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IMPACT AND CHALLENGES OF NATURAL LANGUAGE PROCESSING (NLP) FOR SENTIMENT ANALYSIS IN SOCIAL MEDIA

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Abstract

This study is a descriptive survey research design the explored the impact and challenges of Natural Language Processing (NLP) for sentiment analysis in social media and sought to contribute to the development of more accurate and reliable sentiment analytical tools. Two research questions and two null hypotheses guided this study. The instrument for data collection was Research-made questionnaire titled Impact and Challenges of Natural Language Processing (ICNPL) which was adequately validated by three experts and the reliability co-efficient obtained at 0.82 by the cronbach alpha method. The questionnaire was administered on 400 Respondents comprising of 200 Lecturers and 200 Students of five tertiary institutions in Northern Nigeria which were randomly selected. The mean score and standard deviation were used to answer the research questions and z- test statistical tool was adopted in testing the hypotheses. It was discovered that NLP is impactfu in sentiment analysis and it has revolutionalised sentiment analysis in social media by enabling computers to understand and interpret human language leading to numerous benefits with some challenges persisting. The researcher recommended among other things that NLP should be continuously updated to keep pace with incessant changes inherent with social media platforms and that there should be continuous research in NLP and sentiment analysis so as to be acquainted what it takes to address emerging challenges

Keywords: Natural Language Processing, Sentiment Analysis, Social Media

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Introduction

Natural Language Processing (NLP) is a rapidly emerging trend within the field of artificial intelligence that aims to bridge the gap between human communication and computer understanding. It is a revolutionary force in artificial intelligence, democratizing human-computer interaction by transcending language barriers to grasp the nuances of human thought, emotion and intent. Thomas (2024) posited that it encompasses a wide array of techniques designed to enable machines to understand, interpret, and generate human language in a way that is both meaningful and useful and that this capability is particularly relevant in the context of social media, where vast amounts of text data are generated daily. NLP techniques provide the tools necessary to analyze this unstructured data, extract valuable insights, and understand public sentiment (Manning, Schütze, and Raghavan, 2012).

In the words of Obizue and Obizue (2018), Natural language processing (NLP) refers to the ability of a computer program to understand, interpret and generate human language. It is subsumed under the concept of artificial intelligence (AI) and it enables computer systems to process and analyse natural language data such as texts and speeches. The NPL involves different steps like breaking down languages into individual words called tokens, syntax analysis of grammatic structure of language, understanding language meaning and adopting alorgrithms to understand patterns and how language data relate. Roligatta (2015) observed that NPL can be applied in many ways and one of the techniques is sentiment analysis and also that the harmonious integration of computational linguistics, machine learning and deep learning has created a robust backbone for modern NLP which enables the development of more advanced and reliable text analysis tools and driving innovation in a wide range of applications from language translation to sentiment analysis.

Sentiment analysis is one of the techniques of NPL used in determining the emotional tone of or attitude conveyed by customers through text-based feedbacks such as reviews, tweets or survey responses helping organisations to further understand public opinion, customer satisfaction and brand reputation.

According to Thomas (2024), Sentiment Analysis (SA) in social media is a burgeoning field of study that involves the use of natural language processing (NLP), text analysis, and computational linguistics to identify and extract subjective information from text data.

In the words of Akabueze and Amaefula (2017). The advent of technology has brought about the explosion of social media platforms that have created wide range of data thereby providing a rich resource for sentiment analysis and this has actually revolutionalised the way people exchange and share information and ideas among one another for national and global development. The social media field has evolved significantly and

demonstrated be a valuable tool for real-time sentiment tracking since the early 2010s thereby enhancing the accuracy and notable advancements in machine learning and deep learning algorithms (Lui, 2012 and Thomas, 2024). In most countries of the world, using, USA, UK, Brazil, Nigeria, Kenya and Ghana as good examples, sentiment analysis has proved to be very useful and has equally created very huge impact in monitoring, understanding and analyzing public opinion on various government, social and political issues such as the National Health Service (NHS), election, education and immigration thereby providing policy makers with insightful knowledge for good policy making and execution. Okazaki, Andreu and Campo (2017) analyzed sentiment on Twitter to understand public opinion on government policies in Ghana found that sentiment analysis could provide valuable insights into how the public perceives government performance and policy decisions. The use of sentiment analysis in social media has also extended to monitoring public health issues and during the COVID-19 pandemic, it was used to track public sentiment towards health policies and vaccination campaigns (Thomas, 2024). Thomas (2024) further stated that Lwin, Lu, Sheldenkar, and Schulz (2020) analyzed sentiment on Twitter to understand public opinion on COVID-19 vaccination in the United States and found that sentiment analysis could provide valuable insights into the public's concerns and attitudes towards vaccination, helping public health officials design more effective communication strategies.

Vilton and Ndrela (2017) stated that the application of NLP techniques in sentiment analysis has significant implications for social media monitoring and different businesses organizations use it to gauge public opinion, monitor brand reputation and obtain adequate analysis and valuable insights into consumer attitudes and behaviours and respond effectively to customer feedback in real-time. Sentiment analysis is a subfield of NPL and has emerged a crucial tool for understanding online affairs. Akinwale and Olatunji (2019) posited that there are vast social media platforms which includes Facebook, Twitter (now known as X), Instagram, YouTube etc and these have provided wonderful opportunities for individuals of all levels and at different locations to voice or share their thoughts, ideas, experiences and sentiments. Cajemoni and Zofla (2021) observed that social media handles have become vital aspect of civilized life and modern business activities. It has gone viral with billions of people using the media for various purposes and reasons.

In today's digital world, Natural Language Processing has become a transformative technology thereby revolutionalising the way we interact with information (Akpan, Nwokeke and Uzoechi, 2021). Kwarteng, Asare and Essuman (2019) argued that by navigating the complexities of social domains, NPL has the potential to unlock unprecedented insights, improve communication and drive positive change. This study gets into the journey of exciting applications, impact and challenges of NPL for sentiment analysis in social media

Statement of the Problem

The proliferation of different social media platforms has resulted in an unparalleled size of user-generated data making sentiment generation and analysis very enormous with its attending benefits. The application and impact of natural language processing, sentiment analysis and vast social media platforms notwithstanding, the complexity of human language coupled with the evolving nature of social media platforms poses significant challenges to the accuracy, reliability and effectiveness of NPL. The high number of social media platforms has led to rampant misinformation and propaganda with their adverse effect which are harmful to individuals, organisations, local and international economies (Obizue and Obizue, 2022)

Specifically, sentiment analysis faces the challenges of noisy and voluminous data, detecting sarcasm, opinion spam, language and cultural biases. These challenges have posed great demand that necessitated the researcher to go into this investigation with the aim of provide reasonable insights from social media data for effective sentiment analysis towards more informed decisions that will ultimately benefit a great number of users.

The broad purpose of this study is to examine the impact and challenges of natural language processing for sentiment analysis on social media.

Specifically, the study sought to achieve two major specific objectives which include the following;

1. To investigate on the mean score of information and computer technology Lecturers and Learners of tertiary institutions in northern Nigeria on the impact of natural language processing for sentiment analysis on social media

2. To ascertain the mean score of information and computer technology Lecturers and Learners of tertiary institutions in northern Nigeria on the challenges of natural language processing for sentiment analysis on social media

In line with the study objective, the following research questions were posed to guide this study;

1. What are the impact of natural language processing for sentiment analysis on social media ?

2. What are the challenges of natural language processing for sentiment analysis on social media?

In this study, following null hypotheses were also formulated and tested at 0.05 level of significance

$H0_1$: There is no significant difference between the mean score of information and computer technology Lecturers and Learners of tertiary institutions in northern Nigeria on

the impact of natural language processing for sentiment analysis on social media.

HO_2: There is no significant difference between the mean score of information and computer technology Lecturers and Learners of tertiary institutions in northern Nigeria on the challenges of natural language processing for sentiment analysis on social media.

Literature Review

Natural Language Processing

According to Songotina and Esporete (2016), Natural language processing (NLP) refers to the ability of a computer program to understand, interpret and generate human language. It is subsumed under the concept of artificial intelligence (AI) and it enables computer systems to process and analyse natural language data such as texts and speeches. Alakisa and Peturu (2022) defined NPL as a dynamic subset of artificial intelligence that deals with the interaction between computers and human in natural language. It involves the development of algoritms and statistical model that enables computers to interpret, understand, process and generate natural language data. This technology has far-fetching application in language translation, sentiment analysis and text summarization.

NPL involves different steps like breaking down languages into individual words called tokens, syntax analysis of grammatic structure of language, understanding language meaning and adopting alorgrithms to understand patterns and how language data relate. Campela (2016) observed that NPL can be applied in many ways and one of the techniques is sentiment analysis.

Sentiment Analysis

Sentiment analysis is one of the techniques of NPL used in determining the emotional tone or attitude conveyed by customers through text-based feedbacks such as reviews, tweets or survey responses helping organisations to further understand public opinion, customer satisfaction and brand reputation. It is wonderful tool that creates understanding.

Sentiment analysis serves as a transformative catalyst that empowers organisations to tap into the pulse of their customers' voices uncovering invaluable insights into their opinions, preferences and emotional nuances (Mmadueke, 2021). By harnessing this intelligence, businesses can propel data-driven decision-making, drive meaningful customer centric strategies and ultimately achieve elevated business outcomes.

Theoretical Review

Two theories are adopted in this study namely: the theory of cognitive linguistics and the theory of social constructionism.

Theory of Cognitive Linguistics

This theory took root from the work of George Lakoff and Ronald Langacker and it examined

how language reflects and shapes human cognition. The cognitive linguistics is a subfield of linguistics that explores the mental processes and cognitive structures underlying language use and it also examines how language is processed in the mind and its relationship with human perception, attention, memory and conceptualization. This theory aims to provide a more distinctive understanding of language acquisition, language use and language change by studying the cognitive structures and processes that underlie human communication.

This is validated by the assertion of Langacker and Lakoff (1987) that this theory emphasizes that linguistic structures are closely tied to cognitive processes such as perception, categorization, and reasoning. The researcher adopted this theory in this study because in the realm of NLP for sentiment analysis in social media, cognitive linguistics is relevant because it underscores the importance of conceptual frameworks and mental representations in understanding sentiment expression. Sentiments are not merely conveyed through isolated words but through complex cognitive schemas that shape how individuals perceive and communicate emotions online. For example, cognitive linguistics informs the design of sentiment analysis models that take into account, cognitive structures like metaphorical expressions and conceptual frames, enhancing their ability to accurately interpret sentiment in diverse social media contexts (Johnson-Laird, 1983).

Theory of Social Constructionism

Social constructionism, originally proposed by Berger and Luckmann (1966), posits that reality is socially constructed through language and shared meanings within social groups.

This theory is adopted in this study because it helps in our understanding that reality is not objective rather a product of social consensus and that knowledge is created and sustained through social interactions and shred meanings. It is also relevant here in the sense that it provides a framework for understanding how sentiments expressed in online discourse are influenced by social and cultural factors and it highlights the dynamic nature of language and sentiment, where interpretations can vary based on the context and community norms (Berger and Luckmann, 1966). According to (Gergen, 1999), certain sentiments may be amplified or downplayed depending on the community's shared beliefs and values, impacting the accuracy of sentiment analysis algorithms that must account for these nuances. This theory has implications for how we understand and address social issues, highlighting the importance of considering the social context and power dynamics involved in shaping our understanding of reality

Empirical Review

The following studies were examined in this study as adopted from Thomas (2024).

Hu and Liu (2004) aimed to develop a lexicon-based approach for sentiment analysis on

product reviews and online forums. They proposed a sentiment lexicon combined with linguistic rules to classify sentiment polarity in textual data from diverse domains. Their approach involved semantic analysis and sentiment scoring techniques. The study demonstrated the effectiveness of their lexicon-based approach in accurately identifying sentiment orientations across different domains, enhancing the understanding of consumer opinions and feedback. They recommended continuous updates and expansions of sentiment lexicons to capture evolving language trends and user-generated content effectively.

Go, Bhayani and Huang (2009) aimed to evaluate different machine learning algorithms for sentiment analysis on Twitter data. They implemented Support Vector Machines (SVMs), Naive Bayes, and Maximum Entropy classifiers to classify sentiment in a large dataset of Twitter posts. The study focused on comparing the accuracy and scalability of each algorithm. Their results showed that SVMs outperformed other algorithms in accurately categorizing sentiment, particularly in handling the noisy and dynamic nature of Twitter data. They suggested exploring ensemble learning techniques to further improve the robustness and adaptability of sentiment analysis models for social media applications.

Pak and Paroubek (2010) aimed to compare lexicon-based methods and machine learning approaches for sentiment analysis on Twitter. They utilized lexicon-based sentiment analysis and supervised machine learning algorithms to classify sentiment in a large Twitter corpus. They evaluated the effectiveness of each method in capturing sentiment nuances and handling noise typical of social media data. The study found that lexicon-based methods were effective for general sentiment trends but struggled with contextual complexities such as sarcasm and slang, where machine learning models showed higher accuracy. They suggested integrating lexicon-based approaches with machine learning techniques to enhance sentiment analysis performance on social media platforms.

Wang, Sun, Zhou, Zhao and Zhang (2011) aimed to analyze sentiment trends during political events on Sina Weibo, a Chinese microblogging platform. The researchers employed sentiment lexicons and topic modeling techniques to track sentiment shifts across different phases of political events. They analyzed large-scale data to understand public sentiment dynamics in real-time. They identified fluctuations in sentiment that correlated with key political events, reflecting changes in public perception and sentiment intensity over time. The study recommended integrating temporal sentiment analysis techniques into real-time monitoring systems to capture evolving public opinions during dynamic events.

Bollen, Mao and Zeng (2011) investigated the relationship between sentiment analysis of Twitter data and fluctuations in the stock market. The researchers analyzed sentiment on Twitter using the Google-Profile of Mood

States (GPOMS) and compared it with stock market movements to identify predictive patterns. They found a significant correlation between public sentiment on Twitter and subsequent movements in the stock market, suggesting the potential of sentiment analysis for financial forecasting. They proposed integrating sentiment analysis tools into financial trading algorithms to leverage real-time sentiment data for improved market prediction and risk management strategies.

Mohammad and Turney (2013) investigated sentiment analysis across multiple social media platforms using machine learning techniques. They applied Support Vector Machines (SVMs) and Naive Bayes classifiers to analyze sentiment in Twitter, Facebook, and online forums. Their approach involved building sentiment lexicons and evaluating sentiment polarity in diverse datasets. The study revealed significant variations in sentiment expression across different platforms, with Twitter displaying more polarized sentiment compared to Facebook and forums. They proposed developing platform-specific sentiment analysis models that account for unique linguistic features and user behaviors on each platform.

Tang, Wei, Yang, Zhou, Liu and Qin (2014) aimed to enhance sentiment classification on social media, specifically Twitter, using deep learning techniques. The researchers employed convolutional neural networks (CNNs) and recurrent neural networks (RNNs) to analyze sentiment from a large dataset of Twitter posts. They compared these deep learning models with traditional machine learning approaches. Their study demonstrated that CNNs and RNNs significantly outperformed traditional methods, achieving higher accuracy in sentiment classification tasks due to their ability to capture complex linguistic patterns and contextual information. They recommended further exploration into hybrid models combining CNNs and RNNs to improve sentiment analysis robustness across diverse social media contexts.

Methods

The study adopted a descriptive survey design. The researcher could not ascertain the total numbers of Lecturers and Students in tertiary institutions in northern Nigeria at the time of this study but went ahead and randomly selected 200 Lecturers and 200 Students from the Information and Computer Technology departments of different respondents giving a total of 400 respondents for the study. The instrument for data collection was Research-made questionnaire titled ''Impact and Challenges of Natural Language Processing" (ICNPL) which was adequately validated by three experts and the reliability co-efficient obtained at 0.82 by the cronbach alpha method. The questionnaire was adequately validated by three experts, two from information and computer technology and one from measurement and evaluation and the reliability index stood at 0.82 which proved the consistency of the items using the cronbach alpha method. The questionnaire comprised of two clusters of five question items each and was administered on the 400 Respondents

comprising of 200 Lecturers and 200 Students of information and computer technology department from different tertiary institutions in Northern Nigeria. Two research questions and two null hypotheses were postulated to guide the study. Mean score, mean set and aggregate mean sets were used in answering the research questions while the z-test statistics was adopted in testing the hypotheses.

Results

The results are presented in tables according to the research questions.

Research Question One

What are the impact of natural language processing for sentiment analysis on social media?

Table 1: The Mean Score of Information and Computer Technology Lecturers and Learners of Tertiary Institutions in Northern Nigeria on the Impact of Natural Language Processing for Sentiment Analysis on Social Media

S/N	Items	Lecturers		Learners				
		$\underline{x}_1$	SD_1	$\underline{x}_2$	SD_2	$\underline{Ax}$	ASD	Remarks
1.	NPL helps businesses understand customers' opinions and preferences to achieve data-driven decision making	2.69	0.89	2.65	0.88	2.67	0.89	Agreed
2.	NPL helps to make social media efficient by tracking, saving time and resources	2.81	1.04	2.57	0.83	2.69	0.96	Agreed
3.	Organisations gain competitive advantage through valuable market intelligence and analysis of competitors' social media	2.61	0.83	2.68	0.89	2.64	0.86	Agreed
4.	NPL can generate vast amount of data that leads to challenging analysis	2.38	0.71	2.45	0.73	2.42	0.72	Disagreed

5.	It helps in effective customer service by facilitating timely responses to customers concerns	2.87	1.05	2.61	0.83	2.74	0.94	Agreed
		2.67	0.90	2.59	0.83	2.63	0.87	

Table 1 presented the responses of Lecturers and Learners of the information and computer technology departments of tertiary institutions in northern Nigeria on the impact of natural language processing for sentiment analysis on social media. The result showed means scores of 2.67. 2.69, 2.64, 2.42 and 2.74 for items 1 to 5 respectively. Items 1, 2, 3 and 5 in table 1 scored above the 2.5 criterion mean while item 4 scored below it. This result revealed that the respondents agreed that all the items are the impact of natural language processing for sentiment analysis on social media in Nigeria except item 4 which they disagreed on. This implies that all the Lecturers and Learners gave full consent on items 1, 2, 3 and 5 but disagreed with item 4 as the an impact of natural language processing for sentiment analysis on social media in Nigeria.

Testing Hypothesis One

$H0_1$ There is no significant difference between the mean score of information and computer technology Lecturers and Learners in tertiary institutions in northern Nigeria on the impact of natural language processing for sentiment analysis on social media.

Table 2: Summary of z-test Analysis on the Mean Responses of Information and Computer Technology Lecturers and Learners in Tertiary Institutions in Northern Nigeria on the Impact of Natural Language Processing for Sentiment Analysis on Social Media.

Subjects	N=400	Mean	SD	Df	z-cal	z-critical	Decision
Lecturers	200	2.67	0.90	398	1.17	1.96	Accept
Learners	200	2.59	0.83				

The data on table 2 showed the summaries of the scores, means, standard deviations and the z-test of difference between the mean responses of Information and Computer Technology Lecturers and Learners in tertiary institutions in Northern Nigeria on the impact of natural language processing for sentiment analysis on social media. The result revealed that the z-test calculated value stood at 1.17 while the z-critical showed a higher value of 1.96, hence the null hypothesis was accepted. This

implies that both lecturers and learners are of the same view on the items in research question one of the study hence it is concluded that there is no significant difference between the mean rating of Information and Computer Technology Lecturers and Learners in Tertiary Institutions in Northern Nigeria on the impact of natural language processing for sentiment analysis on social media.

Research Question Two

What are the challenges of natural language processing for sentiment analysis on social media?

Table 3: The Mean Score of Information and Computer Technology Lecturers and Learners of Tertiary Institutions in Northern Nigeria on the Challenges of Natural Language Processing for Sentiment Analysis on Social Media

S/N	Items	Lecturers		Learners				
		$\underline{x}_1$	SD_1	$\underline{x}_2$	SD_2	$\underline{Ax}$	ASD	**Remarks**
6.	There are diverse languages, dialectics and regional variations in social media data posing big challenges for NLP algorithms.	2.72	0.90	2.66	0.88	2.69	0.89	Agreed
7.	Emojis and emotions convey sentiments but are difficult for NLP algorithms to interpret.	2.58	0.83	2.78	0.99	2.68	0.91	Agreed
8.	There are fake and misleading opinions in social media data that are challenging for accurate sentiment analysis	2.56	0.82	2.59	0.83	2.58	0.83	Agreed
9.	It is difficult to develop appropriate evaluation metrics for sentiment analysis in social media	2.69	0.89	2.65	0.87	2.67	0.88	Agreed
10.	There are ethical concerns like the issue of privacy and biases in analyzing sentiment in social media	2.70	0.90	2.66	0.88	2.68	0.89	Agreed
		2.65	0.87	2.67	0.89	2.66	0.88	

The responses of information and computer technology Lecturers and Learners of tertiary institutions in Northern Nigeria on the challenges of natural language processing for sentiment analysis on social media is displayed in table 3 above. A critical look at the result showed that all the items in table 3 recorded mean scores higher than the 2.5 critical value and this indicates that all the respondents

perfectly agreed to the fact that item numbers 6 to 10 are the challenges of natural language processing for sentiment analysis on social media.

Testing Hypothesis Two

HO_2: There is no significant difference between the mean score of information and computer technology Lecturers and Learners of tertiary institutions in northern Nigeria on the challenges of natural language processing for sentiment analysis on social media

Table 4: Summary of z-test Analysis on the Mean Responses of Information and Computer Technology Lecturers and Learners of Tertiary Institutions in Northern Nigeria on the Challenges of Natural Language Processing for Sentiment Analysis on Social Media

Subjects	N=400	Mean	SD	Df	z-cal	z-critical	Decision
Lecturers	200	2.65	0.87	398	1.18	1.96	Accept
Learners	200	2.67	0.89				

Table 4 above showed the summaries of the scores, means, standard deviations and the z-test of difference between the mean responses of Information and Computer Technology Lecturers and Learners of tertiary institutions in Northern Nigeria on the challenges of natural language processing for sentiment analysis on social media. The table showed that z-calculated is 1.18 while the z-critical is 1.96. Given that z-critical is higher than z-calculated, the null hypothesis is hereby accepted indicating that there is no significant difference on the mean rating of the Information and Computer Technology Lecturers and Learners of Information and Computer Technology Lecturers and Learners of tertiary institutions in Northern Nigeria hence they generally agree on items 6 to 10 as the challenges of natural language processing for sentiment analysis on social media.

Discussion of Findings

The study empirically examined the impact and challenges of natural language processing for sentiment analysis on social media. The first research question tried to establish the impact of natural language processing for sentiment analysis on social media. From the result in table 1, it was discovered that the ICT Lecturers and Learners responded positively with an average mean score of 2.63 which is exceeded the critical value of 2.5. With this, it then shows that they agreed to the fact that the various items in table 1 are the various ways

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that natural language processing impact on sentiment analysis on social media platforms. The above findings fell in line with Jomitian (1990) and also agreed with the view of Adeyemi (2013) and Obizue (2016) in their different observations that resource personnel and material as well as in policy implementation arc major barriers to natural language processing in Nigeria. Conversely, item no 4 which says that NPL can generate vast amount of data that leads to challenging analysis showed a low mean score of 2.42 indicating that the respondent did not consent on the point. Even though the respondents did not agree on this item, it also found favour with the findings of scholars like; Bollen, Mao and Zeng (2011), Akinwale and Olatunji (2019), Obizue and Obizue (2022) where they concluded that there are so much biased and misleading data in the social media that are challenging to sentiment analysis.

The second research question sought to determine the challenges facing natural language processing for sentiment analysis on social media. The result recorded an average mean score of 2.66 which is also above the critical value of 2.5. This position indicates that the respondents unanimously agreed on the challenges facing natural language processing for sentiment analysis on social media as listed in items 6 to 10. This result aligned with UNESCO (2005) which enumerated some of these listed in this study as the challenges of natural language processing in his assertion. This study result is also similar to and gained credence from the findings of Songotina and Esporete (2016), Okazaki, Andreu and Campo (20017), Olatunji and Abioye (2019), Obizue and Obizue (2022), in their various studies as they respectively observed that equal access to emerging technologies and digital education will help to enhance necessary foundations for sentiment analysis and the advancement of machine learning algorithms.

Conclusion

This paper has explored the multifaceted areas of natural language processing emphasizing both the impact and challenges associated with it. Generally, this study highlights the transformative impact of NLP on understanding human sentiment in the digital age, offering new avenues for research and application in fields ranging from market research and political analysis to public health and crisis management.

In conclusion, Natural Language Processing has revolutionalised sentiment analysis in social media by enabling computers to understand and interpret human language leading to numerous benefits with some challenges persisting.

Recommendations

Based on the findings in this study, the researcher therefore proffered the following recommendations;

1. NLP should be continuously updated to keep pace with incessant changes inherent with social media platforms

2. There should be continuous research in NLP and sentiment analysis so as to be acquainted what it takes to address emerging challenges

3. There is every need to improve on NLP techniques that will help in optimizing algorithms for efficiency and accuracy and better handle language complexities such as sarcasm and others.

4. Ethical considerations should be prioritized to ensure privacy and consent when collecting and analyzing social media data

5. Sentiment analysis methods and the findings should be clearly communicated to stakeholder

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