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Emotional Tone Analysis to Recommend Songs using a Chatbot

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Abstract: *The purpose of chatbots is to assist and scale company personnel in their interactions with customers. It might be used in any major chat app, such as Messenger, Facebook, Slack, Telegram, WhatsApp, and so on. By streamlining interactions between people and services, chatbot applications increase customer experience. By reducing traditional customer service expenses, they provide business with new approaches to boost customer engagement and operational effectiveness. When powerful techniques such as AI and ML are applied to these chatbots, they become complete conversational experts without the need for a human to mimic people. It is not necessary for a chatbot to be used only for business purposes it can also be used to increase user interaction and to understand the user. This project aims to create a Chatbot that recommends songs based on the tone of the user's conversation with the chatbot by merging numerous services and open-source resources.*

Keywords: Machine learning, Classification, Support Vector Classifier, Recurrent Neural Networks, Natural Language Processing, Emotional Tone Analyzer, API, Chatbot, JSON

I. INTRODUCTION

Chatbot are integrated by many businesses and websites to help their userbase with better understanding and problem-solving methodologies. Popular chat and messaging platforms like SMS, Facebook Messenger, WhatsApp, and more use chatbots for customer service and better engagement with customers. When chatbots are integrated using AI and ML algorithms, by harnessing the enormous amounts of data and cheaper processing power, AI, and related technologies — such as machine learning — it dramatically improves chatbots' quality of understanding and decision-making. Emotional tone analysis is the process of identifying and analysing the underlying emotions expressed in textual data and to derive the tone of the user's text. Song recommendation systems are used by various music providing platforms such as Spotify, SoundCloud, YouTube, iTunes, and others to recommend songs based on the previous songs, top tracks and artists played by the user. These platforms use various ML and AI algorithms to recommend songs. Chatbot, Emotional Tone Analysis, Song Recommendation System are all independent function concepts that serves their purpose accordingly but what would be the outcome if all these systems are integrated? This is precisely what the project aims at combing all the three existing systems and integrate them into a single system that recommends songs to the users based on the emotional tone of their conversation with the chatbot.

II. RELATED WORKS

There are various emotional tone analysis methods provided by various developers and authors used to build better models for prediction of emotional tone. Music has a huge effect on the listener's mood and emotional states it might either compliment the user's mood or change it. Each song has an emotional tone upon which it is built this analysis of the song gives us insight on lyricists mood while writing the song this understanding and analysis of tone is necessary to develop interactive applications, music players to use this understanding to recommend songs based on listeners mood and interest IBM Watson Tone Analyzer API is used for to analyze language and emotional tones form song lyrics a dataset of 300 songs is extracted using the API is executed [1]. Emotion detection and recognition from text uses the Natural Language Processing analyze that may show valuable input to variety of input data but there are various form of writing such as social media posts, news articles, customer reviews, micro-blogs and more and text mining of these content can be useful for creating a larger emotional dataset, this is achieved by a novel neural network architecture is

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implemented called as SENN (Semantic-Emotion Neural Network) that can use both semantic/syntactic and emotional information. The SENN model is divided into two sub-networks: the first uses bidirectional Long-Short Term Memory (BiLSTM) to capture contextual information and focuses on semantic relationships, while the second uses a convolutional neural network (CNN) to extract emotional features and focuses on the emotional relationship between words in the text [4]. Social media has a huge database that is categorized as a big data, for emotional tendency of social media users evaluation a new text emotion classification model is proposed which integrates content features and user features and a text emotion classification model is constructed, which integrates content features and user features this is aided with Maxout neuron to solve the problem of gradient dispersion in the training process and optimize the training process, the proposed model is improved by 2.5% compared to the traditional model [5]. With the rise in developer forums as a informal documentation it is seen that most of developer tend to use API in the software development process , there is a lot of process involved in the choice of API functionality and the lifecycle of the API during the development process to understand why developer's seek and evaluate API options two surveys involving a total of 178 software developers was done to understand why API is used, from the survey it is seen that developers also make an attempt to assess the reliability of the offered opinions and believe that automated tool support for API evaluations will be beneficial [9].API libraries are vital in everyday programming work because they provide thousands of APIs. Mining specifications that officially describe permitted API usages has long been a popular research issue to better understand their applications. Researchers are also working on a variety of other API-related research areas. Despite much research on APIs, many fundamental concerns about APIs remain unanswered [11].

III. EXISTING SYSTEM

A. Song Recommendation System

Song recommendation systems are used by various music providing platforms such as Spotify, SoundCloud, YouTube, iTunes, and others to recommend songs based on the previous songs, top tracks and artists played by the user. These platforms use various algorithms to recommend songs. The first thing one notices on Spotify is the home screen, which is where the recommendations begin, and the home screen is controlled by an AI system known as Bandits for Recommendations. For example, Spotify's algorithm is always finding new ways to understand the kind of music one listens to, from the songs that are always on repeat to the favourite genre that one can't get enough of. BaRT is the reason why Spotify satisfies their users with a good Spotify playlist. Soundcloud is another example, where suggested tracks are chosen by an algorithm that gives suggestions through a network of SoundCloud relations and interactions (for example a user liked a track, a user followed another user, a track is reposted etc.). Track recommendations can be related to tracks in this network both directly and indirectly.

B. Chatbot System

Chatbot are integrated by many businesses and websites to help their userbase with better understanding and problem-solving methodologies. Popular chat and messaging platforms like SMS, Facebook Messenger, WhatsApp, and more use chatbots for customer service and better engagement with customers. When chatbots are integrated using AI and ML algorithms, by harnessing the enormous amounts of data and cheaper processing power, AI, and related technologies — such as machine learning — it dramatically improves chatbot's quality of understanding and decision-making

C. Emotional Tone Analysis System

Emotional tone analysis is the method of determining the user's emotional tone by identifying and evaluating the underlying emotions indicated in textual or other forms of user input data. The creation of emotion analytics software requires a large volume of tagged emotion data which can derived from various text corpuses such as twitter's text data. The emotions data is received from video cameras that capture facial expressions and microphones that collects voice data, or analysis of the words is used. This information is fed into machine learning algorithms, which learn to distinguish facial expressions, tones, and other features associated with different emotions. Today's emotions recognition technology has categorized emotions as either anger, contempt, confusion, disgust, fear, frustration, joy, sadness, or surprise.

IV. PROPOSED SYSTEM

The proposed system combines all three existing systems and integrates them into a single system that recommends songs to users based on the emotional tone of their conversation with the chatbot. After the current song has finished playing, similar songs will be played, or the user can play the next song. This system developed is a blend of a emotional based Chatbot, ML algorithms to detect the emotional tone in the text and the Spotify music player, the system has a major implementation of the API functionality in these modules, API simplifies our execution process and lets us focus more on the functionality and simpler system design is obtained. A simple webpage is developed for user interaction and a Spotify web player which displays the recommended songs.

V. IMPLEMENTATION

A. Chatbot Frontend and Backend

Chatbot is the frontend of our project where our users interact, we are deploying this module using flask, HTML, CSS, and a CakeChat chatbot backend this is developed by lukalabs, this backend module can be found on Github under lukalabs/cakechat repository. We will be using the API functionality in this module, the docker image of this module is taken from docker hub and deployed on localhost port:8080 using docker hub in our system. The chatbot frontend is built on flask framework we use html, css, js and jinja 2 framework to build our webpage on a localhost to deploy our chatbot we collect the user input using a get parameter and this input is sent to our second module Emotional Tone Analyzer. We will be using the POST request to get the chat response we will be providing the post request with two parameters context and emotion. The context is the user input, and the emotion is analyzed from the emotion tone analyzer we must also create a mapping for the emotion received from the emotional tone analyser since CakeChat can recognize only one of the following emotions {'neutral', 'anger', 'joy', 'fear', 'sadness'}, emotion to condition the response on, optional param if not specified, 'neutral' is used. Once the API request is sent, we get a JSON data with the response this JSON data is extracted and is used to display the chatbot response in the webpage.

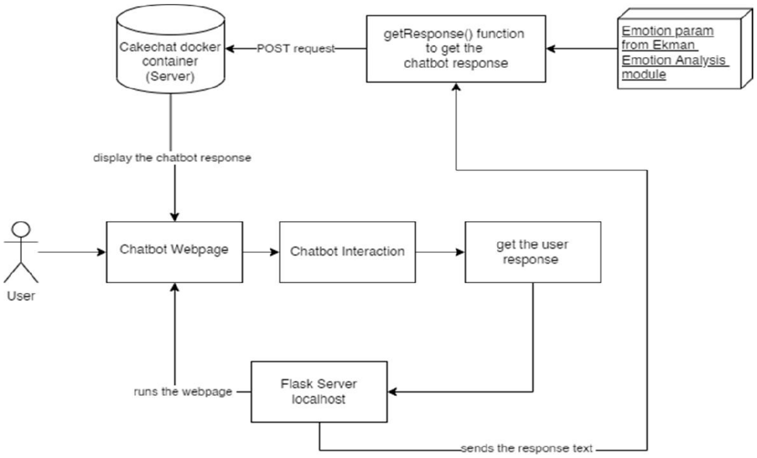
Cakechat docker container (Server)
POST request
getResponse() function to get the chatbot response
Emotion param from Ekman Emotion Analysis module
display the chatbot response
User
Chatbot Webpage
Chatbot Interaction
get the user response
runs the webpage
Flask Server localhost
sends the response text

FIG 3.1 Use case for chatbot frontend and backend

B. Emotional Tone Analyzer

The Emotional Tone Analyzer is used to analyze the user’s emotions base on the text input take from the first module. IBM Tone analyzer was planned to be used in the project but due to some technical reasons this is not used rather an alternative API - Ekman Emotion Analysis is used this API is deployed via rapid API web service. We will we sending a POST request to the API with the id, language and the text parameters, the language and the id are predefined parameters with 1 and EN(English) as their values respectively. Once the request is sent, we will be receiving the JSON data with the prediction and probability data, we will be using the prediction data.

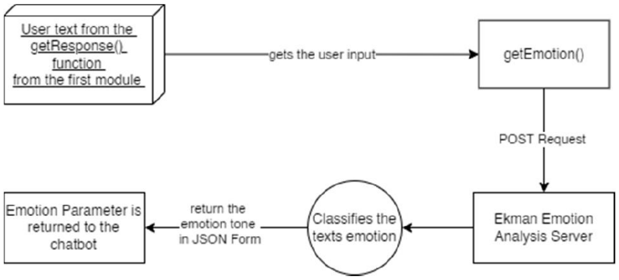
User text from the getResponse() function from the first module
gets the user input
getEmotion()
POST Request
Ekman Emotion Analysis Server
Classifies the texts emotion
return the emotion tone in JSON Form
Emotion Parameter is returned to the chatbot

FIG 3.2 Use case for Emotional Tone Analysis

C. Spotify API

Spotify gives it developers with multiple categories like authenticating the user, getting artist data, getting specific genre, getting different albums, tracks, playlist and much more. We will be using the search API by specifying the genre, this genre is the analyzed emotion of the user that we get from the emotional tone analyzer, and we also need the map the genre to certain category of genres that Spotify has defined. Once the request is sent, we will receive the JSON data with many parameters we will be using the track id we will use the random function in python to randomize the songs list this is then used in the embedded frame to add a song it the Spotify iframe in the page.

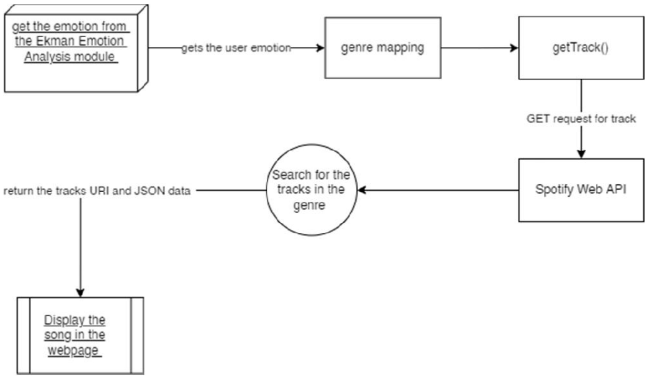
get the emotion from the Ekman Emotion Analysis module
gets the user emotion
genre mapping
getTrack()
GET request for track
Spotify Web API
Search for the tracks in the genre
return the tracks URI and JSON data
Display the song in the webpage

FIG 3.3 Use case for Spotify API

VI. CONCLUSION

Figure 3.1 shows the functionality of the chatbot frontend and the backend, Figure 3.2 show the functionality of the emotion tone analysis This project focuses on combination of three different technological – Chatbot, Emotional Tone Analysis and Song Recommendation systems with our sub focus of the project on API and Flask framework implementations. It also covers the domain of ML and AI, and when these concepts are integrated with a chatbot and how it affects the responsiveness of the chatbot. The emotional analysis when combined with song recommendation can understand user's emotion and play songs that is relevant to users' emotions. The project was successful at getting the user response from the user, analyze the emotion tone of the user and display the songs to user and upon the songs displayed show similar recommendation to the user. This project will be useful for songs providing platforms such as Spotify, SoundCloud, iTunes, YouTube Music and more for better understanding there userbase and deliver optimal songs according to the mood of the user which will in turn enhance the user experience.

VII. FUTURE WORK

The project has huge scope of development the project is currently deployed in a localhost, the project can be upscaled and can be deployed on platforms like Heroku, it can also be integrated in an application as an added feature. Since docker takes up lot of memory space which slows the system hence it can be deployed on a container in any cloud service like Azure, Heroku, AWS and so on. Face detection, or voice as user input data for better cognitive functionality can be used which shall enhance the chatbot as well the user experience. Instead of suggesting few songs playlists could be displayed to the user for selecting a range of songs. Advanced emotion recognition models which have larger datasets as training data can be implemented.

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