the peak of political events. By March 2024, despite the peak of political contests, negative sentiment remained dominant, illustrating the lasting impact of controversies and media portrayals on public opinion.

While the combination of FastText and the GNN model achieved an accuracy of 72%, capturing these temporal sentiment shifts, it faced challenges in interpreting complex language elements such as sarcasm, irony, and contextdependent expressions, which are common in political discourse. These linguistic subtleties affected the model's ability to fully understand and classify sentiment, limiting its effectiveness in accurately reflecting the dynamics of public opinion.

This study contributes to the field of sentiment analysis by applying advanced computational techniques to political sentiment, offering insights into how sentiment evolves over time and is influenced by political and social events. Future research could focus on expanding the dataset to include a broader array of political figures and languages, as well as exploring hybrid models that combine GNNs with other deep learning techniques to improve sentiment classification accuracy. Furthermore, more attention to contextual understanding and the integration of multimodal data, including images and video, could further enhance sentiment analysis models in capturing the full scope of public opinion.

REFERENCES

- W. S. Maitri *et al.*, "Recent Trends in Social Media Marketing Strategy," *Jurnal Minfo Polgan*, vol. 12, no. 2, 2023, doi: 10.33395/jmp.v12i2.12517.
- [2] I. Modifa Tarigan, M. Ade Kurnia Harahap, D. Mayang Sari, R. Dara Sakinah, and A. Muna Almaududi Ausat, "Understanding Social Media: Benefits of Social Media for Individuals".
- S. Larson, "Social Media Users 2024 (Global Data & Statistics)," Priori Data. Accessed: Jun. 29, 2024. [Online]. Available: https://prioridata.com/data/social-media-usage/
- [4] C. Robertson, "Here's what our research says about news audiences on Twitter, the platform now known as X," Reuters Institute for the Study of Journalism. Accessed: Jun. 29, 2024. [Online]. Available: https://reutersinstitute.politics.ox.ac.uk/news/heres-what-ourresearch-says-about-news-audiences-twitter-platform-now-known-x
- [5] "Leading countries based on number of X (formerly Twitter) users as of April 2024," Statista Research Department. Accessed: Jun. 29, 2024. [Online]. Available: https://www.statista.com/statistics/242606/number-of-activetwitter-users-in-selected-countries/
- [6] L. Zhao, S. Sen Gupta, A. Khan, and R. Luo, "Temporal analysis of the entire ethereum blockchain network," in *The Web Conference* 2021 - Proceedings of the World Wide Web Conference, WWW 2021, Association for Computing Machinery, Inc, Apr. 2021, pp. 2258– 2269. doi: 10.1145/3442381.3449916.
- [7] C. M. Garcia, A. de S. Britto, and J. P. Barddal, "Temporal analysis of drifting hashtags in textual data streams: A graph-based application," *Expert Syst Appl*, vol. 257, Jan. 2024, doi: 10.1016/j.eswa.2024.125007.
- [8] M. Vivek and B. R. Prathap, "Spatio-temporal Crime Analysis and Forecasting on Twitter Data Using Machine Learning Algorithms," *SN Comput Sci*, vol. 4, no. 4, Jul. 2023, doi: 10.1007/s42979-023-01816-y.
- [9] M. Ilham and A. Laksito, "Comparative Analysis of Using Word Embedding in Deep Learning for Text Classification," *Jurnal Riset Informatika*, vol. 5, no. 2, pp. 195–202, Mar. 2023.
- [10] L. Yao, C. Mao, and Y. Luo, "Graph Convolutional Networks for Text Classification." [Online]. Available: www.aaai.org

- [11] R. Hershman, D. Milshtein, and A. Henik, "The contribution of temporal analysis of pupillometry measurements to cognitive research," *Psychol Res*, vol. 87, no. 1, pp. 28–42, Feb. 2023, doi: 10.1007/s00426-022-01656-0.
- [12] P. Mirza and S. Tonelli, "PhD Dissertation International Doctorate School in Information and Communication Technologies Extracting Temporal and Causal Relations between Events," 2016.
- [13] S. S. and P. K.V., "Sentiment analysis of malayalam tweets using machine learning techniques," *ICT Express*, vol. 6, no. 4, pp. 300– 305, Dec. 2020, doi: 10.1016/j.icte.2020.04.003.
- [14] S. Shumaly, M. Yazdinejad, and Y. Guo, "Persian sentiment analysis of an online store independent of pre-processing using convolutional neural network with fastText embeddings," *PeerJ Comput Sci*, vol. 7, pp. 1–22, Mar. 2021, doi: 10.7717/peerj-cs.422.
- [15] J. Wu, M. Wen, R. Lu, B. Li, and J. Li, "Toward efficient and effective bullying detection in online social network," *Peer Peer Netw Appl*, vol. 13, no. 5, pp. 1567–1576, Sep. 2020, doi: 10.1007/s12083-019-00832-1.
- [16] M. A. Riza and N. Charibaldi, "Emotion Detection in Twitter Social Media Using Long Short-Term Memory (LSTM) and Fast Text," *International Journal of Artificial Intelligence & Robotics (IJAIR)*, vol. 3, no. 1, pp. 15–26, May 2021, doi: 10.25139/ijair.v3i1.3827.
- [17] C. Murphy, E. Laurence, and A. Allard, "Deep learning of contagion dynamics on complex networks," *Nat Commun*, vol. 12, no. 1, Dec. 2021, doi: 10.1038/s41467-021-24732-2.
- [18] K. Wang, Y. Ding, and S. C. Han, "Graph neural networks for text classification: a survey," *Artif Intell Rev*, vol. 57, no. 8, Aug. 2024, doi: 10.1007/s10462-024-10808-0.
- [19] Y. Li and N. Li, "Sentiment Analysis of Weibo Comments Based on Graph Neural Network," *IEEE Access*, vol. 10, pp. 23497–23510, 2022, doi: 10.1109/ACCESS.2022.3154107.
- [20] F. Sudirjo, K. Diantoro, J. A. Al-Gasawneh, H. Khootimah Azzaakiyyah, and A. M. Almaududi Ausat, "Application of ChatGPT in Improving Customer Sentiment Analysis for Businesses," *Jurnal Teknologi Dan Sistem Informasi Bisnis*, vol. 5, no. 3, pp. 283–288, Jul. 2023, doi: 10.47233/jteksis.v5i3.871.
- [21] W. M. S. Yafooz, "Enhancing Business Intelligence with Hybrid Transformers and Automated Annotation for Arabic Sentiment Analysis," 2024. [Online]. Available: www.ijacsa.thesai.org
- [22] R. Alhejaili, E. Alhazmim, A. Alsaeedi, and W. Yafooz, "Sentiment Analysis of The Covid-19 Vaccine For Arabic Tweets Using Machine Learning," 9th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions), pp. 1–5, Nov. 2021.
- [23] M. Bhat, M. Qadri, N. ul A. Beg, M. Kundroo, N. Ahanger, and B. Agarwal, "Sentiment analysis of social media response on the Covid19 outbreak," Jul. 01, 2020, Academic Press Inc. doi: 10.1016/j.bbi.2020.05.006.
- [24] H. Satria, "Tweet Harvest (Twitter Crawler)," May 20, 2024, 2.6.1. Accessed: Jul. 13, 2024. [Online]. Available: https://github.com/helmisatria/tweet-harvest
- [25] T. Magajna, *Natural Language Processing with Flair*. Packt Publishing, 2022.
- [26] V. R. Joseph and A. Vakayil, "SPlit: An Optimal Method for Data Splitting," *Technometrics*, vol. 64, no. 2, pp. 166–176, 2022, doi: 10.1080/00401706.2021.1921037.
- [27] N. Shabani *et al.*, "A Comprehensive Survey on Graph Summarization With Graph Neural Networks," *IEEE Transactions* on Artificial Intelligence, vol. 5, no. 8, pp. 3780–3800, 2024, doi: 10.1109/TAI.2024.3350545.
- [28] Y. Wang, Y. Sun, Z. Liu, S. E. Sarma, M. M. Bronstein, and J. M. Solomon, "Dynamic graph Cnn for learning on point clouds," ACM Trans Graph, vol. 38, no. 5, Oct. 2019, doi: 10.1145/3326362.
- [29] J. Khatib Sulaiman Dalam No and M. Rizki Nurfiqri, "The Performance Analysis of Graph Neural Network (GNN) and Convolutional Neural Network (CNN) Algorithms for Cyberbullying Detection in Twitter Comments," *Indonesian Journal* of Computer Science.
- [30] F. Chollet, Deep Learning with Python, Second Edition, 2nd ed. Simon and Schuster, 2021.