

Chatbot Using Deep Learning

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Abstract: Chatbots are pieces of computer software that use Natural Language Processing (NLP) to reach out to humans. The development of conversation is a crucial component of any Chatbot. The implementation of a good Chatbot model remains a significant challenge, despite recent advances in NLP and Artificial Intelligence (AI). It can be used for a variety of tasks. Generally, it should understand what the user is trying to accomplish and respond accordingly. Until now, a plethora of features have been introduced that have significantly improved the conversational capabilities of chatbots. This paper proposes a method for developing a chatbot based on deep neural network. The data is learned and processed using a neural network layered with multiple layers. The novelty of the proposed model is that, the bot can be trained on any input data based on the user's needs and requirements, meaning that it was a generalized one. Text to speech conversion is added to make it more user friendly.

I. INTRODUCTION

A chatbot is a piece of Artificial Intelligence (AI) software that simulates a natural language conversation between a user and an interface, such as a website, a mobile app, or a telephone. In the context of human-machine interaction, chatbots are often referred to as one of the most advanced and promising methods. Nevertheless, from a technological standpoint, a chatbot is simply an NLP-enabled question and-answer system. Currently, there are two basic models used in the development of a chatbot i.e., models that are generative and retrieval in nature. As deep learning and AI have advanced in recent years, methods based on handwritten instructions or patterns and statistical methods have quickly become obsolete. Conversation agents are commonly used by government administrations, businesses, and non-profit organizations. They are typically organized by financial institutions such as banks, online retailers, insurance companies, start-ups, and social service providers. These chatbots are used by both large businesses and small start-ups. Text messages, applications, or instant messages can be used to communicate with a chatbot to assist patients. In the market, there are various options for virtual bot development. The problem with both models is their inflexibility and lack of practicality when it comes to real conversations. Google Assistant, Alexa, and Cortana, three of the well-known intelligent personal assistants, have some limitations in functionality. A new type of retrieval-based agent is being introduced to facilitate human-like conversations. Several smart personal assistants today rely on rule-based or retrieval-based techniques designed to deliver better results. Chatbots have recently gained a significant amount of popularity. The use of bots by businesses to meet their customers' needs is becoming increasingly popular. Businesses are adopting chatbot technology in greater numbers, thus there is an increasing

demand for advanced research and development of conversational agents.

2. LITERATURE SURVEY

I Making the conversation between the system and the user feel human-like and natural is a crucial challenge in the design of a chatbot. A number of models with CUI (conversational user interfaces), such as virtual bots, Maintaining the Integrity of the Specifications

mimic the human response process by delivering delayed responses or replies. However, a delayed response can have a bad impact on user satisfaction, especially when quick responses are expected, such as during customer interactions. The paper

[1] presents a chatbot which was created for a college website. On a college's website, it's common to be doubtful of where to look for information. It becomes difficult to obtain information for someone who is not a student or employee at the university. These problems can be solved by implementing a college inquiry chatbot, a quick and informative tool added to college websites to enhance the user experience and provide users with accurate information.

The paper [2], provides an overview of the technologies behind chatbots, including Information Extraction and Deep Learning. They discussed that, "conversational chatbots" are trained based on free-form chat logs while "transactional chatbots" are defined in a manual manner to accomplish a particular goal, such as booking a flight online. In addition, they offered an overview of commercial tools and platforms for developing and deploying chatbots. An interactive chatbot for medical purposes acts as a virtual doctor, according to a paper published in

[3]. Using pattern matching algorithms and NLP, this chatbot was built in Python. The chatbot answered 80 percent of the correct questions in a survey assessing its performance, while 20 percent were ambiguous or incorrect. These results point to the potential use of the chatbot as both a virtual doctor for care and awareness, as well as for teaching medical students.

According to [4], answering long conversations using retrieval-based chatbots is a challenge. Primary goal is to match a response candidate to a conversation's context; the challenge is to identify key pieces of context in this situation and to implement the relationships between speeches in it. Conventional matching methods may not capture key aspects of contexts. The authors proposed a framework known as a sequential matching framework (SMF), and it can effectively match the relations between speeches by taking significant information from the contexts. The purpose of paper [5] was to use NLP to create a chatbot to assist new research scholars. Inexperienced researchers often have no idea where to are prescribed; please do not alter them. You may note

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start, how to begin, and frequently have questions about fundamental concepts in research, funding agencies, data sources, etc. Researchers need a virtual assistant to help them and the author describes a chatbot model that would provide answers to their research questions. The authors examines the technique, terminology, and various platforms used in the design and development of a chatbot [6]. It also includes some real-world, typical applications and examples. It suggests that the chatbot tool can be used for Computer-Aided Design (CAD) applications. This paper presents an NLP and Deep Learning based chatbot which can communicate with humans. The bot is a generalized one, meaning that the input data or the training data can be changed as per user's or any company's requirement. Minimum changes are to be made while implementing the model on a particular or new data.

3.METHODOLOGY

Deep learning is one of the components of Machine Learning. The goal of deep learning is to learn from the structures of the brain. Algorithms that employ deep learning analyze data continuously based on a predetermined logical structure to draw similar conclusions as humans. Neural network, a multi-layered structure of algorithms, allows it to achieve this. Just as the human brain recognizes patterns and categorizes various types of information, neural networks can be taught to do the same. Equations

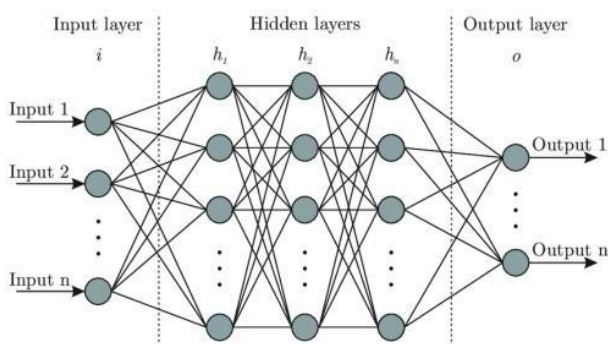


Fig. 1. Neural Network with 3 hidden layers [7]

The bot gives the best answer according to user's input from the list of training data from which the bot has learned. The dataset consists of a JSON file containing a dictionary. It mainly contains "Tags", "Patterns" and "Responses". The tags include the keys such as acquaintance, greeting, annoying, author etc. The model consists of 3 hidden layers, each with 15 neurons. A Graphical User Interface (GUI) is also provided for better aesthetic purposes and also to make the conversation more user-friendly. The block diagram of the model is presented in Fig. 1. When the input is given by the user, the model firstly tokenizes the input, (Tokenization

is the process of dividing a piece of text into smaller units known as tokens. Tokens can be characters, words, or sub-words in this context) and then it converts those into byte streams i.e., 0's and 1's. This method is called pickling or serialization. Thereafter, it compares the given input with the data from which the bot was trained, and it calculates the probability of that particular input with each and every tag. The pattern with the highest probability tag is taken into consideration and compared with a threshold confidence level (0.85). If this tag has a probability greater than the threshold, then any of its responses is displayed on the GUI using a random function. The audio feedback is given accordingly. This process continues till the user types "Quit" or "quit" to end the conversation with bot.

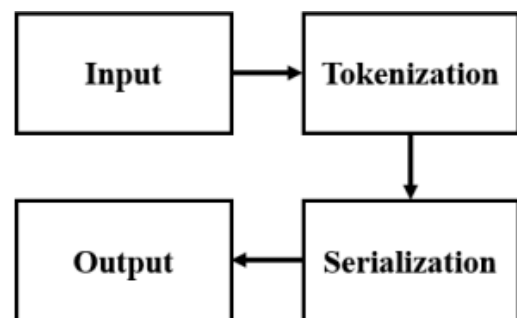


Fig. 2. Block Diagram of the proposed model

The bot is not 100% accurate, sometimes it gives wrong answer on the part which is not trained. The model is a generalized one, meaning that the training data can even be changed to suit user's requirement or any company's requirements. The main libraries used are: NLTK, Pickle, TFLearn, Tkinter and gTTS. There are several libraries and programs in the Natural Language Toolkit (NLTK) for statistical language processing. NLP is used because it enables machine to understand text and spoken words in the same way as humans. Pickle is a Python module for serializing and de-serializing object structures. TFLearn is a deep learning library with a higher-level TensorFlow API. It is a Tensorflow-based transparent deep learning library. Tkinter is Python's standard GUI library. Python, when combined with Tkinter, provides a quick and easy way to create GUI applications. gTTS stands for google text-to-speech. It was used to convert text i.e., bot's response to speech. There is no period after the "et" in the Latin abbreviation "et al."

4.RESULTS

The bot gave an accuracy of 95.24%. Most of the questions were correctly answered by the bot, while some of the answers were incorrect on the data which wasn't trained or on the part which the bot couldn't understand.

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... Start messaging with the bot (type quit to stop)!
User: Hello
1/1 [=====] - 0s 115ms/step
ChatBot: Hello
User: what is your name
1/1 [=====] - 0s 22ms/step
ChatBot: I'm charlie!
User:

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Fig.3 Conversation result of chatbot

5. CONCLUSION

This paper presented a Chatbot for human-machine conversation. The bot performed well and gave good accuracy. Since the technology is increasing with leaps and bounds, and Artificial Intelligence is taking over the world, so there is an increasing need for chatbots and humanoid robots. Although there are some limitations of a chatbot, they cannot be avoided due to their direct link with the growth of a business and revenue generation. Due to their 24*7 availability, many of the clients are interested in connecting with chatbots. Despite all of the limitations, more and more companies are investing in chatbot technology because they know that this technology will revolutionize the world. In future, the bot can be made multi-linguistic, also voice recognition like Google Assistant or Amazon's Siri can be added. Further, it can also be converted to an android or web application.

6. REFERENCES

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