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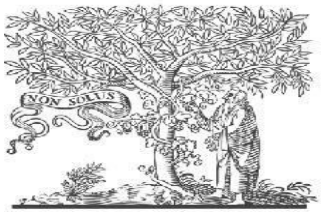

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A College Interactive Agent: Using Deep Learning Technique

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Abstract
The development of Artificial Intelligence technology makes it possible to incorporate chatbots into a variety of educational institutions. Many people are using this technology in classrooms. The use of chatbot technology has the ability to offer quick and individualised services to all parties involved in the industry, including students and staff at academic institutions. [1] An Interactive agent or Chatbot is a software that is used to interact between a computer and a human in natural language like human chat. In this paper we are implementing a Chatbot, which is a deep learning version of an Interactive agent in Python. In order to train the interactive agent accurately, we can modify the data in accordance with academic standards. We classify the user's message into a category using a specialised recurrent neural network called Long Short Term Memory (LSTM), and from there, we choose a random answer from a list of options. We are implementing this Interactive agent to answer queries which are asked by parents and students. This Interactive agent is built using NLTK, Keras, Python etc. This system helps both students and parents to be updated about the college activities and college related details. Parents can use this application asking queries about classes, College fee, Transportation facilities etc. Students can query about the college related activities like exam dates related to exams and results, schedules, new updates etc with the help of this web application.

Keywords: Artificial Intelligence,Deep Learning, LSTM , NLP

Introduction

The creation and research of intelligent agents is known as artificial intelligence, or AI (such as software and robots). It can be used in almost all fields of employment. Many duties can be performed by intelligent machines. Natural language processing, neural networking, and simulations of the human brain are among prominent trends in this area. A "chatbot" is one of the standard illustrations of an AI system. A chatbot is a computer software that replies to conversations as though it were an intelligent being. Text or voice can be used for the communication. Any chatbot programme that uses natural language processing can comprehend one or more human languages. As a result, the system understands input in human language using data that has been provided to it. A chatbot may also carry out various useful tasks like calculating, creating alarms or remainders, etc. AIML pattern matching techniques are used by the ALICE Bot (Artificial Linguistic Internet Computer Entity), a well-known chatbot. [2]

A CHATBOT is a synthetic person, animal, or other being that converses with people. This conversation is being held by text (typing). Although Chabot can be used with local desktops and mobile devices, most people access it online. The technology enables the User to look up any activity relating to their time at school. The customer is not required to physically visit the college to make inquiries. The question and the user's responses are analysed by the system. The computer responds to the question as though it were being answered personally. The technology responds to the pupils' question with artificial intelligence. Earlier chatbots only gave the impression of intelligence by using far simpler pattern matching and string processing design techniques for their interaction with consumers using rule-based and generative-based models. [3] Natural language-based interfaces are becoming more prevalent in human-computer interactionNatural language allows users to communicate with the system in their own words rather than using one of a small number of predetermined techniques, according to recent research, which demonstrate that it is a major enabler for personalization[4]. A text-based or voice-based conversation frequently begins with the user asking a question in natural language, to which the chatbot then replies[5]. The main purpose

of chatbots is to have natural language conversations with people through audio or textual techniques so that people may easily communicate with the chatbots. From their early days as simple chat or amusement systems, chatbots have already advanced significantly. Artificial intelligence is used by modern chatbots to give consumers complex replies, but even the most advanced systems now on the market are a long way from being able to have rational, relevant, and natural conversations with people.. [6].[3]

Classification of Chatbots

With the introduction of new technologies over the past several years, the chatbot industry has become so dynamic that a proper classification of chatbots is now dependent on the extent of their application. Several factors, such as the manner of contact, the knowledge domain, the use of the chatbots, and the design strategies (answer generation method) that are generally used when creating them, can be used to categorise chatbots into different groups. The fundamental design principles of chatbots, the degree to which context must be kept and taken into account in order to understand the discussion, or the nature and goal of the interaction for which the chatbot must be developed may all be among these criteria. [7]. Technology should progress to meet people's demands and make it simpler for them to complete their tasks. The use of chatbots is one such development. ELIZA was one of the first chatbots developed in 1966. Alexa, Google Now, Siri, IBM's Watson, Cortana, and other chatbots are some additional examples. Chatbots are broadly classified into two types:

Retrieval Based Chatbots: The very earliest chatbot implementations were rule-based. Although rule-based models are generally simpler to create and use, they have limited functionality since they have trouble responding to complex queries. Rule-based chatbots reply to user queries by searching for patterns that match; as a result, they are likely to give the incorrect response if they encounter a remark that doesn't meet any pre-established pattern. Additionally, manually encoding pattern matching rules takes time and can be difficult. In addition, pattern matching rules are fragile, extremely domain-specific, and difficult to modify for different problems[8].

AI models, in contrast to rule-based models, are created using machine

learning techniques, allowing them to draw knowledge from a database of earlier human conversations. In order to achieve this, they must first be taught using machine learning methods that can train the model utilising training data. Chatbots can be more flexible and independent from domain-specific expertise thanks to the usage of Machine Learning techniques, which eliminates the need to manually define and code new pattern matching rules. Information Retrieval-based models and Generative models are the two categories of AI models.[8]

2. ***Generative*** **based Chatbots:** There is no fixed list of responses available with these chatbots. On seq to seq neural networks, these models are constructed. The user inputs are mapped to computer-generated responses using this sequence-to-sequence paradigm. Large amounts of data are required for this model. Deep neural networks are used to construct them.

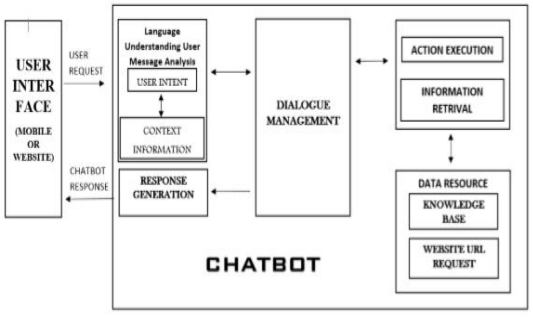

Fig1:Types of Chatbots

Architecture of Chatbot

The CHATBOT's architecture describes how it operates, from user inquiries to the Bot replies (figure 2). The user's appeal is where the background chatbot procedure gets started. Before gathering more pertinent informationUpon receiving the user's request, the Natural Language Understanding (NLUs) component analyses it or translates it to the user's intention. Once it has reached the high-level interpretation or confidence score, a CHATBOT must decide how to move forward and react accordingly. In reaction to fresh knowledge, it can act right away, consider what it has learned while waiting to see what happens next, request more context, or request clarification[9]. Execution/further action and information retrieval take place once the request has been understood clearly. Following data retrieval, BOT intended to execute the requested activities or retrieves the pertinent data from its data sources, a database in the BOT Knowledge Base, or an API call that makes contact with external sources.[10]. All discussions between users are recorded by the dialogue management system.[11]

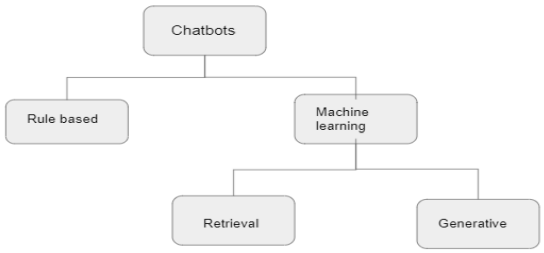

Fig2: Architecture of CHATBOT

Background Technology

Deep learning Techniques

Effective processing power is needed for deep learning. Deep learning works well with the parallel architecture of high-performance GPUs. The development team can reduce the training duration of a deep learning network from weeks to hours or less when combined with clustering or cloud computing.

Deep learning techniques frequently make use of neural network design, which is why deep neural network models are frequently used to refer to deep learning models. Large labelled data sets and neural network topologies, which can learn features directly from the data without manual extraction, are used to train deep learning models. The number of hidden layers in a neural network is frequently referred to as "deep layers." However, there are various kinds of neural networks and deep learning algorithms are quite sophisticated. networks that address particular issues.

Deep learning neural networks, in particular the recurrent neural network (RNN), sequence to sequence, and long short term memory networks (LSTMs), have flourished in the field of conversational modelling. [12].

Convolutional Neural Networks (CNN) are mostly used in image classification and computer vision applications, are able to identify characteristics and patterns in images and make it possible to perform tasks like object recognition and recognition. In the object recognition test, CNN finally recognised a human.

Recurrent neural networks (RNNs) are often utilised in speech and voice recognition applications because they make use of sequential or time series data. A recurrent artificial neural network is a class of artificial neural networks, and a recursive artificial neural network is one of its subtypes. A RNN is essentially a collection of neural networks, each of whose outputs serves as the input for a different neural network. [13]. RNN can model the naturally occurring sequential nature of natural language, where words

derive their semantic meaning from the words that came before them in a sentence.This enables the RNN to keep track of context and generate output based on the words that came before it in the sentence. As a result of this strategy, recurrent neural networks are appropriate for usage in chatbots as it is crucial to comprehend the conversational environment in order to comprehend user input and provide contextually appropriate responses. [14].

Using neural networks to sequence data (Seq2Seq). The Seq2Seq model, based on recurrent neural network (RNN) architecture, consists of an encoder that analyses the input and a decoder that produces the output. [14]. Both the encoder and the decoder can be used to feed the model with input phrases of various lengths. It was first put forth as a tweak to Ritter's generative model in 2014 with the goal of maximising accuracy by utilising current deep learning advancements. After the "status" or input sentence has been encoded, the decoder decodes it and generates the necessary "answer." The model is most typically used for statistical machine translation, when the source sentence is written in one language and the target sentence is written in another. This model can be used in chatbots to translate between the output "response" and the input "status." [15]. In the company, the Sequence to Sequence model (Seq2Seq) is currently the most widely used technique for producing replies. [16].

Networks with Long Short-Term Memory (LSTMs). Long short-term memory networks are a particular type of recurrent neural networks (LSTMs). [7]. To get around the RNN's long-term reliance problem, LSTMs were developed. Memory cells and gates are included into LSTMs, allowing the cells to store previously learnt information for longer periods of time. These memory cells can store information, write new information to them, and read information from them, just like data in a computer's memory. Information flow is regulated by the use of input gates, forget gates, and output gates. [17]. In contrast to a conventional RNN, an LSTM network is the best choice for learning from experience.

Even when there are significant periods of time intervals between important events, a well-trained LSTM network can still perform better time series categorization, processing, and prediction. These characteristics show that the LSTM

performs better than other RNNs, hidden Markov models, and other sequence learning algorithms used in various applications. Since LSTMs have a tendency to repeatedly refer to a piece of distant knowledge over time, they prove to be quite useful in the development of chatbots. [3][18].

Natural Language Processing:

Using natural language processing (NLP), you can examine text to determine the meaning of individual sentences. It is frequently used in machine translation and natural language comprehension because it transforms unstructured text into a format that computers can manage.

NLTK: A platform for generating Python applications for usage with human language data and for natural language statistical processing is called the Natural Language Toolkit (NLTK) (NLP). contains a collection of text editors for semantic thinking, tagging, tokenization, analysis, classification, and reasoning. It also includes cookbooks and manuals outlining the fundamentals of language processing jobs covered by NLTK, as well as visual demonstrations and sample data sets.

The NLTK suite includes tools and libraries for statistical language processing. Its tools enable computers to understand human language and respond correctly when it is utilised, making it one of the most effective NLP libraries.

The Natural Language Toolkit for Python is an open source text processing toolkit that contains tokenization, parsing, categorization, stemming, tagging, and semantic reasoning capabilities.

Methodology

In this project, We have created an accurate deep learning version of an interactive agent in Python. In order to train the interactive agent accurately, we can modify the data in accordance with academic standards. Before we create a deep learning or machine learning model, we have performed a number of preprocessing processes on the data. As part of preprocessing we have done tokenizing, it is the most basic and first thing we can do on text data. Tokenizing is the process of breaking the whole text into small parts like words. Here we iterate through the patterns and tokenize the sentence using nltk.word_tokenize() function and append each word in the words list. We also create a list of classes

for our tags. In order to determine which category the user's message falls under, we employed a particular recurrent neural network called Long Short Term Memory (LSTM). From there, we will choose a random response from a list of responses. We are implementing this Interactive agent to answer queries which are asked by parents and students. This Interactive agent is built using NLTK, Keras, Python etc. This system helps both students and parents to be updated about the college activities and college related details. Parents can use this application asking queries about classes, College fee, Transportation facilities etc. Students can query about the college related activities like exam dates related to exams and results, schedules, new updates etc with the help of this web application.

Result Discussion: The following pictures represent few output screenshots of VJIT CHATBOT.fig3 represents graphical user interface of chatbot, fig 4:Represent chatbot response about principal information , fig 5: represent chatbot response for list of courses and fig6 : represents chatbot response for unknown query

Results Discussion:

The following pictures represent few output screenshots of VJIT CHATBOT.fig3 represents graphical user interface of chatbot, fig 4:Represent chatbot response about principal information , fig 5: represent chatbot response for list of courses and fig6 :

fig3:Vjit Chatbot Response in GUI

Fig4: Chatbot Information About VJIT Principal

Fig5: Chatbot Information about List of Courses Available in College

Fig6: Chatbot Response to unknown Question

References VI. Research challenges

While chatbots may operate as a low-barrier gateway to information, services,

and social interaction, current study suggests that they may also have issues with bias and inclusivity. Additionally, there aren't many systematic or organised studies of chatbots' inclusive and universal design. Understanding the many language components of dialogue and being aware of larger social and cultural variables are necessary for inclusive and responsible chatbot creation. The vision of chatbots for social good [18], which may be a valuable framework for solving this collection of difficulties, includes the goal of employing chatbots to improve democratisation, reduce bias, and facilitate universal design. Additionally, nothing is known about how platforms and frameworks are being utilized to democratise chatbot development and design, despite the fact that they are touted as low barrier to entry techniques of chatbot design and development. [19].

Problems and limitations include a lack of dependence on usability heuristics and inadequate or insufficient dataset training. Future studies should look into how chatbot localization and personality impact learner efficacy and satisfaction[20].

Limitation of Existing System

Although there is a college interactive agent, it does not prove the answer or solutions very accurately. To receive assistance from the college help desk, students must come to the institution in person. The customer must travel to the college if it is far from their house, therefore the process takes a lot of time and money. Additionally, communication issues could arise as a result of this approach.

Advantages of Proposed System

College interactive agents can run on local computers and phones, though most of the time they are accessed through the internet. College interactive agents are typically perceived as engaging software entities that humans can interact with. The user does not have to go in person to the college office to make an inquiry. This application allows the students to be updated with college cultural activities. It can be found everywhere, from outdated HTML pages to cutting-edge social networking sites. College interactive agents can be found on both conventional computers and stylish, smart mobile devices, and it is a highly beneficial and practical method for persons with disabilities.

Performance metrics

There are numerous performance measures available right now, and the industry as a

whole adheres to specific measuring criteria for chatbots [21]. Depending on the nature of their work and the industry they operate in, several businesses require chatbots. The format and duration of a chatbot's conversation is one of the most crucial performance metrics. The output sentence's length must be appropriate for the discourse being conducted and in context. Customer satisfaction does rise when sentences are shorter and simpler in the output and when solutions are found more quickly. The Chatbot's capacity to provide the user with a customised response is another statistic. This means that before creating an output statement that is linked to the user's particular problem or query, the chatbot should interpret and analyse the source language. Furthermore, chatbot performance cannot be measured precisely[22],but parameters like perplexity, learning rate, and bleu score can show how close one can go during model training. [23]

Conclusion

Chatbots are conversational agents that can converse with the user and respond to questions about both general topics and specific services. In this project, we developed a very basic chatbot that responds in accordance with a predetermined set of rules and the cosine similarity of the utterances. The chatbot responds to inquiries about Academics, Basic College Information, and other topics. In conclusion, the College Enquiry Chatbot can help students find the most reliable and up-to-date information sources. It is in the applicants' favour if they have questions about paying fees or academic issues. Students can obtain the information at their fingertips without having to visit the college administration. It improves efficiency by taking over tasks that don't require humans. The scope of the chatbot can be expanded in the future to enhance the capabilities of College Interactive agent by adding data for all departments, training the bot with a variety of data, testing it on a live website, and adding more training data to the bot based on user feedback. In the future, we will build on this by giving the CHATBOT a new voice-based capability that will allow students to ask questions and receive responses verbally. Additionally, we can integrate with various social networking platforms, phone calls, and SMS messages.

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