

REFERENCES

- [1] R. Chugh and U. Ruhi, "Social media in higher education: A literature review of Facebook," *Education and Information Technologies*, vol. 23, no. 2. Springer New York LLC, pp. 605–616, Mar. 01, 2018. doi: 10.1007/s10639-017-9621-2.
- [2] G. Rizos, K. Hemker, and B. Schuller, "Augment to Prevent: Short-Text Data Augmentation in Deep Learning for Hate-Speech Classification," pp. 991–1000, 2019. doi: 10.1145/3357384.3358040.
- [3] S. Zimmerman, C. Fox, and U. Kruschwitz, "Improving hate speech detection with deep learning ensembles," *LREC 2018 - 11th International Conference on Language Resources and Evaluation*, pp. 2546–2553, 2019.
- [4] S. S. Aluru, B. Mathew, P. Saha, and A. Mukherjee, "Deep Learning Models for Multilingual Hate Speech Detection," pp. 1–16, Dec. 2020. doi: 10.48550/arXiv.2004.06465.
- [5] Y. Zhou, Y. Yang, H. Liu, X. Liu, and N. Savage, "Deep Learning Based Fusion Approach for Hate Speech Detection," *IEEE Access*, vol. 8, pp. 128923–128929, 2020. doi: 10.1109/ACCESS.2020.3009244.
- [6] J. A. García-Díaz, S. M. Jiménez-Zafra, M. A. García-Cumbreras, and R. Valencia-García, "Evaluating feature combination strategies for hate-speech detection in Spanish using linguistic features and transformers," *Complex and Intelligent Systems*, 2022. doi: 10.1007/s40747-022-00693-x.
- [7] A. Rana and S. Jha, "Emotion Based Hate Speech Detection using Multimodal Learning," Feb. 2022, doi: 10.48550/arXiv.2202.06218.
- [8] F. Alkomah and X. Ma, "A Literature Review of Textual Hate Speech Detection Methods and Datasets," *Information (Switzerland)*, vol. 13, no. 6. MDPI, Jun. 01, 2022. doi: 10.3390/info13060273.
- [9] T. L. Sutejo and D. P. Lestari, "Indonesia Hate Speech Detection Using Deep Learning," *Proceedings of the 2018 International Conference on Asian Language Processing, IALP 2018*, pp. 39–43, 2019. doi: 10.1109/IALP.2018.8629154.
- [10] A. Marpaung, R. Rismala, and H. Nurrahmi, "Hate Speech Detection in Indonesian Twitter Texts using Bidirectional Gated Recurrent Unit," *KST 2021 - 2021 13th International Conference Knowledge and Smart Technology*, pp. 186–190, 2021. doi: 10.1109/KST51265.2021.9415760.
- [11] A. Muniasamy and A. Alasiry, "Deep learning: The impact on future eLearning," *International Journal of Emerging Technologies in Learning*, vol. 15, no. 1, pp. 188–199, 2020. doi: 10.3991/IJET.V15I01.11435.
- [12] E. B. Setiawan, D. H. Widyatno, and K. Surendro, "Feature expansion using word embedding for tweet topic classification," *Proceeding of 2016 10th International Conference on Telecommunication Systems Services and Applications, TSSA 2016: Special Issue in Radar Technology*, 2017. doi: 10.1109/TSSA.2016.7871085.
- [13] J. Melton, A. Bagavathi, and S. Krishnan, "DeL-haTE: A Deep Learning Tunable Ensemble for Hate Speech Detection," *Proceedings - 19th IEEE International Conference on Machine Learning and Applications, ICMLA 2020*, pp. 1015–1022, 2020. doi: 10.1109/ICMLA51294.2020.00165.
- [14] V. Shah, S. S. Udmale, V. Sambhe, and A. Bhole, *A Deep Hybrid Approach for Hate Speech Analysis*, vol. 13052 LNCS, no. October. Springer International Publishing, 2021. doi: 10.1007/978-3-030-89128-2_41.
- [15] H. Elzayady, M. S. Mohamed, K. M. Badran, and G. I. Salama, "A hybrid approach based on personality traits for hate speech detection in Arabic social media," *International Journal of Electrical and Computer Engineering*, vol. 13, no. 2, pp. 1979–1988, Apr. 2023. doi: 10.11591/ijece.v13i2.pp1979-1988.
- [16] R. A. Yahya and E. Setiawan, "Feature Expansion with FastText on Topic Classification Using the Gradient Boosted Decision Tree on Twitter," *2022 10th International Conference on Information and Communication Technology (ICoICT)*, pp. 322–327, 2022. doi: doi.org/10.1109/ICoICT55009.2022.9914896.
- [17] M. F. D. Putra and E. B. Setiawan, "Influence of Sentiment on Mandiri Bank Stocks (BMRI) Using Feature Expansion with FastText and Logistic Regression Classification," Institute of Electrical and Electronics Engineers (IEEE), Mar. 2023, pp. 1–7. doi: 10.1109/icancis57039.2022.10055450.
- [18] F. Anisty and E. Setiawan, "Hate Speech Detection on Twitter in Indonesia with Feature Expansion Using GloVe," *Jurnal RESTI (Rekayasa Sistem dan Teknologi Informasi)*, vol. 5, no. 6, pp. 1044–1051, 2021. doi: 10.29207/resti.v5i6.3521.
- [19] H. R. Alhakiem and E. B. Setiawan, "Aspect-Based Sentiment Analysis on Twitter Using Logistic Regression with FastText Feature Expansion," *Jurnal RESTI (Rekayasa Sistem dan Teknologi Informasi)*, vol. 6, no. 5, pp. 840–846, Nov. 2022. doi: 10.29207/resti.v6i5.4429.
- [20] I. Ghozali, K. R. Sungkono, R. Sarno, and R. Abdullah, "Synonym based feature expansion for Indonesian hate speech detection," *International Journal of Electrical and Computer Engineering*, vol. 13, no. 1, pp. 1105–1112, Feb. 2023. doi: 10.11591/ijece.v13i1.pp1105-1112.
- [21] M. J. Denny and A. Spirling, "Text Preprocessing for Unsupervised Learning: Why It Matters, When It Misleads, and What to Do about It," *Political Analysis*, vol. 26, no. 2, pp. 168–189, Apr. 2018. doi: 10.1017/pan.2017.44.
- [22] S. Gharatkar, A. Ingle, T. Naik, and A. Save, "Review Preprocessing Using Data Cleaning And Stemming Technique," in *International Conference on Innovations in Information Embedded and Communication Systems (ICIIECS)*, Coimbatore, India, Mar. 2017. doi: 10.1109/ICIIIECS.2017.8276011.
- [23] W. Bourequat and H. Mourad, "Sentiment Analysis Approach for Analyzing iPhone Release using Support Vector Machine," *International Journal of Advances in Data and Information Systems*, vol. 2, no. 1, pp. 36–44, Apr. 2021. doi: 10.25008/ijadis.v2i1.1216.
- [24] O. Bayat, S. Aljawarneh, H. F. Carlak, International Association of Researchers, Institute of Electrical and Electronics Engineers, and Akdeniz Üniversitesi, "Understanding of a Convolutional Neural Network," in *2017 International Conference on Engineering and Technology (ICET)*, Antalya, Turkey, Aug. 2017, pp. 1–6. doi: 10.1109/ICEngTechnol.2017.8308186.
- [25] H. Khotimah, E. Budi, and I. Kurniawan, "Implementation Information Gain Feature Selection for Hoax News Detection on Twitter using Convolutional Neural Network (CNN)," 2020. doi: 10.34818/indoje.c.2021.5.3.506.
- [26] N. Kaur and G. Gupta, "Refurbished and improvised model using convolution network for autism disorder detection in facial images," *Indonesian Journal of Electrical Engineering and Computer Science*, vol. 29, no. 2, pp. 883–889, Feb. 2023. doi: 10.11591/ijeecs.v29.i2.pp883-889.
- [27] B. Gambäck and U. K. Sikdar, "Using Convolutional Neural Networks to Classify Hate-Speech," no. January, pp. 85–90, 2017. doi: 10.18653/v1/w17-3013.
- [28] P. Li *et al.*, "Bidirectional gated recurrent unit neural network for Chinese address element segmentation," *ISPRS Int J Geoinf*, vol. 9, no. 11, pp. 1–19, Oct. 2020. doi: 10.3390/ijgi9110635.
- [29] Y. Lee, S. Yoon, and K. Jung, "Comparative Studies of Detecting Abusive Language on Twitter," Aug. 2018. doi: 10.48550/arXiv.1808.10245.

- [30] B. Jena, S. Saxena, G. K. Nayak, L. Saba, N. Sharma, and J. S. Suri, "Artificial intelligence-based hybrid deep learning models for image classification: The first narrative review," *Computers in Biology and Medicine*, vol. 137. Elsevier Ltd, Oct. 01, 2021. doi: 10.1016/j.combiomed.2021.104803.

BIOGRAPHIES OF AUTHORS



I Gde Bagus Janardana Abasan is pursuing a Bachelor's Degree in Computer Science at Telkom University. He is very interested in the fields of artificial intelligence, machine learning, and software engineering. His interest continued and he became part of the IT research team at Direktorat Pusat Teknologi Informasi, Telkom University. He can be contacted at email: bjanardana@student.telkomuniversity.ac.id



Erwin Budi Setiawan is a senior lecturer in Informatics, School of Computing, Telkom University, Bandung, Indonesia. He has more than 10 years of Research and Teaching experience in the domain of Informatics. Currently, he is an Associate Professor. His research interests are machine learning, people analytics, modeling & simulation, and social media analysis. He can be contacted at email: erwinbudisetiawan@telkomuniversity.ac.id