

Sentiment Analysis for Defence Ecosystem and Armed Forces

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Abstract: Today's battlefields extend far beyond physical terrain into the digital realm, where military operations are won or lost through the power of perception. This research dives deep into how Sentiment Analysis (SA) has become a game-changing intelligence asset for modern defence operations. When Russia invaded Ukraine in February 2022, an extraordinary sentiment shift among Ukrainians was observed in the public opinion. Analysis of public discourse on social media revealed a substantial transformation throughout the war with initial support for negotiations gradually giving way to increased resolve for continued resistance. This fundamentally altered the geopolitical understanding of Russia Ukraine war and brought about a significant pivot in military planning and diplomatic approaches. On 28 February 2025, three years later, an interaction between the President of United States, Donald Trump and Ukrainian President, Volodymyr Zelensky spiralled into a heated confrontation and a very public spat. One of the many fall outs of this incident was the significant spike in President Zelensky's approval ratings (69%) in Ukraine. This dramatic reversal, having deeply altered modern political outlook and military planning, has compelled strategists to rethink the brass tacks. The strategic impact of SA on conduct of military operations was further cemented during the Israel-Hamas conflict, where Israeli forces analysed over 400,000 Reddit conversations to identify emotional flashpoints and counter misinformation before it gained traction. The relevance of SA can be established by the statements of an anonymous Israeli intelligence officer: "The temperature of online conversations now matters as much as satellite imagery in modern warfare." As the operational landscape becomes increasingly asymmetrical the application of sentiment analysis in contemporary geopolitical theatres emerges as a substantial force multiplier, allowing defence strategies to shorten the OODA (Observe, Orient, Decide, Act) loop significantly. From Afghanistan to the South China Sea, military commanders increasingly rely on sentiment data to navigate complex operational environments. Integrating SA in the overall military decision making process will enable the armed forces to conduct proactive information dominance, neutralise adversarial narrative warfare and enhance strategic situational awareness. By dynamically recalibrating mission critical communication strategies, SA will transform from a passive intelligence tool to an active psychological operations (PsyOps) force multiplier. These capabilities allow military commanders to model potential adversarial decision trees, simulate cognitive reaction scenarios and develop multidimensional contingency frameworks that proactively neutralise emerging operational risks before they materialise in kinetic domains. This research unveils the strategic significance of SA as a paradigm shifting intelligence capability that redefines the modern battlespaces, demonstrating how armed forces that incorporate this will gain decisive advantages in both, battlefield operations and the equally crucial battle for public support. Defence Ecosystems and Armed Forces that master this emerging intelligence frontier can and will secure decisive advantages both across kinetic and informational domains.

Keywords: Sentiment analysis, Defence, AI, Information warfare, Geopolitics, Strategic decision-making, Public opinion, Military intelligence, Social media analytics

1. Introduction

1.1 Context

In the contemporary geopolitical landscape interspersed with rapid technological advancements and pervasive digital communication, the need to understand public sentiment regarding increasingly fluid international dynamics has never been so strong. The Russia Ukraine War (RUW) which escalated dramatically on February 24, 2022 emerged as a pivotal inflection point in modern warfare exemplifying how rapid digital communication can fundamentally reshape strategic doctrine and international policy dynamics. RUW transcended traditional military engagement, evolving into a complex, multi-dimensional confrontation that simultaneously unfolded across physical, diplomatic, and digital terrains. The humanitarian, political, and economic repercussions reverberated globally, fundamentally reconfiguring international strategic relationships and exposing the intricate interconnectedness of modern geopolitical systems.

Social media platforms like 'X' (formerly Twitter) have become key arenas for sentiment analysis, providing unprecedented real-time insights into collective psychological responses and strategic narratives. Analysis of Twitter data during the Russia Ukraine war revealed significant shifts in public sentiment over time (Shevtsov et al., 2022). As documented by Hakimov and Cheema (2024), examination of 1.5 million tweets across 60 languages demonstrated evolving narrative patterns with stance classification revealing 89% unsure, 7.3% pro-Ukraine, and 2.7% pro-Russia sentiment distributions globally (Figure 1). These sentiment shifts offered valuable

insights that helped defence strategists reconsider both military and diplomatic approaches, particularly in addressing information warfare campaigns that showed consistent narrative patterns across multiple regions. For defence strategists this shift offered critical insights, compelling a comprehensive re-evaluation of military and diplomatic strategies that extended far beyond traditional operational planning.

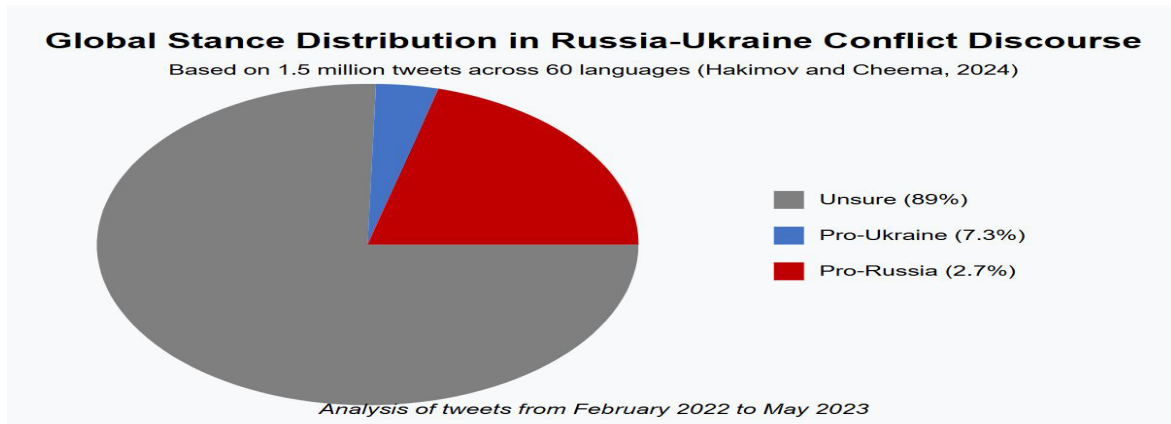


Figure 1: Global stance distribution of tweets in Russia Ukraine War

SA goes beyond simple opinion categorisation to provide nuanced insights that may influence strategic decisions and response planning. The process requires feature engineering and sophisticated machine learning algorithms to handle the vast amount of unstructured data, ultimately improving the accuracy of sentiment extraction. The IsamasRed dataset, with nearly 400,000 Reddit conversations about the Israel-Hamas conflict, helped track and identify controversial or emotionally charged content. This allowed Israeli forces to address misinformation through targeted information campaigns thereby displaying that narrative superiority is as critical as traditional kinetic capabilities. The application of SA transforms traditional communication strategies from unidirectional information dissemination to dynamic, responsive engagement mechanisms that prioritise public trust and strategic transparency, as evidenced in Figure 2. The Gallup poll visualised here illustrates a dramatic shift in U.S. public opinion of the Israeli offensive, underscoring how sentiment analysis can detect evolving public attitudes in near real-time, allowing defence and geopolitical actors to adapt narratives before perception gaps widen.

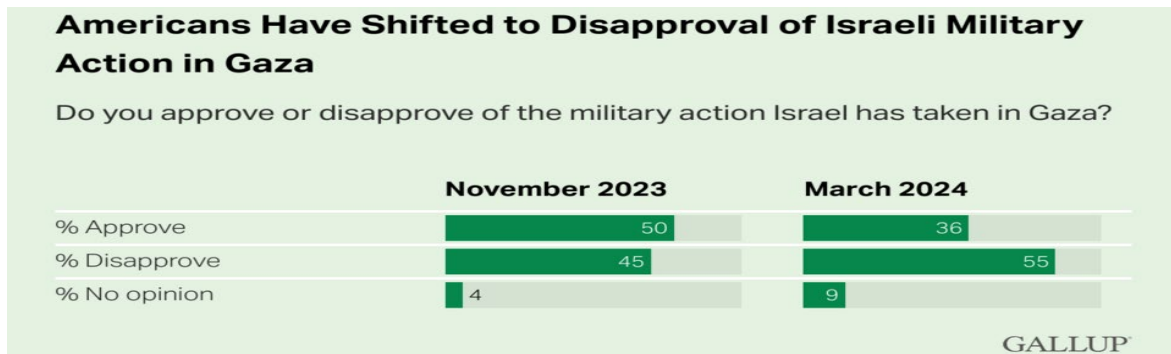


Figure 2: Gallup poll showing US change from majority approval to majority disapproval of Israeli offensive

1.2 Research Methodology

The research architecture integrates theoretical analysis and methodological triangulation-based experiments creating an understanding of sentiment analysis applications in military contexts. The research framework addressed several identified gaps in the existing literature: Contextual Relevance—current sentiment analysis research has insufficiently addressed linguistic diversity and specific geopolitical dynamics; Practical Insights—limited studies on sentiment analysis integration into military operations has delayed understanding and adoption; Defence Specific Focus—the scarcity of documented use cases for armed forces applications has constrained institutional knowledge transfer. By integrating literature-based insights with military knowledge, this research bridges the gap between academic sentiment analysis research and defence applications. The aim is to use these advancements to enhance strategic application, ensuring defence ecosystem is equipped with cognitive domain awareness capabilities commensurate with emerging hybrid warfare challenges.

2. Various Approaches of Sentiment Analysis

Sentiment analysis uses natural language processing and computational algorithms to assess opinions and sentiments. Here, we explore the main approaches and applications for defence ecosystem.

2.1 Rule-Based Approach

Rule-based sentiment analysis is a foundational approach that relies on predefined linguistic rules to classify text sentiments. It employs computational techniques such as stemming, tokenisation, and parsing. Sentiment classification typically depends on the frequency of positive and negative terms in text.

Defence Application: In military communications, rule-based systems can provide initial insights into public sentiment regarding operational reports or policy announcements.

Limitation: These systems often struggle with complex sentence structures, sarcasm, and contextual nuances, limiting their effectiveness in real-world scenarios.

2.2 Machine Learning Approach

This approach treats sentiment classification as a machine learning problem. Models learn associations between input text and sentiment labels from training data. Feature extraction techniques, such as bag-of-words and word embeddings, transform text into numerical vectors, enabling accurate classifications.

Defence Application: This approach can monitor large-scale social media discussions, identifying trends and risks in real time.

Strength: Automated methods handle unstructured data better than rule-based systems, making them more reliable for operational use.

Limitation: Accuracy heavily depends on the quality and diversity of training data.

2.3 Hybrid Approach

Hybrid approaches combine rule-based and machine learning methods to offset individual limitations and enhance sentiment classification.

Defence Application: In nuanced contexts like military intelligence, hybrid approaches can analyse structured and unstructured language more effectively thereby ensuring actionable insights.

2.4 Deep Learning and Advanced Models

Deep learning, particularly transformer-based models like BERT(Bidirectional Encoder Representations from Transformers), has revolutionised sentiment analysis. These models use self-attention mechanisms to process complex and context-rich text.

Defence Application: BERT's bidirectional text analysis can be used for interpreting international communications or intelligence reports where sentiment intricacies carry strategic implications.

2.5 Domain-Specific and Multimodal Analysis

Domain-specific sentiment analysis is a tailored approach to specialised contexts, such as defence operations. It often incorporates jargon and operational language to improve model relevance.

Multimodal Analysis: This integrates text, audio, and visual data to provide comprehensive sentiment profiles.

Defence Application: Analysts can monitor sentiment during public addresses or on social media using multimodal tools to understand both verbal and non-verbal cues.

To operationalise sentiment analysis within the defence ecosystem, this research introduces a structured, mission-oriented analytical framework tailored to the demands of modern battlespaces. As illustrated in Figure 3, the proposed three-phase framework, comprising of Data Gathering, Processing and Analysis offers a phased approach for converting raw sentiment data into actionable intelligence.

Sentiment Analysis Framework for Defence Applications



Figure 3: Three-Phase Sentiment Analysis Framework for Defence Applications

3. Sentiment Analysis Tools

3.1 VADER (Valence Aware Dictionary and sEntiment Reasoner)

VADER is a rule-based sentiment analysis tool designed for social media and informal text that can process slang, abbreviations and emojis. This makes it ideal for tracking real-time sentiments on digital platforms.

Military Application: VADER can work particularly well for monitoring sentiments around policy changes or international peacekeeping missions. By tracking social media, military analysts can anticipate public reactions and address misinformation before it escalates.

3.2 Hugging Face Transformers

Hugging Face transformers are state-of-the-art NLP libraries that support models such as BERT, RoBERTa and GPT which excel at processing context-rich languages and understanding nuanced sentence structures.

Military Application: These models can process classified intelligence and public communications, offering nuanced sentiment insights that can influence military decision making and diplomatic strategies.

3.3 IBM Watson Natural Language Understanding (NLU)

IBM Watson NLU offers comprehensive text analysis capabilities including sentiment and emotion detection, keyword extraction and contextual analysis. It's designed for large-scale, detailed sentiment analysis and can be customised for domain specific use.

Military Application: IBM Watson can analyse intelligence reports, diplomatic statements and large-scale media content, helping military leaders anticipate potential reactions and adjust strategies accordingly.

3.4 Microsoft Text Analytics

Microsoft Text Analytics, part of Azure Cognitive Services provides scalable sentiment analysis, key phrase extraction and language detection. It works particularly well when integrated with Azure-based projects.

Military Application: This tool can continuously monitor news and social media, aiding rapid response to public sentiment during military deployments or policy announcements.

3.5 Custom-Built Solutions with Python and Machine Learning

Custom-built sentiment analysis solutions using Python and frameworks such as TensorFlow and PyTorch offer unmatched flexibility for defence agencies requiring specialised models. These solutions can incorporate military specific jargons and regional dialects for comprehensive sentiment analysis.

Military Application: Custom solutions can process various data types from OSINT (Open Source Intelligence) and public communications to encrypted military transmissions. They can include context specific features such as sarcasm detection and in-depth sentiment interpretation.

The integration of sentiment analysis into defence operations fundamentally alters the strategic calculus of military planning and execution. As visualised in Figure 4, the operational impact of SA extends across multiple domains, from pre-mission sentiment mapping and real-time influence monitoring to post-action perception

analysis. This schematic captures how SA acts as a force multiplier by compressing the OODA (Observe Orient Decide Act) loop, enhancing narrative dominance and enabling anticipatory information manoeuvre.

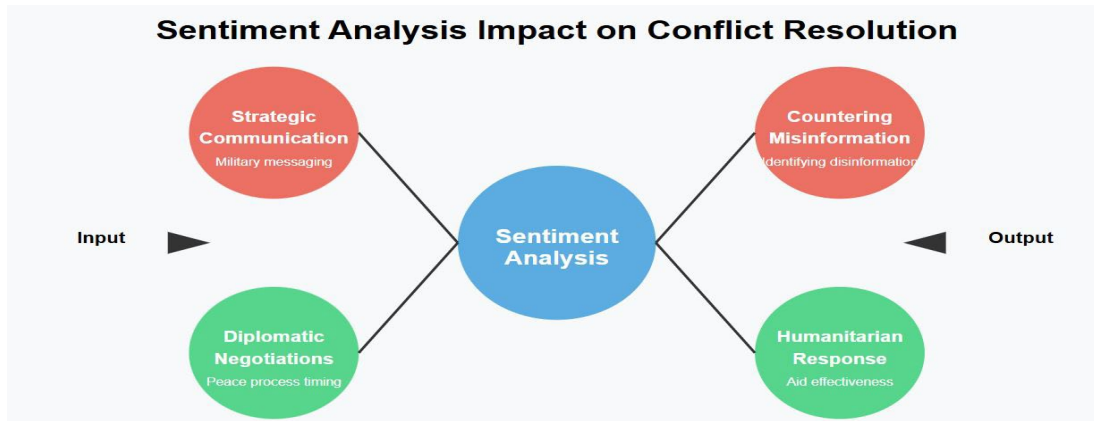


Figure 4: Impact of Sentiment Analysis on Military Operations

4. Notable Use Cases

4.1 Russia-Ukraine War

Sentiment analysis of the Russia-Ukraine war revealed critical geopolitical insights that influenced strategic decision-making. Analysis detected a significant shift in Ukrainian public sentiment throughout the conflict timeline (Chen and Ferrara, 2023). As depicted in Figure 5, while support for continued resistance remained the predominant sentiment through subsequent phases of the war, negotiation support gradually increased as hostilities protracted. Various think tanks such as the International Republican Institute documented how public discourse evolved from initially favouring fight until victory to increasingly supporting a call for diplomatic solutions and finally pivoting towards continued resistance as the conflict progressed. A survey by Kyiv International Institute of Sociology released in March 2025 revealed a significant spike in President Zelensky’s approval ratings post the oval office confrontation, gaining traction from a mere 52% in December 2024 to a substantial 69% in March 2025.

As a result of application in Russia Ukraine War, sentiment analysis has become an integral component of strategic intelligence, providing commanders with near real-time tracking of information warfare campaigns and public opinion trends which ultimately affect operational planning in a significant way. Additionally, sentiment patterns across different regions revealed divergences between official government positions and public opinion, particularly in Eastern European countries where public sentiment was more pro-Ukraine than what the government policy initially indicated. These findings demonstrate how sentiment analysis provides a real-time barometer of public perception that serves as a vital intelligence source for shaping diplomatic approaches, military strategies and information warfare tactics.

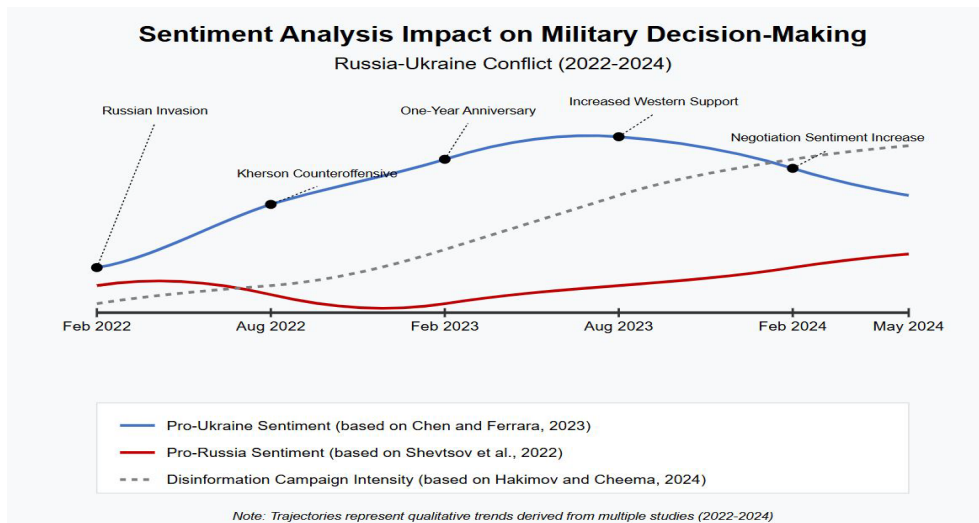


Figure 5: Sentiment Analysis Timeline and Geopolitical Implications in the Russia-Ukraine War

4.2 Israel-Hamas War

The October 2023 escalation between Hamas and Israel created not just a battlefield crisis but also a global information war fought across social media platforms. Analysis using deep learning techniques (Liyih et al., 2024) of over 24,000 YouTube comments revealed striking insights into public perception with implications for military strategy and diplomatic engagement. The distribution showed a predominance of negative sentiment (46%), followed by positive (31%) and neutral (23%) reactions, reflecting the polarised global discourse surrounding the conflict (Figure 6).

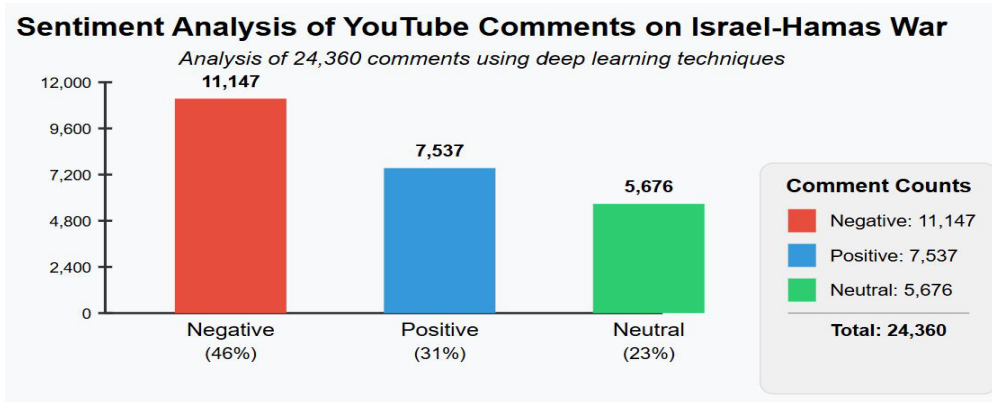


Figure 6: Analysis of 24,360 YouTube comments on the Israel-Hamas War

This sentiment landscape shaped military and diplomatic approaches in a significant manner. Israeli defence forces reportedly monitored social media sentiment to identify contentious narratives and deploy targeted counter-messaging campaigns. Meanwhile, Israeli humanitarian organisations tracked sentiment shifts to time aid announcements for maximum impact and public support. Perhaps most critically, sentiment analysis provided early warning signals of disinformation campaigns. Sharp spikes in negative sentiment often preceded or coincided with the spread of unverified claims, allowing security agencies to identify and counter false narratives before they gained traction. The study of 5000 Google News headlines involving sentiment analysis performed through a supervised machine learning algorithm in which logistic regression was used to classify the sentiments into positive, negative, or neutral was conducted by Razaq & Naeem (2024). The impact analysis exposed a clear prevalence of the neutral affect displayed with a more extensive ratio of negative affect compared to the positive one.

Sentiment Analysis of Israel-Hamas war establishes a significant evolution in public perception over time (Figure 7). Research examining social media comments and news headlines demonstrates initial public discourse gravitating towards substantial support to Israel’s position which gradually pivoted away amid growing humanitarian concerns. Studies by Liyih et al. (2024) and Razaq & Naeem (2024) show how digital platforms become primary battlegrounds for competing narratives with sentiment analysis revealing patterns of misinformation and counter-messaging campaigns. This analysis clearly underscores how public perception has become a dynamic, real time geopolitical intelligence source, fundamentally reshaping how international conflicts are perceived and responded to. This case demonstrates how AI-powered sentiment analysis has evolved from academic exercise to essential strategic tool in modern information warfare, shaping military decisions, diplomatic initiatives and ultimately, paths to possible conflict resolution.

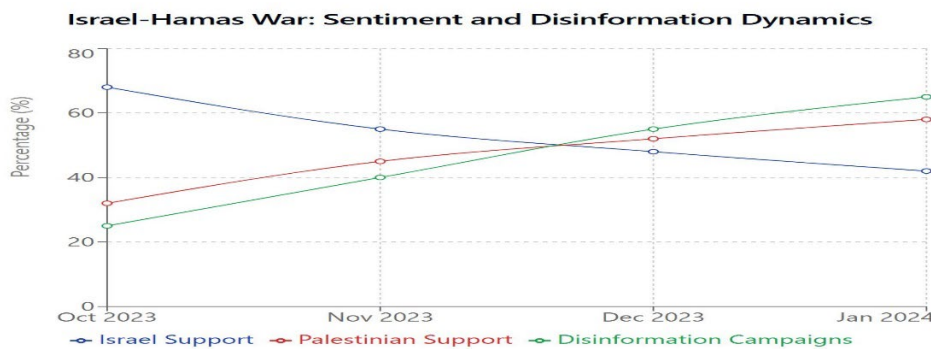


Figure 7: Visualisation of sentiment shifts and disinformation trends during the Israel-Hamas conflict

4.3 Indian Armed Forces: Agnipath Scheme

Twitter sentiment analysis of India's Agnipath military recruitment scheme revealed surprising insights that challenge prevailing media narratives. Examining 4,000 tweets, researchers discovered substantial public support despite mainstream coverage focusing on protests. As depicted in Figure 8, the VADER sentiment analysis tool demonstrated that while most tweets (86.4%) expressed neutral sentiments, positive reactions (9.4%) notably outweighed negative ones (4.2%), contradicting the predominant narrative of widespread rejection (Sajwan et al., 2023).

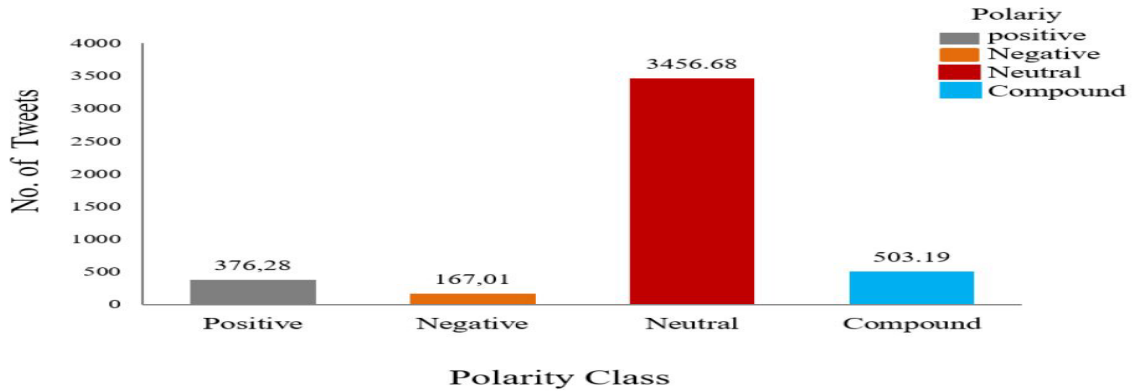


Figure 8: Sentiment Analysis of over 4000 tweets with #Agnipath

For this research, we conducted a controlled sentiment analysis experiment to examine public stance regarding the Agnipath scheme beyond traditional survey methods, using carefully selected tweets representing diverse perspectives on the military recruitment policy. The analysis employed three complementary approaches: rule-based VADER sentiment analyser, Hugging Face's transformer-based model, and a novel hybrid method combining both techniques for enhanced accuracy. Manual content analysis of the dataset revealed a balanced distribution (35% positive, 35% negative, 30% neutral), while the advanced computational methods showed slightly higher positive sentiment. The VADER analysis detected 45% positive sentiment compared to 35% negative and 20% neutral expressions, while the Hugging Face model indicated an even 40-40-20 split. The hybrid approach, which leveraged strengths from both methods, yielded the most refined results with 45% positive, 40% negative, and 15% neutral classifications (Figure 9).

These findings align with the large-scale Twitter analysis by Sajwan et al., 2023, confirming that despite media portrayal of widespread opposition, public sentiment toward the Agnipath scheme is certainly favourable. This methodological triangulation demonstrates how sentiment analysis can offer defence strategists a more nuanced understanding of public opinion than traditional media monitoring alone, providing valuable intelligence for strategic communication and policy refinement.

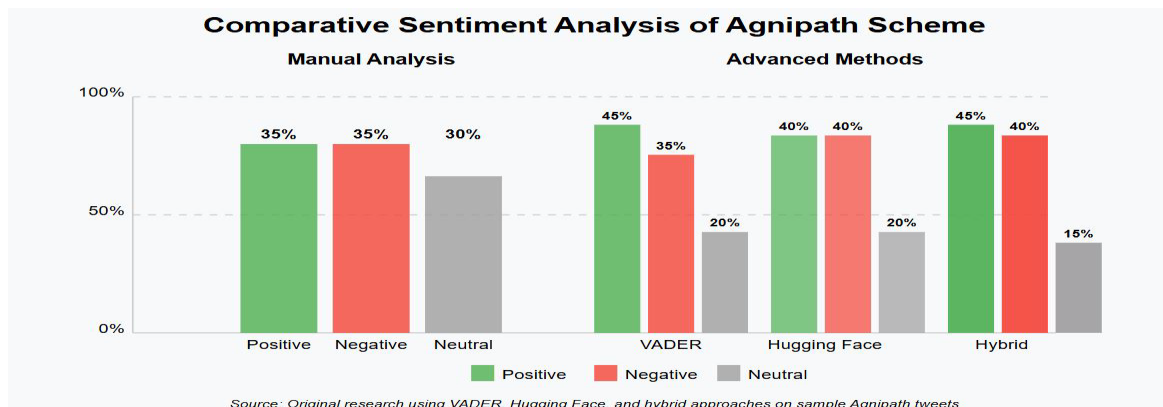


Figure 9: Comparative Sentiment Analysis bringing out Hybrid Approach as most accurate

5. Future of Sentiment Analysis

5.1 Future and Technological Advancements

The future of sentiment analysis looks promising with rapid advancements in artificial intelligence and natural language processing. Emerging technologies such as transformer-based models, including BERT and GPT-4, offer significant improvements in accuracy and scalability. These advancements enable more nuanced sentiment detection, particularly in multilingual and multimodal contexts. Real-time sentiment tracking, coupled with predictive analytics, is likely to revolutionise military intelligence and public relations. Moreover, advancements in SA are making it increasingly possible to analyse data from diverse media formats, including audio and video, expanding its applicability in psychological operations and crisis management.

5.2 Collaborative Efforts

Collaboration between armed forces, government, industry and academia is essential to overcome existing challenges and fully realise the potential of SA. Governments worldwide, including India, are beginning to recognise the importance of fostering such partnerships to develop indigenous capabilities tailored to their unique socio-political and linguistic landscapes. For instance, India's Defence Research and Development Organisation (DRDO) has initiated collaborations with technology firms and academic institutions to develop AI-driven sentiment analysis tools.

5.3 Ethical and Regulatory Considerations

The operational use of sentiment analysis in defence contexts raises critical concerns around data privacy, AI bias and the potential for information manipulations. While global frameworks like the EU AI Act and NATO's ethical AI guidelines exist, domain-specific regulation for military sentiment analysis remains underdeveloped. Integrating oversight mechanisms, transparent audit trails and culturally adaptive models is essential to ensure lawful, ethical and mission-aligned deployment of sentiment analysis capabilities in the cognitive battlespace. Key considerations for integration of SA into defence ecosystem are outlined below:

- **Data Privacy and Civil Liberties** Leveraging open-source sentiment data requires strict safeguards to prevent unintended breaches of privacy, especially in civilian digital ecosystems.
- **Algorithmic Bias and Operational Integrity** Models trained on culturally skewed or imbalanced data may misclassify sentiment, resulting in distorted operational assessments.
- **Potential for Misuse and Information Manipulation** SA tools, if misapplied, could influence narratives disproportionately or undermine public confidence, particularly in domestic geopolitical scenarios.

5.4 Challenges and Opportunities

While the potential of sentiment analysis is vast, challenges persist. Key limitations include:

- **Linguistic Diversity:** The need for robust multilingual models capable of handling regional dialects and linguistic nuances remains a critical challenge, especially in linguistically diverse countries like India.
- **Data Quality and Noise:** Unstructured and noisy data from social media and other sources can significantly hinder the accuracy of sentiment analysis models.
- **Computational Complexity:** High resource requirements for training and deploying advanced AI models can limit their adoption, particularly in resource-constrained environments.

5.5 Vision Ahead

By addressing current limitations and leveraging technological advancements this field can provide invaluable insights to support national security, public relations and crisis management. Defence agencies must adopt a proactive approach, investing in research, infrastructure and ethical governance to ensure that SA becomes a cornerstone of their strategic toolkit.

Ethics Declaration: This research was conducted in accordance with ethical guidelines. No ethical clearance was needed for the research referred to in this paper.

AI Declaration: AI tools such as Language Models were used for creating visualisations, format editing, structuring of research, language translation and ensuing paraphrasing of certain sections. All AI generated content was verified and reviewed by authors to ensure integrity. This research work is the original work of the authors and for which they remain responsible.

References

- Chen, E. and Ferrara, E. (2023) 'Tweets in Time of Conflict: A Public Dataset Tracking the Twitter Discourse on the War between Ukraine and Russia', *Proceedings of the Seventeenth International AAAI Conference on Web and Social Media*, 17(1), pp. 1006-1013.
- Hakimov, S. and Cheema, G. S. (2024) 'Unveiling Global Narratives: A Multilingual Twitter Dataset of News Media on the Russo-Ukrainian Conflict', *Proceedings of the 2024 International Conference on Multimedia Retrieval (ICMR '24)*, Association for Computing Machinery, New York, pp. 1160-1164. doi: 10.1145/3652583.3657622.
- Liyih, A., Anagaw, S., Yibeyin, M. et al., 2024. Sentiment analysis of the Hamas-Israel war on YouTube comments using deep learning. *Scientific Reports*, 14, pp.13647. Metzger, M. (2020) 'Exploring multimodal sentiment analysis for psychological operations', *Military Psychology*, 32(2), pp. 120-135.
- Razaq, M. U. & Naeem, N. 2024. Corpus-Assisted Sentiment Analysis of News Headlines on Palestine-Israel Conflict: A Computational Approach. *Global Foreign Policies Review*, VII, 59-67.
- Sajwan, V., Awasthi, M., Goel, A. and Sharma, P., 2023. Sentiment analysis of Twitter data regarding the agnipath scheme of the defense forces. *Indonesian Journal of Electrical Engineering and Computer Science*, 30(3), pp.1643-1650.
- Shevtsov, A., Tzagkarakis, C., Antonakaki, D., Pratikakis, P. and Ioannidis, S. (2022) 'Twitter Dataset on the Russo-Ukrainian War', *arXiv:2204.08530v1* [cs.SI].