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A Behavioral Chatbot Using Encoder Decoder Architecture

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Abstract: *Although there are many ways to build chatbots, they lack the human touch and sound very robotic. We don't have chatbots designed to mimicpersonality or human-like characteristics, although we have everything we need in terms of data and computing. The goal of this project is to make an efficient as well as human-like chat with a modern encoder-decoder. There are many frameworks and libraries available for developing AI-based chatbots, including program-based, rule-based, and interface-based. But they lack the flexibility to develop a real dialogue and understand people. The use of chatbots has grownrapidly in recent years due to their ability to handle repetitive tasks, provide 24/7 customer support and improve customer engagement. Developing chatbots requires the use of natural language processing (NLP) technology to understand and generate human responses. In this project, we propose a behavior-based chat that uses encoder-decoder architecture. An encoder-decoder architecture is a neural network that can receive input sequences and output the corresponding network that can receive input sequences and output the corresponding sequence. The encoder component converts the input sequence into a fixed-length vector, while the decoder component creates an output sequence based on the encoded vector.Our proposed chatbot model uses a sequence-to-sequence (seq2seq) architecture with an attention mechanism to improve accuracy. of the responses generated. The chatbot model is trained on adataset of customer support conversations to learn human conversationalpatterns and behavior.*

Key Word: *Seq2Seq;Natural Language Processing;; Chatbot;Encoder-Decoder.*

I.INTRODUCTION

Chatbots are becoming increasingly popular in a variety of industries, including customer support, healthcare and education, due to their ability to deliver instant responses and improve customer engagement. However, developing a chat engine that understands and generates human responses is a complex task that requires natural language processing (NLP) techniques and machine learning algorithms. One of the most promising approaches to developing chatbots is neural network models, such as encoder-decoder architecture. The encoder-decoder architecture is sequence-to-sequence (seq2seq) construct that can take an input sequence and produce a corresponding output sequence. The encoder component of the model converts the input sequence into a fixed-length vector, while the decoder component generates an output sequence based on the encoded vector. In this project, we propose a behavioral chat using encoder-decoder architecture that can learn and learn to imitate human behavior in natural language conversations. The chatbot model is trained on a dataset of customer support conversations to learn human conversationalpatterns and behavior. We use an attention mechanism to improve the accuracy of the generated responses by focusing on the most important parts of the input sequence. Our proposed chatbot model has several advantages over traditional rule-based chatbots. It can learn from data and adapt to different conversational styles and contexts, making it more flexible and resilient. Additionally, using an encoder-decoder architecture allows the chat to generate more natural and consistent responses compared to rule-based systems. The rest of this article is organized as follows. In the next section, we provide a detailed overview of the work related to chatbots and encoder-decoders. We then describe the architecture and training of our proposed chatbot model. Finally, we present the results of a user study that evaluated the performance of our chatbot model against a rules-based chat and customer support agent.

Existing System: Handwritten rules and patterns and rudimentary statistical approaches have previously been used to build chatbot systems. Certain words, phrases and even actions trigger a series of responses from the chat using rule-based pattern recognition technology. Many modern chatbots are built using rule-based approaches, basic machine learning algorithms or search-based strategies, none of which provide satisfactory results. Tensor Flow was used to create the neural network model of the chat, while NLP methods were used to store the conversation.

Disadvantages:

Machine learning techniques that are less powerful compared to deep learning techniques. Current chatbots use a rule-based approach, basic machine learning algorithms or a search-based strategy that does not produce humanized results. They lack the flexibility to develop real conversations and understand.

II.LITERTURE REVIEW

ii.i) Chatbot and Its Needs

Chatbots are conversational tools that efficiently handle routine tasks. People like them because they help them

complete those tasks quickly so that they can turn their attention to high-level, strategic and engaging activities that require human skills that machines cannot imitate.Chatbots can reduce customer queue time. Users can get immediate answers to frequently asked questions(order status, opening hours, location, etc.) in the chat-her window instead of waiting for a response from email, phone, or another channel.

ii.ii) AI Chatbot

There are many ways to build conversational chatbots, but they sound impersonal and very robotic. No chatbot is meant to mimic a fraction of personality or human-like traits, but it has everything you need in terms of data and computation.This project uses a modern encoder/decoder architecture. It aims to develop efficient, human-like chatbots by using. Current chatbots use rule-based approaches, basic machine learning algorithms, or fetch-based strategies that don't provide humanized output. H. These chatbots are unable to generate engaging interactions.The second paper exactly discusses the various techniques of Chatbots

ii.iii) Emotionally Intelligent Chatbots

Conversational technology is changing the landscape of human-machine interaction. Chatbots are increasingly being used in multiple fields to replace human agents in performing tasks, answering questions, providing advice, and providing social and emotional support. Using these technologies to improve the user experience is therefore essential to a successful integration. Researchers are using artificial intelligence (AI) and natural language processing (NLP) techniques to provide chatbots with emotional intelligence capabilities. This study provides a systematic overview of research on developing emotionally intelligent chatbots. We apply a systematic approach to collect and analyze 2 articles published in the last decade.

ii.iv) Chatbot for Depressed People

This paper is developed to take the edge off depression. Chatbots are special agents which are used to process a specific task, and it can be used to introduce a product to a customer or solve relative problems associated with a product, thus saving human resources. In this study, we have aimed to provide a chatbot for a society that will help to reduce the number of depression survivors. In this study, we have used the RNN LST Mencoder-decoder model to know the user's emotional state and according to that chatbot gives the best response. We have proposed a multi-purpose dialogue model which can be used in daily communication rather than for specific tasks. It helps those people who are suffering from depression and have fear of sharing their feelings or fear of being judged.

ii.v) Chatbot using Convolutional Neural Networks

Chatbots are artificial intelligence systems that comprehend the intent, context, and sentiment of the user, and interact properly with them leading to an increased development of their creation, the past few years. In this study, Convolutional Neural Networks (CNNs) are applied as the classifier and some specific tools for tokenization are used for the creation of a chatbot. we use a technique called "Word Embedding", which converts a text into numbers in order to run text processing.

III.SYSTEM DESIGN

Programming Language **:** Python
Software **:** Pycharm
Algorithm **:** Natural language processing, Recurrent Neural Network

iii.i) Python

Python is a multi-paradigm programming language. Object-oriented and structured programming are fully supported, and many of its features support functional and aspect-oriented programming, including meta programming and contented objects (magic methods). Many other paradigms are supported by extensions, such as design by contract and logic programming. Python is often described as a "batteries included" language due to its comprehensive standard library.

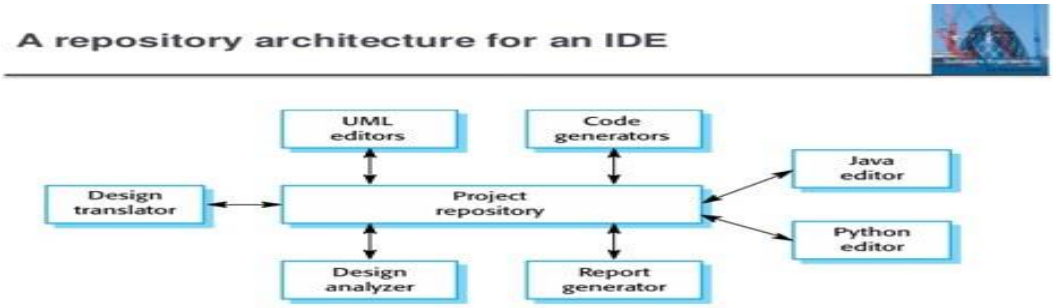

fig 3.1

iii.ii) Pycharm Tool

PyCharm is a purpose-built Python integrated development environment (IDE) that provides a wide range of essential tools for Python developers to create a working environment for productive Python, web, and data science development. Tightly integrated.PyCharm is an integrated development environment (IDE). Python is a language created by developers and PyCharm is a platform created by developers to build their projects.

iii.iii) Natural language processing (NLP)

Natural Language Processing (NLP) is a subsection of Artificial Intelligence (AI). It helps machines process and understand human language so they can perform repetitive tasks automatically. Examples include machine translation, summarization, flag classification and spelling. Natural Language Processing (NLP) is a subsection of Artificial Intelligence (AI). Ithelps machines process and understand human language so they can perform repetitive tasks automatically.

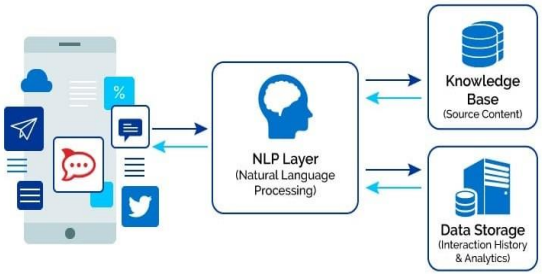

fig 3.2

iii.iv) Recurrent Neural Network

Recurrent Neural Network (RNN) is a type of neural network where the result of the previous step is provided as input to the current step. In traditional neural networks, all inputs and outputs are independent of each other, but in such cases, when it is necessary to predict the next word of a sentence, the previous words are mandatory and therefore the previous words must be remembered. Thus, RNN was born, which solved this problem by using a hidden layer. The main and most important feature of RNN is the hidden state, which remembers part of the sequence. For my task, I practiced a word-level sorting model: I feed the network a list of words and expect the same as the output. Instead of a vanilla RNN, I used an LSTM layer, which guarantees better control of the network's memory mechanism (by understanding LSTM). The final architecture contains only two LSTM layers, each followed by an output.

iii.v) System Design

Chatbot process design has seven stages which are scope and requirement, identify input, understand UI elements, create first interaction, create conversation and finally test. An illustration of the chatbot design process can be The first step in designing a chatbot is to know the scope and requirements, such as the reason for the chatbot, the platform to run the chatbot, and its limitations. The second step is to recognize user input in the form of questions through text, audio or images, from devices and intelligence systems. The third step is to understand the user interface (UI) elements that we see in our applications. There are five types of user interface elements: command line (CL), graphical user interface (GUI), menu interface (MDI), form-driven interface (FBI), and natural language interface (NLI).

IV.PROPOSED SYSTEM

iv.i) Proposed Methodology

Using an encoder-decoder architecture, our behavioral chat consists of two main components: an encoder and a decoder. An encoder takes an input sequence (ie a user message) and encodes it into a fixed-length vector representation. The decoder takes the encrypted vector and creates a resulting sequence (ie the chat's response). To improve the accuracy of generated responses, we use a seq2seq architecture with an alert mechanism. The tracking mechanism allows the decoder to focus on the most important parts of the input sequence while generating the output sequence, resulting in a smoother and more natural-sounding response. To train our chat model, we use a dataset of customer support conversations, which includes both user messages and corresponding responses from customer support representatives. We preprocess the data by tagging messages and responses and convert them to numbers through word input. During training, we use the teacher's forcing approach, where instead of a pre-generated output, the decoder receives a ground-truth response at each time step. This approach helps stabilize the training process and improve the accuracy of the generated responses. Once the chatbot model is trained, it can be used to generate real-time responses to user queries. To do this, the input message is first encrypted using the trained encoder component and then the decoder generates the corresponding response.The attention mechanism ensures that the decoder focuses on the most important parts of the input message when generating a response, resulting in more accurate and natural responses. Overall, our proposed behavior-based chat using an encoder-decoder architecture offers a promising approach for development. chatbots that can learn and imitate human behavior in natural language conversations.

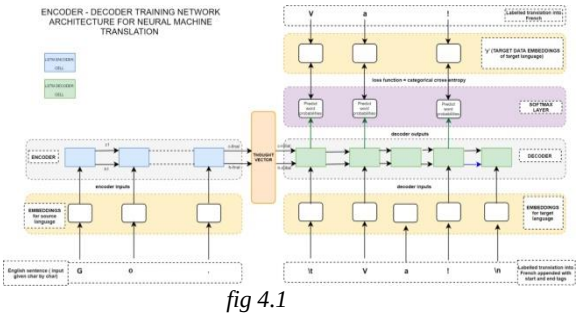

fig 4.1

V.IMPLEMENTATION

Chatbot and its types

A chatbot is an artificial intelligence that lets humans interact with the human on the other side of the user which simulates them to believe as if it's a real human and make it more conversational to get the job done.Existing chatbot examples like alexa,siri,etc.Before we start implementing a chat, it's important to decide what kind of chat we want to implement: rule-based, self-learning, or a combination of the two.Hence we decided to go with both and develop a more advanced chatbot using deep learning using encoder decoder architecture.

Analyzing the importance of dialogues to be trained

We need to know the target group for whom we are making our chat. We cannot have a one-size-fits-all chat that can answer all questions about many potential problems. Let's also consider the natural communication language of the chat. We choose natural language after deciding the target audience. We also need to provide relevant answers to the chatbot's initial questions.And also sometimes it is difficult to work with a chatbot. It might fail to give the expected output, So we have to meet our expectations accordingly.Chatbot is a machine and has a specific domain. We can't expect a chatbot to know everything about everything.

Implementing Encoder-Decoder Architecture

An encoder-decoder architecture was developed where the input sequence was read as a whole and encoded into a fixed-length internal representation. The decoder network then used this internal representation to output words until the end of a consecutive character was reached. LSTM networks were used in both encoder and decoder.An encoder typically consists of a set of layers that transform the input data into a compressed representation that can then be used to reconstruct the original input data to the decoder component of the autoencoder.The purpose of decoding is to convert encrypted information into a format more suitable for a particular application or communication channel. In digital communication, a decoder is often used to recover the original message sent along the communication channel. For example, a binary encoder can be used to convert a stream of binary numbers back to the original text or image format.

Training the Chatbot

Your first task is to enter the person's identity and respond according to the permissions you gave to Mike. We use the name of one person, Mike, and a trusted friend, Tyson.Task 2 is to train it based on custom data, Once the bot recognizes you, you train the bot with your following personal information. The spaces contain your personal information.Let's start coding now. You will receive a skeleton code and have to fill in the missing parts. Instructions are provided as highlighted code comments that you can use to structure your solution accordingly.

Testing the chatbot

You have to examine your chatbot by testing it regurously so you will analyze how it is working and what situation it does not work according to your expectation and you will be able train it more on recurring problems and be able to improve the accuracy of your chatbot.A/B testing is a method where you show testers two or more versions of the same variable to see which one performs better. You can use it to test different chat scenarios, message formats or voice to voice.

VI.ADVANTAGES AND DISADVANTAGES

Advantages of the chatbot

- The proposed method achieves higher performance.
- Today, organizations work around the clock to help their customers and explore new areas
- Chatbots can help minimize errors, but unfortunately, customer service representatives can make mistakes (human error) when providing the right information to customers.
- Replacing humans with chatbots can minimize operational costs.

Disadvantages of chatbot

- To ensure that chatbots provide customers with relevant information.
- People today use keyboard shortcuts to speed up their response and increase their efficiency. As a result, chatbots cannot adapt their language to human language. As a result, slang, misspellings, and sarcasm are oftenmisinterpreted by bots.
- When a user asks a question that is not in the chatbot's database. Chatbot cannot respond. Bots avoid leaving you without an answer.

VII.RESULTS AND DISCUSSION

The expected Result of the chatbot has been achieved and it is working successfully and it is trained based on the customers requirements with a particular dataset of dialogues for now we have trained with some basic question in the activities of organization in the IT industry. Example: During the Covid-19 outbreak, the Indian government has teamed up with conversational AI company Haptik to develop a Whats App chatbot that combats misinformation and quickly responds to and enlightens people's questions. Within, I created a chatbot that can respond in both Hindi and English. Chatbots helped governments deal with the pandemic, responding to 110 million requests. Users can use chatbots to access information about viruses, symptoms, safety measures, and other topics of interest.

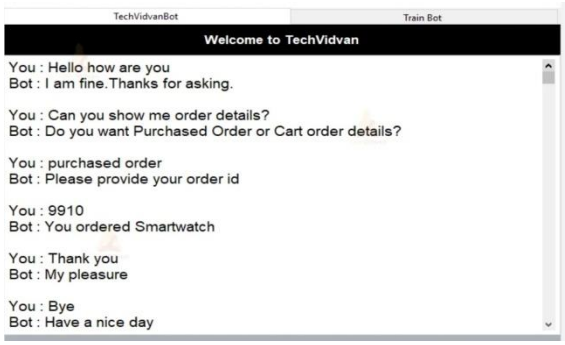

Fig 7.1

VIII.CONCLUSION

Although this project has achieved commendable results, the chat still has shortcomings in answering certain factual questions suchas "What is your name?", "What is your occupation?" It also does not effectively hold context. More vocabulary is needed to solve the above problems. Enhance your chat by adding two-way LSTM, collection and attention models.

Our chatbot model was trained on a dataset of customer support chats and we used an attention mechanism to improve the accuracy of the generated responses. The results of our user study showed that our chatbot model outperformed the rule-based chatbot and was comparable to a human client. Support shows the quality of responses and user satisfaction. Using an encoder-decoder architecture and an attention mechanism enabled our chat to produce more natural and consistent responses compared to rule-based systems. Our proposed chatbot model also has several advantages over traditional rule-based chatbots, such as the ability to learn from data and adapt to different chat styles and contexts. Future work could explore the use of more advanced NLP techniques such as sentiment analysis and topic modeling. to further improve the accuracy and naturalness of the chat.

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