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DEPBOT: THE ANTI-DEPRESSION BOT

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Abstract– ***This research paper presents the idea of using conversational bots (chatbot) to analyse, asses and cure the people who are suffering from depression. Chatbots are conversational agents that uses a set of known knowledge base to help the people suffering from depression. A bot can either be an open or close ended chatbot, in this case we are going to useanopen ended bot to maintain the conversation as natural as possible. Any person can ask a question in natural language (Here it's English) and the bot uses Artificial Intelligence in the form of machine learning to analyze the problem and overcome it.***
The DEPBOT would be deployed on a website as a web application and mobile application. The bot will be tested several times and the data would be fed to bot by conducting surveys in the initial stage. Many chatbots have been created and all have a certain degree of success but none of the bot deals with normal life problems.

Keywords – depbot, knowledge base, artificial intelligence.

I. INTRODUCTION

A chatbot can also be called a talkbot, interactive agent, chatterbot or Bot [1]. It is a conversational agent which is designed by the developers to simulate a human like conversation with other people. They are mainly used to try and simulate how humans interact with other humans this is mainly due to their ability to make small conversations/dialogues hence their uses in online customer services and personal assistants. People suffering from depression must tell their problems to the bot. The query is then processed and since the system is a generative based model, which means it would be able to generate answers which it has not answered ever before by studying the psychology of the person. It then uses pattern matching algorithms to find the answer for the input. Natural language processing (NLP) is used to take the unstructured input and produce a structured representation of the text. Data is then processed by using the logistic regression to determine whether a person is suffering from depression or not and then calculating the probability of him/her falling into depression again after recovering. [2]. The method implemented for information extraction is regular expression in which the sentences can be treated as regular expressions, and can be pattern matched against the documents in the bot's knowledge database by figuring out that if there was any similar kind of incidence in the past with anyone or not.[2]. The categories supported by the system includes depression, motivation, overcoming obstacles. The system will also act as companion/partner, allowing people to get out of there problems. The response time of the chatbot will be mainly dependent on whether the internet connection will be fast or slow. Fast internet connection results in faster response time while slow internet results in slow response time and even a connection time-out.

II. RELATED WORK

During the early phases, chatbots were mainly used to simulate very simple conversations between humans and computers in a scripted way. For example, ELIZA (featured in the TV series,*Young Sheldon*). It was the first chatbot developed by Joseph Weizenbaum at MIT in 1964, who used a series of pre-recorded patterns and substitution of those patterns in response to the query provided by patients with psychological disorders. Initially, he wanted to disprove the illusion of self- learning machines —now called AI. There are 2 categories of chatbots:

- Retrieval based model – it uses a predefined knowledge base of predefined responses and employs pattern matching algorithms with a heuristic which selects the most appropriate answer for the input. The heuristic could be as simple as a rule-based expression match or can become complex as an ensemble of Machine Learning classifiers. Retrieval based models do not generate new answers if asked queries rather they just pick the most appropriate response from a fixed knowledgebase.
- Generative based models – these types of chatbots are different from retrieval based models in that they are able to generate answers to the questions/queries which are out of its scope. They do not have a knowledge base/database this model relies on the machine translation techniques and also extensive training using huge amounts of training data is necessary so as to equip it with ways to generate answers and chat with people.

The main advantage of retrieval based model over generative model is that retrieval based model's knowledge's base is created by the developer which is not prone to syntactical mistakes whilst the main disadvantage is that it is not capable to answer questions which are outside the scope of its knowledge base [6]. Also retrieval based chatbots less prone to general answer problems. On the other hand generative models are difficult to train and also prone to grammatical errors.

Presently, chatbots can complete semantic analysis of the text that the user inputs, to provide a more tailored response. Chatbots are now being used successfully as a means of providing useful information. In one study, a chatbot enabled adolescents to ask questions about sex, drugs and alcohol which is more useful compared to traditional information outlets or search engines [3]. Chatbots can now be implemented in different sectors which includes health where they can be used to diagnose diseases and also prescribe/suggest medicines to name just a few. They can be used in the education sector in which their benefits includes collaboration, cooperation, interaction, active learning, constructive learning, creative learning and social learning which are the ingredients which helps students as they develop. Chatbots can also be used as intelligent tutoring systems [4] and educational software tools which motivates students to learn basic computer science [5]. Chatbots can also be implemented in the business sector which helps improve productivity because of their positive impacts and allows customer interactions at twice the speed and at a fraction of the cost since companies are under pressure to reduce the cost of customer service. Chatbots also assist in helping sales and marketing teams work faster and more effectively.

METHODOLOGIES

Here the focus is a breakdown of how modules can be developed separately each with its specific function.
Word embedding are responsible for the conversion of natural language into a format that computers efficiently work with [8]. Some of the ways of extracting relevant information from a sentence includes:
Dialogue Act Recognition– typically includes a taxonomy of dialog types or tags that classify the different functions dialog acts can play
Bayesian Approach to Dialogue Act models– works buy calculating the probability of every sequence and the sequence with biggest probability is choosen [7].
Memory Bases Learning– extraction of meaning occurs by implementing the K-nearest neighbor and storing question in the memory. When new question are asked, the model looks for the nearest answer and deems it fit.
Sequence to sequence models –this technique utilizes neural networks by using artificial neural networks (ANN). It uses the sequence to sequence long short- term memory cell neural networks (LSTM) [11].
Extraction of Information
WordBox– only focuses on counting the number of times a word has occurred and ignores the structure of the sentence and the punctuation. The resulting words are then matched against those in the knowledge base in trying to find the result. This technique is less accurate [7].
Regular expressions– a certain portion of words in the sentence are matched against those in the knowledge base. If the text is matched, it then triggers the phrase in the knowledge base and it becomes the answer.
Text-To-Speech– words are spoken by the computer using text-to-speech synthesis, reading out each and every word
Support Vector Machine- this technique uses supervised learning which means if it is given a set of training data, the algorithm is responsible for generating a hyper plane which will divide the sample into their proper labels. The hyper plane will divide the data into more than 2 labeled categories.
Challenges of Bot
Some of the challenges that bots possess are:
Chatbots are still in the primitive phase that is it is still a research area hence there are many difficulties associated with this including limited data for training the chatbot. This has an impact as a chatbot is only good as the learning data that it has beenprovided.
Most of the chatbots that are in use utilizes decision trees when they are making decisions on an answer, this makes them able to answer the first questions properly but as the conversations becomes multi-linear and users switch conversation midway, the chatbot becomes confused and starts giving wrong answers.
Chatbots functions buy extracting intents from the utterances of users and gives back appropriate answers, problems arises when users asks long questions with many intents. The chatbot will just pick the intent with the highest probability and returns an answer which may not be true hence users must make their questions brief for effective use of the chatbots.
Since a chatbot cannot answer all the questions correctly, it is therefore difficult to determine how good or bad the chatbot is besides the reviews that comes from the users.
Most of the chatbots in use do not have personalities and they do not have a human feel/emotion hence it is difficult for them to recognize sarcasm, jokes and humor. A very good example of such case is when you tell the more popular assistant Siri jokes it will answer with responses like "I will not tolerate this form harassment".

Measuring success of chatbots

Here we try to find a way of measuring how good a chatbot is in answering the questions at hand. Although chatbots are good, they still do not match the interaction between customers and humans [9]. Some of the ways of measuring the success of a chatbotare Self-service rate: measures to what extent is the chatbot able to handle a conversation without referring to a second-tier call center.

Satisfaction rate: refers to the feedback that the chatbot gets from users after interacting with it.

Confusion triggers: Chatbots get confused during the course of the conversation and so do people in general hence the rate of confusion of the chatbot must be kept low for them to be effective. The confusion rate can be calculated by sampling previous conversations [9].

Scalability: chatbots must not only support one user at a time but it must allow concurrency.

Artificial intelligence learning rate: determines how strong is the artificial intelligence in the chatbot and also the rate at which a chatbot learns new things[10].

III. PROPOSEDSOLUTION

The anti-depression bot will be able to take queries or questions from users' and reply with the most appropriate answer. In the case that the answer given buy the system is wrong, the answer will be marked as invalid by the user and the admin will be responsible for reviewing the answer. The depbot will be placed on a website so that users can interact with it.

These are the modules contained by the system:

Online chatbot – which will provide answers to queries automatically using a generative model. It will also feature an online support forum.

Users – includes people from every age group irrespective of their gender. Developer would be responsible for managing the system like reviewing marked answers, reviewing statistics of most asked questions.

A database which will hold history of all the asked questions and the replies from the system will be created. The database will feature a 2 dimensional form with strings of arrays. The rows will contain the questions which have been asked and the columns will save the answers that the depbot provided.

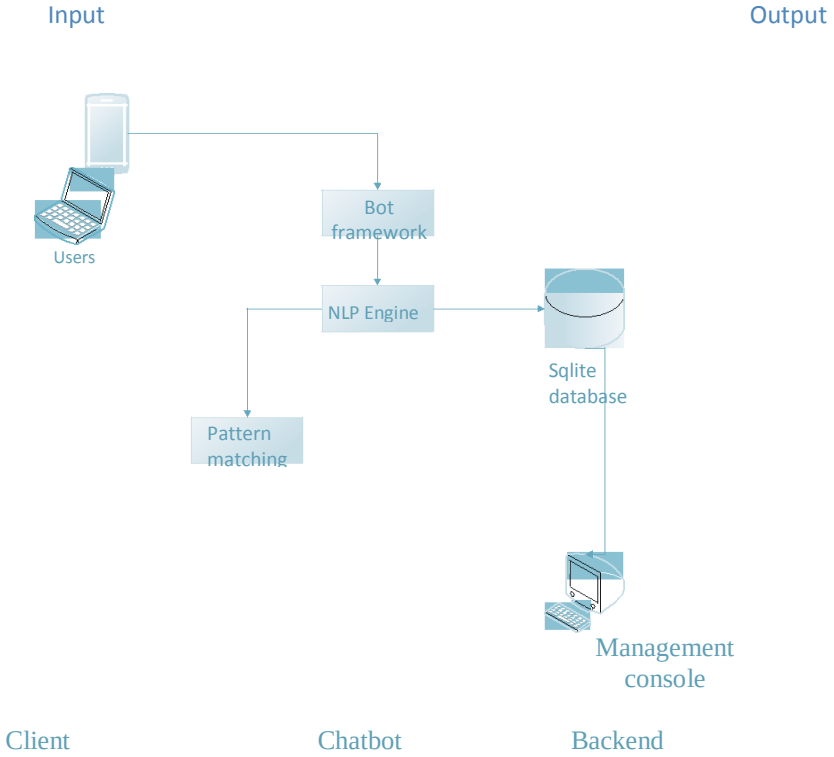
The bot can be one's best friend as you can share whatever you want here. Here Rasa.ai would be used for the NLP part. A messenger bot will also be there for proper analysis of data.

For training the chatbot, recurrent neural networks (RNN) will be used. It uses a long short term memory (LSTM) sequence-to-sequence model. The input (question) from the user goes through the encoder then the decoder and then produces the output (answer). The tensorflow backend will be used which is a machine learning library which can be imported in python.

Architecture diagram for sequence to sequence model

System Architectural diagram

It provides a description or a layout of the environment or platform on which the system will run on.



TOOLS TO BE USED

- Python language
- Pycharm Community IDE for writing and compiling programs
- Tensorflow and keras
- SQLite/Mongo database for storing data.
- Web Server with python support and Github as a repository for the code.
- Rasa.ai

Several
Python
Libraries

pymessenger
Gunicorn

Pandas

Numpy

scikit-learn

seaborn

matplotlib

requests-toolbelt

apscheduler

```
fakeredis
future
graphviz
h5py
jsonpickle
keras
numpy
pandoc
redis
six
tensorflow
typing
networkx
fbmessenger
tqdm
ConfigArgParse
pykwalify
coloredlogs
ruamel.yaml
flask
scikit-learn
slackclient
requests
python-telegram-bot
rasa_nlu
```

IV. CONCLUSION

After reviewing the current, future and old bots, the system which will be built will be a open domain bot capable of analyzing, answering and developing a level of relationship with that person. The generative based model is also to be implemented with AI in the form of rule-based pattern matching, natural language classifier and also rule based conversation manager which can generate scripted responses based on the user's intent.

In the future, the researchers and developers might be able to develop a DepBot which allows different languages as input and replies also in different. Also open ended and generative based chatbots models are still difficult to create but they are the most useful since they are able to learn and answer any types of question hence they allow for more implementation roles in all kind of sectors. After the successful implementation of the DEPBOT, it will be nice to add voice recognition such that users can interact with the system using their voices.