**A**

**REPORT**

**ON**

**Enhanced Sentiment Analysis Web application**

**using VADER Model**

**Submitted partial fulfillment of the requirement**

**For the Degree of Bachelor of Technology**

**In**

**INFORMATION TECHNOLOGY**

**Submitted by**

**Under the guidance of**

**Prof. Y.D.Chaudhary**

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**K. D. K. COLLEGE OF ENGINEERING,**

**Nagpur – 440009**

**2023 – 2024**

**Declaration**

This Project work entitled “Enhanced Sentiment Analysis Web application using VADER Model’’ is our own carried out under the supervision of Prof. Y.D. Chaudhary at Department of Information Technology, K D K College of Engineering, Nagpur. It is ensured that proper citation of references is done.

As far as our knowledge is concern, this work has not been submitted to any other university for the award of any degree.

Name of the Students Signature

1. Jyoti Santosh Rangu
2. Sakshi Raju Malve
3. Ritik Roshan Urkude
4. Vedant Rakesh Patel

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**Department of Information Technology**

**K. D. K. College of Engineering, Nagpur**

**Certificate**

This is to certify that the project work entitled “Enhanced Sentiment Analysis Web application using VADER Model’’issubmitted by the following students of VI Semester B. Tech. Information Technology.

**Names of Student**

**1. Jyoti Santosh Rangu 2. Skashi Raju Malve**

**3. Ritik Roshan Urkude 4. Vedant Rakesh Patel**

is a bonafied work done under my/our supervision. This project work is submitted in partial fulfillment of the requirement for the award of Degree of Bachelor of Information Technology under the Faculty of Science & Technology; RTM Nagpur University, Nagpur during the Academic Year 2023 – 2024.

**Prof. Y. D. Chaudhary**

Professor

**Dr. Mrs. S. P. Khandait Dr. V. P. Varghese**

Professor & Head, IT, Principal

K. D. K. College of Engineering, Nagpur K. D. K. College of Engineering, Nagpur

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**ABSTRACT**

The proposed application represents a sophisticated solution designed to automatically detect and analyze sentiments expressed within social media comments. Its primary objective is to categorize comments into three main sentiment categories: positive, negative, and neutral. This classification process is made possible through the utilization of advanced Natural Language Processing (NLP) techniques, particularly leveraging the VADER model, renowned for its effectiveness in sentiment analysis tasks.

To ensure a user-friendly and visually appealing experience, the application's user interface design is crafted using the Figma tool. Figma enables the creation of intuitive and visually engaging interfaces, which enhances user interaction and understanding of the sentiment analysis results.

In terms of implementation, the frontend components of the application are developed using modern frontend technologies. These technologies not only facilitate seamless navigation but also enable the effective visualization of sentiment analysis results, providing users with clear insights into the sentiments expressed within the social media comments.

Moreover, to manage and process the vast amount of data generated from social media comments, a PostgreSQL database is integrated into the application. This integration is achieved through the development of a Json API using the Flask framework in Python. By employing Flask, the application ensures efficient data management and scalability, crucial aspects for handling large volumes of social media data.

Overall, the proposed application represents a comprehensive approach to sentiment analysis in social media comments, contributing significantly to the advancement of automated analytics within the digital landscape. By leveraging cutting-edge technologies and methodologies, it aims to provide users with valuable insights into the sentiments expressed within social media conversations, thereby facilitating informed decision-making and deeper understanding of online interactions.

INTRODUCTION

In the bygone era of the digital landscape, social media platforms emerged as omnipresent arenas for individuals to freely express their thoughts, feelings, and viewpoints. Yet, grappling with the sheer magnitude of these interactions through manual analysis proved increasingly unfeasible. In response to this burgeoning challenge, our team conceived the notion of developing an innovative application dedicated to the automatic detection and comprehensive analysis of sentiments—ranging from positive and negative to neutral—found within the vast sea of social media comments.

At the core of our conceptualization lay the imperative task of processing user-provided data, predominantly comprising comments in CSV format, including those adorned with expressive emojis. Leveraging cutting-edge advancements in Natural Language Processing (NLP) techniques, our application harnessed a sophisticated sentiment analysis model, prominently featuring the renowned VADER model. This technological marvel empowered our system to meticulously classify comments into discernible sentiment categories, thereby furnishing users with insightful perspectives on the prevailing emotional tones within social media discourse.

Turning our attention to the realm of user interface design, we embarked upon a journey of crafting an engaging and user-friendly experience. Employing the versatile Figma toolset, we meticulously orchestrated the visual aesthetics and interactive elements, ensuring an intuitive and aesthetically pleasing encounter for users. Through a harmonious fusion of HTML, CSS, and JavaScript, we brought to life a frontend interface characterized by seamless navigation and dynamic visualization capabilities. Users were bestowed with the ability to effortlessly traverse through the application, seamlessly interpreting sentiment analysis outcomes through captivating graphical representations, such as dynamic pie charts and informative graphs.

In our quest for scalability and operational efficiency, we endeavored to integrate a robust backend infrastructure, marked by the adoption of a PostgreSQL database seamlessly orchestrated via a Flask class in Python. This pivotal integration facilitated the seamless exchange of data between the frontend interface and the backend repository, thereby empowering the storage and retrieval of meticulously analyzed comment data with unparalleled efficiency and reliability.

Our proposed solution transcended mere technical innovation; it embodied a paradigm shift in the realm of sentiment analysis, redefining the boundaries of automated analytics within the dynamic landscape of social media discourse. Through the seamless integration of cutting-edge UI design tools, frontend technologies, and backend frameworks, we unveiled a comprehensive approach to unraveling the intricate tapestry of sentiments embedded within social media comments. In doing so, we not only simplified sentiment analysis for end-users but also propelled the boundaries of technological innovation, contributing to the ongoing evolution of automated analytics in the digital domain.

Related Work

The VADER algorithm, standing for Valence Aware Dictionary and Sentiment Reasoner, has been a significant tool in sentiment analysis, leveraging the valence of individual words to gauge the overall sentiment of a sentence. However, despite its advantages, its accuracy has been noted to be comparatively lower than some other sentiment analysis algorithms. Hence, efforts have been made to enhance its performance.

In a study by Liu et al. (2012), foundational work in sentiment analysis was explored, covering a wide range of methodologies including lexicon-based approaches and machine learning techniques. Pang and Lee also contributed by addressing computational challenges and opportunities in sentiment analysis, stressing the importance of feature selection, sentiment representation, and classification algorithms. These works collectively form a robust basis for understanding sentiment analysis methodologies and their practical applications.

Initially, VADER achieved a maximum accuracy of 0.84%. However, when the information about verbs was removed, the accuracy decreased to 0.74%, and further dropped to 0.54% for sentences lacking any action.

Shayaa et al. (2017) conducted a study on social media sentiment analysis concerning employment in Malaysia, revealing predominantly negative sentiment scores associated with employment issues.

C.J. Hutto and Eric Gilbert introduced the VADER algorithm, a Parsimonious Rule-based Model for sentiment analysis of social media text. Their comparative study concluded that VADER outperformed other sentiment analysis algorithms such as SentiWordNet and Support Vector Machines (SVM).

Mandsberg et al. (2019) investigated the use of social media for sentiment analysis of Airport Service Quality (ASQ), utilizing machine learning techniques to analyze public perceptions of airport services through Twitter data.

A model proposed by A. Sharada and P. Preethi Krishna focused on verb-based sentiment representation, particularly tailored for sentiment analysis of movie reviews. They utilized Parts-of-Speech (POS) tags and Natural Language Processing (NLP) libraries for polarity determination.

In a different approach, Jihang Mao and Wanli Liu presented a BERT-based method for automatic humor detection and scoring in tweets, utilizing Bidirectional Long Short-Term Memory (BiLSTM) and Long Short-Term Memory (LSTM) networks for text classification tasks.

Expanding on the previous discussion, these studies collectively showcase the evolution of sentiment analysis methodologies and their diverse applications across various domains. Further research in this field may explore more sophisticated algorithms and techniques to improve accuracy and applicability, especially in nuanced contexts such as humor detection and sentiment analysis in specialized domains.

**Methodology**

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In this research paper, we introduced a detailed methodology for sentiment analysis, which we thoroughly explored to shed light on the complex data flow inherent in the process. Our approach commenced with the pivotal stage of data collection, facilitated by the upload of CSV files. This initial step allowed us to gather structured data efficiently, offering users the flexibility to upload text from various sources, including customer reviews and social media posts. By utilizing CSV files, we streamlined the process, enabling straightforward data processing through easy ingestion and organization. Additionally, we incorporated validation checks to uphold data integrity, ensuring that the inputs were of high quality, thereby establishing a solid foundation for accurate sentiment analysis outcomes.

Moving forward, our methodology delved into the preprocessing of textual data, a crucial phase aimed at refining and preparing the raw textual data for sentiment analysis. We employed a range of techniques, with a notable focus on leveraging the Vader sentiment analysis model. This model considers various lexical features, such as punctuation, capitalization, and conjunctions, to provide sentiment scores, thereby offering a comprehensive analysis of text sentiment. Furthermore, recognizing the significance of emojis in conveying sentiment, we introduced emoji-based scoring to capture sentiment expressed through emojis, thus enhancing the depth and accuracy of our analysis. By calculating the average sentiment score for each piece of text, we synthesized the sentiment scores obtained from both the Vader model and emoji-based analysis, providing a holistic understanding of the overall sentiment expressed in the text.

Our research paper also emphasized the integration of analytical models into the sentiment analysis process, a critical aspect that ensures the efficient functionality of the system. We seamlessly merged various components, leveraging Flask for the backend development and modern web technologies such as HTML, CSS, and JavaScript for the frontend. This integration facilitated the creation of RESTful APIs, enabling real-time analysis of user-provided text through API endpoints exposed by the backend. By integrating these components, we established a cohesive system architecture that allowed for the smooth flow of data and interactions between the frontend, backend, and sentiment analysis modules, thereby ensuring a robust and scalable solution for sentiment analysis tasks across diverse domains.

Furthermore, our methodology emphasized the importance of visualizing sentiment analysis results to facilitate intuitive exploration and interpretation. We utilized JavaScript libraries like D3.js or Chart.js to create dynamic and interactive visualizations, including bar charts and pie charts, effectively illustrating sentiment distribution and breakdown within the analyzed text data. These visualizations empowered users to gain actionable insights into sentiment trends and patterns, enabling them to make informed decisions based on the analyzed data.

Overall, our research paper aimed to provide a comprehensive understanding of the data flow in sentiment analysis systems, elucidating each phase's significance and intricacies. Through detailed exploration and demonstration, we laid the groundwork for effective sentiment analysis implementations, offering a practical and insightful approach to sentiment analysis in the digital age.



In the research paper, a comprehensive methodology for sentiment analysis was presented, focusing on the intricate data flow involved in the process. The study highlighted the critical role of data collection, emphasizing the use of CSV files for structured data collection, enabling users to upload text from various sources such as customer reviews or social media posts. This approach simplified data processing, allowing for easy ingestion and organization, while validation checks were incorporated to maintain data integrity.

In the data processing phase, several key techniques were employed. Firstly, the Vader sentiment analysis model was utilized to assess the sentiment of the text, considering lexical features such as punctuation, capitalization, and conjunctions to provide sentiment scores. Additionally, emoji-based scoring was incorporated to capture sentiment expressed through emojis, enhancing analysis accuracy. Finally, the average sentiment score was calculated to synthesize scores obtained from both the Vader model and emoji-based analysis, providing a comprehensive understanding of overall sentiment expressed in the text.

The programmatic representation of the sentiment analysis algorithm served as a concise and executable solution for sentiment analysis tasks. It offered clear functions for analyzing sentiment using both the Vader model and custom emoji sentiment dictionary, with the main algorithm orchestrating these functions to compute comprehensive sentiment analysis results.

In the integration phase, various components were seamlessly merged to ensure efficient functionality. Flask, a lightweight and versatile web framework for Python, was employed to develop the backend of the system, allowing for the creation of RESTful APIs to handle incoming requests from the frontend and interact with sentiment analysis modules. The frontend was developed using modern web technologies such as HTML, CSS, and JavaScript, providing an intuitive user interface for interacting with sentiment analysis functionalities. Integration with the Vader model enabled real-time analysis of user-provided text through API endpoints exposed by the backend.

During the visualization phase, JavaScript libraries like D3.js or Chart.js were leveraged to create dynamic and interactive visualizations, including bar charts and pie charts. These visualizations effectively illustrated sentiment distribution and breakdown within the analyzed text data, empowering users to explore and interpret sentiment analysis results intuitively.

Overall, the seamless integration of data collection, processing, integration, and visualization components formed the backbone of the sentiment analysis system. Through a structured approach facilitated by CSV file uploads, accessibility and ease of use were ensured for users, while advanced techniques such as the Vader sentiment analysis model and emoji-based scoring enhanced analysis accuracy and depth. Integration with Flask backend and JavaScript libraries enabled real-time analysis and seamless interaction with sentiment analysis functionalities, while dynamic visualizations provided actionable insights into sentiment trends and patterns.

**CONCLUSION**

In summary, our research delineated the invaluable application of sentiment analysis in mining insights from social media data, spanning a spectrum of domains ranging from informing business strategies to aiding in disaster response efforts. By harnessing the power of Flask, the VADER model, and a PostgreSQL API, we had devised an effective methodology for scrutinizing sentiment, encompassing even the nuanced expressions conveyed through emojis.

In our quest to push the boundaries of sentiment analysis, we harbored aspirations to delve deeper into the realms beyond mere textual data. This included venturing into the analysis of images, videos, and audio clips, thereby enriching our understanding of user sentiments on social media platforms and amplifying the depth of our insights.

Looking ahead, our sights were set on refining the universality of sentiment analysis models, recognizing the need to tailor these frameworks to accommodate diverse linguistic and cultural contexts. Additionally, our roadmap featured an ambitious agenda of delving into multimodal data analysis, an endeavor poised to unravel a more nuanced understanding of sentiment by integrating multiple modes of communication.

Moreover, our future endeavors encompassed extending our analytical gaze to embrace a broader array of social media platforms, recognizing the unique nuances and user behaviors inherent in each platform. By widening our scope, we aimed to capture a more comprehensive snapshot of public sentiment, thereby empowering decision-makers with actionable insights in the dynamic landscape of digital discourse.

Furthermore, we aspired to foster collaborations with industry stakeholders to deploy our sentiment analysis system in real-world scenarios. This collaborative endeavor would not only serve to validate the efficacy and practical utility of our approach but also pave the way for refining and fine-tuning our methodologies based on real-world feedback and use cases. In doing so, we remained steadfast in our commitment to advancing the frontier of sentiment analysis and leveraging its potential to inform decision-making processes in today's ever-evolving digital ecosystem.

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