

Emotion Detection - Focus On Mental Wellness

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Abstract— Mental health encompasses an individual's emotional, cognitive, and behavioral well-being. It is a vital aspect of overall wellness as it affects how people feel, think, and handle various situations. Mental health can be negatively impacted by factors such as depression, anxiety, and stress, among others. Neglecting proper care for someone experiencing a mental illness can lead to severe consequences. With the advancement of technology, computer-based tools can be used to detect the onset of mental illnesses. Online screening is one such tool that can identify mental health conditions at an early stage. After completing an online screening test, individuals who receive a positive result can consult a mental health professional for guidance and treatment. This project aims to develop an online chat platform for the early detection of mental health-related issues, such as (depression, anxiety, and stress) based on the textual data which user enters. We have used textual emotion analysis using Streamlit. It is an open-source machine learning framework for building web applications. Our application also provides prediction probability and visualization for proper comparison and analysis of various emotions, extracted from the input text.

I. INTRODUCTION

In our daily lives, we encounter various situations that evoke emotions within us. Emotions are intense feelings that arise due to human relationships and situations. People use facial expressions to convey their emotions, which can include love, joy, anger, sadness, fear, and surprise. Humans can express a broad range of emotions through different means, including speech, actions, written text, and facial expressions. With the widespread use of devices like computers, smartphones, and tablets to access the internet, large amounts of textual data are

generated. Analyzing this data manually for a specific purpose is no longer feasible, so advancements in automated data analysis, such as automatic emotion analysis, have opened new research directions. Emotion analysis has garnered significant attention from researchers due to its diverse applications. For instance, security agencies can use this technique to monitor emails, messages, and blogs to identify any suspicious activities. Emotions can be any intense feelings related to a specific situation, mood, or relationship. The exchange of emotions can be carried out through text and speech. However, computers face difficulty in identifying human emotions in written form, which is a challenge as humans are capable of identifying their own emotions. In this digital age, the role of human computer interaction is vital for effective digitalization.

Depression is one of the most common widespread mental health conditions globally and one of the most misunderstood. The World Health Organization (WHO) Trusted Source estimates that depression affects approximately 280 million people worldwide. With a population of nearly 200m people with diverse mental health needs with numerous barriers such as access to high-quality professional support - lack of awareness, social and self-stigma, and expensive access to services, the treatment gap for mental health in India is nearly 95%.

The overall well-being of a person's cognitive, emotional, and behavioral state is referred to as their mental health. It encompasses how individuals feel, behave, think, and cope with various situations. Mental health is a crucial component of an individual's overall health. Factors such as depression, anxiety, and stress can negatively impact mental health, and if left untreated, can lead to severe consequences. With the advancement of technology, computer-based tools can aid in detecting early signs of mental health disorders. Online screening tests are one such tool that can identify mental health

conditions at an early stage. After taking an online screening test, individuals can consult with a mental health provider for further guidance on their treatment. This project aims to create an online questionnaire to detect mental health-related issues such as depression, stress, and anxiety.

II. LITERATURE SURVEY

As part of the literature survey, various journals were investigated and it was identified that machine learning algorithms can be used for detecting depression.

The field of Natural Language Processing has shown keen interest in the topic of Emotion Analysis, which has gained a lot of popularity lately. Earlier research in Affective Computing focused on studying the cognitive, psychological, and behavioral aspects of human beings. The process of emotion analysis involved capturing facial expressions, body language, gestures, and speech to determine the emotional state of individuals. The way people speak, including intonation and accentuation, was also important in detecting emotions. However, analyzing emotions from online data presents a different challenge as users tend to use abbreviations, emoticons, emojis, and colloquial language, among other things. Furthermore, classifying text into multiple emotion categories poses a greater challenge than a single-label problem because a particular word can be associated with various emotions. For example, the word "excited" can be mapped to anticipation, joy, and trust, while the word "guilt" can be linked to fear and sadness. Recent research in this field mainly involves deep learning techniques such as LSTM and Convolutional Neural Networks.

The strategy employed in this approach involves establishing a connection between the polarity and the emotional content of text, organizing these categories and their relationships in a hierarchical structure, and subsequently conducting classification based on this hierarchy. This approach includes seven emotional classes, one of which pertains to non-emotional sentences, while the remaining six are based on Ekman's emotions: happiness, sadness, fear, anger, disgust, and surprise. The Hierarchical Classification Approach to Emotion Recognition in Twitter applies a three-level classification system. The first stage identifies whether the text is emotional or not, classifying it accordingly. The second stage determines the polarity of the emotional text, categorizing it as positive or negative. The third stage identifies the specific emotion category to which the text belongs, recognizing that in Ekman's six classifications of emotions, only happiness is positive.

The proposed method involves analyzing the emotional content of text and creating a hierarchical structure to classify it. The classification process includes seven emotional categories, with one being non-emotional and the rest being Ekman's six emotions: happiness, sadness, fear, anger, disgust, and surprise. The approach utilizes a three-level hierarchy to recognize emotions in Twitter. The first step classifies text as emotional or non-emotional, the second step determines the polarity as positive or negative, and the third step identifies the specific emotion class. Only happiness falls under the positive category in Ekman's six emotions.

The Classifier Chains (CC) technique is intended to simplify multilabel classification problems by converting them into one or more single label classification problems. Bayesian Classifier Chains (BCC) is a type of Bayesian network that learns the dependency relationships between class variables from data. Several chain classifiers are constructed to ensure that the order of class variables in the chain corresponds to the class. Additionally, there are five deep learning-based approaches that can be used, such as the Phan et al. (2016) method for detecting emotions in conversation transcripts. This method proposes a three-step process for emotion detection, which includes building an emotion lexicon from WordNet, using a simple neural network to adapt the lexicon to training data, and using a deep neural network with features extracted from the adapted lexicon to classify the multi-label corpus. It is critical to consider the context information of the conversation and what was previously said in the previous utterance. To feed the network, the raw input is pre-processed and has features extracted. The network has two hidden layers and an output layer, which is the sigmoid layer. To classify both sentiment and emotion, Yu et al. (2018) employ a new architecture that utilizes transfer learning. This architecture divides sentences into two different feature spaces, capturing both sentiment and emotion using a dual attention network. To complete the process, the Multilayers Perceptron (MLP) is used in the last stage, which is then followed by a hidden layer that is normalized by applying the SoftMax layer. This enables the acquisition of probabilistic values for all classes of emotions.

The model's goal is to predict multiple emotions given a sentence, using the dataset provided for SemEval2018 Task 1C (Mohammad et al., 2018). Each word in the input sentence is mapped into a d-dimensional vector space, and Bidirectional Long Short-Term Memory (Bi-LSTM) is used to process each word to represent the sentences.

III. PROPOSED SYSTEM ARCHITECTURE

Figure 1 represents the workflow of our application.

This application contains one home page which includes a text area where, user can enter some text.

Then the input text is sent to the pipeline (ML model) to analyze and give the result like prediction probability, back to the home page.

Then whatever result comes, is going to be stored in the database. And from database result is sent the other section of the app, to track all the predictions and to show visualizations.

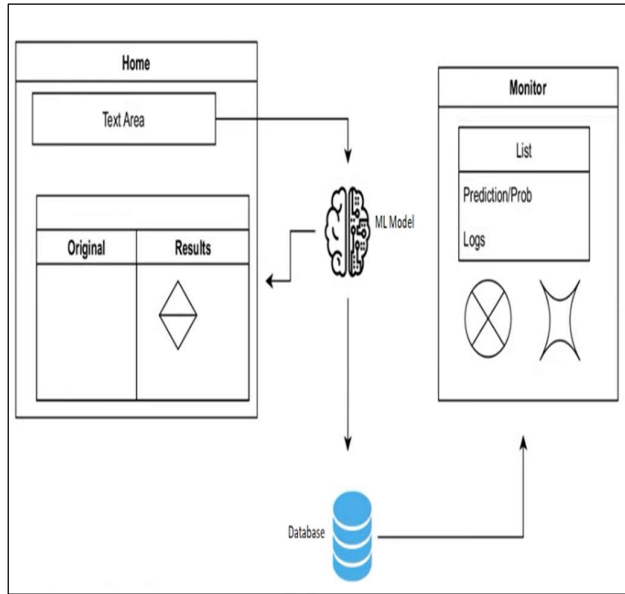


Fig 1: App workflow

Figure 2 shows the block diagram of the development of this project. This project was developed in various stages.

1.Data collection and preparation:

First of all we started the process with data collection to prepare data set. We have taken data from various research papers, and surveys. We have used this data to create the data set. Our data set contains two columns - text, and its related emotion, with over 34000 entries. And we have set of six emotions i.e., anger, fear, joy, love, surprise and sadness.

This stage also includes data cleaning. After collecting data, any unwanted text like special characters, punctuation or emojis must be removed. For the model to be accurate and successful, after gathering and cleansing the data. Removing missing data, dealing with outliers, and balancing the data are all parts of data cleaning was performed.

Feature Engineering: This stage involves the process of extracting different keywords present in dataset based on the six specific emotions available. Additionally, relevant features must be chosen and transformed from the data during feature engineering.

Model Building:

For this project we have used Logistic regression (LR) and Countvectorizer to build our Machine learning model.

Logistic regression is a ML algorithm used to give the probability of the occurrence of an event, according to the dataset provided. And countvectorizer is a technique used in machine learning to convert the given text to numerical data.

Model Evaluation: Assess the efficiency of the model by utilizing different evaluation metrics to ensure that no aspect of its performance is left unexamined.

Model Interpretation: To improve the performance of a model, it is necessary to adjust and refine its hyperparameters,

features, or algorithms. No information can be left out when optimizing the model.

Model Productionizing and model deployment: To utilize the model for making predictions or classifications on fresh data, it is necessary to integrate it into a production environment.

We have used Streamlit. It is an open-source machine learning framework for building web applications. It was used to integrate ML model with the web application.

Model Monitoring and Tracking: It is consistently observed and assessed the model's effectiveness, to make any required adjustments to ensure that it stays precise and applicable to all requirements.

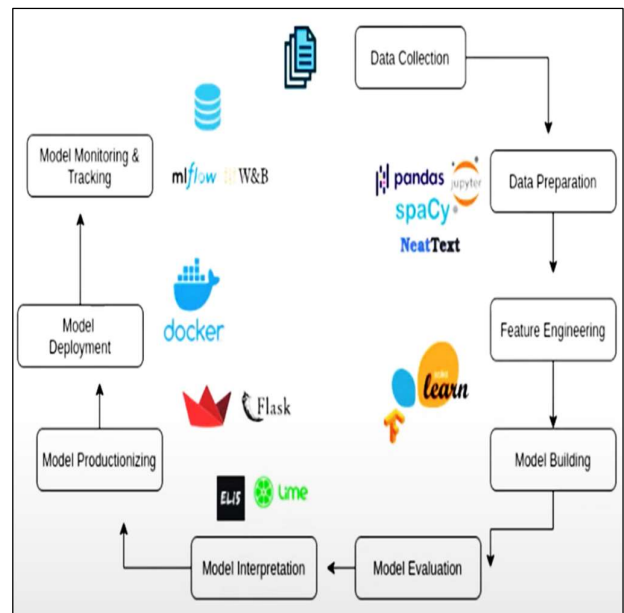


Fig 2: Block Diagram of different stages of project

IV. SOFTWARE DESCRIPTION

It is a web-based platform built on purely Python, and its libraries, which is why the graphs are drawn using the Matplotlib library, the calculations are made using the Numpy library, and the analysis is done using the Streamlit library.

In order to perform database queries, we used SQL programming language.

Testing was conducted on Microsoft Visual Studio 2022, a code editor and compiler that was designed specifically for Code editors.

Pre requirement:

Windows: 7/8/10/11 or mac

Ram: 2GB/4GB/8GB

Browser: chrome/Microsoft Edge/Mozilla etc.

These are the basic requirements.

V. DATASET DESCRIPTION

A number of sources were used for the data collection, including IEEE (research paper), GitHub, and group surveys. Among the data sets we hold are day-to-day thoughts, chats, and internal emotions that happen throughout the course of a day. Based on the analysis of our data, we were able to determine patterns in our users' behavior and developed an algorithm to predict their preferences based on their behavior. We are confident that our results will help us to offer the best user experience. We can analyze these data in order to gain a better understanding of human behavior patterns and the underlying causes of certain emotions. We have created a class that contains the methods for building the model, fitting the model, and predicting the accuracy of our model. Such as NLP model (natural language processing model) NLP enables computers to understand natural language as humans do. Whether the language is spoken or written, natural language processing uses artificial intelligence to take real-world input, process it, and make sense of it in a way a computer can understand. We are using WordCloud as our primary means of visualizing our data.

Few important functions we have used to achieve our set goals, there details are as follow:

Data Cleaning Functions i.e., the function which “lemmatizes” words.

- Lemmatize words means => 'bringing' will be lemmatized to 'bring'
- Lemmatization is done by inspecting the Part-of-Speech before deciding if lemmatization should occur.
- 'Feeling' may be classified as an adjective, i.e., will not be lemmatized into 'feel' in certain contexts.

All these data sets are inputted into our library, whenever the request comes from the user it will go first in the database, where our train library is there, and match it, thereafter the response will be generated.

VI. RESULT AND ANALYSIS

We have used thousands of datasets in our software. when a user gives a input sentence for the emotion, the machine learning algorithm that we have applied in it starts to search for the specified keywords in our datasets and matches the input sentence with the sentence available in the datasets. According to the match the software gives out the percentage of particular emotion through a graphical representation.

Text-based Emotion Classifier App

Home - Emotion In Text

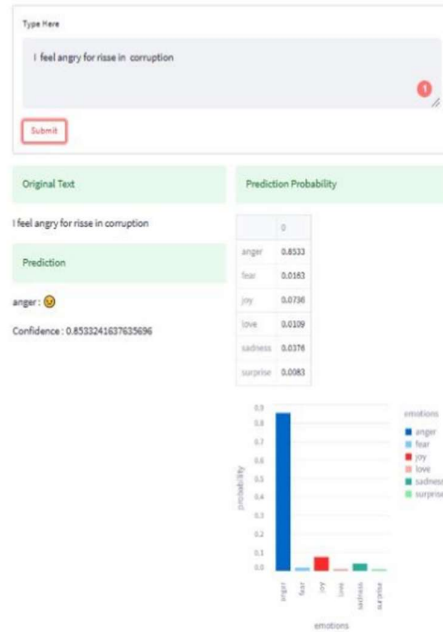


Fig 3.a: Home page of application

Figure 3.a shows our home page. It has a text box, where the user can enter some text and when he presses the submit button, he gets the predicted results.

He can see the emotion type (anger, sad, happy, joy) along with the confidence level. He can also see the visualization of the result in the form of bar graph and can compare different other predicted feelings.

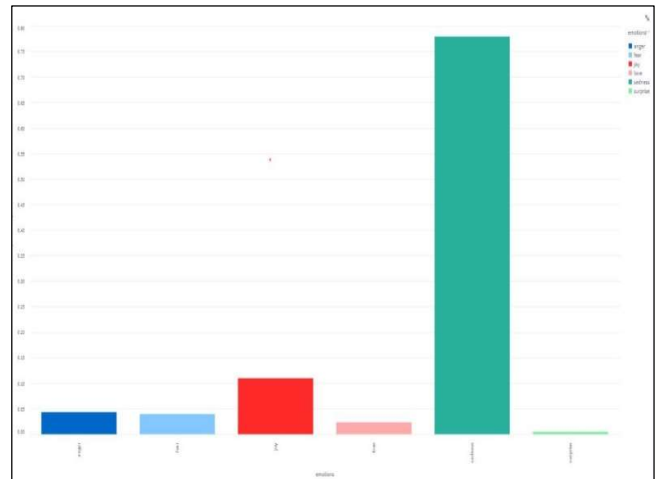


Fig.3.b: Bar graph showing the predicted emotion

	0
anger	0.0433
fear	0.0396
joy	0.1097
love	0.0234
sadness	0.7792
surprise	0.0047

Fig:3.c probability of different emotions.

VII. FUTURE WORK

One potential future scope for your project could be to further develop and refine its capabilities as a SAS (software as a service) platform, making it even more adaptable and customizable for different industries and use cases. This could involve expanding its functionality to incorporate more advanced data analysis and machine learning algorithms, as well as creating more user-friendly interfaces and integrations with other software platforms.

Another potential future application for your software could be to partner with large application-supporting companies like Zomato, Flipkart, and Dominos to provide targeted recommendations and insights based on user behavior and preferences. This could help these companies improve their customer experience and increase user engagement, while also providing valuable data and insights for analysis and research.

Finally, software could also have potential applications in the field of mental health and wellness. By analyzing user behavior and language patterns, it could provide personalized recommendations and resources to help improve mental health and well-being. This could involve partnering with mental health professionals or organizations, as well as further developing the software's natural language processing and sentiment analysis capabilities.

Overall, the future scope of your project appears to be quite promising, with numerous opportunities for further development, refinement, and collaboration with other industries and organizations.

This can be used in future in various domain such as:

1. Business: In the marketing field companies use it to develop their strategies, to understand customers' feelings towards products or brands, how people respond to their campaigns or product launches and why consumers don't buy some products.
2. Politics: In the political field, it is used to keep track of political views, and to detect consistency

and inconsistency between statements and actions at the government level. It can be used to predict election results as well!

3. Public Actions: Sentiment analysis also is used for social phenomena, and potentially dangerous situations, and to determine the general mood of the blogosphere.

In the future: there will be video and speed-based emotion recognition can be seen. which can give accuracy of more than 90% and is used in most of the tech-driven business intelligence.

VIII. CONCLUSION

By analyzing the text that a person inputs into a text box, the machine learning algorithm can identify patterns in language that correspond to specific emotions, such as happiness, sadness, anger, or fear. This can be achieved by training the algorithm on a large dataset of texts that have been labeled with the appropriate emotion, and using techniques such as natural language processing (NLP) and sentiment analysis.

The implementation of this technology has the potential to greatly enhance our understanding of how people express emotions through language and can be used to improve the effectiveness of communication in various contexts. For example, businesses can use this technology to analyze customer feedback and identify areas for improvement in their products or services. Mental health professionals can also use this technology to monitor the emotional state of patients over time and identify any changes that may require intervention.

Overall, the use of machine learning and python in identifying emotions from text has great potential for practical application and further research. As technology continues to advance, it is likely that we will see even more sophisticated and accurate methods for identifying emotions in text.

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