

A Survey of Various Strategies in Chatbot Development

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ABSTRACT

Chatbots, commonly referred to as Conversational interfaces, offer a novel means of human-computer interaction. In the past, utilizing a search engine or completing a form was required in order to have a software application respond to a query. With a chatbot, a user may simply ask inquiries the same way they would with a human. Alexa and Siri are the two voice chatbots that are currently the most well-known. On the other hand, chatbot adoption rates on computer chat platforms are currently very strong. Natural language processing, or “NLP” is the technology driving the chatbot revolution. Natural language processing is now much more accurate and efficient thanks to recent developments in machine learning, which makes chatbots a practical choice for a lot of businesses. Chatbots have come a long way in the last few years. This study offers a thorough examination of several approaches for putting the chatbot into practice, along with a summary of the algorithm that performs best overall.

Keywords - Chatbot, Conversation, Deep Learning, Machine Learning, Natural Language Processing,

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I. Introduction:

Chatbots are computer programmes that may automatically have voice or text conversations with users. The first chatbot, Eliza, was developed in 1966 at the Massachusetts Institute of Technology (MIT). Since then, a variety of industries, including banking, business, healthcare, and education, have adopted chatbots. Chatbot usage has increased dramatically as a result of the COVID-19 pandemic’s sudden changes in work habits and decline in in-person services. Despite its restricted communication, the Eliza chatbot was able to communicate about a limited topic set by using response selection and pattern matching algorithms based on template sets. Moreover, this initial chatbot was unable to conduct lengthy discussions or deduce context from them. A chatbot consists of three mandatory components. The semantic context of the interaction is controlled by the conversation engine. The conversation’s brain and subject matter is the knowledge base. The knowledge base lists three different kinds of chatbots: rule-based, retrieval-based and generative. Decision tree models, a determined collection of rules, were utilised by rule-based Chatbots to communicate with users. This kind of chatbot cannot learn through user interactions and solely uses prepared responses to answer users’ questions. While retrieval-based chatbots also

contain prepared responses, they may also extract these responses using certain heuristics, providing a shortcut to the full decision tree technique. Even though this kind of chatbot may have some AI components, it does not produce original responses. Large volumes of conversational data can be used by generative-based chatbots to start a new conversation. Combinations of supervised learning, unsupervised learning, reinforcement learning, and adversarial learning can be employed by the generative-approach.

Additionally, chatbots can have extensive conversations in which a lot of information is exchanged, or brief chats in which only one response is generated for a single Q&A session. Chatbots can have an open discussion domain, which aims to serve many forms of conversations on various themes, or a closed conversation domain, which serves a specified purpose or topic and requires less expertise for output responses. Numerous closed-domain chatbots are available that are specifically made for business, healthcare, and educational purposes. However, there aren’t many chatbots designed to provide underprivileged communities with legal support. There are not many references to chatbots in Tamil. The complexity and character of the Tamil language make Tamil chatbots unique as well. The design and development of multilingual chatbots with a legal

assistance for underprivileged communities is the major focus of this work.

II. Chatbot Implementation Methodology:

Conversational Agent systems are becoming more and more developed in the commercial business, particularly in the retail, banking, and education sectors. The purpose of the research is to increase accuracy and make communication between the user and the chatbot as identical as possible to real-world chats. In addition to the conventional rule-based method previously employed, Natural language processing (NLP) and deep learning are two examples of advanced concepts and techniques that are useful in the construction of chatbots and other simple machine learning algorithms. Several researches have used machine learning algorithms like KNN, Naïve Bayes and other classification algorithms to train the Chatbot model. [1] uses KNN to treat illness of the patients. Chatbot categorises the ailment as either a serious or insignificant health issue based on the symptoms. In cases where the user's health problem is serious, medical advice is provided to seek a better treatment from a physician; in cases where the disease is minor, medical aid is provided. For health issues, the chatbot can even prescribe medication. The Chatbot cures linked health issues with homeopathy and Ayurvedic remedies in addition to prescription drugs. The chatbot keeps all of its information in a database, which it uses to determine keywords and decide whether to reply to users. [2] also uses KNN to train a mode where users can communicate with the chatbot in the same way they would with a human, and by asking it a series of questions, it will recognise the user's symptoms, anticipate their illness, and suggest a course of action. People can use this system to perform daily health check-ups, learn about their current state of health, and be encouraged to take the necessary precautions to stay healthy. This study shows that people are less aware of and do not use such a system very often. [3] uses SVM to train a model that evaluates the anxiety, depression, and hypomania index of perinatal women. It trains a model by analysing 31 characteristics of 223 samples using SVM. In the meanwhile, psychological test scales are employed to support assessment and offer recommendations for treatment to help people enhance their mental well-being. The application of AI and deep learning methods, such as RNN, Bi-directional RNN, LSTM, and Sequence-to-Sequence

models, is an improvement over this machine learning model. Numerous studies have been conducted regarding the application of RNN in the creation of chatbots. [4] uses Bidirectional Recurrent Neural Networks (BRNN) with attention layers allows phrases with a lot of tokens in the input to be processed more efficiently. (20–40 words) are addressed with a more suitable dialogue. Reddit provides the dataset that was utilised in the research to train the model. The model is designed to translate from English to English. [4] identifies the Bleu Score for translation in the same language while also increasing the model's complexity and learning rate. As RNN is so effective, it is also used to identify the text's emotions. [5] uses RNN to identify the emotions of the text. Sentiment analysis is used for processing before data collection based on conversations and sentiment analysis results. Then, using the conversations that are happens at current, RNN is used to classify the emotions. This method yields a precise accuracy of 0.76, which is a promising outcome. One desirable goal of the chatbot application is to gather the phrases that express a certain user goal when communicating with the chatbot. Sentences that share the same objective ought to be accurately classified in order to deliver pertinent responses. It is easy for humans to interpret different phrase structures that have the same meaning. For chatbots, however, a unique method is needed. [6] uses a deep learning algorithm to create a conversation intent categorization model for intelligent chatbots. As such, chatbots are able to comprehend a wider range of language expressions with greater accuracy. Using RNN yields a promising outcome, with an accuracy of 81%. RNN is so powerful such that it can be used to find the emotion and intentions of the conversation. In order to construct an efficient chatbot for a web application, [7] studied many recurrent neural network types, including GRU, bi-directional LSTM, and a single forward pass LSTM available be used in a high-level API. When the results of the various models were examined, it was found that the for question answering systems. These networks can single forward pass LSTM outperformed the other models for the bulk of the tasks in the dataset, although the bi-directional LSTM and the GRU performed better in a small number of tasks. The precise accuracy gained with this method is 96%. [8] has used LSTM to develop the chatbot for the lab manual. Students can ask real-world questions like

Table

Algorithm	Description	Dataset	Accuracy	Ref
KNN	Personal healthcare chatbot for medical suggestions using artificial intelligence and machine learning	Clinical data	82%	[1]
KNN	Chatbot for Disease Prediction and Treatment Recommendation using Machine Learning	patient data, medical history, and symptoms data	-	[2]
SVM	Supervised Machine Learning Chatbots for Perinatal Mental Healthcare	Data about pregnant women, newborns	-	[3]
RNN	An intelligent Chatbot using deep learning with Bidirectional RNN and attention model	Reddit dataset	-	[4]
RNN	Conversations Sentiment and Intent Categorization Using Context RNN for Emotion Recognition	Movie Conversations	79%	[5]
RNN	Intents Categorization for Chatbot Development Using Recurrent Neural Network (RNN) Learning	Guest book of universities	81%	[6]
LSTM	A Metaphorical Study Of Variants Of Recurrent Neural Network Models For A Context Learning Chatbot	Facebook bAbi data	96%	[7]
LSTM	Natural language processing and deep learning chatbot using long short term memory algorithm	Conversations between users	-	[8]

how to install software instead of reading the handbook. It is possible to ask questions. Google respond to such queries, but because there are numerous choices, students may find it difficult to choose the ideal one. Questions can have multiple answers, but when our goal is narrowed down, there will only be one response. Instructors can determine the likelihood of a question being asked based on their ability to train the model to provide a precise response to a student's query. To obtain the precise response to the question posed by the student during the practical. The exact accuracy obtained with this method is 99%. [9] has delivered an Encoder-Decoder system for intent recognition and defines chatbot using Xatkit, a platform for developing chatbots. Using a bidirectional transformer (CamemBERT), it encodes utterances as context representations for the encoder. To determine the

student's intent, it employs an intent classification decoder for the decoder. This chatbot is used in order to enhance and streamline instruction for instructors and students, lessen teacher burnout, and accelerate comprehension. [14] presents a novel ensemble-based method for value-based DRL chatbots, which represent meaning via finite action sets. A large number of closed domain chatbots have been developed recently. However, there is a dearth of studies on offering less fortunate people getting legal support. Selecting the appropriate language and domain for the chatbot's development is just as crucial as selecting the appropriate algorithm. Numerous studies have been conducted on multilingual chatbots. Several of those studies have shown to be more fruitful than chatbots that can only speak one language. The development of a Tamil chatbot has not undergone much research. This is a consequence of the Tamil vocabulary's ambiguity and complexity. [10] focuses on Poongkuzhali, an intelligent Tamil chatterbot, is generic and can converse on any technical subject for which there is a knowledge base available. The

user can formulate his query anyway he desires. Poongkuzhali interprets and comprehend it regardless of its grammatical structure. Every keyword has a corresponding priority or weight. The text's left-to-right scan in favour of the person with a higher rank. In the same way, a set of reassembly rules corresponds with each breakdown rule. There are several ways to generate the answer using these reassembly principles. Because Tamil provides a wealth of contextual information, morphological analysers are used to extract plurals, obliques, and clitics. Because of its general design, the software can operate in any technical domain without requiring modifications to the code. Three files make up the Knowledge Base; they each contain the Domain Knowledge, technical terminology, and non-technical terms in that order. Automation of the Knowledge Base greatly benefits the system because the software heavily depends on the Knowledge Base. [11] has designed a chatbot that uses natural language processing (NLP) and the Dialogue Flow API to respond to parent enquiries in Tamil, helping parents monitor their children's progress in college. This chatbot's key features include slot fulfilment, intent recognition, conversation management routines, and dialogue design. Pusher Channels and the Flask micro framework are also used. [12] have attempted to use Language Agnostic Embeddings to evaluate Tamil emotions. The LaBSE model is used for Tamil text feature extraction. [13] explains the design and implementation of Tilly, a Tamil chatbot system for language learning. Tilly is implemented using Dialogflow. People ask inquiries in Tamil using this, and the system will reply in the same language. The three question categories that make up the chatbot's question base are basic, moderate, and advanced, based on each person's proficiency in the Tamil language.

III. Conclusion:

This study reviews several methods for developing chatbots. Using basic logistic regression and an iterative classifier optimizer, machine learning was used to interpret the relationships and intentions in the requests. Upon further examination, it appears that chatbots trained by deep learning perform far better than those trained through machine learning. RNN is widely employed for intent identification and emotion analysis due to its outstanding performance. However, when an immense number of tokens are involved, RNN fails to operate adequately. Thus, LSTM and Bi-LSTM were employed. Attention-meant encoder-decoder models are used to improve generative chatbot response generation. These work better than any other model at generating responses. One of the

greatest initiatives for a Tamil chatbot is POONGKUZHALI. Dialogflow-a framework for natural language understanding (NLU) that is used by certain Tamil chatbots.

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