

## DAFTAR PUSTAKA

- Abas, A. R., Elhenawy, I., Zidan, M., & Othman, M. (2022). Bert-cnn: A deep learning model for detecting emotions from text. *Computers, Materials and Continua*, *71*(2), 2943–2961. <https://doi.org/10.32604/cmc.2022.021671>
- Acheampong, F. A., Nunoo-Mensah, H., & Chen, W. (2021). Transformer Models for Text-based Emotion Detection: A Review of BERT-based Approaches. *Artificial Intelligence Review*, *54*(8), 5789–5829. <https://doi.org/10.1007/s10462-021-09958-2>
- Adrielvino, N. A., & Ayunda, A. T. (2026). Penerapan IndoBERT dan BERTopic Dalam ABSA untuk Evaluasi Kualitas Aplikasi E-Government Indonesia. *Rabit: Jurnal Teknologi dan Sistem Informasi Univrab*, *11*(1), 847–868. <https://doi.org/10.36341/rabit.v11i1.7143>
- Akiba, T., Sano, S., Yanase, T., Ohta, T., & Koyama, M. (2019). Optuna: A Next-generation Hyperparameter Optimization Framework. *Proceedings of the ACM SIGKDD International Conference on Knowledge Discovery and Data Mining*, 2623–2631. <https://doi.org/10.1145/3292500.3330701>
- Andrade, G. H. B., Yada, S., & Aramaki, E. (2024). Is Boundary Annotation Necessary? Evaluating Boundary-Free Approaches to Improve Clinical Named Entity Annotation Efficiency: Case Study. *JMIR Medical Informatics*, *12*(1), e59680. <https://doi.org/10.2196/59680>
- Artstein, R., & Poesio, M. (2008). Survey Article Inter-Coder Agreement for Computational Linguistics. *Computational Linguistics*, *34*(4), 555–596. <https://doi.org/10.1162/coli.07-034-R2>
- Asmani, J. M. (2025). Analisis Kenaikan Pajak dalam Kerangka Keadilan, Kemaslahatan, dan Fiqh Sosial. *Santri: Journal of Pesantren and Fiqh Sosial*, *6*(1), 95–112. <https://doi.org/10.35878/santri.v6i1.1720>
- Audyna, A. P., Sholikah, R. W., Ginardi, R. V. H., & Hernandez, R. M. (2024). Aspect-Based Sentiment Analysis on Social Media X for Electric Vehicles (EV) in Indonesia

- Using IndoBERT and Machine Learning. *2024 9th International Conference on Informatics and Computing, ICIC 2024*, 1–6. <https://doi.org/10.1109/ICIC64337.2024.10956679>
- Äyräväinen, L. E. M., Hinds, J., & Davidson, B. I. (2025). Disambiguating sentiment annotation: A mixed methods investigation of annotator experience and impact of instructions on annotator agreement. *PLOS ONE*, *20*(12), e0336269. <https://doi.org/10.1371/journal.pone.0336269>
- Barik, A. M., Mahendra, R., & Adriani, M. (2019). Normalization of Indonesian-English Code-Mixed Twitter Data. *Proceedings of the 5th Workshop on Noisy User-generated Text (W-NUT 2019)*, 417–424. <https://doi.org/10.18653/v1/D19-5554>
- Bergstra, J., Bardenet, R., Bengio, Y., & Kégl, B. (2011). Algorithms for Hyper-Parameter Optimization. *Proceedings of the 24th International Conference on Neural Information Processing Systems*, 2546–2554. <https://proceedings.neurips.cc/paper/2011/hash/86e8f7ab32cfd12577bc2619bc635690-Abstract.html>
- Birjali, M., Kasri, M., & Beni-Hssane, A. (2021). A comprehensive survey on sentiment analysis: Approaches, challenges and trends. *Knowledge-Based Systems*, *226*. <https://doi.org/10.1016/j.knosys.2021.107134>
- Brauwiers, G., & Frasincar, F. (2022). A Survey on Aspect-Based Sentiment Classification. *ACM Computing Surveys*, *55*(4), 1–37. <https://doi.org/10.1145/3503044>
- Chai, C. P. (2023). Comparison of text preprocessing methods. *Natural Language Engineering*, *29*(3), 509–553. <https://doi.org/10.1017/S1351324922000213>
- Darren, C., & Oetama, R. S. (2025). Sentiment Analysis of a Private Mobile Banking Application with DISTILBERT Fine-Tuning. *2025 8th International Conference on New Media Studies (CONMEDIA)*, 9–15. <https://doi.org/10.1109/CONMEDIA67140.2025.11290622>

- Devlin, J., Chang, M.-W., Lee, K., Google, K. T., & Language, A. I. (2019). *BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding*. <https://doi.org/10.18653/v1/N19-1423>
- Dieng, A. B., Ruiz, F. J. R., & Blei, D. M. (2020). Topic Modeling in Embedding Spaces. *Transactions of the Association for Computational Linguistics*, 8, 439–453. [https://doi.org/10.1162/tacl\\_a\\_00325](https://doi.org/10.1162/tacl_a_00325)
- Ersuputra, P. A. R., & Faizah. (2025). Sentence Pair Classification Fine-Tuning of Bidirectional Encoding Representation from Transformer (BERT) for Aspect-Based Sentiment Analysis (ABSA) on IMDb Movie Reviews. *Proceedings of the 2025 International Conference on Advanced Machine Learning and Data Science, AMLDS 2025*, 659–664. <https://doi.org/10.1109/AMLDS63918.2025.11159419>
- Ganesh, P., Chen, Y., Lou, X., Khan, M. A., Yang, Y., Sajjad, H., Nakov, P., Chen, D., & Winslett, M. (2021). Compressing Large-Scale Transformer-Based Models: A Case Study on BERT. *Transactions of the Association for Computational Linguistics*, 9, 1061–1080. <https://doi.org/10.1162/tacl>
- Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep Learning* (1 ed.). MIT Press.
- Grandini, M., Bagli, E., & Visani, G. (2020). *Metrics for Multi-Class Classification: an Overview*. <http://arxiv.org/abs/2008.05756>
- Grootendorst, M. (2022). BERTopic: Neural topic modeling with a class-based TF-IDF procedure. *arXiv preprint arXiv:2203.05794*. <http://arxiv.org/abs/2203.05794>
- Hakami, S. A. A., Hendley, R., & Smith, P. (2022). Emoji Sentiment Roles for Sentiment Analysis: A Case Study in Arabic Texts. *Proceedings of the Seventh Arabic Natural Language Processing Workshop (WANLP)*, 346–355. <https://doi.org/10.18653/v1/2022.wanlp-1.32>
- Hankar, M., Kasri, M., & Beni-Hssane, A. (2025). A comprehensive overview of topic modeling: Techniques, applications and challenges. *Neurocomputing*, 628, 129638. <https://doi.org/10.1016/j.neucom.2025.129638>

- Henning, S., Beluch, W., Fraser, A., & Friedrich, A. (2023). A Survey of Methods for Addressing Class Imbalance in Deep-Learning Based Natural Language Processing. *Proceedings of the 17th Conference of the European Chapter of the Association for Computational Linguistics*, 523–540. <https://doi.org/10.48550/arXiv.2210.04675>
- Hovy, E., & Lavid, J. (2010). Towards a “Science” of Corpus Annotation: A New Methodological Challenge for Corpus Linguistics. *International Journal of Translation*, 22(1), 13–26. <https://www.cs.cmu.edu/~hovy/papers/10KNS-annotation-Hovy-Lavid.pdf>
- Hua, Y. C., Denny, P., Wicker, J., & Taskova, K. (2024). A systematic review of aspect-based sentiment analysis: domains, methods, and trends. *Artificial Intelligence Review*, 57(11), 296. <https://doi.org/10.1007/s10462-024-10906-z>
- Joseph, V. R. (2022). Optimal ratio for data splitting. *Statistical Analysis and Data Mining*, 15(4), 531–538. <https://doi.org/10.1002/sam.11583>
- Kapoor, S., & Narayanan, A. (2023). Leakage and the reproducibility crisis in machine-learning-based science. *Patterns*, 4(9). <https://doi.org/10.1016/j.patter.2023.100804>
- Kaur, H., Pannu, H. S., & Malhi, A. K. (2020). A systematic review on imbalanced data challenges in machine learning: Applications and solutions. Dalam *ACM Computing Surveys* (Vol. 52, Nomor 4, hlm. 1–36). Association for Computing Machinery. <https://doi.org/10.1145/3343440>
- Khder, M. A. (2021). Web scraping or web crawling: State of art, techniques, approaches and application. *International Journal of Advances in Soft Computing and its Applications*, 13(3), 144–168. <https://doi.org/10.15849/ijasca.211128.11>
- Kodali, P., Bhatnagar, A., Ahuja, N., Shrivastava, M., & Kumaraguru, P. (2022). HashSet- A Dataset For Hashtag Segmentation. *Proceedings of the Thirteenth Language Resources and Evaluation Conference*, 7215–7219. <https://doi.org/10.48550/arXiv.2201.06741>
- Koto, F., Lau, H. J., & Baldwin, T. (2021). INDOBERTWEET: A Pretrained Language Model for Indonesian Twitter with Effective Domain-Specific Vocabulary

- Initialization. *Proceedings of the 2021 Conference on Empirical Methods in Natural Language Processing*, 10660–10668. <https://doi.org/10.18653/v1/2021.emnlp-main.833>
- Kurniawan, R., Saputra, H. T., Fatayat, Melia, T., Sukamto, Elfizar, & Batubara, A. S. (2025). Evaluation of Islamic Preaching through Topic Modeling of Comments Using BERTopic and IndoBERT. *2025 8th International Conference of Computer and Informatics Engineering (IC2IE)*, 1–6. <https://doi.org/10.1109/IC2IE67206.2025.11283361>
- Lee, K., Ippolito, D., Nystrom, A., Zhang, C., Eck, D., Callison-Burch, C., & Carlini, N. (2022). Deduplicating Training Data Makes Language Models Better. *Proceedings of the 60th Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)*, 1, 8424–8445. <https://doi.org/10.18653/v1/2022.acl-long.577>
- Lin, T., Wang, Y., Liu, X., & Qiu, X. (2022). *A survey of transformers*. 3, 111–132. <https://doi.org/10.1016/j.aiopen.2022.10.001>
- Liu, B. (2012). *Sentiment Analysis and Opinion Mining* (1 ed.). Morgan & Claypool Publishers. <https://doi.org/10.2200/S00416ED1V01Y201204HLT016>
- Loshchilov, I., & Hutter, F. (2019, Januari 4). Decoupled Weight Decay Regularization. *International Conference on Learning Representations (ICLR)*. <https://doi.org/10.48550/arXiv.1711.05101>
- Maddela, M., Xu, W., & Preet, iucpreot, iuc-Pietro, D. (2019). Multi-task Pairwise Neural Ranking for Hashtag Segmentation. *Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics*, 2538–2549. <https://doi.org/10.18653/v1/P19-1242>
- Mansur, Z., Omar, N., Tiun, S., & Alshari, E. M. (2024). A normalization model for repeated letters in social media hate speech text based on rules and spelling correction. *PLoS ONE*, 19(3), e0299652. <https://doi.org/10.1371/journal.pone.0299652>
- McHugh, M. L. (2012). Interrater reliability: the kappa statistic. *Biochemia Medica*, (3), 276–282. <https://doi.org/10.11613/BM.2012.031>

- McInnes, L., Healy, J., & Astels, S. (2017). hdbscan: Hierarchical density based clustering. *The Journal of Open Source Software*, 2(11), 205. <https://doi.org/10.21105/joss.00205>
- McInnes, L., Healy, J., & Melville, J. (2020). *UMAP: Uniform Manifold Approximation and Projection for Dimension Reduction*. <http://arxiv.org/abs/1802.03426>
- Nesca, M., Katz, A., Leung, C. K., & Lix, L. M. (2022). A scoping review of preprocessing methods for unstructured text data to assess data quality. *International Journal of Population Data Science Journal Website: www.ijpds.org*, 7(1), 1757. <https://doi.org/10.23889/ijpds.v6i1.1757>
- Ogunsanya, M., Isichei, J., & Desai, S. (2023). Grid Search Hyperparameter Tuning in Additive Manufacturing Processes. *Manufacturing Letters*, 35(Supplement), 1031–1042. <https://doi.org/10.1016/j.mfglet.2023.08.056>
- Pahtoni, T. Y., & Jati, H. (2024). Analisis Sentimen Data Twitter Terkait CHATGPT Menggunakan Orange Data Mining. *Jurnal Teknologi Informasi dan Ilmu Komputer*, 11(2), 329–336. <https://doi.org/10.25126/jtiik.20241127276>
- Pang, B., & Lee, L. (2008). Opinion mining and sentiment analysis. *Foundations and Trends in Information Retrieval*, 2(2), 1–135. <https://doi.org/10.1561/1500000011>
- Perwira, R. I., Permadi, V. A., Purnamasari, D. I., & Agusdin, R. P. (2025). Domain-Specific Fine-Tuning of IndoBERT for Aspect-Based Sentiment Analysis in Indonesian Travel User-Generated Content. *Journal of Information Systems Engineering and Business Intelligence*, 11(1), 30–40. <https://doi.org/10.20473/jisebi.11.1.30-40>
- Pontiki, M., Galanis, D., Papageorgiou, H., Androutsopoulos, I., Manandhar, S., Al-Smadi, M., Al-Ayyoub, M., Zhao, Y., Qin, B., De Clercq, O., Hoste, V., Apidianaki, M., Tannier, X., Loukachevitch, N., Kotelnikov, E., Bel, N., María Jiménez-Zafra, S., & Eryiğit, G. (2016). SemEval-2016 Task 5: Aspect Based Sentiment Analysis. *Proceedings of the 10th International Workshop on Semantic Evaluation (SemEval-2016)*, 19–30. <https://doi.org/10.18653/v1/S16-1002>
- Purwandari, K., Jiwanggi, M. A., & Yulianti, E. (2024). Sentiment Analysis on YouTube Comment Data for the Candidate Debate in the 2024 Presidential Election of the

Republic of Indonesia. *2024 5th International Conference on Artificial Intelligence and Data Sciences, AiDAS 2024 - Proceedings*, 392–397. <https://doi.org/10.1109/AiDAS63860.2024.10730443>

Reimers, N., & Gurevych, I. (2019). Sentence-BERT: Sentence Embeddings using Siamese BERT-Networks. *Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing and the 9th International Joint Conference on Natural Language Processing (EMNLP-IJCNLP)*, 3982–3992. <https://doi.org/10.18653/v1/D19-1410>

Rianto, Mutiara, A. B., Wibowo, E. P., & Santosa, P. I. (2021). Improving the accuracy of text classification using stemming method, a case of non-formal Indonesian conversation. *Journal of Big Data*, 8(1), 1–16. <https://doi.org/10.1186/s40537-021-00413-1>

Röder, M., Both, A., & Hinneburg, A. (2015). Exploring the space of topic coherence measures. *WSDM 2015 - Proceedings of the 8th ACM International Conference on Web Search and Data Mining*, 399–408. <https://doi.org/10.1145/2684822.2685324>

Sanh, V., Debut, L., Chaumond, J., & Wolf, T. (2019, Maret 1). DistilBERT, a distilled version of BERT: smaller, faster, cheaper and lighter. *NeurIPS 2019 Workshop on Energy Efficient Machine Learning and Cognitive Computing*. <http://arxiv.org/abs/1910.01108>

Santos, F., & Acosta, N. (2023). An Approach Based on Web Scraping and Denoising Encoders to Curate Food Security Datasets. *Agriculture (Switzerland)*, 13(5), 1–19. <https://doi.org/10.3390/agriculture13051015>

Sarker, I. H. (2021). Machine Learning: Algorithms, Real-World Applications and Research Directions. Dalam *SN Computer Science* (Vol. 2, Nomor 3, hlm. 1–21). Springer. <https://doi.org/10.1007/s42979-021-00592-x>

Sechidis, K., Tsoumakas, G., & Vlahavas, I. (2011). On the Stratification of Multi-Label Data. *Machine Learning and Knowledge Discovery in Databases (ECML PKDD 2011)*, 145–158. [https://doi.org/10.1007/978-3-642-23808-6\\_10](https://doi.org/10.1007/978-3-642-23808-6_10)

- Sejati, P. T., Al Zami, F., Marjuni, A., Indrayani, H., & Puspitarini, I. D. (2024). Aspect-Based Sentiment Analysis for Enhanced Understanding of “Kemenkeu” Tweets. *Journal of Applied Informatics and Computing (JAIC)*, 8(2), 487–498. <https://doi.org/10.30871/jaic.v8i2.8558>
- Sihombing, W. M., & Widiyaningtyas, T. (2025). Sentiment Analysis and Topic Modelling Using IndoBERTweet and BERTopic for Public Health Issues. *Indonesian Journal of Innovation Studies*, 26(4). <https://doi.org/10.21070/ijins.v26i4.1833>
- Siino, M., Tinnirello, I., & La Cascia, M. (2024). Is text preprocessing still worth the time? A comparative survey on the influence of popular preprocessing methods on Transformers and traditional classifiers. *Information Systems*, 121, 102342. <https://doi.org/10.1016/j.is.2023.102342>
- Sun, C., Qiu, X., Xu, Y., & Huang, X. (2020). How to Fine-Tune BERT for Text Classification? *China National Conference on Computational Linguistics*, 194–206. <https://doi.org/10.48550/arXiv.1905.05583>
- Symeonidis, S., Effrosynidis, D., & Arampatzis, A. (2018). A comparative evaluation of preprocessing techniques and their interactions for twitter sentiment analysis. *Expert Systems with Applications*, 110, 298–310. <https://doi.org/10.1016/j.eswa.2018.06.022>
- Szeghalmy, S., & Fazekas, A. (2023). A Comparative Study of the Use of Stratified Cross-Validation and Distribution-Balanced Stratified Cross-Validation in Imbalanced Learning. *Sensors*, 23(4), 1–27. <https://doi.org/10.3390/s23042333>
- Tanoto, K., Gunawan, A. A. S., Suhartono, D., Mursitama, T. N., Rahayu, A., & Ariff, M. I. M. (2024). Investigation of challenges in aspect-based sentiment analysis enhanced using softmax function on twitter during the 2024 Indonesian presidential election. *Procedia Computer Science*, 245(C), 989–997. <https://doi.org/10.1016/j.procs.2024.10.327>
- Uma, A. N., Fornaciari, T., Hovy, D., Bocconi, U., Paun, M. S., Plank, B., & Poesio, M. (2021). Learning from Disagreement: A Survey. *Journal of Artificial Intelligence Research*, 72, 1385–1470. <https://doi.org/https://doi.org/10.1613/jair.1.12752>

- Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., Kaiser, L., & Polosukhin, I. (2023). Attention Is All You Need. *Advances in Neural Information Processing Systems (NeurIPS 2017)*, 5998–6008. <http://arxiv.org/abs/1706.03762>
- Wafda, A., Fudholi, D. H., & Nugraha, J. (2025). Aspect-Based Sentiment Analysis on Twitter Tweets about The Merdeka Curriculum Using IndoBERT. *JITK (Jurnal Ilmu Pengetahuan dan Teknologi Komputer)*, 10(3), 586–599. <https://doi.org/10.33480/jitk.v10i3.5692>
- Wankhade, M., Rao, A. C. S., & Kulkarni, C. (2022). A survey on sentiment analysis methods, applications, and challenges. *Artificial Intelligence Review*, 55(7), 5731–5780. <https://doi.org/10.1007/s10462-022-10144-1>
- Watanabe, S. (2023). *Tree-Structured Parzen Estimator: Understanding Its Algorithm Components and Their Roles for Better Empirical Performance*. <http://arxiv.org/abs/2304.11127>
- Watanabe, S., & Hutter, F. (2023). *c-TPE: Tree-structured Parzen Estimator with Inequality Constraints for Expensive Hyperparameter Optimization*. <http://arxiv.org/abs/2211.14411>
- Weston, S. J., Shryock, I., Light, R., & Fisher, P. A. (2023). Selecting the Number and Labels of Topics in Topic Modeling: A Tutorial. *Advances in Methods and Practices in Psychological Science*, 6(2), 1–13. <https://doi.org/10.1177/25152459231160105>
- Wu, C., Ma, B., Liu, Y., Zhang, Z., Deng, N., Li, Y., Chen, B., Zhang, Y., Xue, Y., & Plank, B. (2025). M-ABSA: A Multilingual Dataset for Aspect-Based Sentiment Analysis. *Proceedings of the 2025 Conference on Empirical Methods in Natural Language Processing (EMNLP)*, 2530–2557. <https://doi.org/10.18653/v1/2025.emnlp-main.128>
- Wu, G., & Zhu, J. (2020). Multi-label classification: do Hamming loss and subset accuracy really conflict with each other? *Advances in Neural Information Processing Systems (NeurIPS 2020)*, 1568–1578. <https://doi.org/10.48550/arXiv.2011.07805>
- Xu, H., Liu, B., Shu, L., & Yu, P. S. (2019). BERT Post-Training for Review Reading Comprehension and Aspect-based Sentiment Analysis. *Proceedings of the 2019*

*Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies (NAACL-HLT)*, 2324–2335.  
<https://doi.org/10.18653/v1/N19-1242>

Xu, Q. A., Jayne, C., & Chang, V. (2024). An emoji feature-incorporated multi-view deep learning for explainable sentiment classification of social media reviews. *Technological Forecasting and Social Change*, 202, 123326.  
<https://doi.org/10.1016/j.techfore.2024.123326>

Yang, D., Kejian, L., Cheng, Y., Yuanyuan, F., & Weihao, L. (2022). *Emoji-based Fine-grained Attention Network for Sentiment Analysis in the Microblog Comments*.  
<https://doi.org/10.48550/arXiv.2206.12262>

Yang, S. (2025). Application of BERT Model in Chinese Language and Literature Text Generation and Evaluation. *International Journal of Knowledge Management*, 21(1).  
<https://doi.org/10.4018/IJKM.386766>

Ying, X. (2019). An Overview of Overfitting and its Solutions. *Journal of Physics: Conference Series*, 1168(2), 022022. <https://doi.org/10.1088/1742-6596/1168/2/022022>

Yulianti, E., & Nissa, N. K. (2024). ABSA of Indonesian customer reviews using IndoBERT: single-sentence and sentence-pair classification approaches. *Bulletin of Electrical Engineering and Informatics*, 13(5), 3579–3589.  
<https://doi.org/10.11591/eei.v13i5.8032>

Zhang, M.-L., & Zhou, Z.-H. (2014). A Review on Multi-Label Learning Algorithms. *IEEE Transactions on Knowledge and Data Engineering*, 26(8), 1819–1837.  
<https://doi.org/10.1109/TKDE.2013.39>

Zhang, W., Li, X., Deng, Y., Bing, L., & Lam, W. (2023). A Survey on Aspect-Based Sentiment Analysis: Tasks, Methods, and Challenges. *IEEE Transactions on Knowledge and Data Engineering*, 35(11), 11019–11038.  
<https://doi.org/10.1109/TKDE.2022.3230975>

Zhang, X., Wu, Z., Liu, K., Zhao, Z., Wang, J., & Wu, C. (2023). Text Sentiment Classification Based on BERT Embedding and Sliced Multi-Head Self-Attention Bi-GRU. *Sensors*, 23(3), 1481. <https://doi.org/10.3390/s23031481>

Zhao, Y., Li, L., Wang, H., Cai, H., Bissyandé, T. F., Klein, J., & Grundy, J. (2021). On the Impact of Sample Duplication in Machine-Learning-Based Android Malware Detection. *ACM Transactions on Software Engineering and Methodology*, 30(3), 1–38. <https://doi.org/10.1145/3446905>