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Real Time Twitter Sentiment Analysis

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Abstract: ***The purpose of tweet sentiment analysis is to determine the positive, negative, or neutral sentiment component in tweeter data. Sentiment analysis may assist any organisation in discovering people's perceptions of their firm and products. We ran sentiment analysis on the Twitter data set. Our algorithm accepts the input tweet, sentiment, and selected text that begins and ends in the input tweet. We have decided to create an end-to end project on' Sentiment analysis and visualisation of popular topics on Twitter. There will be areas such as products, compare, and so on. The user will be able to search for a topic of interest and find an analysis of that issue.***
Index Terms: Real Time Twitter Sentiment Analysis.

I. INTRODUCTION

One of the most valuable assets for brands is their online reputation. A negative social media review can be costly to a company if it is not handled appropriately and quickly. Twitter sentiment analysis is the process of recognising and categorising the sentiments represented in the text source, i.e. tweets. This could be an opinion, a judgement, or a feeling about a certain product expressed on social media, and it can assist you in detecting irate customers or unfavourable mentions before they escalate.
Simultaneously, Twitter sentiment analysis can provide valuable insights that influence decisions. What do customers like best about your company? What aspects receive the most unfavourable attention?
Our project can do analysis and deliver useful information.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

A. Discover Brand Perception

The Twitter sentiment analysis dataset can provide an overview of your brand's perception. You can find out what people are saying about your company and its customers. Understanding brand perception can help you spot possible difficulties as well as capitalise on untapped opportunities.

B. Grow Your Influence

Improving brand perception through the use of social media brand ambassadors can help you expand your audience's impact. The Twitter sentiment analysis tool can assist you in identifying and connecting with these brand ambassadors. You can also develop social media tactics that are in harmony with your business goals. sentiment analysis might assist you in gaining greater popularity. You may increase your brand's influence by responding immediately to both positive and negative comments expressed by customers.

C. Improve Customer Service

Customers expect immediate solutions to their problems in a world where everything is available at the stroke of a mouse. This is why it is critical to follow client complaints on Twitter using the sentiment analysis tool and to employ customer support representatives that can handle their issues quickly. The Twitter sentiment analysis tool can find tweets that need immediate attention whereas it would be hard for these agents to sift through a sea of data.

III. RELATED TECHNOLOGIES

This application was created using a variety of technologies. Spring Boot, Angular JS, and Java are the technologies used. These technologies are explained thoroughly below:

1) Java Spring Boot is an open-source technology that makes it easy to construct microservices and web programmes using Java-based frameworks. Spring Boot discussions must begin with Java, one of the most popular and widely used development languages and computing platforms for app development.

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2) AngularJS is a robust JavaScript-based programming framework for building RICH Internet Applications (RIA). Developers can design client-side apps using JavaScript and AngularJS in a tidy MVC (Model View Controller) style. The AngularJS application is cross browser compatible..
3) Java is a popular object-oriented programming language and software platform that powers billions of devices such as notebook computers, mobile devices, gaming consoles, medical equipment, and many more. The Java programming language's ideas and grammar are based on the C and C++ programming languages.
4) Two of the key technologies used to construct Web pages are HTML (Hypertext Markup Language) and CSS (Cascading Style Sheets). While CSS supplies the (visual and auditory) layout for a range of devices, HTML delivers the website structure

IV. IMPLEMENTATION DETAILS OF MODULE

A. *Class Diagram*

System Backend Overview

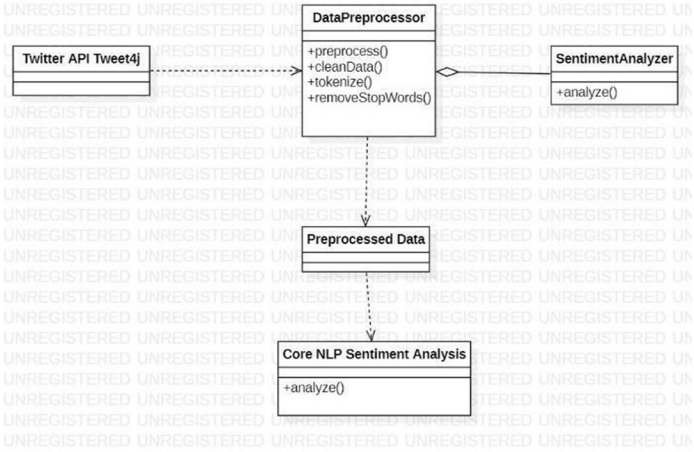


Figure 4.1

The above class diagram represents all base classes in the backend. Details about the classes are as follows:

1) In the above figure 1.1 the TwitterData class represents a single tweet and contains fields for the raw tweet text, the cleaned text, sentiment score, and sentiment label.
2) The TweetAnalyzer class is responsible for analysing and cleaning the tweet data using the Tweet4j library.
3) The SentimentAnalyzer class is responsible for analysing the sentiment of a given tweet using the CoreNLP library.
4) The Tweet4j class is used to interact with the Twitter API and retrieve tweets based on specific query parameters.
5) The CoreNLP class provides natural language processing tools to analyse the sentiment of the cleaned tweet data.

B. *Data Flow Diagram Of Preliminary Model*

In the above figure 1.2 the data flow diagram depicts the flow of data in the Sentiment analysis process. Here is some information on this subject:

1) *Tweet4j API:* This component provides a Java interface for the Twitter API, making it easier to interact with and retrieve data from Twitter.
2) *Twitter Data:* This component represents the tweets retrieved from the Twitter API using the Tweet4j API.
3) *CoreNLP Library:* This component is a natural language processing library that can analyse and parse text to extract various features, such as sentiment scores.
4) *Sentiment Scores:* This component represents the scores that CoreNLP assigns to each tweet, indicating its overall sentiment (positive, negative, or neutral).
5) *Analysis:* This component involves analysing the sentiment scores assigned by CoreNLP and generating insights and conclusions about the data set.
6) *Results/Output:* This component represents the final output of the system, which could be in the form of visualizations, reports, or other formats that summarize the sentiment analysis results.

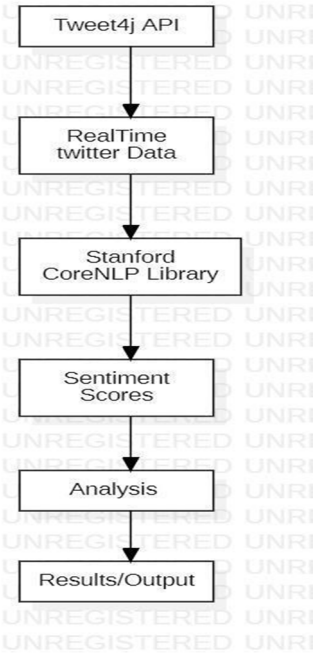


Figure 4.2

C. Activity Diagram: Architecture Overview

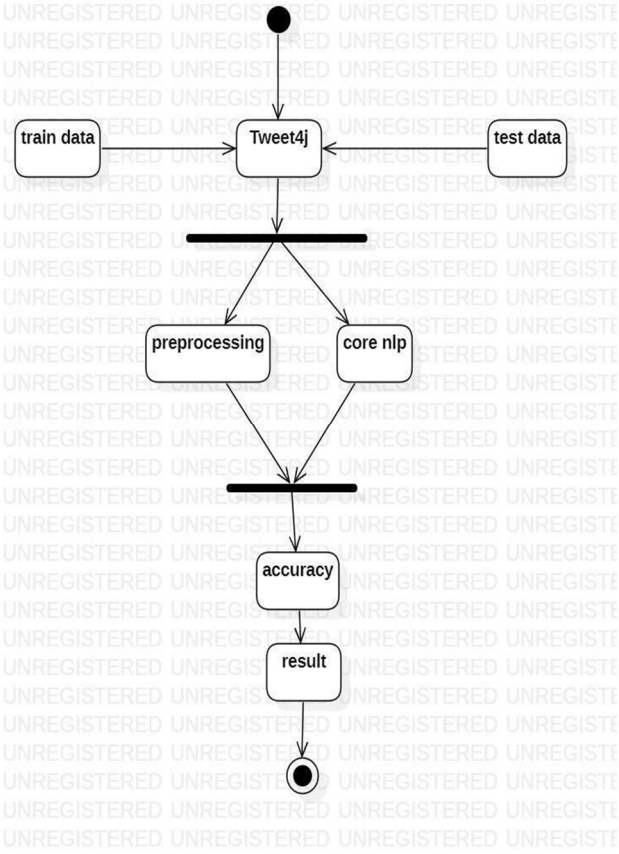


Figure 4.3

1) In the above figure 1.3 the activity starts with the user inputting a query to search for tweets.
2) The system authenticates the user using the provided credentials and searches for the tweets using the Tweet4j library.
3) The retrieved tweets are then cleaned using the CoreNLP library to remove any unwanted characters or information from the tweet text. The cleaned tweet text is then analysed for sentiment using the same CoreNLP library.
4) Finally, the system outputs the sentiment result of the analysed tweet text. The activity then ends.
5) This activity diagram illustrates the steps involved in performing Twitter sentiment analysis using Tweet4j and CoreNLP.

D. Sequence Diagram

1) In the figure 1.4 the sequence diagram shows the interaction between the user, the TweetAnalyzer class, and the Sentiment Analyzer class.
2) The user initiates the searchTweets method in the TweetAnalyzer class to retrieve tweets based on a specific query.
3) The TweetAnalyzer class returns an array of TwitterData objects, each representing a single tweet.
4) The SentimentAnalyzer class then receives each TwitterData object and calls the analyzeTweet method to analyze the sentiment of the tweet using the CoreNLP library.
5) The SentimentAnalyzer class returns a SentimentResult object containing the sentiment score and label of the analyzed tweet.
6) The TweetAnalyzer class then retrieves the sentiment result for each tweet and creates a result object to return to the user.
7) The sequence diagram shows the interaction between the user, the TweetAnalyzer class, and the SentimentAnalyzer class in performing Twitter sentiment analysis using Tweet4j and CoreNLP.

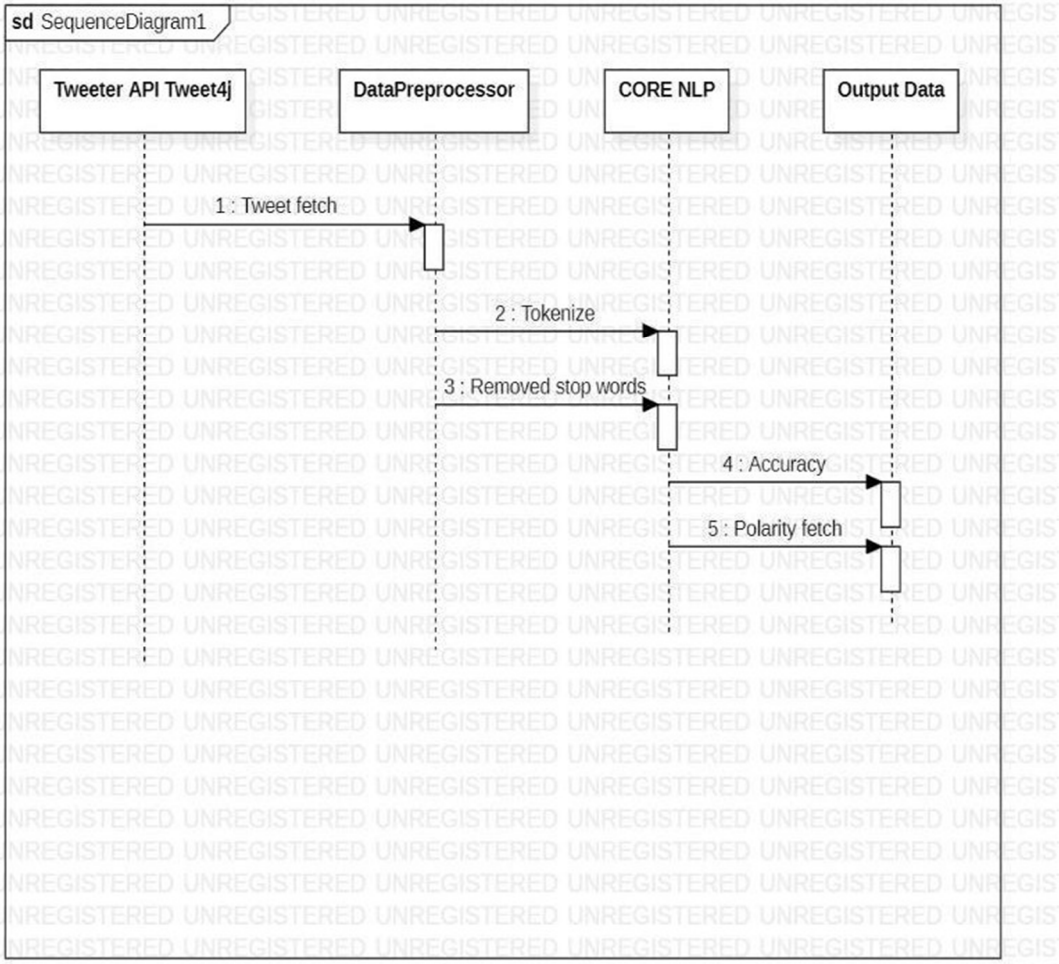


Figure 4.4

V. LITERATURE SURVEY

Table 5.1

#	Research Paper Details				
	Paper Name	Author	Year of Publication	Publication	Seed Idea
1	*Sentiment knowledge discovery in Twitter streaming data*	Bifet, A., Frank, E., & Holmes, G	(2011)	13th International Conference on Discovery Science	They proposed an algorithm called MOA-TweetSentiment, which utilizes the MOA (Massive Online Analysis) framework to analyze the sentiment of tweets in real time. The algorithm extracts features such as emoticons, hashtags, and negations from tweets and uses a Naive Bayes classifier to predict the sentiment.
2	*Sentiment analysis of Twitter data*	Agarwal, A., Xie, B., Vovsha, I., Rambow, O., & Passonneau, R.	(2011)	Workshop on Languages in Social Media	Another study by Agarwal et al. (2011) proposed a system called TwitSent, which is based on a machine learning approach using Stanford CoreNLP. They extracted various features such as part-of-speech tags, sentiment lexicons, and emoticons from tweets and used a support vector machine (SVM) classifier to classify tweets into positive, negative, or neutral sentiments.
3	*Real-time sentiment analysis of Twitter data using machine learning algorithms*	Goyal, V., Singh, S., Yadav, S. & Goyal, R.	(2019)	International Journal of Advanced Computer Science and Applications	In a more recent study, Goyal et al. (2019) proposed a real-time Twitter sentiment analysis system called STANFORD-TSA, which utilizes Stanford CoreNLP for sentiment analysis. The system extracts various features such as sentiment lexicons, n-grams, and part-of-speech tags from tweets and uses an SVM classifier to predict the sentiment.
4	*A deep learning-based approach for real-time Twitter sentiment analysis*	Singh, N., Puri, A., & Kumar, P.	(2020)	Conference on Computing, Communication and Networking Technologies (ICCCNT)	Similarly, Singh et al. (2020) proposed a real-time Twitter sentiment analysis system called Deep-STAN, which utilizes a deep learning approach using Stanford CoreNLP. The system extracts features such as word embeddings, part-of-speech tags, and sentiment lexicons from tweets and uses a deep neural network to predict the sentiment.
5	*Real-time sentiment analysis of Twitter data with the deep learning approach*	Liu, X., Chen, S., Wang, Y., & Zhang, B.	(2018)	Journal of Real-Time Image Processing	In a study by Liu et al. (2018), they proposed a real-time Twitter sentiment analysis system called STARS, which utilizes Stanford CoreNLP and a deep learning approach. The system extracts features such as word embeddings and part-of-speech tags from tweets and uses a long short-term memory (LSTM) neural network to predict the sentiment.
6	*A hybrid approach for real-time Twitter sentiment analysis*	Ma, T., Xu, J., Xu, C., & Li, S.	(2020)	A hybrid approach for real-time Twitter sentiment analysis. IEEE Access, 8, 186460-186472.	Another study by Ma et al. (2020) proposed a real-time Twitter sentiment analysis system called TW-Senti that uses Stanford CoreNLP and a hybrid approach. The system extracts features such as n-grams, part-of-speech tags, and sentiment lexicons from tweets and uses a combination of SVM and decision tree classifiers to predict the sentiment.

VI. PROPOSED SYSTEM

1) Collect Twitter data: Collecting Twitter data involves using the Twitter API to access real-time tweets related to a particular topic or keyword. We used Twitter4j, a Java library for accessing the Twitter API, or any other similar library for this purpose. Once we have access to the Twitter API, you can search for tweets using the relevant keyword or hashtags, and collect them in real-time.

2) Storing Tweets: The collected tweets can be stored in a database or data storage system for later analysis.

3) Preprocess the data: Preprocessing is a crucial step in sentiment analysis. It involves cleaning and transforming the collected data into a suitable format that can be used for sentiment analysis. We used Stanford CoreNLP to preprocess the collected tweets in this step. Stanford CoreNLP can help with tasks like tokenization, stemming, and entity recognition. For example, We used CoreNLP to identify and remove stop words, which are common words like "the," "and," or "a" that do not add much value to the sentiment analysis.

4) Perform sentiment analysis: Sentiment analysis involves analyzing the text of a tweet to determine whether it expresses positive, negative, or neutral sentiment. We used the sentiment analysis module in Stanford CoreNLP to assign a sentiment score to each tweet. The sentiment score ranges from -1 to 1, with -1 indicating very negative sentiment, 0 indicating neutral sentiment, and 1 indicating very positive sentiment. We used the score to classify the tweet as positive, negative, or neutral.

5) Build the backend: The backend of the web app is responsible for handling the data processing and storage tasks. In this step, we need to build the backend of the web app using Java Spring Boot. The backend should have REST APIs to handle requests from the front end. We used Spring Boot to create a RESTful web service that receives requests from the front end and returns sentiment analysis results.

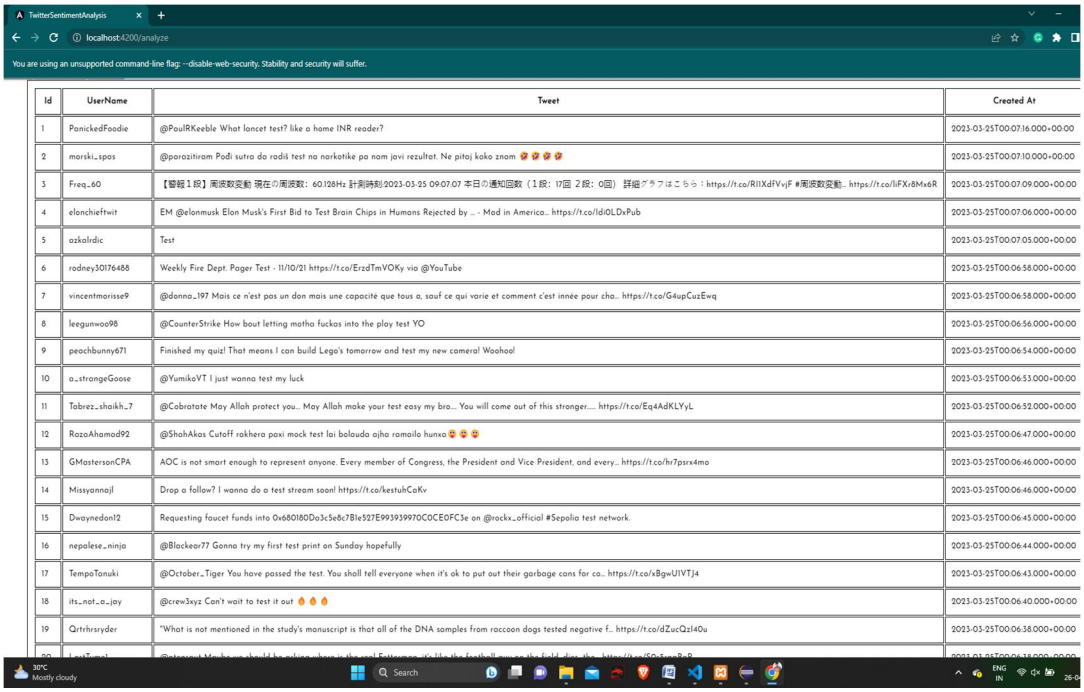
6) Build the front end: The front end of the web app is responsible for displaying the user interface to the users. We used Angular to build the front end of the web app. The front end should have a user interface that allows users to enter the keyword for which they want to analyze the sentiment. You can also add other features to the front end, such as data visualization and real-time updates.

7) Connect the front end and back end: To connect the front end and back end of the web app, we used REST APIs. The front end sends a request to the backend to get the sentiment analysis results. The backend processes the request and returns the results to the frontend in JSON format. We used Angular's HttpClient module to send HTTP requests to the backend and receive responses.

8) Display the results: Once the backend returns the sentiment analysis results, we displayed them on the front end. We used charts to visualize the results. For instance, we displayed the sentiment analysis results as a pie chart that shows the percentage of positive, negative, and neutral tweets.

VII. RESULT AND DISCUSSION

In a Twitter-like social media platform, many people such as celebrities and politicians tweet their opinions on a topic or event, and we can analyse the significance of that topic or event based on their opinions.



Id	UserName	Tweet	Created At
1	PanickedFoodie	@PaulRKeeble What lancet test? like a home INR reader?	2023-03-25T00:07:16.000+00:00
2	morski_spos	@porazitiram Podi sutra do radiš test na narkotike pa nam javi rezultat. Ne pitaj koko znam 🤣🤣🤣🤣	2023-03-25T00:07:10.000+00:00
3	Freq_60	【警報 1 段】周波数変動 現在の周波数：60.128Hz 計測時刻:2023-03-25 09:07:07 本日の通知回数（1 段：17回 2 段：0回） 詳細グラフはこちら：https://t.co/RIIXdfVvjF #周波数変動... https://t.co/liFXr8Mx6R	2023-03-25T00:07:09.000+00:00
4	elonchieftwit	EM @elonmusk Elon Musk's First Bid to Test Brain Chips in Humans Rejected by ... - Mad in America... https://t.co/IdiOLDxPub	2023-03-25T00:07:06.000+00:00
5	azkalrdic	Test	2023-03-25T00:07:05.000+00:00
6	rodney30176488	Weekly Fire Dept. Pager Test - 11/10/21 https://t.co/ErzdTmVOKy via @YouTube	2023-03-25T00:06:58.000+00:00
7	vincentmorisse9	@donna_197 Mais ce n'est pas un don mais une capacité que tous a, sauf ce qui varie et comment c'est innée pour cha... https://t.co/G4upCuzEwq	2023-03-25T00:06:58.000+00:00
8	leegunwoo98	@CounterStrike How bout letting motha fuckas into the play test YO	2023-03-25T00:06:56.000+00:00
9	peachbunny671	Finished my quiz! That means I can build Lego's tomorrow and test my new camera! Woohoo!	2023-03-25T00:06:54.000+00:00
10	a_strangeGoose	@YumikoVT I just wanna test my luck	2023-03-25T00:06:53.000+00:00
11	Tabrez_shaikh_7	@Cabratate May Allah protect you... May Allah make your test easy my bro... You will come out of this stronger.... https://t.co/Eq4AdKLYyL	2023-03-25T00:06:52.000+00:00
12	RozaAhamad92	@ShahAkas Cutoff rakhera paxi mock test lai bolauda ajha ramailo hunxa😍😍😍	2023-03-25T00:06:47.000+00:00
13	GMastersonCPA	AOC is not smart enough to represent anyone. Every member of Congress, the President and Vice President, and every... https://t.co/hr7psrx4mo	2023-03-25T00:06:46.000+00:00
14	Missyannajl	Drop a follow? I wanna do a test stream soon! https://t.co/kestuhCaKv	2023-03-25T00:06:46.000+00:00
15	Dwaynedon12	Requesting faucet funds into 0x680180Da3c5e8c7B1e527E993939970C0CE0FC3e on @rockx_official #Sepolia test network.	2023-03-25T00:06:45.000+00:00
16	nepalese_ninja	@Blackear77 Gonna try my first test print on Sunday hopefully	2023-03-25T00:06:44.000+00:00
17	TempoTanuki	@October_Tiger You have passed the test. You shall tell everyone when it's ok to put out their garbage cans for co... https://t.co/xBgwU1VTJ4	2023-03-25T00:06:43.000+00:00
18	its_not_a_jay	@crew3xyz Can't wait to test it out 🔥🔥🔥	2023-03-25T00:06:40.000+00:00
19	Qrtrhrsryder	"What is not mentioned in the study's manuscript is that all of the DNA samples from raccoon dogs tested negative f... https://t.co/dZucQz1f40u	2023-03-25T00:06:38.000+00:00

Figure 8.1

In Figure 8.1, The table represents the fetched tweets using Twitter4j. It has the following columns:

1) *Id:* Unique Id of the row entry.

2) *Username:* The username of the Twitter user who posted the tweet.

3) *Created At:* The date and time when the tweet was posted.

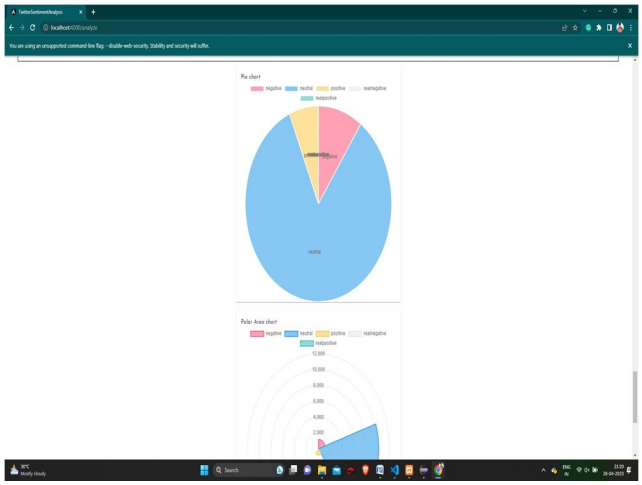


Figure 8.2

Figure 8.2 shows a pie chart and a radar chart. These graphs depict the analysis of the tweets retrieved. The analysis is performed in the background on the retrieved tweets and is displayed in the web interface as charts.

VIII. CONCLUSION

Performing an end-to-end analysis for Twitter trends analysis. The real-time interpretation of massive amounts of data can be assisted by Twitter sentiment analysis. Manually performing this would require a huge amount of labour and might still produce results that were biased by people. It involves using machine learning models for classification, text mining, text analysis, data analysis, and data visualisation to separate positive tweets from bad tweets as part of a natural language processing problem. Twitter sentiment analysis enables you to monitor what people are saying about your product or service on social media and can assist you in identifying upset clients or unfavourable remarks before they become more serious. At the same time, Twitter sentiment analysis can offer insightful data that influences choices. What do customers love about your brand? What aspects get the most negative mentions? This tweet, for example, indicates One of the things this Amazon client values the most is quick shipping.

IX. ACKNOWLEDGEMENT

Our project's success is due to the joint efforts of many individuals and organisations, without whom it would not have been feasible. We would like to take this occasion to extend our heartfelt gratitude to all of you for your invaluable assistance and support. We would like to express our heartfelt appreciation to each and every one of them. We are grateful to Ms Shweta Chaku, designation, Department for her direction and frequent supervision, for providing important project information and for her assistance in finishing the project. We would like to thank Prof. (Dr.) Vijay Singh, Head of Computer Engineering, and Prof. (Dr.) Ajay Kumar, Director of Indraprastha Engineering College, for their kind cooperation and encouragement in completing this research. Thank you to our friends who kindly donated their time and expertise.

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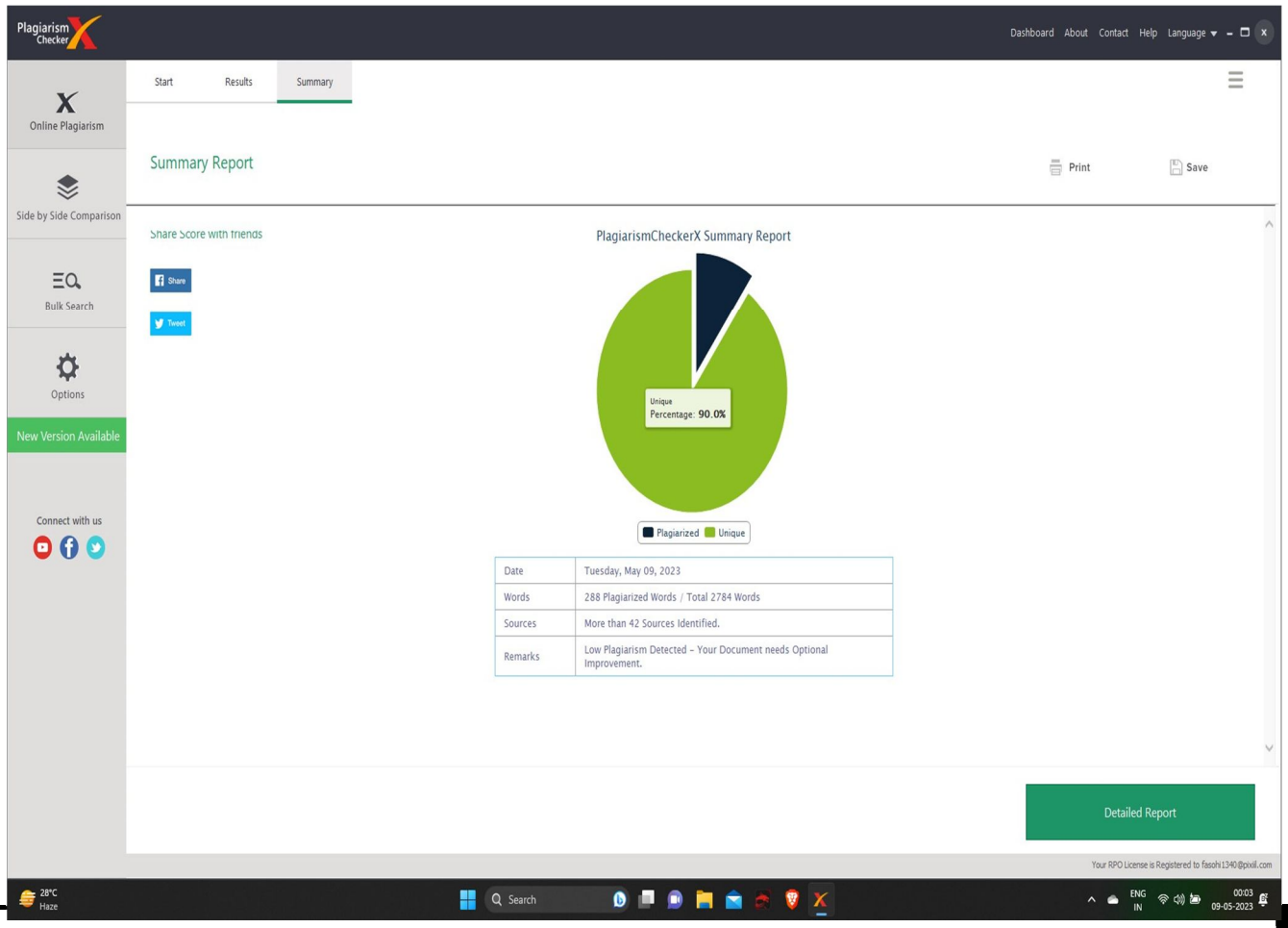
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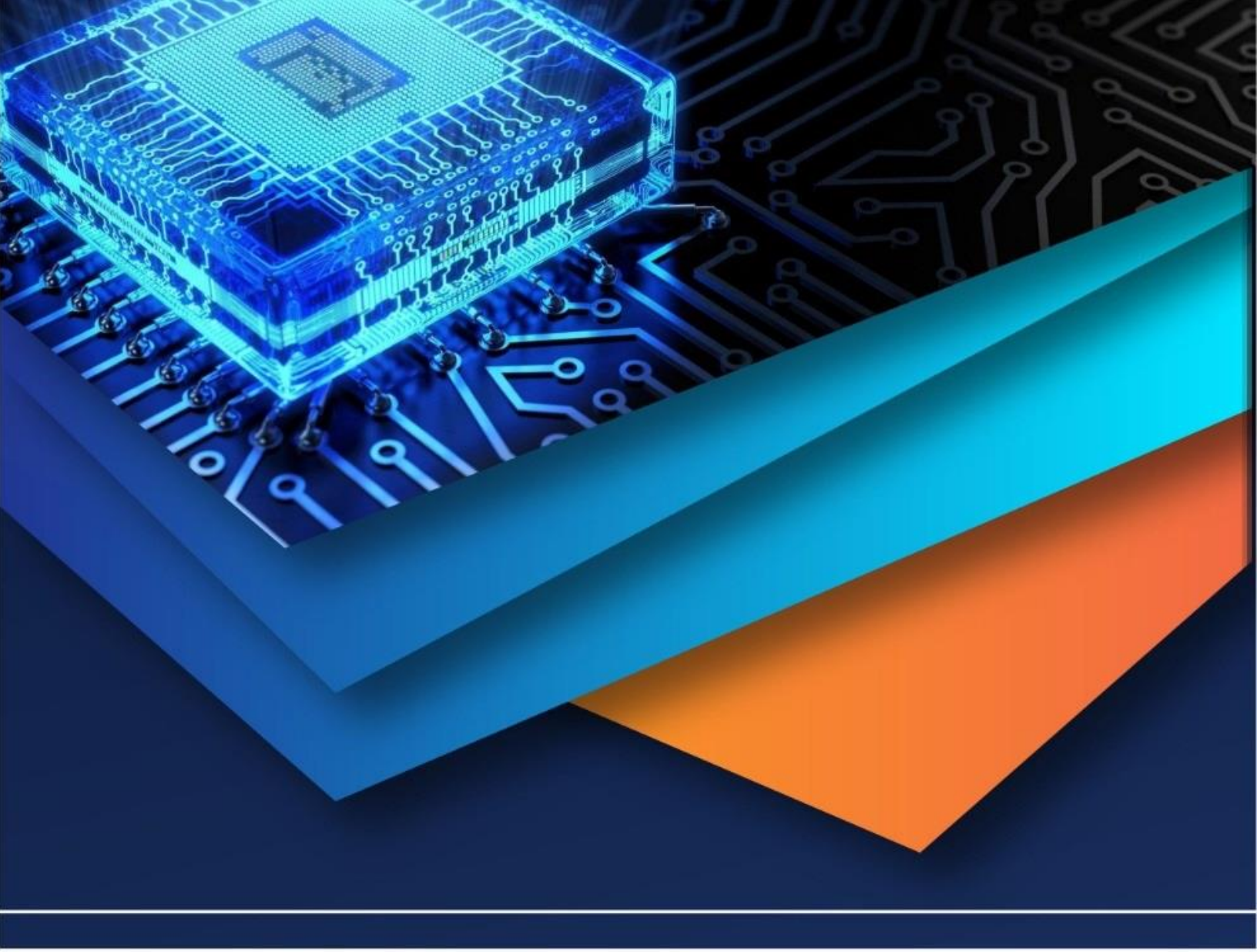
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