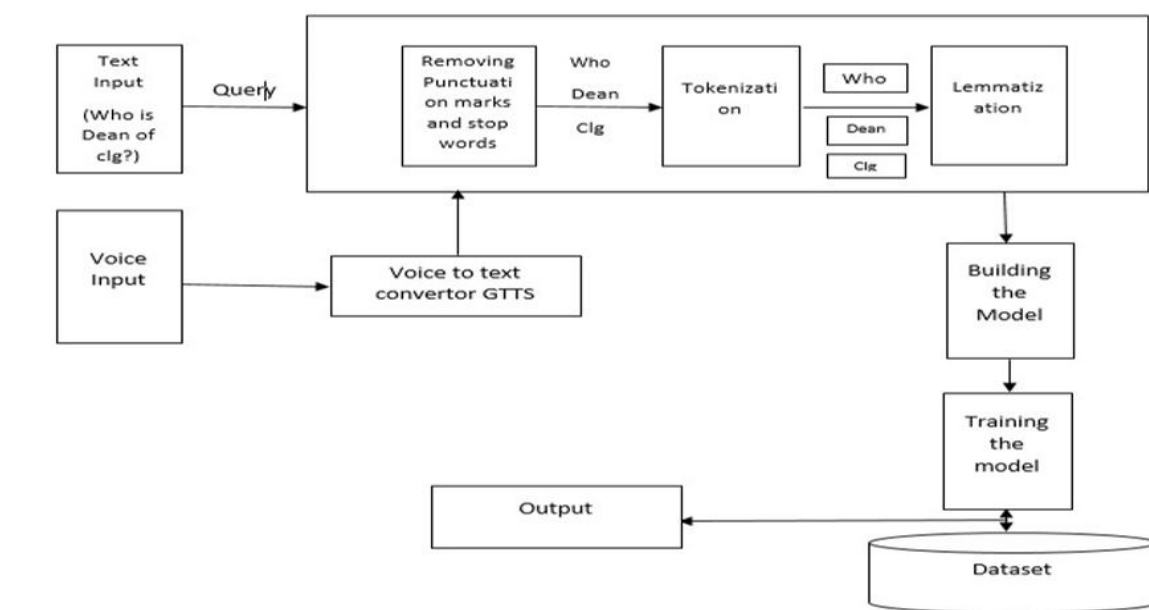


Fig. 1. Flowchart of working of the chatbot

OPTIMIZER

Optimizers are the algorithms used to exchange the weights and learning rate of hidden layer neurons to reduce the losses of the network. The losses of the network are represented through Error function, a mathematical function which is additionally recognized as Objective characteristic invariably depends on the model's internal learnable parameters. The identical function is used for computing the goal values from the set of predictors used in the model.

ACTIVATION FUNCTION

In DNN, the activation characteristic of artificial neurons takes a set of input values or inputs and produces the output according to the activation function used.

The most important properties of activation characteristic include

- An activation function is always differentiable.
- An activation function is acceptable when it is bounded.
- An activation characteristic is a easy feature with monotonic derivatives.
- An activation characteristic is a monotonic function.

III. EXPERIMENTAL RESULTS

For appropriate communication with the chatbot, a user-friendly graphic user interface (GUI) is created. A software GUI library known as 'Tkinter' for Python is used to create a easy user interface. Tkinter is one of the fastest ways to create a simple GUI application. It is cross-platform, so the same code works for exceptional operating systems. Tkinter is Python's de-facto standard GUI package, so it is easy to use when compared to different GUI creating applications.

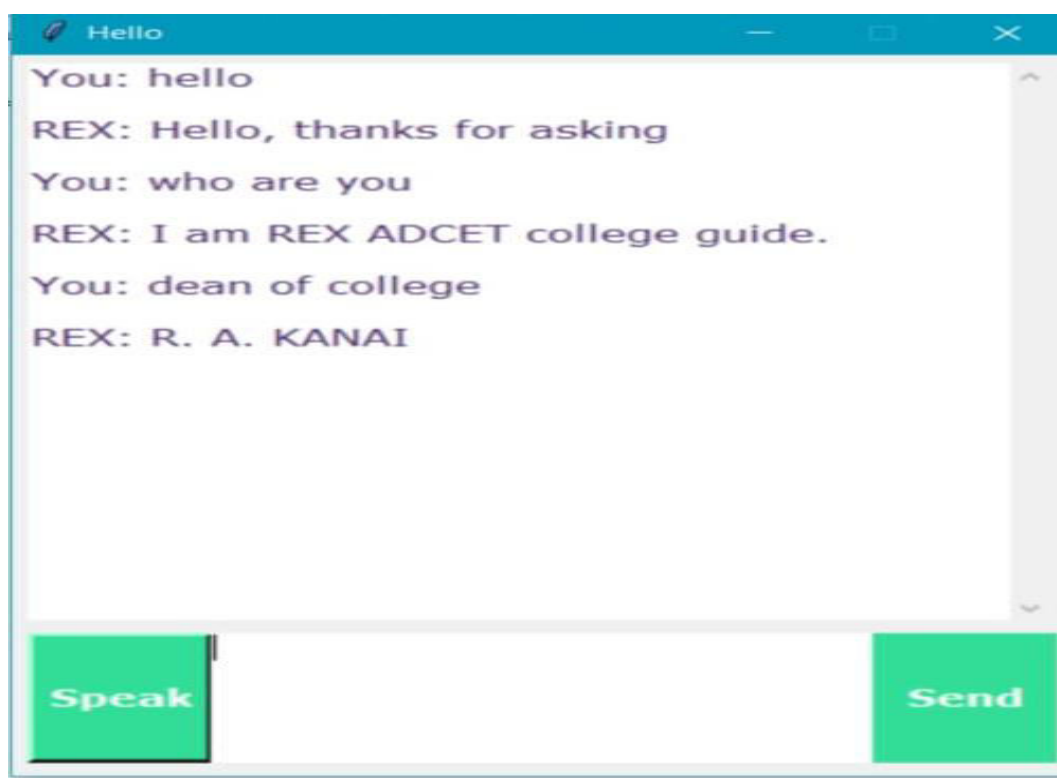


Fig.2. GUI of the Chatbot

ACCURACY OF STOCHASTIC GRADIENT DESCENT OPTIMIZER

The train and check information are split into 0.2 proportion. In this analysis, there are different models created for each optimizer algorithm, and evaluation is carried out on every one of them. Here every model has two hidden layers and Relu as an activation feature in hidden layers.

Stochastic Gradient Descent (SGD) optimizer outperforms different optimizer algorithms in this precise neural network model. The first minima generated by the model is with zero validation and education loss, which implies that the community adapts speedy using SGD. It works the identical as normal gradient descent, however updates for each epoch. SGD is susceptible to noise in the data, but here it performs better, which implies the outliers in the data is much less than expected. The dataset is small. Hence, something from the SGD optimizer is expected, and it gives the excellent overall performance in terms of accuracy. Somehow, it finds the minima, which is greater than other optimizers, but SGD gives the great outcomes while solving the problem.

RESULT ANALYSIS.

Increasing epochs while training the module will reach to providing good amount of accuracy. Learning Rate: 0.1 is giving best result as learning rate for module to trained. Conclusion: Using 200 epochs and 0.1 as learning rate to train module with help of Stochastic Gradient Descent algorithm we meet good accuracy as 95%.

	SGD
Accuracy	95%

TABLE II. Accuracy of optimizer algorithm.

Epoques	Average Accuracy
50 Epoques	48%
100 Epoques	77%
150 Epoques	88%
200 Epoques	95%

TABLE III. Accuracy of different Epoques

Learning Rate	Average Accuracy
0.4	21%
0.3	32%
0.2	68%
0.1	95%

TABLE IV. Accuracy of different Learning Rates

Epoques	Training Losses (%)
50	2.2
100	0.6
150	0.5
200	0.3

TABLE V. Training losses for different Epoques

IV. CONCLUSION

The proposed methodology for Chat-bot is the combination of NLP and Deep Neural Networks algorithms. NLP algorithm is used for Data Pre-Processing and for Building deep learning model using Keras. For Training we used stochastic gradient descent. This Software is used by student parents for asking queries about college through both text and voice facility. This Chat-bot is efficient for answering all queries of user. This Chat-bot will help solve all queries of user easily as we have provided voice option which is user friendly.

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