SENTIMENT ANALYSIS OF COMMENTS ON THE ISRAEL-PALESTINE CONFLICT AND SHOWING GEOPOLITICAL STANCE DISTRIBUTION

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This research titled "**Sentiment Analysis of Comments of the Israel-Palestine Conflict and Showing Geopolitical Stance Distribution**", submitted by **MD. EMON SHARKAR**, ID No: **201-15-3141** to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 22/01/2024.
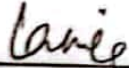
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We hereby declare that, this project has been done by us under the supervision of **Ms. Nushrat Jahan Ria, Lecturer, Department of Computer Science and Engineering** of Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ABSTRACT

Sentiment analysis has kept its landmark in Natural Language Processing by analyzing the text to extract sentimental value. The result usually goes with positive, negative, or neutral sentiment with necessary data preprocessing, data processing, and encoding. We collected the dataset from Kaggle which obtains the comments taken from Reddit posts regarding the Israel-Palestine conflict. The previous works and hypotheses were analyzedand the implementation of KNN and SVM is effective on those implementations. However, the whole concept of sentiment analysis is broadly focused on Natural Language Processing, and algorithms related to it should be used for actual accuracy and analysis. We applied Sentiment Intensity Analyzer and TextBlob algorithms and libraries to do the sentiment analysis of the desired dataset and compared them. These twoalgorithms have been widely described until today for their efficiency in sentimentanalysis. We found accuracy of 87.74% and 49.08% in the Sentiment Intensity Analyzer and TextBlob algorithm respectively. The best algorithm found here is the Sentiment Intensity Analyzer and we tested it accordingly. Finally, we showed Geopolitical Stance by applying manually entered input on topics, such as - Against Israel/Palestine, Supports Palestine, Neutral/Stance Not Clear. These two algorithms are easy and time-saving whereas traditional machine learning algorithm like KNN and SVM takes a lot of time and arealso not significant for sentiment analysis.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Sentiment analysis is a branch of Natural Language Processing that is concerned with the determination and classification of sentiments through machine analysis of textual data. Interpreting the text's emotional language, attitude, or emotional information—which is often classified as good, negative, or neutral — is the main objective [1]. Sentiment analysis is essential for many uses, from social media surveillance to business analytics and consumer feedback interpretation. Sentiment analysis allows social scientists and humanities scholars to assess public opinions, attitudes, and emotional reactions to various subjects or events. With the development of machine learning and natural language processing, this technology has advanced quickly and helped to provide an improved comprehension of human emotion in the digital era [2].

The study of how machines and human languages interact is the subject of the artificial intelligence discipline known as natural language processing, also known as NLP in short. Making machines able to understand, interpret, and produce writing that resembles that of humans is their primary goal. Information extraction, sentiment analysis, translation of languages, recognition of speech, and other activities fall under the broad category of natural language processing. NLP algorithms are made to handle and analyze textual data to get significant insights into the emotions that are expressed via language. Through the application of artificial intelligence, machine learning, and deep learning techniques, natural language processing techniques enable machines to understand and respond to text in an approach that is similar to that of human understanding [3].

A supervised machine learning approach called K-Nearest Neighbors (KNN) is utilized for regression and classification problems. KNN classifies a text according to the sentiments of the data points that surround it in the context of sentiment analysis. By determining the sentiments of an input text's closest neighbors in the feature space, the algorithm classifies the text [4]. Even while KNN has become known for its ease of use and straightforward method, it is less effective for sentiment analysis, especially when working with big

datasets. The algorithm is less scalable for large datasets than other advanced machine learning techniques because it depends too much on the proximity of data points, which might result in computational problems. Furthermore, one effective supervised learning technique used for classification problems is the Support Vector Machine (SVM). By locating an ideal hyperplane in the feature space, support vector machines (SVM) are used in sentiment analysis to classify textual input into several sentiment classes [5]. Effectively, this hyperplane divides data points that correspond to several sentiment groups. The ability of SVM is in its capacity to process high- dimensional data and provide reliable classification results. However, given its computational complexity, it could be difficult to use in situations where processing speed and scalability are essential, particularly when handling significant quantities of textual input.

People throughout the world have differing opinions about the long-standing geopolitical problem of the Israel-Palestine conflict. Due to the conflict's complex character, which has historical, political, and cultural roots, a range of viewpoints and emotions aregenerated. Researchers may learn a great deal about the public's emotional responses, opinions, and viewpoints on this complicated and divisive subject by examining people's emotions [6]. The ideas and diversity of thought on sites such as Reddit are reflected in the sentiments expressed in comments about the Israel-Palestine issue. Recognizing thesefeelings can assist scholars and politicians in better traversing the complexities of this complex geopolitical by providing a more thorough knowledge of the public conversation. Popular social networking site Reddit provides a dynamic forum for debates, viewpoints, and idea sharing [7]. The format of the site, which consists of several specialized subreddits, allows users to participate in discussions on certain subjects, including sensitive and complicated problems like the conflict between Israel and Palestine.

One pre-trained sentiment analysis tool is SentimentIntensityAnalyzer, which is a component of the Natural Language Toolkit (NLTK) package. This algorithm determines the overall sentiment of a text by assigning it a compound sentiment score, which can be positive, negative, or neutral [8]. By taking into account both the polarity and intensity of feelings, the integrated score offers a thorough understanding of the sentiment represented in the text. Additionally, TextBlob is a strong and easy Natural Language analysis tool that offers a simple user interface for evaluating the individuality and neutrality of text [9].

The degree of subjectivity score quantifies the level of subjectivity in the text, whereas the polarity score shows the sentiment's positivity or negative.TextBlob is important for sentiment analysis because of how easy and efficient it is touse. TextBlob provides a high-level Application Programming Interface (API) for typical NLP tasks, such as sentiment analysis, and is made with ease of use in mind. Because of its accessibility, sentiment analysis may now be used by people with little to no experience in machine learning, democratizing its use across a wide range of industries. Because of its effectiveness and user-friendliness, the SentimentIntensityAnalyzer isimportant in the field of sentiment analysis. Because it's a pre-trained model, it doesn't require a lot of training data, thus users with different degrees of machine learning experience may utilize it. The method has been widely used in sentiment analysis jobs across several domains due to its accuracy and adaptability.

This study explores sentiment analysis as it relates to statements made on the conflict between Israel and Palestine. It analyzes more modern options like TextBlob and SentimentIntensityAnalyzer in addition to more established ones like KNN and SVM. The study highlights the benefits of the latter two algorithms over more conventional methods and highlights their effectiveness and accuracy in sentiment analysis. The study also looks into Reddit user sentiment, which offers valuable insight into the range of responses to the Israel-Palestine issue. In light of this complex geopolitical problem, research into sentiment analysis algorithms and their applications advances our knowledge of public sentiment and geopolitical positions. The study highlights how sentiment analysis is developing, emphasizing accessibility, accuracy, and the role that public discussion plays in forming public opinion on complicated international topics.

1.2 Objective

The objective of Sentiment analysis and visualization of Geopolitical stance is very significant. Understanding public opinion is more important than ever at a time when social media and digital communication rule the roost, particularly when it comes to global issues and disasters. Sentiment analysis is a potent use of natural language processing that becomes essential for understanding the complex nature of global sentiments and efficiently managing crises.

Sentiments are dynamic and subject to a wide range of influences in the field of international affairs, from political choices and diplomatic developments to humanitarian crises and conflicts. Sentiment analysis is extremely important for delivering globalinsights and crisis management for the following reasons:

1. To develop advanced sentiment analysis models that provides a deep understanding ofglobal sentiments on international issues

2. To implement real-time sentiment analysis for swift and adaptive crisis responsestrategies

3. To consider cultural diversion and language variations to provide accurate cross-culturesentiment analysis on a global scale

4. To offer insights to policymakers for evidence-based policy formulation by aligningpolicies with sentiments and expectations of diverse global populations

5. To analyze sentiments in diplomatic communications

6. To increase media literacy by analyzing media-driven sentiments

7. To build effective public engagement strategies during crises based on real-time sentiment analysis

8. To facilitate international cooperation by identifying shared sentiments and concerns

1.3 Motivation

The Israel-Palestine conflict is a continuing burning issue in the constantly shifting world of international relations. It frequently sparks online discussions, debates, and occasionally even violent altercations. Given that the war continues to provoke strong reactions from people all around the world, we are driven by the necessity of understanding, decoding, and placing the thoughts contained within the enormous sea of comments that are making their way across digital platforms. The realization that sentiment analysis is an effective tool that allows us to understand the complexities of human emotions, viewpoints, and views is what drives us. Sentiment analysis has becomea cornerstone in the field of Natural Language Processing, providing an advanced understanding of textual content and the sentiments represented within. Sorting feelings into good, negative, and neutral categories

opens the door to understanding how people feel about a certain topic—in this case, the complex and multidimensional Israel- Palestine conflict. The internet has developed into a commonplace forum for opinion sharing, acting as a virtual arena where people from all over the world congregate to discuss global concerns. In these virtual discussions, the Israel-Palestine issue demands a great deal of attention due to its historical, political, and humanitarian components. Sentiments are braided into literary expressions within this digital reverb chamber, creating a complicated quilt of perspectives that require investigation.

Beyond sentiment analysis, our motivation extends to the exploration of geopolitical stances embedded in the comments. By manually inputting geopolitical affiliations such as 'Against Israel/Palestine,' 'Supports Israel,' or 'Neutral/Stance Not Clear,' we aim to adda final layer of understanding to our analysis. This nuanced approach aligns with the intricate nature of the conflict, acknowledging that sentiments are inherently linked to geopolitical perspectives. In essence, our motivation is rooted in the belief that theapplication of sentiment analysis, coupled with the discerning capabilities of advanced algorithms, can unravel the layers of emotions, opinions, and geopolitical stances encapsulated in the comments surrounding the Israel-Palestine conflict. By undertaking this research endeavor, we strive to contribute to the scholarly discourse on sentiment analysis, offering insights that transcend the digital rhetoric and illuminate the diverse voices echoing in the virtual corridors of global discussions.

1.4 Reasons behind the study

The growing digitization of public discourse—particularly concerning complicated geopolitical problems like the Israel-Palestine conflict—is the driving force behind this study. Given the complexity of this dispute and how it affects public opinion, a thorough examination of the opinions voiced in online conversations is required. We evaluate the effectiveness of sentiment analysis methods such as Sentiment Intensity Analyzer and TextBlob with conventional machine learning models like KNN and SVM [10], utilizing advances in Natural Language Processing. Our focus on simple techniques is consistent to increase the accessibility of sentiment analysis to a wider range of users. Furthermore, the incorporation of geopolitical attitudes into the study provides a comprehensive comprehension of feelings within the framework of wider global viewpoints. By offering

a comprehensive assessment of the Israel-Palestine digital discourse in the modern period, this study hopes to make a significant contribution to the academic discussion on sentiment analysis, geopolitics, and digital communication.

1.5   Research Questions

- How effective are Sentiment Intensity Analyzer and TextBlob in analyzing sentiments within comments on the Israel-Palestine conflict?

- What is the comparative performance of traditional machine learning models, specifically KNN and SVM, in sentiment analysis of the same dataset?

- How do sentiment analysis result correlate with users' geopolitical stance in the context of the Israel-Palestine conflict?

- How do comments on social media platforms, particularly Reddit, reflect the diverse sentiments and opinions of users regarding the conflict?

- Can sentiment analysis be a valuable tool for researchers, policymakers, or organizations seeking real-time public opinion on international crises?

- How does the choice of sentiment analysis algorithms impact the accuracy and efficiency of the analysis in the context of the Israel-Palestine conflict?

1.6 Expected Outcome

Our main goal was to find out the sentiment statistics of the comments taken from Reddit on the topic of the Israel-Palestine conflict and show the best algorithm that goes with the model of sentiment analysis with same features. Moreover, we intended to show geopolitical stance distribution using the best algorithm found. Besides, we showed KNN and SVM not so perfect from sentiment analysis as it goes with encoding which has lack on accurate sentiment extraction.

The project intends to extract detailed sentiment values from the text data and classify comments into positive, negative, and neutral attitudes using advanced algorithms like Sentiment Intensity Analyzer and TextBlob. The anticipated results include a thorough comprehension of sentiment distribution, a comparative evaluation of algorithm accuracy,

and the derivation of the geopolitical positions conveyed in the comments. In the end, this study uses an analysis of internet speech to provide important new insights into public opinion and views regarding the Israel-Palestine issue.

1.7   Report Layout

There is a total of five chapters in our report. Throughout chapter 1 we have an overview of the whole project. Several sections like 1.1- Introduction, 1.2- Objective, 1.3- Motivation, 1.4- Reasonsbehind the study, 1.5-Research Questions, 1.6- Expected Outcome, 1.7- Report layout: The discussion sections in the second chapter are 2.1- Introduction, 2.2- Literature Review, 2.3- Research Summary, 2.4- Challenges. The research method, including its subsections, is covered in Chapter 3 they are 3.1- Introduction, 3.2- Research subject and intermediary,3.3- Data collection procedure, 3.4- Data fetching and data pre-processing. The tests and paragraphs are covered in the fourth part 4.1-Introduction, 4.2- Implementational results, 4.3- Descriptive Analysis, 4.4- moral. The fifth chapter shows the impacts. 5.1- Impact on Society, 5.2- Impact on Environment, 5.3- Ethical Issue, 5.4- Sustainability Plan. The sixth chapter discusses the subsections 6.1- Summary of the study, 6.2- Conclusion, 6.3- Indication for further study. After every section, situations were created that aided our research.

CHAPTER 2
BACKGROUND STUDIES

2.1 Introduction

Encouraging a wider audience to use sentiment analysis is consistent with our emphasis on user-friendly algorithms. A comprehensive knowledge of feelings in the context of larger global viewpoints is also provided by the analysis's incorporation of geopolitical stances. This work aims to provide a comprehensive understanding of the Israel-Palestinedigital discourse in the modern period, adding significant insights to the scholarly debate on sentiment analysis, geopolitics, and digital communication.

Description (Given Text)   Sentiment Value
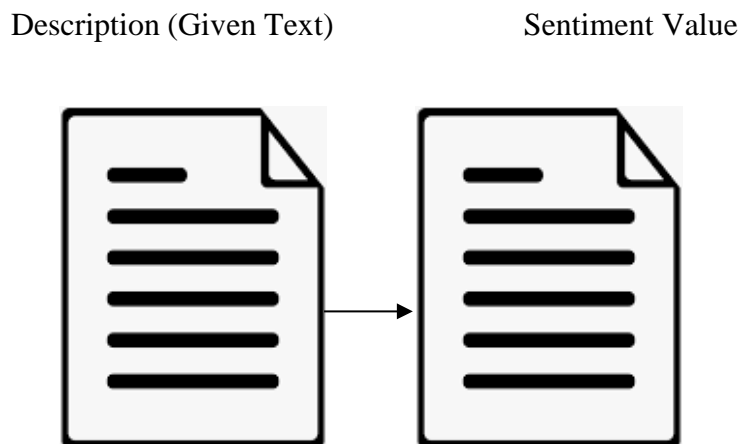
Figure 2.1: Sample View

We collect our data from different sources like the internet, various news channel websites, Kaggle, etc. We needed to do necessary data cleaning and preprocessing to process for the Sentiment Analysis algorithms and execute our aim accordingly.

2.2 Literature Review

A review that carefully charts the territory of Multimodal Sentiment Analysis (MSA) and examines its historical foundations, various fusion structures, and extensive applications was carried out by Gandhi et al. [11]. They provide a clear taxonomic framework for comparing MSA's ten various architectures and shed light on the field's progress from text-centric analysis to its current state of proliferation. By examining the advantages and

disadvantages of each architecture—from the flexibility of late fusion to the simplicity of early fusion—they provide a comprehensive picture of MSA's promise and present difficulties. Finally, they provide readers with a thorough grasp of this vibrant area by showcasing MSA's multidisciplinary reach and highlighting exciting future avenues for study.

William et al. [12] explored the early frontiers of sentiment analysis on tweets, proposing three novel approaches tailored to the platform's unique structure. They leverage emotion lexicons and grammatical relationships to classify tweets based on subjectivity, semantic association, and polarity, outperforming existing text-based methods. This work lays the groundwork for further research in extracting sentiment from the dynamic world oftweets.

Tunca et al. [13] broke new ground by analyzing Guardian articles on the metaverse, blending content and sentiment analysis. Leximancer unveils key themes like "games" and "platforms," while NLTK pinpoints a 61% positive sentiment trend. Optimism swirls around metaverse innovation, fueled by blockchain and gaming potential. However, shadows of social media woes like misinformation loom large, sparking concerns about potential harms. This unique marriage of qualitative and quantitative methods sheds light on the metaverse's complex image, paving the way for deeper dives into itstransformative implications.

The research conducted by Gunasekaran [14] carefully analyzes the constantly changing field of sentiment analysis (SA) in NLP. They examine a wide range of SA strategies through an extensive study, ranging from lexicon- and rule-based methods to state-of-the-art machine and deep learning techniques. Acknowledging the difficulties presented by irony, sarcasm, and a variety of languages, Gunasekaran also explores moral issues in SA. They highlight the wide range of SA applications spanning social media, healthcare, marketing, and more by using Twitter as a real-world case study. To close gaps and improve SA for smoother, error-free sentiment identification, he provides a useful tool for practitioners and scholars alike by carefully analyzing current trends, datasets, and assessment criteria. In the end, this research opens the door to increased effectiveness and precision in the crucial area of text comprehension of human emotions.

E. O. Omuya [15] tackles the challenge of noisy and high-dimensional social media sentiment analysis by proposing a model incorporating dimensionality reduction and NLP

with part-of-speech tagging. They test it against Naive Bayes, SVM, and KNN, demonstrating performance improvements compared to existing models. This innovative approach paves the way for more accurate sentiment analysis in the ever-growing world of social media data.

J. Mutinda et al. [16] addressed the limitations of existing text representation techniques in sentiment analysis by proposing LeBERT, a hybrid model combining sentiment lexicons, N-grams, BERT, and CNNs. By focusing on sentiment-rich sections of text, LeBERT surpasses pre-trained embeddings that ignore word sentiment. Evaluated on three diverse datasets, LeBERT achieves an impressive F-measure of 88.73% in binary sentiment classification, marking a significant advancement in the field. This research paves the way for more accurate and nuanced sentiment analysis in real-world applications.

Addressing the dearth of Bangla SA datasets, M. Hasan et al. [17] built a novel resource of Russia-Ukraine conflict comments annotated for sentiments. They fine-tune various pre-trained Transformer models on this data, demonstrating BanglaBERT's impressive performance with 86% accuracy and 0.82 F1 score, highlighting its potential for accurate sentiment analysis in Bangla social media. This research paves the way for further exploration of Bangla NLP by providing a valuable dataset and showcasing the efficacy of Transformer models in this under-researched language.

While Durga et al. [18] offered an overview of the importance of sentiment analysis inthe digital world and its applications in website building, company profiles, and customer interactions, the paper lacks the depth and technical specifics expected in a research paper for a literature review. It mentions the collaboration of NLP and ML for sentiment analysis, briefly touches on NLP tools and data transformation, and Python's role in ML models, but doesn't delve into specific algorithms, evaluation methods, or empiricalresults. This makes it unsuitable for a detailed analysis alongside other research papers in a literature review. Instead, it might be more appropriate for a general audience article or introductory blog post on the benefits and basic workings of sentiment analysis in the digital landscape.

A. R. W. Sait and M. K. Ishak [19] tackled the persistent challenge of sarcasm in sentiment analysis by proposing a novel deep learning with an NLP-enabled model (DLNLP-SA). Their approach uses Mayfly optimization with a multi-head self-attention-based GRU (MHSA-GRU) model, eliminating the need for handcrafted features through

automatic feature extraction from N-grams. Tested on a News Headlines dataset, DLNLP-SA outperforms existing methods, proving its efficacy in sarcasm detection and classification. This research significantly advances the field of sentiment analysis by offering a robust deep-learning solution to a longstanding obstacle.

A. Zhang et al. [20] addressed the limitations of traditional NLP and pre-trained LLMs in financial sentiment analysis, where data scarcity and context dependence are crucial challenges. They propose a novel retrieval-augmented LLM framework equipped with 1) instruction-tuned LLMs trained specifically for sentiment prediction, and 2) context retrieval from reliable external sources to enrich the analysis. This hybrid approach, benchmarked against traditional models and popular LLMs like ChatGPT and LLaMA, demonstrates significant performance gains (15-48%) in accuracy and F1 score, paving the way for more robust and accurate financial sentiment analysis with the power of LLMs.

O. Abiola et al. [21] explore public sentiment towards COVID-19 in Nigeria, analyzing 1 million tweets using VADER and TextBlob sentiment analysis tools. While both tools reveal a slight majority neutral response (31.3%-36.7%), they diverge on positive and negative sentiment, highlighting potential subjectivity in sentiment analysis methods. This research, though lacking in-depth exploration of sociological, environmental, and economic impacts, provides valuable insights into Nigerian public opinion on COVID-19 and sheds light on the nuances of sentiment analysis techniques. Future research could delve deeper into specific aspects of the pandemic's impact and utilize more extensive qualitative analysis to enrich the understanding of Nigerian experiences with COVID-19.

Ashari et al. [22] examined public opinion in Indonesia over the government's concession to permit the use of outdoor masks in 2022 by using sentiment analysis on Twitter. Their analysis, which used TextBlob and Naive Bayes on 1,000 tweets with the term "jokowi mask," indicates a mostly neutral mood (75.76%), indicating reluctance on the part of the public or a lack of strong sentiments toward the policy change. Although the study provides insightful information about Indonesian attitudes toward mask mandates, its limitations—such as its reliance on a single keyword and possibly small data sets—mean that additional research with larger data sets and more sophisticated sentiment analysis techniques is necessary to fully comprehend the nuances of public opinion on changing pandemic policies.

T. H. Rochadiani [23] explored public sentiment towards ChatGPT using sentiment analysis on YouTube comments. Analyzing a large dataset after pre-processing, they employ TextBlob and VADER tools to categorize user responses as positive, neutral, or negative. Their findings reveal a predominantly positive sentiment (around 46-49%), suggesting public enthusiasm and acceptance of this new AI technology. This research contributes valuable insights into user perception of ChatGPT, informing its development and guiding future applications to align with public interests. However, limitations like potential bias in chosen platforms and sentiment analysis tools warrant further research with diverse data sources and advanced techniques for a more comprehensive understanding of public response to emerging AI technologies like ChatGPT.

Kukkar et al. [24] addressed a significant problem in sentiment research on social media: long phrases like "happpyyyyyy." They suggest a brand-new lexicon-based approach that takes these terms into account without eliminating or standardizing them. Using framed lexicon rules, the algorithm determines aggregated sentiment scores for longer words, which it then adds to the sentiment analysis. Their technique achieves F-measure rates of 81% to 96%, outperforming previous systems that disregard longer words. It is tested using casual chat datasets from Facebook, Tweets, and personal conversations. This study demonstrates a noteworthy advancement in the identification of sensitive sentiment in social media data, opening the door to more precise and perceptive evaluations of user mood and public opinion.

S. Saifullah et al. [25] push the boundaries of anxiety detection in Indonesia by analyzing COVID-19-related YouTube comments through machine learning. Their research compares six ML algorithms (KNN, SVM, DT, NB, RF, XG-Boost) combined with four feature extraction methods (CV, TF-IDF, Word2Vec, HV) on a dataset of 9,706 categorized comments. The winning combination of Random Forest and count-vectorization achieved a remarkable 98.4% accuracy in identifying anxious sentiment, surpassing previous efforts by 14.3%. This significant advancement highlights the potential of machine learning for automated mental health screening and intervention support, particularly in under-resourced languages like Indonesian. However, future research could explore incorporating contextual factors beyond keywords to provide a more complex understanding of emotional states expressed in online text.

D. A. Kristiyanti et al. [26] addressed the challenge of feature selection in sentiment

analysis by proposing a novel binary Salp Swarm Algorithm (SSA) equipped with a new V-shaped transfer function (TF). They compare this method against traditional feature selection approaches and various TFs using KNN, SVM, and Naive Bayes classifiers. Their results demonstrate the superiority of SSA-New V-TF, achieving a 31.55% accuracy increase and the highest overall accuracy of 80.95% with the KNN model,while also requiring less runtime. This research underscores the potential of metaheuristic optimization algorithms for effective feature selection in sentiment analysis, leading to enhanced model performance.

K. Naithani and Y. P. Raiwani [27] offer a comprehensive review of sentiment analysis research, surveying various NLP techniques and machine learning algorithms employed for text-based sentiment evaluation. They delve into both established methods like SVM, BN, and ANN, and explore novel approaches like CNN, LSTM, and KNN, analyzing their strengths, limitations, and performance on major datasets. This extensive survey aims to provide insights for researchers seeking to choose the most suitable NLP and machine learning tools for their specific sentiment analysis needs. However, the paper might benefit from a more focused analysis by narrowing its scope or highlightingspecific research gaps or future directions in the field of sentiment analysis.

Paper	Dataset	Method & Techniques	Results
[11]	MSA	CNN	59.6%
[12]	Twitter Comments	N/A	N/A
[13]	Metaverse Dataset	VADER	61%
[14]	1000 phrases	SVM	80%
[15]	Sentiment140 dataset	KNN	79.8%
[16]	Amazon Products' Reviews, IMDB Movies' Reviews, Yelp Restaurants' Reviews	LeBERT	88.73%

[17]	Bangla annotated dataset	XLM-RoBERTa-base	86%
[18]	N/A	N/A	N/A
[19]	News Headlines Dataset	DLNLP-SA model	92.43%
[20]	Financial News Dataset	LLM	48%
[21]	COVID-19 tweets dataset	VADER	46%
[22]	COVID-19 Indonesia dataset	Naïve Bayes	75.76%
[23]	ChatGPT positive sentiment	TextBlob VADER	46.6% 49.5%
[24]	Social Media chats dataset	IOT-ER	81%
[25]	Indonesian-language YouTube video comments about COVID-19	RF-CV	98.4%
[26]	Textual Datasets	KNN	80.95%

Table 2.1: Comparison Table of Related Works

2.3 Research Summary

Our study stands out as an engaging voice in the highly competitive field of sentiment analysis research because it provides a fresh viewpoint and insightful additions to the current conversation. This comparative study explores the similarities and differences between our work and those that we have submitted, highlighting the advantages of our article and outlining its unique path. Several major topics in the papers that are being given are consistent with our findings. This research has three similarities: they all aim to achieve

demanding performance measures, advanced NLP and machine learning methodologies, and accurate and complex sentiment analysis across several areas. This common environment highlights how vitally important our area is, and how much potential there is for numerous applications in interpreting the emotional brocade weaved inside literature.

2.4 Challenges

The application of this study presents several obstacles that must be skillfully overcome. The intrinsic intricacy of sentiment analysis is one of the main obstacles, especially when considering the extremely delicate and emotionally sensitive subject of the Israel- Palestine conflict. It is difficult to effectively capture the sentiments inherent within remarks due to the subtle nature of language, cultural context, and multiple expressionsof sentiment. Challenges are also introduced by the variety of the dataset and any biasesin the comments that were gathered [28]. Since Reddit is an open forum, a wide variety of viewpoints, even extreme ones, may be found there. To prevent biased findings,considerable attention and preprocessing are necessary to ensure the stability and fairnessof sentiment analysis in the face of such variation [29]. The selection of algorithms also presents a unique set of difficulties. Although Sentiment Intensity Analyzer and TextBlobare the main focus of the study, these tools may need to be customized and fine-tuned to the unique particulars of the Israel-Palestine conflict. Achieving a workable implementation requires balancing computing efficiency and algorithm complexity.

This stage involves personality even if it gives the investigation a qualitative component. Determining geopolitical attitudes requires some interpretation, and one's differing viewpoints may have an impact on how accurate the inference is. Moreover, one must be cognizant of the dynamic character of feeling due to the real-time nature of online comments. As events develop, comments may change over time, affecting the mood conveyed. The temporal dimension poses obstacles to preserving the accuracy and relevance of sentiment analysis findings. It is essential to take ethics into account, particularly when discussing sensitive topics. Following ethical norms and implementing measures with caution is necessary to ensure privacy and manage potentially objectionable information properly. Retaining the integrity of the study calls for finding a compromise between ethical issues and transparency. In conclusion, there are several issues to be resolved when using sentiment analysis to remarks about the Israel- Palestine conflict,

including language subtleties, dataset variety, algorithmic applicability,manual inference, temporal dynamics, and ethical considerations. To guarantee the validity and trustworthiness of the study findings, these obstacles must be overcome.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Introduction

We mention that our entire study process in this part. Every research project is different from the perspective of the methods used to solve it. The methodology includes every strategy that was used in the study project. This methodology section includes a brief summary of each component as well as a discussion of applying models.

The following flow chart illustrates the entire work process.
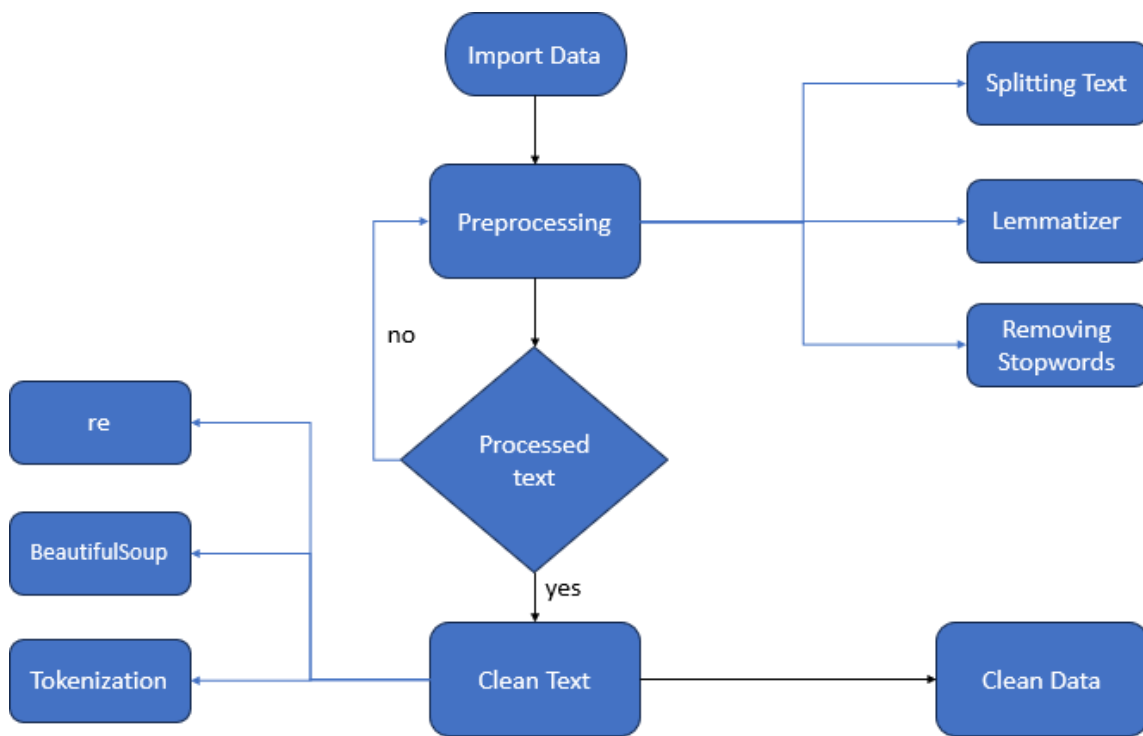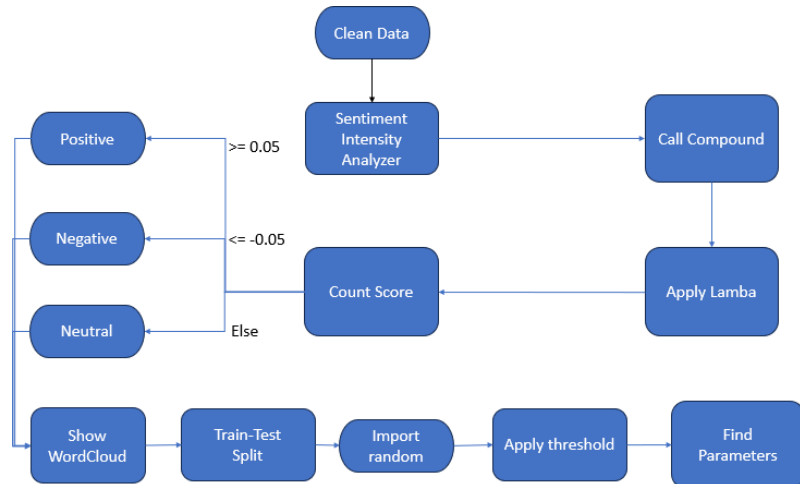

Figure 3.1: Extracting Clean Data

Figure 3.2: Sentiment Intensity Analyzer Flowchart

This study was done based on a dataset collected from Kaggle where we have 5 features and 4,36,425 threads taken from Reddit under similar subreddit that goes with the topic of our study. The rated score on the comments is also noted to analyze them too to specify the sentiment. Human looks at one another to know about the sentiment with the words they are exchanging. But NLP works with the textual data to know about the sentiment of the texts from its rule-based organization. Moreover, it works with the lexicons extracted from the textual data.
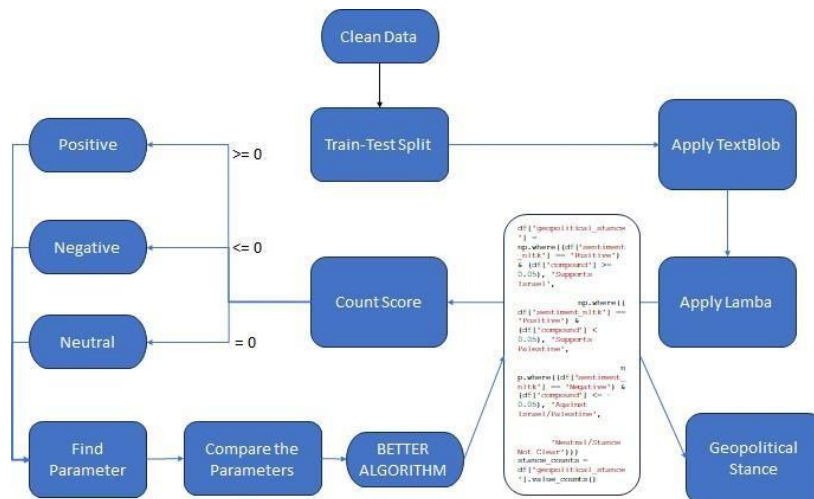

Figure 3.3: Flowchart of TextBlob, Comparison, and Geopolitical Stance

This study addresses the complex field of sentiment analysis by analyzing remarks about the Israel-Palestine conflict that were taken from Reddit threads. The main goal is to deconstruct the attitudes that are present in these remarks to offer insightful information about the public's perception of this divisive topic. By using sophisticated Natural Language Processing methods and algorithms to identify attitudes, the work advances the fields of computational linguistics and sentiment analysis. The dataset, which was obtained through Kaggle, contains a dynamic and varied set of remarks made by Reddit users on the conflict between Israel and Palestine. Essential details including the text content, the subreddit where it was posted, the unique identification,the score or upvotes earned, and the creation period are all included with each comment. This diverse dataset serves as the basis for our investigation into sentiment analysis and provides a timely and sophisticated look into the prevailing viewpoints on this strongly debated worldwide subject.

Using the Sentiment Intensity Analyzer, a potent tool taken from the Natural Language Toolkit, is a crucial component of this study. This method goes beyond the basic division of feelings into groups that are neutral, positive, or negative. Rather, it offers an upgraded perspective by giving feelings intensity levels that represent the text's emotional expression gradients. The Sentiment Intensity Analyzer's importance stems from its capacity to interpret the nuances of language and context. It acknowledges the intensity of feelings, enabling a more complex comprehension of user viewpoints. In the context of the Israel-Palestine conflict, where opinions can vary from mild disagreement to strong emotional outpouring, this is very important. The ability of the analyzer to measure sentiment intensity elevates the sophistication of the sentiment analysis procedure and improves the precision and breadth of our results.

This research work intends to analyze the attitudes surrounding the Israel-Palestine conflict by using sentiment analysis, specifically using the Sentiment Intensity Analyzer as a lens. Using this investigation, the study hopes to make a significant contribution to the domain of sentiment analysis as well as our understanding of the diverse viewpoints present in the online conversation around this divisive worldwide subject.

3.2   Research Subject and Intermediary

The title of our research topic is "Sentiment Analysis of Comments on the Israel-Palestine Conflict and Showing Geopolitical Stance Distribution". A key aspect of this research is the application of the Sentiment Intensity Analyzer, a powerful tool harnessed from the Natural Language Toolkit (NLTK). This method goes beyond the basic division offeelings into groups that are neutral, positive, or negative. Rather, it offers a moresophisticated view by giving feelings intensity levels that represent the text's emotional expression variations. On a broader scale, sentiment analysis plays a pivotal role in understanding societal dynamics and reactions to significant events. The study is on a global conflict. The Israel-Palestine conflict, being a globally recognized and emotionally charged issue, serves as a pertinent case study for the application of sentiment analysis. By unraveling the sentiments within comments, this research contributes not only to academic discourse but also to the broader understanding of how public sentiment shapes and is shaped by such geopolitical discussions.

Below is a list of the equipment needed for this model.

Hardware and software	Development Tools
Intel Core i5-8250U CPU @ 1.60GHz 1.80 GHz	Windows 10
1 TB HDD	Python 3.7
Google Colab, Jupyter Notebook	TensorFlow Backend Engine (1.15.0)
RAM 12GB	Pandas
	NLTK

Table 3.1: Software and Tools

3.3 Data Collection Procedure

For Israel-Palestine Conflict and showing geopolitical stance distribution related to the topic, we collected the dataset from Kaggle from the latest upload and update list from the website.

The first column of the dataset shows the *comment_id* which is not important. It was done for

sequential organizing purpose. The column *score* shows the score or upvotes received by the comment done on Reddit. The thired column *self_text* shows the actual text content of the comment that will be used for the judgement and sentiment analysis. The column *subreddit* is the threads or categories of posts that have been posted on the Reddit website. The hashtags were taken under filtration to get the comments faster and within easy tries. The timestamp when the comment was done or created on Reddit under the specified subreddit is taken under the column *created_time* in the dataset which is the last column.

3.4 Data Fetching and Data Pre-processing

Data preprocessing is an effective way to clean our own dataset. Because without a good dataset we cannot achieve the desired output. In the preprocessing phase of our research, we took meticulous steps to ensure that the data extracted from Reddit comments on the Israel-Palestine conflict was cleansed and optimized for accurate sentiment analysis. The process can be encapsulated in the following steps:
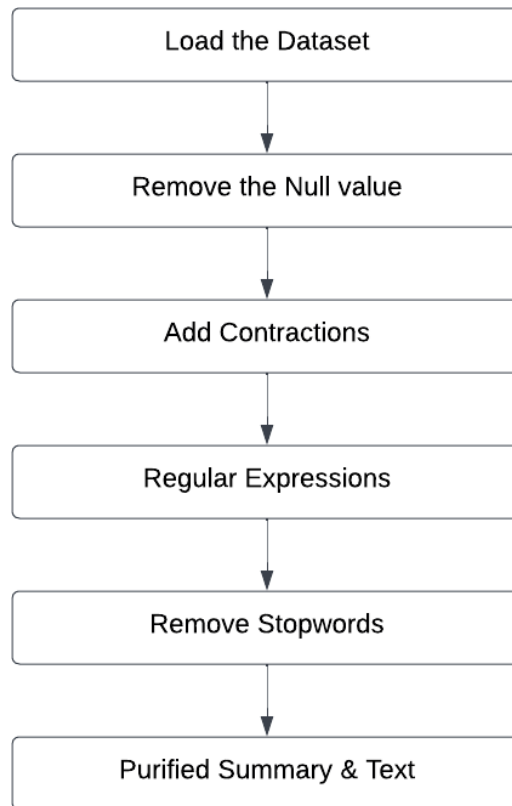

Figure 3.4 Dataset Preprocessing

Before models are formed, processing data is a significant task. Preprocessing the data requires a variety of processes.

CHAPTER 4

EXPERIMENTAL OUTCOME OVERVIEW

4.1 Experimental Setup

We utilized a dataset sourced from Kaggle, which contained comments extracted from Reddit posts discussing the Israel-Palestine conflict. The dataset offered a diverse range of sentiments and opinions, making it a suitable testbed for our sentiment analysis experiments. Before the experiments, a comprehensive data preprocessing pipeline was employed. This included text cleaning to remove URLs, HTML tags, and non-alphanumeric characters. Tokenization, lemmatization, and stopword removal were performed to standardize and refine the textual data. We opted for two widely-used sentiment analysis algorithms - Sentiment Intensity Analyzer and TextBlob. The Sentiment Intensity Analyzer, based on the VADER sentiment analysis tool, is renowned for its effectiveness in capturing nuanced sentiments. TextBlob, a simpler natural language processing library, was chosen for its ease of use and applicability. Both algorithms were applied to the preprocessed dataset to perform sentiment analysis. The Sentiment Intensity Analyzer provided sentiment labels (Positive, Negative, Neutral) based on compound scores, while TextBlob assigned polarity scores and corresponding sentiments. The accuracy of each algorithm was evaluated by comparing the predicted sentiments with ground truth sentiments. Accuracy scores were calculated, providing a quantitative measure of the algorithms' performance. A thorough comparative analysis was conducted to assess the strengths and weaknesses of each algorithm. This involved examining the distribution of sentiments, identifying frequently occurring words through word clouds, and visualizing the results. To extend the analysis, geopolitical stances wereinferred based on sentiment scores and dominant topics. This step provided additional insights into the geopolitical sentiments expressed in the comments. The effectiveness of the algorithms was further tested by allowing user input for sentiment analysis. This interactive aspect gauged the real-world applicability and user-friendliness of the sentiment analysis models. All experiments and analyses were carried out using Python programming language. Relevant libraries such as NLTK, TextBlob, scikit-learn, and

BeautifulSoup were utilized. The experiments were conducted on a machine with standard hardware specifications.
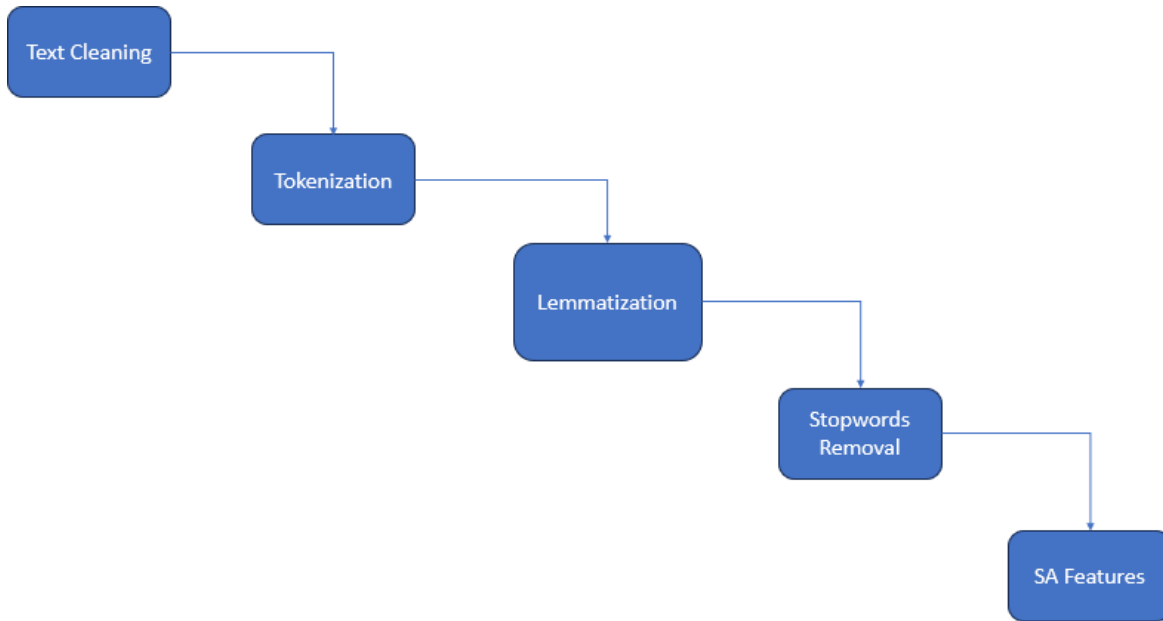
Figure 4.1: Encapsulated Process

4.2 Implementation Results

The experimental findings of our research paper on sentiment analysis of comments related to the Israel-Palestine conflict revealed insightful findings. We applied two prominent sentiment analysis algorithms, Sentiment Intensity Analyzer, and TextBlob, for evaluating the sentiments expressed in the diverse set of comments sourced from Reddit posts. Sentiment Intensity Analyzer exhibited a notable accuracy of 87.74%, showcasing its efficacy in capturing complex sentiments with a focus on positive, negative, and neutral categorizations. The algorithm's power is found in its capacity to produce a compound score that captures the sentiment intensity of a text in its entirety. On the other hand, TextBlob, while a widely used and accessible library, demonstrated a lower accuracy of 49.08%. The algorithm's polarity-based approach assigned positive, negative, or neutral sentiments based on the calculated polarity scores. In addition to sentiment analysis, the research progressed into geopolitical stance inference, providing an additional layer of insight into the sentiments expressed in the comments. To provide an in-depth understanding of the feelings surrounding the conflict, the distribution of geopolitical positions—including support for Israel, support for Palestine, and a neutral stance—was graphically represented.

| Original Description: | Lol what kind of busted translator device you got. Does it speak only hasbara?

"Translation: Amen. Kill jews and continue gazan oppression!"

Friendly fact reminder: Israel has been stealing Palestines land, bombing their civilians, controlling their access to water/food and kidnapping Palestinian civilians for over 50 years. Israel has been committing genocide on Palestine but somehow people like you like to place the blame on Palestine. If you think Hamas is bad, I have some bad news about the IDF for you.

Well, i would never support Hamas, but there actions Israel could do that would make me stop supporting it: State orginized killing of Israeli or west bank Arabs or use of Atomic weaponary. |
|---|---|
| **Extracted Outcome:** | Neutral
Negative
Negative
Negative |
| **Input text (Description):** | Hamas and Israel should go on peace now!

Israel, you moron.

Hamas is not doing the right thing. |

Response summary:	Positive
	Negative
	Neutral

Table 4.1: Sample of the Response Summary

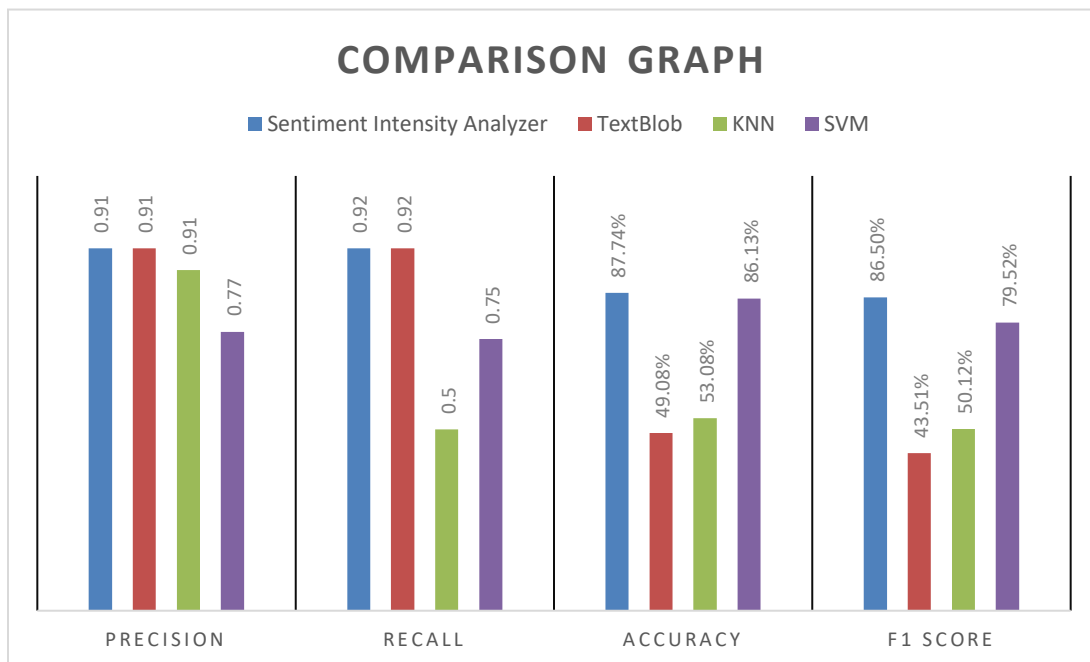| Algorithm	Precision	Recall	Accuracy
Sentiment Intensity Analyzer	0.91	0.92	87.74%
TextBlob	0.91	0.92	49.08%
KNN	0.91	0.50	53.08%
SVM	0.77	0.75	86.13%

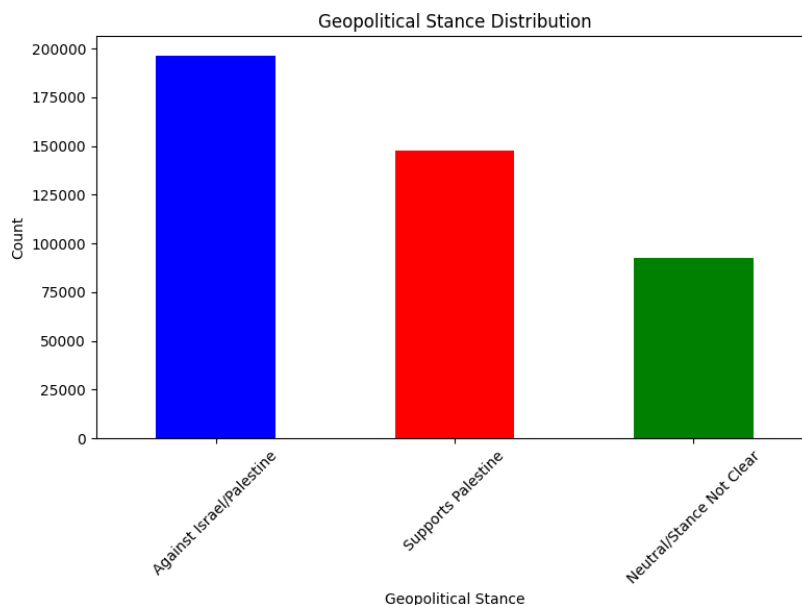Table 4.2: Comparison Table

Figure 4.2: Comparison Graph

Figure 4.3: Geopolitical Stance Distribution

4.3 Descriptive Analysis

The dataset, which was taken from Kaggle, included a variety of remarks made on Reddit threads about the conflict between Israel and Palestine. The research concentrated on sentiment analysis using TextBlob and Sentiment Intensity Analyzer. Tokenization and cleaning were part of the preprocessing step for efficient analysis. The results demonstrated the better accuracy (87.74%) of Sentiment Intensity Analyzer in collecting complex feelings. Geopolitical stance inference depicted attitudes, whereas user input testing indicated practical application. In the context of the war, the study providedinsights into attitudes, geopolitical positions, and the practical use of sentiment analysis.

Paper	Methods & Techniques	Limitation	Our Solution
[4]	KNN	We cannot get the exact accurate by encoding to traditional algorithm.	We used NLP algorithm to overcome this limitation of encoding.
[5]	SVM	Encoding to traditional algorithm	We used two NLP algorithms and

		and analyzing its sentiment cannot be labelled to be perfect.	proved one to be the best one and it goes with SA.
[10]	TextBlob, Naïve Bayes, SVM	SA cannot be exactly done with proper accuracy if encoding is needed. TextBlob performed with 62.6% accuracy without being properly vectorized.	We cleaned the data using different libraries and also applied noise to know accuracy in difficulties and found Sentiment Intensity Analyzer to be more effective.
[15]	KNN	It lacks the way for more accurate SA in the ever-growing world of social media data.	SA should be exactly generated while testing so it was done in our study.
[16]	LeBERT	Its accuracy is good but it requires organized information and also takes a good amount of time.	Sentiment Intensity Analyzer is more friendly to SA and it is fast and friendly with unorganized data.
[18]	Hybrid Model	It works with basic workings of SA in the digital landscape and it is much unusual to be applied.	Sentiment Intensity Analyzer has Python library and easy to be handled.
[19]	DLNLP-SA model	It shows a good accuracy but it offers a robus deep-learning solution to a longstanding obstacle. It needs many unique and heavy libraries to be cleaned.	Our study proved Sentiment Intensity Analyzer to be effective on clean data which are cleaned using already organized libraries.
[25]	RF-CV	A huge number to be its accuracy but it lacks in exploring contextual factors beyond keywords to provide a more complex	Sentiment Intensity Analyzer is effective if we judge about the execution time and also the use of lesser heavy

		understanding of emotional states expressed in online text.	libraries and algorithms.

Table 4.3: Uniqueness of this Study

4.4 Moral

The study highlights the usefulness of sentiment analysis in assessing opinions on delicate subjects like the Israel-Palestine conflict, particularly when using tools such as Sentiment Intensity Analyzer. It highlights how useful these studies are for deciphering public opinion, illuminating geopolitical positions, and demonstrating the need of utilizing cutting-edge NLP approaches for perceptive real-world applications. The moral of the research lies in the ability of sentiment analysis to give nuanced viewpoints and contribute to a more educated understanding of complicated challenges in our interconnected world.

CHAPTER 5

IMPACT ON SOCIETY, ENVIRONMENT AND SUSTAINABILITY

5.1 Impact on society

The increased knowledge and understanding of the processes of public opinion that this research provides is one of the main social effects. The study offers a comprehensive perspective on how people react to and understand events relating to the Israel-Palestine conflict by classifying attitudes as positive, negative, or neutral. This increased consciousness is essential for promoting more informed public debates and, as a result, more thoughtful decision-making. Informed decision-making can be supported by the research in a number of fields. Online debates can provide useful insights for policymakers, analysts, and stakeholders engaged in diplomatic and humanitarian endeavors [31]. This knowledge can help with more efficient and contextually aware decision-making by guiding tactics and actions.

The ability to reject false information has a big social influence. Sentiment analysis is then used as a technique to spot and correct false narratives, advancing accuracy and halting the spread of inaccurate or biased information [30]. This feature of sentiment analysis is vital in a time when information travels quickly across digital channels.

Moreover, the study possesses the capability to fill up knowledge gaps betweenvarious viewpoints. It is possible to determine points of agreement and disagreement by examining attitudes. This realization is crucial for encouraging communication and understanding between people who hold different opinions. Monitoring changes in society is another benefit of the study. Through sentiment analysis over time, the study reveals changing public trends and attitudes. This data is essential for modifying programs and strategies to conform to changing public perceptions.

The results have implications for public participation as well, as they can be utilized to start fruitful conversations. Constructing forums for positive discourse in response to opinions voiced in internet comments can result in more inclusive and knowledgeable public discussions. Media companies might improve their communication tactics by utilizing sentiment analysis information. Media outlets are able to deliver content in ways that are well-received by the public when they have a thorough understanding of

how audiences acquire and interpret information.

5.2 Impact on Environment

The sentiment analysis can also lead to a greater understanding of wider global issues, such as environmental issues. People who are exposed to the subtleties of international wars may come away with a more thorough comprehension of the interrelated global issues that face the world today, such as climate change and environmental degradation. Furthermore, decisions made at several levels, from personal preferences to the creation of policies, can have an indirect impact on environmental results. Environmental responsibility, resource conservation, and sustainability are allimportant factors to take into account while making decisions. There may be a knock- on impact when people and groups learn more about the complexity of global challenges and start to advocate for ecologically friendly behavior [32].

In addition, the study adds to the conversation about society values and priorities. Understanding the opinions voiced in online forums helps society to better grasp its goals and problems as a whole. If these feelings have a significant connection to environmental challenges, it may help fuel a larger social movement toward ecologically friendly behaviors and laws.

Public discourse and media narratives about environmental issues can be influenced by the research. Media companies may decide to highlight environmental issues in their coverage based on sentiment research data. In turn, this greater visibility may encourage public knowledge of and participation in environmental issues.

5.3 Ethical Issue

It is essential to protect people's privacy and anonymity when they voice their thoughts. To prevent any inadvertent disclosure of personal data, the research team is required to strictly abide by data protection and privacy standards. Maintaining ethicalstandards requires striking a compromise between relevant sentiment analysis and data anonymization. Ethical considerations also apply to the results' interpretation and presentation. The research team should stay clear of sensationalism and make sure that results are communicated impartially, without adjusting sentiment scores to conform

to predetermined ideas. Ethical research practices benefit from the impartial and open presentation of emotions.

5.4 Sustainability Plan

Developing user-friendly sentiment analysis tools, incorporating effective sentiment analysis algorithms into cutting-edge technologies, and maintaining ongoing partnerships with academic and industrial partners are all part of the sustainability plan. The goal of these initiatives is to increase sentiment analysis's marketability for a range of uses, including online reputation management and social media monitoring. By staying up to date with emerging natural language processing technology, the objective is to make a lasting impression and serve upcoming business needs.

CHAPTER 6

SUMMARY AND FUTURE PLAN

6.1 Summary of the Study

The study used advanced algorithms like Sentiment Intensity Analyzer and TextBlob to analyze the sentiment of comments made about the Israel-Palestine conflict. The study demonstrated these algorithms' effectiveness with accuracy rates of 49.08% and 87.74%, respectively. The general emotion distribution was revealed by identifying and presenting the geopolitical positions. Emphasis was placed on the value of sentiment analysis in an international setting, as it provides insight into the attitudes and reactions of the public during times of crisis. The difficulties in putting into practice classic machine learning algorithms like KNN and SVM were emphasized, highlighting the usefulness of the selected methods. The study adds significant knowledge to the fields of sentiment analysis, geopolitics, and the applicability of sophisticated NLP algorithms to the comprehension of intricate social issues.

We have done our project by several steps and options. The project's complete overview and step-by-step instructions are provided below.

No	Steps
1.	Collecting data from Kaggle.
2.	Note all labels and description of data.
3.	Import necessary imports.
4.	Text Cleaning
5.	Preprocessing the data
6.	Count Vocabulary size
7.	Apply BeautifulSoup
8.	Tokenization and Lemmatization
9.	Created the Sequence-to-Sequence model

10.	Trained the model
11.	Apply SentimentIntensityAnalyzer
12.	Visualize word cloud
13	Introduce random noise for testing
14	Find accuracy for SentimentIntensityAnalyzer
15	Apply TextBlob
16	Find accuracy for TextBlob
17	Compare Accuracy and show the better one
18	Execute comparison in histogram bar
19	Set user input and show desired result
20	Apply NLTK and show Geopolitical Stance Distribution
21	Encode and Decode for KNN and SVM
22	Apply train-test split
23	Apply KNN and find accuracy
24	Apply SVM and find accuracy
25	Visualize their accuracy comparison

Table 6.1: Project Overview

Our suggested approach may aid future study in our NLP field by analyzing sentiment from the comments done by user and compare and find the lessons for abstract lessons.

6.2 Conclusion

The research embarked on an in-depth exploration of sentiment analysis within thecontext of comments regarding the Israel-Palestine conflict. Leveraging advanced algorithms like Sentiment Intensity Analyzer and TextBlob, the study aimed to extract nuanced sentiments from user comments, shedding light on the multifaceted nature of public opinions. The application of these algorithms resulted in noteworthy accuracy rates, with Sentiment Intensity Analyzer outperforming TextBlob. The decision to focus on advanced NLP

algorithms rather than traditional machine learning models like KNN and SVM stemmed from the time efficiency and effectiveness observed in sentiment analysis. The research unveiled the practicality and relevance of employing these algorithms in analyzing sentiments within international crises, showcasing their utility in understanding the sentiments expressed by individuals on platforms like Reddit. The significance of sentiment analysis in gaining international insights during crises was emphasized, elucidating the importance of understanding public sentiments in real-time. The research sought to bridge the gap between theoretical concepts and practical applications, contributing to the field of sentiment analysis and natural language processing. Certain challenges were encountered, such as data preprocessing complexities and potential biases in the chosen dataset. The study also underscored the ethical considerations in sentiment analysis, acknowledging the responsibility of handlingsensitive topics.

All things considered, this study provides proof of how sentiment analysis is developing and how important it is to comprehend public opinion on delicate international matters. Sophistication is added to the investigation through the use of sophisticated natural language processing algorithms and the examination of geopolitical positions. Given the growing reliance of society on digital platforms for opinion expression, the results of this study offer important new understandings into the field of sentiment analysis and its applicability in global settings.

6.3 Further study

The research embarked on an in-depth exploration of sentiment analysis within thecontext of comments regarding the Israel-Palestine conflict. Leveraging advanced algorithms like Sentiment Intensity Analyzer and TextBlob, the study aimed to extract nuanced sentiments from user comments, shedding light on the multifaceted nature of public opinions. The application of these algorithms resulted in noteworthy accuracy rates, with Sentiment Intensity Analyzer outperforming TextBlob. The decision to focus on advanced NLP algorithms rather than traditional machine learning models like KNN and SVM stemmed from the time efficiency and effectiveness observed in sentiment analysis. The research unveiled the practicality and relevance of employing these

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All things considered, this study provides proof of how sentiment analysis is developing and how important it is to comprehend public opinion on delicate international matters. Sophistication is added to the investigation through the use of sophisticated natural language processing algorithms and the examination of geopolitical positions. Given the growing reliance of society on digital platforms for opinion expression, the results of this study offer important new understandings into the field of sentiment analysis and its applicability in global settings.

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SENTIMENT ANALYSIS

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