

To implement a Deep Learning-Based SEB Analysis Tool to analyze Sentiment, Emotion and Behaviour of students using Twitter tweets

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ABSTRACT

As Twitter is the most prominent social media networking site, students, in particular, use it to express their feelings and opinions about current events, issues, events, products, and services. The researcher has concentrated on students in this system, attempting to determine their psychological status through social media conversations. The automated SEB analysis tool implemented in this study combines psychology, artificial intelligence, and Twitter tweets. It is possible to determine what is going on in the mind of a student who replies on social media. The researcher has taken this opportunity to use the deep learning algorithm CNN to analyze Twitter tweets mirrored by students based on three parameters: Sentiment, Emotion, and Behaviour. Sentiments behind the Student's Tweets are classified using the three classes Positive, Neutral, and Negative whereas Emotions are classified based on five classes: Angry, Fear, Hate, Joy, and Sad.

Keywords - Social Media, Twitter, CNN, Deep Learning, SentimentAnalysis, Emotion Analysis, and Behaviour Analysis.

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I. INTRODUCTION

In the era of digitization and social media, students are continuously approaching the variety of social media through different electronic gadgets. They are comfortable exploring themselves on social media through posts, likes, dislikes, comments, photos, audio, and videos and like to be part of this virtual reality.

Although social media is widely used by students, understanding the goal or purpose of a specific post at a specific time or situation is more important. Recognizing his/her sentiments, emotions, and behaviour based on the post is also necessary because it will aid in making predictions, and further actions or operations can be carried out based on these.

Sentiment Analysis gives you a better understanding of people's viewpoints and decides if a piece of writing is positive, negative, or neutral. Emotion analysis is the next step or deeper understanding in sentiment analysis. Emotion

analysis, also known as emotion recognition, aids in the understanding of human behaviour through the use of data such as text, speech, and pictures.

Previously, much research has been conducted on social media content analysis. However, only a few of them have concentrated on student social media usage. To fill this research gap, researchers considered students' sentiment, emotional, and behavioural aspects in this work. Previous research has primarily focused on machine learning techniques, but a few have incorporated deep learning techniques into their studies. So by considering this scenario, our tool has tried to analyze sentiments, emotions, and behavior of students on real-time data from Twitter.

II. CNN FOR SENTIMENT AND EMOTION ANALYSIS OF TWEETS

CNN is a deep learning algorithm that works on the concept of a feed-forward neural network. It facilitates the analysis of the text as well as visual images by processing data with grid-like

topology. It is developed with the help of Keras sequential model for the multi-class classification problem for sentiment and emotion analysis.

The CNN model for analyzing the sentiments of tweets is trained with 5 epochs and a 4096 batch size. Here, CNN is trained and validated with 13, 38,414 samples and 2, 67,683 samples from the sentiment dataset respectively. CNN performed with the highest accuracy of 97.45% for the sentiment analysis as compared to other models. For emotion analysis of the tweets, the CNN model is trained with 6 epochs and a 4096 batch size. CNN is trained over 1, 02,548 samples, and validated over 25,637 samples from the emotion dataset. It has given the highest accuracy of 94.85% for the emotion analysis of tweets.

CNN has performed better among all other models so it is selected for the analysis of real-time tweets. Figures 1.1 and 1.2 depict the outcomes of the CNN model for Sentiment and Emotion Analysis of Tweets respectively.

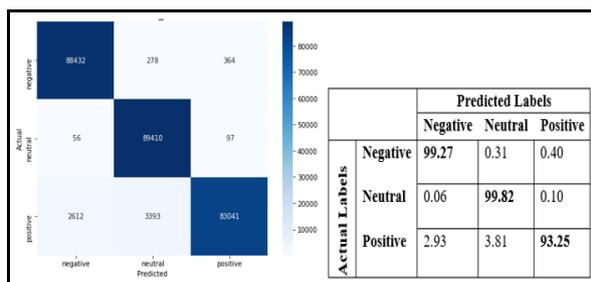


Figure 1.1 Confusion matrix of the CNN model for SA

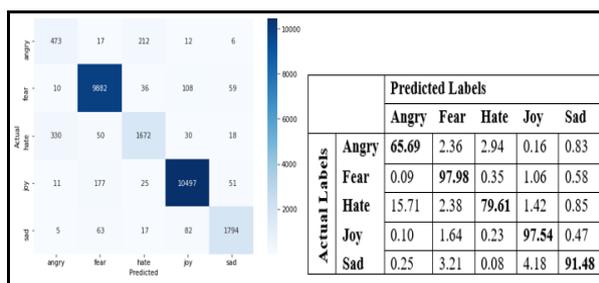


Figure 1.2 Confusion matrix of the CNN model for EA

III. ARCHITECTURE OF SEB ANALYSIS TOOL

Initially, a Twitter developer account was established and after that Twitter Application is created. By generation of the token and secret key of the application, it can communicate with the Twitter API.

The web-based SEB Analysis tool is developed using Python along with the Django and Flask Framework. Front-end designing is done

through HTML and CSS. Postgres and Redis are used to handle database operations. With the help of Twitter REST API, real-time tweets are extracted. Different Python libraries like TensorFlow, Keras, Scikit-learn, Numpy, Pandas, Tweepy, and Matplotlib are used for handling various operations with respect to the model development process.

Authors have tried to predict the sentiments, emotions, and behavioural patterns of the students through an automated web-based SEB analysis tool which is developed by referencing outcomes of the deep learning-based proposed model. SEB analysis tool employs to analyze the sentiment, emotion, and behaviour of the students with special regards to the Twitter real-time data.

After logging by admin account credentials to the system different modules like Student's Registration, Twitter Credentials, Sentiment Analysis, Emotion Analysis and Behaviour Analysis the system can be accessed. The system is evaluated to analyze the sentiment, emotion, and behaviour of the students on the platform of Twitter. The overall framework of the SEB analysis tool is sketched presented in the below Figure 1.3.

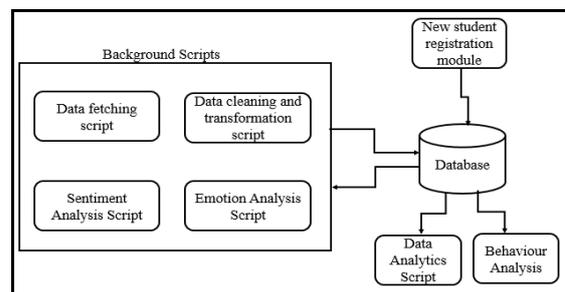


Figure 1.3 System Flow of SEB tool

The framework of the SEB analysis tool is a combination of different background scripts like Data fetching, Data cleaning and transformation, Sentiment Analysis, and Emotion Analysis which initiates automatically.

The student's registration module enables the registration of the new student in the system. Data fetching script enables the storing and fetching of data to and from the database. Data cleaning and transformation Script clean and convert the data in the expected format for further analysis. Sentiment and Emotion Analysis Scripts calculates the sentiment emotion of tweets using CNN. Statistical analysis of sentiment and emotions of tweets is done through a Data Analytics script. This analysis is represented in the graphical format. As per the values evaluated for the sentiments and emotions behaviour of the students is displayed. Sentiments are categorized as Positive, Neutral, and Negative. Emotions are classified as Angry, Fear, Hate, Joy,

and Sad. Behaviour Analysis is done using classes Pessimistic, Moderate, and Optimistic.

The average percentage of the “Negative” sentiments and summation of the percentage count of “Angry, Fear, Hate, and Sad” emotions are considered for behaviour analysis. A student is nominated as Pessimistic if the average percentage of both of these values is above 60%. “Moderate” if both of these values are greater than 40% and less than equal to 60%. “Optimistic” if both of these values are less than equal to 40%.

IV. RESULTS AND DISCUSSION

The researcher has employed to implement a web-based tool to analyze the sentiments, emotions, and behaviour of students on the platform of Twitter. To monitor the online movements of students with respect to the tweets, this tool is designed and implemented. Students are registered with their details like email, first name, and last name along with their Twitter credentials in the system. Tweets posted by students are extracted using their Twitter username and through the Twitter REST API and stored in the database. These tweets are processed and unnecessary kinds of stuff are removed from the tweets and these clean tweets are stored in a separate table.

These cleaned tweets are classified using the CNN model for sentiment and emotion analysis.

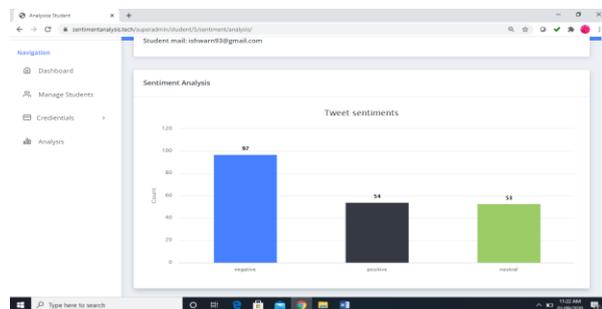


Figure 1.4: Sentiment Classification of real-time tweets for a selected student

Figure 1.4 displays the sentiment classification of a student in a graphical format which displays the sentiment classification count as 97 for negative, 54 for positive, and 53 for neutral. In the given bar chart, the class negative has maximum sentiment count as compared to neutral and positive so, it clears that the selected student has more negative kind of sentiments behind his tweets.

Figure 1.5 shows the graph of the emotion classification of the selected student. The bar chart shows the emotion count for five emotion classes i.e. 105 for joy, 71 for fear, 11 for hate, 9 for angry, and 8 for sad. This particular student is with a positive

perspective as the count of class joy is highest with regards to other emotion classes.

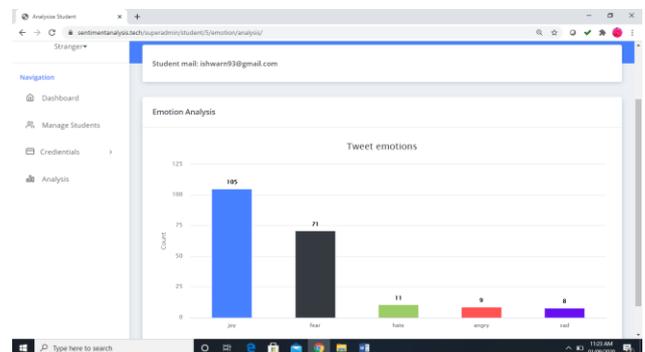


Figure 1.5: Emotion Classification of real-time tweets for a selected student

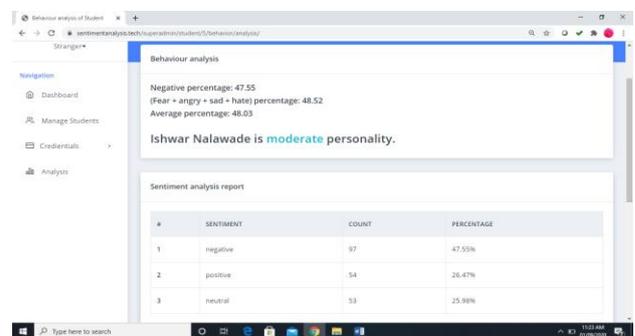


Figure 1.6: Behaviour Analysis and Sentiment Analysis of real-time tweets for a selected student

By considering the sentiment and emotion analysis statistics the behaviour analysis of the selected student is done. The average percentage of negative sentiment and emotions (fear + angry + sad + hate) is 48.03%. As per the SEB analysis tool, it concludes that the selected student is of a moderate personality.

V. CONCLUSION

The authors have concluded the study undertaken as follows:

- The motto behind the development of a deep learning-based SEB analysis tool is to classify tweets posted by students on Twitter. Sentiment, emotion, and behaviour are the three parameters used for the analysis of tweets posted on Twitter by the students.
- Digital movements of students on Twitter are caught by the authors to keep track of their psychological fluctuations.
- As today’s generation is dealing with this age of digital media, there are a variety of mutations available for the students in the form of online games, online forums, online communities etc.

- It has become difficult for parents, school teachers, and psychiatrists to analyze the personality of students. In this study, authors have tried to attain the same.
- The results disclosed by the study may help parents, teachers, psychologists, doctors to classify the problems raised regarding the students in the form of emotion, sentiments, and behaviour, etc.

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