

DAFTAR PUSTAKA

- [1] T. Wulandari, “Kenapa Bahasa Inggris Menjadi Bahasa Internasional? Ini Alasannya,” *detikEdu*, Jakarta, Nov. 16, 2021. [Online]. Available: <https://www.detik.com/edu/detikpedia/d-5813529/kenapa-bahasa-inggris-menjadi-bahasa-internasional-ini-alasannya>
- [2] CNN Indonesia, “Warga RI Tak Fasih Berbahasa Inggris, Posisi ke-81 dari 111 Negara,” *CNN Indonesia*, Jakarta, Nov. 20, 2022. [Online]. Available: <https://www.cnnindonesia.com/gaya-hidup/20221119141305-284-875876/warga-ri-tak-fasih-berbahasa-inggris-posisi-ke-81-dari-111-negara>
- [3] M. E. S. Sulistyawati, N. Dewi, and E. S. Andayani, “Pemanfaatan Media Komputer Dalam Pembelajaran Bahasa Inggris Dengan Metode Direct Method (Internet Based),” *JURIKOM (Jurnal Riset Komputer)*, vol. 6, no. 4, pp. 389–394, 2019, [Online]. Available: <http://ejurnal.stmik-budidarma.ac.id/index.php/jurikom/article/view/1290>
- [4] C. M. Annur, “Aplikasi Belajar Bahasa Duolingo Punya 56 Juta Pengguna per Kuartal III-2022,” *databoks*. Accessed: Oct. 01, 2023. [Online]. Available: <https://databoks.katadata.co.id/datapublish/2023/01/12/aplikasi-belajar-bahasa-duolingo-punya-56-juta-pengguna-per-kuartal-iii-2022>
- [5] N. Rosa, “Spirit Belajar Bahasa Tinggi! Indonesia di Posisi 2 Pengguna Duolingo Terbanyak,” *detik.com*, Jakarta, 2023. [Online]. Available: <https://www.detik.com/edu/edutainment/d-6766558/spirit-belajar-bahasa-tinggi-indonesia-di-posisi-2-pengguna-duolingo-terbanyak>
- [6] B. E. Purnama, “Duolingo Luncurkan Fitur Premium Super Duolingo di Seluruh Wilayah Asia Tenggara,” *Media Indonesia*. Accessed: Jan. 23, 2025. [Online]. Available: <https://mediaindonesia.com/teknologi/578527/duolingo-luncurkan-fitur-premium-super-duolingo-di-seluruh-wilayah-asia-tenggara>
- [7] Android Developers, “Core app quality,” Android Developers. [Online]. Available: <https://developer.android.com/docs/quality-guidelines/core-app-quality>
- [8] E. Suryati, A. Ari Aldino, and E. Suryati Submitted, “Analisis Sentimen Transportasi Online Menggunakan Ekstraksi Fitur Model Word2vec Text Embedding Dan Algoritma Support Vector Machine (SVM),” *Jurnal Teknologi dan Sistem Informasi*, vol. 4, no. 1, 2023.
- [9] D. Pontes, “What is BERT (Bidirectional Encoder Representations from Transformers)?,” *ziliz.com*. [Online]. Available: <https://ziliz.com/learn/what-is-bert>

- [10] S. N. Nugraha, R. Pebrianto, A. Latif, and M. R. Firdaus, "Analisis Sentimen Twitter Terhadap Menteri Indonesia Dengan Algoritma Support Vector Machine Dan Naive Bayes," *E-Link: Jurnal Teknik Elektro dan Informatika*, vol. 17, no. 1, p. 1, 2022, doi: 10.30587/e-link.v17i1.3965.
- [11] R. Mas, R. W. Panca, K. Atmaja¹, and W. Yustanti², "Analisis Sentimen Customer Review Aplikasi Ruang Guru dengan Metode BERT (Bidirectional Encoder Representations from Transformers)," *Jeisbi*, vol. 02, no. 3, pp. 55–62, 2021.
- [12] R. Abdullah, Suhariyanto, and R. Sarno, "Aspect Based Sentiment Analysis for Explicit and Implicit Aspects in Restaurant Review using Grammatical Rules, Hybrid Approach, and SentiCircle," *International Journal of Intelligent Engineering and Systems*, vol. 14, no. 5, 2021, doi: 10.22266/ijies2021.1031.27.
- [13] K. Namee, J. Polpinij, and B. Luaphol, "A Hybrid Approach for Aspect-based Sentiment Analysis: A Case Study of Hotel Reviews," *Curr Appl Sci Technol*, vol. 23, no. 2, pp. 1–16, 2023, doi: 10.55003/cast.2022.02.23.008.
- [14] P. A. Aritonang, M. E. Johan, and I. Prasetiawan, "Aspect-Based Sentiment Analysis on Application Review using Convolutional Neural Network," *Ultima InfoSys : Jurnal Ilmu Sistem Informasi*, vol. 13, no. 1, pp. 54–61, Aug. 2022, doi: 10.31937/si.v13i1.2684.
- [15] D. F. Sjoraida, B. W. K. Guna, and D. Yudhakusuma, "Analisis Sentimen Film Dirty Vote Menggunakan BERT (Bidirectional Encoder Representations from Transformers)," *Jurnal JTIK (Jurnal Teknologi Informasi dan Komunikasi)*, vol. 8, no. 2, pp. 393–404, 2024, doi: 10.35870/jtik.v8i2.1580.
- [16] M. P. Geetha and D. Karthika Renuka, "Improving the performance of aspect based sentiment analysis using fine-tuned Bert Base Uncased model," *International Journal of Intelligent Networks*, vol. 2, no. June, pp. 64–69, 2021, doi: 10.1016/j.ijin.2021.06.005.
- [17] M. Singh, A. K. Jakhar, and S. Pandey, "Sentiment analysis on the impact of coronavirus in social life using the BERT model," *Soc Netw Anal Min*, vol. 11, no. 1, pp. 1–11, 2021, doi: 10.1007/s13278-021-00737-z.
- [18] Andreas and Wella, "How Positive Sentiment of Telemedicine Applications using Naïve Bayes and Support Vector Machine?," *G-Tech: Jurnal Teknologi Terapan*, vol. 8, no. 2, pp. 857–867, 2024, doi: 10.33379/gtech.v8i2.4046.
- [19] H. Imaduddin, F. Y. A'la, and Y. S. Nugroho, "Sentiment Analysis in Indonesian Healthcare Applications using IndoBERT Approach,"

International Journal of Advanced Computer Science and Applications, vol. 14, no. 8, pp. 113–117, 2023, doi: 10.14569/IJACSA.2023.0140813.

- [20] C. A. Bahri and L. H. Suadaa, “Aspect-Based Sentiment Analysis in Bromo Tengger Semeru National Park Indonesia Based on Google Maps User Reviews,” *IJCCS (Indonesian Journal of Computing and Cybernetics Systems)*, vol. 17, no. 1, p. 79, 2023, doi: 10.22146/ijccs.77354.
- [21] G. Radiana and A. Nugroho, “Analisis Sentimen Berbasis Aspek Pada Ulasan Aplikasi Kai Access Menggunakan Metode Support Vector Machine,” *Jurnal Pendidikan Teknologi Informasi (JUKANTI)*, vol. 6, no. 1, pp. 1–10, 2023, doi: 10.37792/jukanti.v6i1.836.
- [22] Duolingo, “Duolingo: Belajar Bahasa,” Google Play Store. [Online]. Available: <https://play.google.com/store/apps/details?id=com.duolingo&hl=id>
- [23] Marc, “The History of Duolingo,” ilovelanguages. Accessed: Oct. 10, 2023. [Online]. Available: <https://www.ilovelanguages.com/the-history-of-duolingo/>
- [24] Duolingo, “Duolingo - About Us,” Duolingo. Accessed: Oct. 10, 2023. [Online]. Available: <https://www.duolingo.com>
- [25] R. Naquitasia, D. H. Fudholi, and L. Iswari, “Analisis Sentimen Berbasis Aspek pada Wisata Halal dengan Metode Deep Learning,” *Jurnal Teknoinfo*, vol. 16, no. 2, 2022, doi: 10.33365/jti.v16i2.1516.
- [26] R. M. Turjaman and I. Budi, “Analisis Sentimen Berbasis Aspek Marketing Mix Terhadap Ulasan Aplikasi Dompot Digital (Studi Kasus: Aplikasi LinkAja Pada Twitter),” *Jurnal Darma Agung*, vol. 30, no. 2, p. 266, Aug. 2022, doi: 10.46930/ojsuda.v30i2.1672.
- [27] LP2M, “Analisis Sentimen (Sentiment Analysis) : Definisi, Tipe dan Cara Kerjanya,” Lembaga Penelitian dan Pengabdian Masyarakat Universitas Medan. Accessed: Oct. 09, 2023. [Online]. Available: <https://lp2m.uma.ac.id/2022/02/21/analisis-sentimen-sentiment-analysis-definisi-tipe-dan-cara-kerjanya/>
- [28] G. D’Aniello, M. Gaeta, and I. La Rocca, “KnowMIS-ABSA: an overview and a reference model for applications of sentiment analysis and aspect-based sentiment analysis,” *Artif Intell Rev*, vol. 55, no. 7, 2022, doi: 10.1007/s10462-021-10134-9.
- [29] P. N. Andono, Sunardi, R. A. Nugroho, and B. Harjo, “Aspect-Based Sentiment Analysis for Hotel Review Using LDA, Semantic Similarity, and BERT,” *International Journal of Intelligent Engineering and Systems*, vol. 15, no. 5, pp. 232–243, 2022, doi: 10.22266/ijies2022.1031.21.

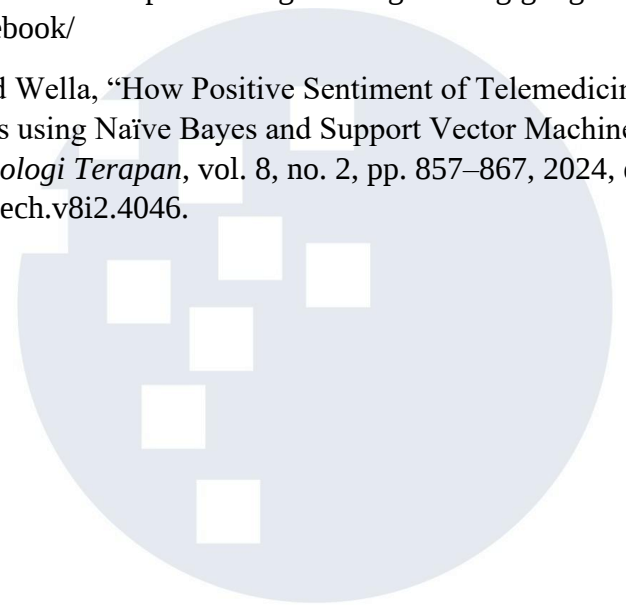
- [30] Munawir, M. D. Koerniawan, and B. J. Dewancker, "Visitor Perceptions and Effectiveness of Place Branding Strategies in Thematic Parks in Bandung City Using Text Mining Based on Google Maps User Reviews," *Sustainability*, vol. 11, no. 7, 2019, doi: 10.3390/SU11072123.
- [31] A. Firdaus and W. I. Firdaus, "Text Mining Dan Pola Algoritma Dalam Penyelesaian Masalah Informasi : (Sebuah Ulasan)," *Jurnal JUPITER*, vol. 13, no. 1, p. 66, 2021.
- [32] N. Nofiyani and W. Wulandari, "Implementasi Electronic Data Processing Untuk meningkatkan Efektifitas dan Efisiensi Pada Text Mining," *Jurnal Media Informatika Budidarma*, vol. 6, no. 3, p. 1621, 2022, doi: 10.30865/mib.v6i3.4332.
- [33] A. Rani, N. Kumar, J. Kumar, J. Kumar, and N. K. Sinha, "Support Vector Machine," *ScienceDirect*, pp. 143–168, 2022. [Online]. Available: <https://www.sciencedirect.com/topics/computer-science/support-vector-machine>
- [34] J. Alcaraz, M. Labbé, and M. Landete, "Support Vector Machine with feature selection: A multiobjective approach," *Expert Syst Appl*, vol. 204, 2022, doi: 10.1016/j.eswa.2022.117485.
- [35] M. N. Muttaqin and I. Kharisudin, "Analisis Sentimen Pada Ulasan Aplikasi Gojek Menggunakan Metode Support Vector Machine dan K Nearest Neighbor," *UNNES Journal of Mathematics*, vol. 10, no. 2, pp. 22–27, 2021, [Online]. Available: <http://journal.unnes.ac.id/sju/index.php/ujm>
- [36] A. Bello, S. C. Ng, and M. F. Leung, "A BERT Framework to Sentiment Analysis of Tweets," *Sensors*, vol. 23, no. 1, 2023, doi: 10.3390/s23010506.
- [37] GeeksforGeeks, "BERT Model - NLP," GeeksforGeeks. [Online]. Available: <https://www.geeksforgeeks.org/explanation-of-bert-model-nlp/>
- [38] G. Z. Nabiilah, I. N. Alam, E. S. Purwanto, and M. F. Hidayat, "Indonesian multilabel classification using IndoBERT embedding and MBERT classification," vol. 14, no. 1, pp. 1071–1078, 2024, doi: 10.11591/ijece.v14i1.pp1071-1078.
- [39] Anugerah Simanjuntak *et al.*, "Research and Analysis of IndoBERT Hyperparameter Tuning in Fake News Detection," *Jurnal Nasional Teknik Elektro dan Teknologi Informasi*, vol. 13, no. 1, pp. 60–67, 2024, doi: 10.22146/jnteti.v13i1.8532.
- [40] D. Normawati and S. A. Prayogi, "Implementasi Naïve Bayes Classifier Dan Confusion Matrix Pada Analisis Sentimen Berbasis Teks Pada

- Twitter,” *Jurnal Sains Komputer & Informatika (J-SAKTI)*, vol. 5, no. 2, pp. 697–711, 2021.
- [41] M. Hasnain, M. F. Pasha, I. Ghani, M. Imran, M. Y. Alzahrani, and R. Budiarto, “Evaluating Trust Prediction and Confusion Matrix Measures for Web Services Ranking,” *IEEE Access*, vol. 8, pp. 90847–90861, 2020, doi: 10.1109/ACCESS.2020.2994222.
 - [42] J. Mohajon, “Confusion Matrix for Your Multi-Class Machine Learning Model,” *Towards Data Science*, 2020. [Online]. Available: <https://towardsdatascience.com/confusion-matrix-for-your-multi-class-machine-learning-model-ff9aa3bf7826>
 - [43] GeeksforGeeks, “Confusion Matrix in Machine Learning,” GeeksforGeeks. Accessed: Oct. 10, 2023. [Online]. Available: <https://www.geeksforgeeks.org/confusion-matrix-machine-learning/>
 - [44] A. Nurdin, B. Anggo Seno Aji, A. Bustamin, and Z. Abidin, “Perbandingan Kinerja Word Embedding Word2Vec, Glove, Dan Fasttext Pada Klasifikasi Teks,” *Jurnal Tekno Kompak*, vol. 14, no. 2, p. 74, 2020, doi: 10.33365/jtk.v14i2.732.
 - [45] H. Faouzi *et al.*, “Towards Amazigh Word Embedding: Corpus Creation and Word2Vec Models Evaluations,” *Revue d’Intelligence Artificielle*, vol. 37, no. 3, pp. 753–759, 2023.
 - [46] S. Widodo, H. Brawijaya, and S. Samudi, “Stratified K-fold cross validation optimization on machine learning for prediction,” *Sinkron*, vol. 7, no. 4, pp. 2407–2414, 2022, doi: 10.33395/sinkron.v7i4.11792.
 - [47] Rohan, “Stratified K Fold Cross Validation,” GeeksforGeeks. Accessed: Apr. 25, 2025. [Online]. Available: <https://www.geeksforgeeks.org/stratified-k-fold-cross-validation/>
 - [48] A. M. Halim, M. Dwifabri, and F. Nhita, “Handling Imbalanced Data Sets Using SMOTE and ADASYN to Improve Classification Performance of Ecoli Data Sets,” *Building of Informatics, Technology and Science (BITS)*, vol. 5, no. 1, pp. 246–253, 2023, doi: 10.47065/bits.v5i1.3647.
 - [49] C. Kaope and Y. Pristyanto, “The Effect of Class Imbalance Handling on Datasets Toward Classification Algorithm Performance,” *MATRIK : Jurnal Manajemen, Teknik Informatika dan Rekayasa Komputer*, vol. 22, no. 2, pp. 227–238, 2023, doi: 10.30812/matrik.v22i2.2515.
 - [50] I. K. Sukesha, “CRISP DM Sebagai Salah Satu Standard untuk Menghasilkan Data Driven Decision Making yang Berkualitas,” DJKN Kementerian Keuangan Republik Indonesia. [Online]. Available: <https://www.djkn.kemenkeu.go.id/artikel/baca/15134/CRISP-DM-Sebagai->

Salah-Satu-Standard-untuk-Menghasilkan-Data-Driven-Decision-Making-yang-Berkualitas.html

- [51] M. A. Wiratama and W. M. Pradnya, "Optimasi Algoritma Data Mining Menggunakan Backward Elimination untuk Klasifikasi Penyakit Diabetes," *Jurnal Nasional Pendidikan Teknik Informatika (JANAPATI)*, vol. 11, no. 1, pp. 1–12, 2022, doi: 10.23887/janapati.v11i1.45282.
- [52] Y. Christian and K. O. Y. R. Qi, "Penerapan K-Means pada Segmentasi Pasar untuk Riset Pemasaran pada Startup Early Stage dengan Menggunakan CRISP-DM," *JURIKOM (Jurnal Riset Komputer)*, vol. 9, no. 4, pp. 966–973, 2022, doi: 10.30865/jurikom.v9i4.4486.
- [53] I. N. Laily, "Cara Update Google Play Store dalam 5 Langkah Mudah," katadata. Accessed: Oct. 10, 2023. [Online]. Available: <https://katadata.co.id/agung/digital/62ec984e61e07/cara-update-google-play-store-dalam-5-langkah-mudah>
- [54] Indra, "Mari Kita Bahas Aplikasi Sejuta Umat! Google Play Store," *idmetafora*, 2022. [Online]. Available: <https://idmetafora.com/news/read/898/Mari-Kita-Bahas-Aplikasi-Sejuta-Umat-Google-Play-Store.html>
- [55] Python, "The Python Logo," Python Software Foundation. Accessed: Oct. 10, 2023. [Online]. Available: <https://www.python.org/community/logos/>
- [56] R. K. Ngantung and M. A. I. Pakereng, "Model Pengembangan Sistem Informasi Akademik Berbasis User Centered Design Menerapkan Framework Flask Python," *Jurnal Media Informatika Budidarma*, vol. 5, no. 3, p. 1052, 2021, doi: 10.30865/mib.v5i3.3054.
- [57] RevoU, "Apa itu Google Colab?," RevoU. [Online]. Available: <https://www.revou.co/kosakata/google-colab>
- [58] V. K. M. Putri, "Microsoft Excel: Pengertian dan Fungsinya," Kompas.com. Accessed: Oct. 11, 2023. [Online]. Available: <https://www.kompas.com/skola/read/2023/02/01/090000069/microsoft-excel--pengertian-dan-fungsinya>
- [59] V. Plotnikova, M. Dumas, and F. Milani, "Adaptations of data mining methodologies: A systematic literature review," *PeerJ Comput Sci*, vol. 6, pp. 1–43, 2020, doi: 10.7717/PEERJ-CS.267.
- [60] Sampoerna University, "Teknik Purposive Sampling: Definisi, Tujuan, dan Syarat," Sampoerna University. Accessed: May 11, 2025. [Online]. Available: <https://www.sampoernauniversity.ac.id/id/news/purposive-sampling-adalah>

- [61] K. Qothrunnada, “Pengertian Variabel dan Jenisnya dalam Penelitian,” detikEdu. [Online]. Available: <https://www.detik.com/edu/detikpedia/d-5821887/pengertian-variabel-dan-jenisnya-dalam-penelitian>
- [62] C. Ozgur, T. Colliau, G. Rogers, and Z. Hughes, “MatLab vs. Python vs. R,” *Journal of Data Science*, vol. 15, no. 3, pp. 355–372, 2021, doi: 10.6339/jds.201707_15(3).0001.
- [63] GeeksforGeeks, “Google Colab vs Jupyter Notebook,” GeeksforGeeks. [Online]. Available: <https://www.geeksforgeeks.org/google-collab-vs-jupyter-notebook/>
- [64] Andreas and Wella, “How Positive Sentiment of Telemedicine Applications using Naïve Bayes and Support Vector Machine?,” *G-Tech: Jurnal Teknologi Terapan*, vol. 8, no. 2, pp. 857–867, 2024, doi: 10.33379/gtech.v8i2.4046.



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