komentar dalam struktur grafis. Namun, juga dapat diamati bahwa CNN lebih lemah dibandingkan dengan SVM, dengan akurasi sebesar 71,25%. Namun, dibandingkan dengan GNN, SVM juga lebih lemah.

Meningkatkan jumlah epochs dalam GNN mengarah pada peningkatan kinerja, seperti yang ditunjukkan oleh hasil eksperimental peningkatan akurasi, presisi, recall, dan f1-score dengan iterasi pelatihan yang meningkat. Pada **Tabel 2** hasil eksperimen dengan 20 epochs, akurasi berada pada 80,25%, sedangkan dengan 200 epochs, meningkat menjadi 92,78%. Namun, peningkatan waktu komputasi menjadi pertimbangan dalam memilih jumlah epochs yang optimal. Studi ini menegaskan superioritas GNN dalam mendeteksi *Cyberbullying* dibandingkan dengan CNN, serta pentingnya penyesuaian parameter pelatihan seperti jumlah epochs untuk mencapai kinerja optimal dalam konteks yang bervariasi.

DAFTAR PUSTAKA

[1]   "THE CHANGING WORLD OF DIGITAL IN 2023," we are social . Accessed: May 24, 2024. [Online]. Available: https://wearesocial.com/id/blog/2023/01/the-changing-world-of-digital-in-2023-2/

[2]   Monavia Ayu Rizaty, "Pengguna Internet di Indonesia Sentuh 212 Juta pada 2023," DataIndonesia. Accessed: Nov. 22, 2023. [Online]. Available: https://dataindonesia.id/internet/detail/penggunainternet-di-indonesia-sentuh-212-juta-pada-2023

[3]   E. Merdan, "The Ugly Face of the Digital World," 2022, pp. 489–505. doi: 10.4018/978-1-7998-91871.ch021.

[4]   B. P. Hendry, L. ann M. Hellsten, L. J. McIntyre, and B. R. R. Smith, "Recommendations for *Cyberbullying* prevention and intervention: A Western Canadian perspective from key stakeholders," *Front Psychol*, vol. 14, 2023, doi: 10.3389/fpsyg.2023.1067484.

[5]   Shubham Bharti, Arun Kumar Yadav, Mohit Kumar, and Divakar Yadav, "*Cyberbullying* detection from tweets using deep learning," *Cyberbullying detection from tweets using deep learning*, Jul. 2021, Accessed: Nov. 22, 2023. [Online]. Available: https://www.emerald.com/insight/content/doi/10.1108/K-01-2021-0061/full/html

[6]   Sophia Bernazzani, "How *Twitter* Is Fighting Harassment & Cyberbullying," Hubspor. Accessed: Nov. 23, 2023. [Online]. Available: https://blog.hubspot.com/marketing/*Twitter*-harassment-cyberbullying

[7]   J.-M. Xu, K.-S. Jun, X. Zhu, and A. Bellmore, "Learning from Bullying Traces in Social Media." Accessed: Apr. 28, 2024. [Online]. Available: https://aclanthology.org/N12-1084

[8]   D. Sultan *et al.*, "A Review of Machine Learning Techniques in *Cyberbullying* Detection," *Computers, Materials and Continua*, vol. 74, no. 3. Tech Science Press, pp. 2625–2640, 2023. doi: 10.32604/cmc.2023.033682.

[9]   B. A. Talpur and D. O'Sullivan, "*Cyberbullying* severity detection: A machine learning approach," *PLoS One*, vol. 15, no. 10 October, Oct. 2020, doi: 10.1371/journal.pone.0240924.

[10]   A. Bouliche and A. Rezoug, "Detection of *Cyberbullying* in Arabic social media using dynamic *Graph Neural Network*," 2022. [Online]. Available: http://ceur-ws.org

[11]   A. Alhlou and A. Alam, "Bullying Tweets Detection using CNN- Attention," *International Journal on Cybernetics & Informatics*, vol. 12, no. 1, pp. 1–14, Jan. 2023, doi: 10.5121/ijci.2023.120106.

[12]   Vaigai College of Engineering and Institute of Electrical and Electronics Engineers, *Proceedings of the International Conference on Intelligent Computing and Control Systems (ICICCS 2020) : 13-15 May, 2020*.

[13]   S. Indolia, A. K. Goswami, S. P. Mishra, and P. Asopa, "Conceptual Understanding of *Convolutional Neural Network*- A Deep Learning Approach," in *Procedia Computer Science*, Elsevier B.V., 2018, pp. 679–688. doi: 10.1016/j.procs.2018.05.069.

[14]   J. M. Vaz and S. Balaji, "*Convolutional Neural Network*s (CNNs): concepts and applications in pharmacogenomics," *Mol Divers*, vol. 25, no. 3, pp. 1569–1584, Aug. 2021, doi: 10.1007/s11030-02110225-3.

[15]   A. Khan, A. Sohail, U. Zahoora, and A. S. Qureshi, "A survey of the recent architectures of deep *Convolutional Neural Network*s," *Artif Intell Rev*, vol. 53, no. 8, pp. 5455–5516, Dec. 2020, doi: 10.1007/s10462-020-09825-6.

[16]   R. Alshalan and H. Al-Khalifa, "A Deep Learning Approach for Automatic Hate Speech Detection in the Saudi *Twitter*sphere," *Applied Sciences*, vol. 10, no. 23, p. 8614, Dec. 2020, doi: 10.3390/app10238614.

[17]   X. Ma *et al.*, "A Comprehensive Survey on Graph Anomaly Detection with Deep Learning," *IEEE Trans Knowl Data Eng*, 2021, doi: 10.1109/TKDE.2021.3118815.

[18]   J. Zhou *et al.*, "*Graph Neural Network*s: A review of methods and applications," *AI Open*, vol. 1. Elsevier B.V., pp. 57–81, Jan. 01, 2020. doi: 10.1016/j.aiopen.2021.01.001.

[19]   L. Yao, C. Mao, and Y. Luo, "Graph Convolutional Networks for Text Classification." [Online]. Available: www.aaai.org

[20]   L. Shao, C. Fu, Y. You, and D. Fu, "Classification of ASD based on fMRI data with deep learning," *Cogn Neurodyn*, vol. 15, no. 6, pp. 961–974, Dec. 2021, doi: 10.1007/s11571-021-09683-0.

[21]   SAURABH SHAHANE, "*Cyberbullying Dataset*," Kaggle.com. Accessed: Apr. 15, 2024. [Online]. Available: https://www.kaggle.com/*Dataset*s/saurabhshahane/cyberbullying-*Dataset*