

**ANALISIS SENTIMEN ULASAN CANDI BOROBUDUR PADA TRIPADVISOR
MENGGUNAKAN SUPPORT VECTOR MACHINE**

Skripsi

Diajukan untuk Memenuhi Sebagian dari Syarat Memenuhi Gelar Sarjana Komputer
Program Studi Ilmu Komputer



Oleh
Nadhira Haifa Firdausi
1908046

**PROGRAM STUDI ILMU KOMPUTER
FAKULTAS PENDIDIKAN MATEMATIKA DAN ILMU PENGETAHUAN ALAM
UNIVERSITAS PENDIDIKAN INDONESIA
2024**

**ANALISIS SENTIMEN ULASAN CANDI BOROBUDUR PADA TRIPADVISOR
MENGGUNAKAN SUPPORT VECTOR MACHINE**

Oleh

Nadhira Haifa Firdausi

1908046

Sebuah Skripsi yang Diajukan untuk Memenuhi Salah Satu Syarat Memperoleh
Gelar Sarjana Komputer pada Fakultas Pendidikan Matematika dan Ilmu
Pengetahuan Alam

© Nadhira Haifa Firdausi 2024

Universitas Pendidikan Indonesia

Agustus 2024

Hak Cipta Dilindungi Undang-Undang

Skripsi ini tidak boleh diperbanyak seluruhnya atau sebagian, dengan dicetak
ulang, difotokopi, atau cara lainnya tanpa izin dari penulis

NADHIRA HAIFA FIRDAUSI

1908046

**ANALISIS SENTIMEN ULASAN CANDI BOROBUDUR PADA TRIPADVISOR
MENGGUNAKAN SUPPORT VECTOR MACHINE**

DISETUJUI DAN DISAHKAN OLEH PEMBIMBING:

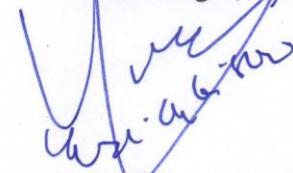
Pembimbing I,



Prof. Dr. Lala Septem Riza, M.T.

NIP. 197809262008121001

Pembimbing II,
29/03/24

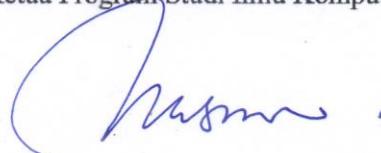


Dr. Yudi Wibisono, M. T.

NIP. 197507072003121003

Mengetahui,

Ketua Program Studi Ilmu Komputer



Dr. Muhammad Nursalman, M. T.

NIP. 197909292006041002

PERNYATAAN

Dengan ini penulis menyatakan bahwa skripsi yang berjudul “Analisis Sentimen Ulasan TripAdvisor Candi Borobudur Menggunakan Support Vector Machine” beserta seluruh isinya merupakan hasil karya penulis sendiri. Tidak ada bagian di dalamnya yang merupakan plagiat. Penulis tidak melakukan pengutipan atau penjiplakan dengan cara-cara yang tidak sesuai dengan etika yang berlaku dalam masyarakat keilmuan. Atas pernyataan ini, saya siap menanggung risiko/sanksi apabila kemudian ditemukan adanya pelanggaran terhadap etika keilmuan atau klaim pihak lain pada karya saya ini.

Bandung, Agustus 2024

Yang Membuat Pernyataan,

Nadhira Haifa Firdausi

NIM 1908046

KATA PENGANTAR

Puji dan syukur penulis panjatkan kepada Allah SWT. karena hanya dengan kehendak, rahmat dan karunia-Nya lah penulis dapat menyelesaikan skripsi yang berjudul “Analisis Sentimen Ulasan TripAdvisor Candi Borobudur Menggunakan Support Vector Machine”.

Penyusunan skripsi ini dimaksudkan untuk memenuhi dan melengkapi salah satu syarat dalam memperoleh gelar sarjana komputer jenjang studi strata 1 pada program studi Ilmu Komputer Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam Universitas Indonesia.

Penulis menyadari bahwa penyusunan skripsi ini masih jauh dari kata sempurna dikarenakan banyaknya kekurangan atau keterbatasan yang dimiliki penulis. Oleh karena itu penulis sangat mengharapkan kritik dan saran yang membangun agar tidak terjadi kesalahan yang sama dikemudian hari dan dapat meningkatkan kualitas ke tahap lebih baik. Semoga skripsi ini bermanfaat khusus bagi penulis dan umumnya bagi pembaca.

Bandung, Agustus 2024

Yang Membuat Pernyataan,

Nadhira Haifa Firdausi

NIM. 1908046

UCAPAN TERIMAKASIH

Puji dan syukur kita panjatkan ke hadirat Allah SWT Tuhan Yang Maha Esa atas rahmat dan karunia-Nya sehingga penulis dapat menyelesaikan penulisan skripsi ini. Selama proses penelitian dan penulisan skripsi ini, penulis menerima banyak bimbingan, dorongan, dan bantuan dari berbagai pihak. Oleh karena itu penulis mengucapkan terima kasih dan penghargaan setinggi-tingginya kepada:

1. Kedua orang tua, Mamah Dede Hidayah dan Bapak Rubaya, Teteh Nizza Nadya Rachmani, serta Adik Nazwa Latifa Maulida yang tanpa henti-hentinya memberikan doa dan dukungan, baik itu dukungan moral, materiil, maupun spiritual sehingga dapat memotivasi penulis dalam menyelesaikan skripsi ini.
2. Bapak Prof. Dr. Lala Septem Riza, M.T., selaku Dosen Pembimbing I yang telah bersedia meluangkan waktu, tenaga dan pikiran dalam memberikan pengarahan penyusunan skripsi ini.
3. Bapak Dr. Yudi Wibisono, M.T., selaku Dosen Pembimbing II yang telah bersedia meluangkan waktu, tenaga dan pikiran dalam memberikan pengarahan penyusunan skripsi ini.
4. Bapak Dr. Muhammad Nursalman, M. T., selaku Ketua Program Studi Ilmu Komputer Universitas Pendidikan Indonesia.
5. Bapak Yudi Ahmad Hambali, M.T., selaku Dosen Pembimbing Akademik atas segala bimbingan dan dukungan selama menempuh pendidikan tinggi.
6. Bapak dan Ibu Dosen serta staf administrasi Program Studi Ilmu Komputer yang telah berbagi ilmu dan keterampilan yang sangat bermanfaat kepada penulis.
7. Ajeng, Aliffia, dan Tasya sebagai rekan seperjuangan selama masa perkuliahan. Sekar dan Teh Eva sebagai rekan seperjuangan selama penyusunan skripsi.
8. Tiara Humaira dan Aldiandya Irsyad yang selalu meneman, membantu dan memberikan semangat sehingga penulis bisa menyelesaikan skripsi ini.
9. Rekan seperjuangan teman-teman mahasiswa Ilmu Komputer UPI angkatan tahun 2019.

10. Semua pihak yang turut membantu penulis dalam penyusunan skripsi yang tidak dapat penulis sebutkan satu per satu.

Semoga Allah SWT senantiasa membalas semua amal kebaikan yang telah diberikan. Semoga penelitian ini dapat bermanfaat bagi peneliti umumnya kepada pembaca. Aamiin.

Bandung, Agustus 2024

Nadhira Haifa Firdausi

ANALISIS SENTIMEN ULASAN CANDI BOROBUDUR PADA TRIPADVISOR MENGGUNAKAN SUPPORT VECTOR MACHINE

Oleh

Nadhira Haifa Firdausi — nadhirahaifa@upi.edu

1908046

ABSTRAK

Industri pariwisata global, termasuk Indonesia, mengalami dampak mendalam dari pandemi COVID-19, yang ditandai dengan penurunan jumlah pengunjung internasional dan domestik pasca-2019. Sebagai tanggapan, Indonesia menerapkan inisiatif Destinasi Super Prioritas dengan fokus terutama pada situs seperti Candi Borobudur di Pulau Jawa, yang diakui dunia karena signifikansi budaya dan sejarahnya sebagai situs Warisan Dunia UNESCO. Penelitian ini bertujuan untuk melakukan analisis sentimen ulasan TripAdvisor berbahasa Inggris tentang Candi Borobudur dengan menggunakan Support Vector Machine untuk klasifikasi. Data yang digunakan dalam penelitian ini dikumpulkan dari Oktober 2005 hingga Mei 2024. Studi ini mencakup berbagai tahap: mulai dari pengumpulan data dan preprocessing teks hingga pembagian data untuk pelatihan dan pengujian, anotasi manual label sentimen, ekstraksi fitur TF-IDF, pelatihan model SVM, dan evaluasi kinerja. Akurasi 80%, dengan skor F1 0,77, presisi 0,78, dan recall 0,83.

Kata Kunci: *Pariwisata, Sentimen Analisis, Support Vector Machine, Borobudur, TripAdvisor.*

**SENTIMENT ANALYSIS OF BOROBUDUR TEMPLE REVIEWS ON
TRIPADVISOR USING SUPPORT VECTOR MACHINE**

Arrange by

Nadhira Haifa Firdausi — nadhira@upi.edu

1908046

ABSTRACT

The global tourism industry, including Indonesia, experienced profound repercussions from the COVID-19 pandemic, marked by a notable downturn in international and domestic visitor numbers post-2019. In response, Indonesia implemented the Super Priority Destinations initiative, focusing particularly on iconic sites such as Candi Borobudur on Java Island, recognized worldwide for its cultural and historical significance as a UNESCO World Heritage site. This research utilizes Support Vector Machine (SVM) for sentiment analysis of English-language TripAdvisor reviews of Candi Borobudur, leveraging TripAdvisor's role as a pivotal platform for travelers to express opinions and share experiences. The data used in this study was collected from October 2005 to May 2024. The study encompasses various stages: from data collection and text preprocessing to partitioning data for training and testing, manual annotation of sentiment labels, TF-IDF feature extraction, SVM model training, and subsequent performance evaluation. Achieving an accuracy of 83%, with an F1-score of 0.77, precision of 0.78, and recall of 0.83.

Keywords: Tourism, Sentiment Analysis, Support Vector Machine, Borobudur, TripAdvisor.

DAFTAR ISI

PERNYATAAN	i
KATA PENGANTAR.....	ii
UCAPAN TERIMAKASIH	iii
ABSTRAK	v
ABSTRACT	vi
DAFTAR ISI	vii
DAFTAR GAMBAR	ix
DAFTAR TABEL.....	xi
BAB I PENDAHULUAN	1
1.1 Latar Belakang	1
1.2 Rumusan Masalah	3
1.3 Tujuan Penelitian.....	3
1.4 Batasan Masalah.....	4
1.5 Sistematika Penulisan	4
BAB II KAJIAN PUSTAKA	5
2.1 Pariwisata	5
2.1.2 Jenis Pariwisata	6
2.1.3 Komponen Pariwisata	10
2.2 Destinasi Super Prioritas Borobudur.....	11
2.3 TripAdvisor	14
2.4 Analisis Sentimen.....	16
2.5 Machine Learning	21
2.6 Natural Language Processing.....	26
2.7 Support Vector Machine.....	34
2.8 TF-IDF	41
2.9 Scikit Learn	42
2.10 Website Scraping.....	45
2.11 Confusion Matrix	46
2.12 Penelitian Terkait.....	48
BAB III METODE PENELITIAN.....	56
3.1 Desain Penelitian.....	56

3.2 Alat dan Bahan Penelitian	58
3.2.1 Alat Penelitian	58
3.2.2 Bahan Penelitian.....	58
BAB IV HASIL DAN PEMBAHASAN.....	60
4.1 Pengumpulan Data	60
4.2 Perancangan Model Komputasi	61
4.2.1 Perancangan Data Collection	61
4.2.2 Perancangan Text Preprocessing.....	65
4.2.3 Perancangan Analisis Sentimen	68
4.2.4 Perancangan Data Visualisasi	72
4.3 Implementasi Model Komputasi	75
4.3.1 Implementasi Data Collection.....	75
4.3.2 Implementasi Text Preprocessing.....	76
4.3.3 Implementasi Analisis Sentimen	81
4.3.4 Implementasi Data Visualisasi	86
4.4 Skenario Eksperimen	91
4.5 Hasil dan Analisis Eksperimen	92
4.5.1 Hasil Eksperimen	92
4.5.2 Analisis Eksperimen.....	97
BAB V KESIMPULAN	114
5.1 Kesimpulan	114
5.2 Saran.....	114
DAFTAR PUSTAKA	116
LAMPIRAN	128

DAFTAR GAMBAR

Gambar 1. 1 Statistik Wisatawan Indonesia (Badan Pusat Statistik)	1
Gambar 2. 1 Candi Borobudur (Dokumentasi Pribadi, 2015)	11
Gambar 2. 2 Struktur Candi Borobudur (Mujiono, 2021)	12
Gambar 2. 3 Antarmuka Destinasi Wisata	14
Gambar 2. 4 Bagian Ulasan TripAdvisor.....	15
Gambar 2. 5 Contoh Ulasan Positif di TripAdvisor.....	16
Gambar 2. 6 Contoh Ulasan Negatif di TripAdvisor	16
Gambar 2. 7 Pendekatan Sentimen Analisis (Birjali, et. al., 2021).....	19
Gambar 2. 8 Tahapan Text Preprocessing	31
Gambar 2. 9 Tahapan Proses Case Folding.....	32
Gambar 2. 10 Tahapan Proses Tokenization	32
Gambar 2. 11 Tahapan Proses Stopwords Removal.....	33
Gambar 2. 12 Tahapan Proses Stemming.....	34
Gambar 2. 13 Contoh Pemisahan Linear (Kononenko & Kukar, 2007)	35
Gambar 2. 14 Contoh Hyperplane Optimal (Kononenko & Kukar, 2007)	35
Gambar 3. 1 Desain Penelitian.....	56
Gambar 4. 1 Contoh Ulasan pada TripAdvisor	60
Gambar 4. 2 Model Komputasi.....	62
Gambar 4. 3 Flowchart Website Scraping.....	63
Gambar 4. 4 Pseudocode Text Preprocessing	65
Gambar 4. 5 Contoh Proses Text Filtering	65
Gambar 4. 6 Contoh Proses Case Folding	66
Gambar 4. 7 Contoh Proses Tokenization	66
Gambar 4. 8 Contoh Proses Stopword Removal.....	67
Gambar 4. 9 Contoh Proses Stemming	67
Gambar 4. 10 Pseudocode Data Splitting	69
Gambar 4. 11 Proses TF-IDF	69
Gambar 4. 12 Pseudocode TF-IDF	70
Gambar 4. 13 Pseudocode RBF Kernel	71
Gambar 4. 14 Pseudocode Evaluasi Model.....	72

Gambar 4. 15 Contoh Output Aspect Filtering	73
Gambar 4. 16 Rancangan Dashboard.....	74
Gambar 4. 17 Dashboard Analisis Sentimen.....	90
Gambar 4. 18 Distribusi Klasifikasi Sentimen.....	93
Gambar 4. 19 Tren ulasan per Tahun	94
Gambar 4. 20 Tren Sentimen Ulasan per Tahun	94
Gambar 4. 21 Distribusi Aspek per Sentimen.....	95
Gambar 4. 22 Distribusi Rating	95
Gambar 4. 23 Distribusi Rating per Sentimen	96
Gambar 4. 24 Distribusi Tipe Kunjungan	96
Gambar 4. 25 Wordcloud sentimen positif, netral, dan negatif.....	97
Gambar 4. 26 Word frequency sentimen positif, netral, dan negatif	97
Gambar 4. 27 Perbandingan Akurasi	99
Gambar 4. 28 Perbandingan F1-score.....	100
Gambar 4. 29 Perbandingan Precision	100
Gambar 4. 30 Perbandingan Recall.....	101
Gambar 4. 31 Perbandingan Waktu.....	101
Gambar 4. 32 Jumlah Pengunjung Candi Borobudur (BPS, 2023)	102
Gambar 4. 33 Jumlah Ulasan Candi Borobudur dari 2019-2024.....	103
Gambar 4. 34 Jumlah Pengunjung Candi Borobudur per Bulan Tahun 2021 – 2023	103
Gambar 4. 35 Jumlah Kunjungan per Bulan Tahun 2021 – 2023	104
Gambar 4. 36 Sentimen per Bulan Tahun 2021	105
Gambar 4. 37 Sentimen per Bulan Tahun 2022	105
Gambar 4. 38 Sentimen per Bulan Tahun 2023	106
Gambar 4. 39 Sentimen per Bulan Tahun 2024	106

DAFTAR TABEL

Tabel 2. 1 Contoh Perhitungan SVM	36
Tabel 2. 2 Kernel Populer di SVM (Cervantes, 2019)	38
Tabel 2. 3 Contoh Confusion Matrix (Kulkarni, et, al. 2020).....	46
Tabel 2. 4 Penelitian Terkait Sentimen Analisis.....	49
Tabel 4. 1 Contoh Output Website Scraping	64
Tabel 4. 2 Contoh Data Pelabelan	68
Tabel 4. 3 Contoh Output TF-IDF.....	70
Tabel 4. 4 Output Data Collection.....	77
Tabel 4. 5 Output Proses Text Preprocessing	80
Tabel 4. 6 Pelabelan Data.....	81
Tabel 4. 7 Hasil Proses TF-IDF.....	83
Tabel 4. 8 Bentuk Data Training dan Data Testing	84
Tabel 4. 9 Hasil Prediksi Sentimen	85
Tabel 4. 10 Kata Kunci Setiap Aspek.....	86
Tabel 4. 11 Output Aspect Filtering	88
Tabel 4. 12 Parameter Simulasi Skenario	91
Tabel 4. 13 Confusion Matrix	92
Tabel 4. 14 Perbandingan Kernel	97
Tabel 4. 15 Hasil Eksperimen Parameter	98
Tabel 4. 16 Harga Tiket Candi Borobudur Tahun 2024	107
Tabel 4. 17 Hasil Evaluasi Klasifikasi dengan Evaluator	107
Tabel 4. 18 Perbandingan dengan Penelitian Sebelumnya.....	110

DAFTAR PUSTAKA

- Agustina, C., Purwanto, P., & Farikhin, F. (2024). Enhancing Sentiment Analysis Accuracy in Borobudur Temple Visitor Reviews through Semi-Supervised Learning and SMOTE Upsampling. *Journal of Advances in Information Technology*, 15(4), 492–499. <https://doi.org/10.12720/jait.15.4.492-499>
- Ahuja, R., Chug, A., Kohli, S., Gupta, S., & Ahuja, P. (2019). The impact of features extraction on the sentiment analysis. *Procedia Computer Science*, 152, 341–348. <https://doi.org/10.1016/j.procs.2019.05.008>
- Ainin, S., Feizollah, A., Anuar, N. B., & Abdullah, N. A. (2020). Sentiment analyses of multilingual tweets on halal tourism. *Tourism Management Perspectives*, 34, 100658. <https://doi.org/10.1016/j.tmp.2020.100658>
- Ali, T., Marc, B., Omar, B., Soulaimane, K., & Larbi, S. (2021). Exploring destination's negative e-reputation using aspect based sentiment analysis approach: Case of Marrakech destination on TripAdvisor. *Tourism Management Perspectives*, 40, 100892. <https://doi.org/10.1016/j.tmp.2021.100892>
- ALTobi, M. A. S., et. al. (2019). Fault diagnosis of a centrifugal pump using MLP-GABP and SVM with CWT. *Engineering Science and Technology, an International Journal*, 22(3), 854-861.
- Alzami, F., Udayanti, E. D., Prabowo, D. P., & Megantara, R. A. (2020). Document Preprocessing with TF-IDF to Improve the Polarity Classification Performance of Unstructured Sentiment Analysis. *Kinetik: Game Technology, Information System, Computer Network, Computing, Electronics, and Control*, 235–242. <https://doi.org/10.22219/kinetik.v5i3.1066>
- Amarouche, K., Benbrahim, H., & Kassou, I. (2015). Product Opinion Mining for Competitive Intelligence. *Procedia Computer Science*, 73, 358–365. <https://doi.org/10.1016/j.procs.2015.12.004>
- Ardhanariswari, K. A., & Pratiwi, K. W. (2021). Strengthening of Collaboration Strategy through Pentahelix Model in Borobudur as a Super Priority Tourist Destination. *RSF Conference Series: Business, Management and Social Sciences*, 1(4), 150–161. <https://doi.org/10.31098/bmss.v1i4.360>

- Baskoro, B. B., Susanto, I., & Khomsah, S. (2021). Analisis Sentimen Pelanggan Hotel di Purwokerto Menggunakan Metode Random Forest dan TF-IDF (Studi Kasus: Ulasan Pelanggan Pada Situs TRIPADVISOR). *INISTA (Journal of Informatics Information System Software Engineering and Applications)*, 3(2), 21–29. <https://doi.org/10.20895/INISTA.V3>
- Butarbutar, R. R., Wiratanaya, G. N., Rachmarwi, W., Ganika, G., Susanty, S., Widyaningsih, I. U., Pertiwi, W. N. B., Kurniawan, J., Madij, R., Setiorini, A., Hasbi, I., Sari, D. P., Nugroho, L., Susanti, P. H., Azhar, & Suma, N. N. (2021). Pengantar Pariwisata. Widina Bhakti Persada Bandung.
- Cervantes, J., Garcia-Lamont, F., Rodríguez-Mazahua, L., & Lopez, A. (2020). A comprehensive survey on support vector machine classification: Applications, challenges and trends. Elsevier BV. <https://doi.org/10.1016/j.neucom.2019.10.118>
- Chang, V., Liu, L., Xu, Q., Li, T., & Hsu, C. (2023). An improved model for sentiment analysis on luxury hotel review. *Expert Systems*, 40(2). <https://doi.org/10.1111/exsy.12580>
- Chang, Y. W., et. al. (2010). Training and testing low-degree polynomial data mappings via linear SVM. *Journal of Machine Learning Research*, 11(4).
- Chapelle, O., et. al. (1999). Support vector machines for histogram-based image classification. *IEEE transactions on Neural Networks*, 10(5), 1055-1064.
- Chaudhuri, A., & De, K. (2011). Fuzzy support vector machine for bankruptcy prediction. *Applied Soft Computing*, 11(2), 2472-2486.
- Chen, K. C., et. al. (2014). Applying automatic kernel parameter selection method to the full bandwidth RBF kernel function for hyperspectral image classification. In 2014 IEEE Geoscience and Remote Sensing Symposium (pp. 3442-3445). IEEE.
- Chen, W., Xu, Z., Zheng, X., Yu, Q., & Luo, Y. (2020). Research on Sentiment Classification of Online Travel Review Text. *Applied Sciences*, 10(15), 5275. <https://doi.org/10.3390/app10155275>
- Dang, N. C., et. al. (2020). Sentiment Analysis Based on Deep Learning: A Comparative Study. *Electronics*, 9(3), 483. <https://doi.org/10.3390/electronics9030483>

- Darmawan, F. (2023). Konservasi vs Pariwisata Massal: Konflik Kebijakan dan Tantangan Borobudur sebagai Warisan Budaya Dunia UNESCO. *Jurnal Vokasi Indonesia*, 10(1), 22–28. <https://scholarhub.ui.ac.id/jvi/vol10/iss1/3>
- Dey, S., Wasif, S., Tonmoy, D. S., Sultana, S., Sarkar, J., & Dey, M. (2020). A Comparative Study of Support Vector Machine and Naive Bayes Classifier for Sentiment Analysis on Amazon Product Reviews. *2020 International Conference on Contemporary Computing and Applications (IC3A)*, 217–220. <https://doi.org/10.1109/IC3A48958.2020.233300>
- Doni Abdul Fatah, Eka Mala Sari Rochman, Fajrul Ihsan Kamil, & Ahmad Su'ud. (2023). Sentiment Analysis of Madura Tourism Opinion Using Support Vector Machine (SVM). *Technium: Romanian Journal of Applied Sciences and Technology*, 16, 243–249. <https://doi.org/10.47577/technium.v16i.9988>
- Doni Abdul Fatah, Eka Mala Sari Rochman, Fajrul Ihsan Kamil, & Ahmad Su'ud. (2023). Sentiment Analysis of Madura Tourism Opinion Using Support Vector Machine (SVM). *Technium: Romanian Journal of Applied Sciences and Technology*, 16, 243–249. <https://doi.org/10.47577/technium.v16i.9988>
- Eisenstein, J. (2019). Introduction to natural language processing. London, England: MIT Press.
- Erwin, L. T. (2012). Desa wisata kawasan Borobudur: tersembunyi di 20 desa wisata : wisata alam, agrowisata, kuliner, kerajinan, tradisi & homestay : 145 destinasi wisata. Indonesia: Gramedia Pustaka Utama.
- Géron, A. (2017). Hands-on machine learning with scikit-learn and tensorflow: Concepts, tools, and techniques to build Intelligent Systems. O'Reilly Media.
- Girosi, F., et. al. (1996). Comparing support vector machines with gaussian kernels to radial basis function classifiers. Tech. rep. Technical Report 1599.
- Goldberg, Y., & Elhadad, M. (2008, June). splitSVM: fast, space-efficient, non-heuristic, polynomial kernel computation for NLP applications. In Proceedings of ACL-08: HLT, short papers (pp. 237-240).
- Gopi, A. P., Jyothi, R. N. S., Narayana, V. L., & Sandeep, K. S. (2020). Classification of tweets data based on polarity using improved RBF kernel of SVM. *International Journal of Information Technology*. doi:10.1007/s41870-019-00409-4

- Grama, L., et. al. (2017). On the optimization of SVM kernel parameters for improving audio classification accuracy. Presented at the 2017 14th International Conference on Engineering of Modern Electric Systems (EMES). <https://doi.org/10.1109/emes.2017.7980420>
- Guerreiro, J., & Rita, P. (2020). How to predict explicit recommendations in online reviews using text mining and sentiment analysis. *Journal of Hospitality and Tourism Management*, 43, 269–272. <https://doi.org/10.1016/j.jhtm.2019.07.001>
- Henrique, B. M., et. al. (2018). Stock price prediction using support vector regression on daily and up to the minute prices. In *The Journal of Finance and Data Science* (Vol. 4, Issue 3, pp. 183–201). Elsevier BV. <https://doi.org/10.1016/j.jfds.2018.04.003>
- Hobbs, J. R., & Riloff, E. (2020). Information Extraction. In *Handbook of natural language processing* (2nd ed., pp. 511–532). Philadelphia, PA: Chapman & Hall/CRC.
- Huang, B., et. al. (2022). Aspect-level sentiment analysis with aspect-specific context position information. *Knowledge-Based Systems*, 243, 108473. <https://doi.org/10.1016/j.knosys.2022.108473>
- Jiang, Z., Gao, B., He, Y., Han, Y., Doyle, P., & Zhu, Q. (2021). Text Classification Using Novel Term Weighting Scheme-Based Improved TF-IDF for Internet Media Reports. *Mathematical Problems in Engineering*, 2021, 1–30. <https://doi.org/10.1155/2021/6619088>
- Kane, F. (2017). Hands-on data science and python machine learning. Birmingham, England: Packt Publishing.
- Kang, Yue; Cai, Zhao; Tan, Chee-Wee; Huang, Qian; Liu, Hefu (2020). Natural language processing (NLP) in management research: A literature review. *Journal of Management Analytics*, 0, 1–34. doi:10.1080/23270012.2020.1756939
- Kim, Y., Dwivedi, R., Zhang, J., & Jeong, S. R. (2016). Competitive intelligence in social media Twitter: iPhone 6 vs. Galaxy S5. *Online Information Review*, 40(1), 42–61. <https://doi.org/10.1108/OIR-03-2015-0068>

- Kononenko, I., & Kukar, M. (2007). Statistical Learning. Machine Learning and Data Mining, 259–274. doi:10.1533/9780857099440.259
- Kulkarni, A., Chong, D., & Batarseh, F. A. (2020). Foundations of data imbalance and solutions for a data democracy. In Data Democracy (pp. 83–106). Elsevier. <https://doi.org/10.1016/B978-0-12-818366-3.00005-8>
- Kuo, B. C., et. al. (2013). A kernel-based feature selection method for SVM with RBF kernel for hyperspectral image classification. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, 7(1), 317-326.
- Leelawat, N., Jariyapongpaiboon, S., Promjun, A., Boonyarak, S., Saengtabtim, K., Laosunthara, A., Yudha, A. K., & Tang, J. (2022). Twitter data sentiment analysis of tourism in Thailand during the COVID-19 pandemic using machine learning. *Heliyon*, 8(10), e10894. <https://doi.org/10.1016/j.heliyon.2022.e10894>
- Lighthart, A., et. al. (2021). Systematic reviews in sentiment analysis: a tertiary study. Artificial Intelligence Review, 54(7), 4997–5053. <https://doi.org/10.1007/s10462-021-09973-3>
- Liu, B. (2010). Sentiment Analysis and Subjectivity. Handbook of Natural Language Processing.
- Liu, B. (2020). Sentiment Analysis. Cambridge University Press. <https://doi.org/10.1017/9781108639286>
- Liu, Y., Lian, J., Bartolacci, M. R., & Zeng, Q.-A. (2014). Density-Based Penalty Parameter Optimization on C-SVM. The Scientific World Journal, 2014, 1–9. <https://doi.org/10.1155/2014/851814>
- Maldonado, S., & López, J. (2015). An embedded feature selection approach for support vector classification via second-order cone programming. IOS Press. <https://doi.org/10.3233/ida-150781>
- Mali, M., Atique, M. (2021). The Relevance of Preprocessing in Text Classification. In: Singh Mer, K.K., Semwal, V.B., Bijalwan, V., Crespo, R.G. (eds) Proceedings of Integrated Intelligence Enable Networks and Computing. Algorithms for Intelligent Systems. Springer, Singapore. https://doi.org/10.1007/978-981-33-6307-6_55

- Mehraliyev, F., Chan, I. C. C., & Kirilenko, A. P. (2022). Sentiment analysis in hospitality and tourism: a thematic and methodological review. *International Journal of Contemporary Hospitality Management*, 34(1), 46–77. <https://doi.org/10.1108/IJCHM-02-2021-0132>
- Mehta, P., & Pandya, D. (2020). A Review On Sentiment Analysis Methodologies, Practices And Applications. *International Journal of Scientific & Technology Research*, 9, 601-609.
- Mishra, R. K., Urolagin, S., Jothi, J. A. A., Neogi, A. S., & Nawaz, N. (2021). Deep Learning-based Sentiment Analysis and Topic Modeling on Tourism During Covid-19 Pandemic. *Frontiers in Computer Science*, 3. <https://doi.org/10.3389/fcomp.2021.775368>
- Mohamed, K., & Bayraktar, Ü. A. (2022). Analyzing The Role of Sentiment Analysis in Public Relations: Brand Monitoring and Crisis Management. *International Journal of Humanities and Social Science*, 9(3), 116–126. <https://doi.org/10.14445/23942703/ijhss-v9i3p116>
- Molla-Aliod, D., & Vicedo, J. (2020). Question Answering. In *Handbook of natural language processing* (2nd ed., pp. 485–510). Philadelphia, PA: Chapman & Hall/CRC.
- Mujiono, N. (2021). Pahatan Cangkang Moluska Pada Relief Candi Borobudur. *Zoo Indonesia*, 30(2), 85–97. https://biologyjournal.brin.go.id/index.php/zoo_indonesia/article/view/4105/3418
- Nazir, A., et. al. (2020). Issues and Challenges of Aspect-based Sentiment Analysis: A Comprehensive Survey. *IEEE Transactions on Affective Computing*, 1–1. doi:10.1109/taffc.2020.2970399
- Obiedat, R., Qaddoura, R., Al-Zoubi, A. M., Al-Qaisi, L., Harfoushi, O., Alrefai, M., & Faris, H. (2022). Sentiment Analysis of Customers' Reviews Using a Hybrid Evolutionary SVM-Based Approach in an Imbalanced Data Distribution. *IEEE Access*, 10, 22260–22273. <https://doi.org/10.1109/ACCESS.2022.3149482>

- Onan, A. (2021). Sentiment analysis on product reviews based on weighted word embeddings and deep neural networks. *Concurrency and Computation: Practice and Experience*, 33(23). <https://doi.org/10.1002/cpe.5909>
- Palmer, D. D. (2020). Text Preprocessing. In *Handbook of natural language processing* (2nd ed., pp. 9–30). Philadelphia, PA: Chapman & Hall/CRC.
- Pamungkas, T. J., & Romadhony, A. (2021). Analisis Sentimen Berbasis Aspek Terhadap Ulasan Restoran Berbahasa Indonesia menggunakan Support Vector Machines. *E-Proceeding of Engineering*, 8(4), 4102–4114.
- Paolanti, M., Mancini, A., Frontoni, E., Felicetti, A., Marinelli, L., Marcheggiani, E., & Pierdicca, R. (2021). Tourism destination management using sentiment analysis and geo-location information: a deep learning approach. *Information Technology & Tourism*, 23(2), 241–264. <https://doi.org/10.1007/s40558-021-00196-4>
- Park, E., Kang, J., Choi, D., & Han, J. (2020). Understanding Customers' Hotel Revisiting Behaviour: A Sentiment Analysis of Online Feedback Reviews. *Current Issues in Tourism*, 23(5), 605–611. <https://doi.org/10.1080/13683500.2018.1549025>
- Pati, G. K., & Umar, E. (2022). Analisis Sentimen Komentar Pengunjung Terhadap Tempat Wisata Danau Weekuri Menggunakan Metode Naive Bayes Classifier Dan K-Nearest Neighbor. *Jurnal Media Informatika Budidarma*, 6(4), 2309. <https://doi.org/10.30865/mib.v6i4.4635>
- Paulina, W., Bachtiar, F. A., & Rusydi, A. N. (2020). Analisis Sentimen Berbasis Aspek Ulasan Pelanggan Terhadap Kertanegara Premium Guest House Menggunakan Support Vector Machine. *Jurnal Pengembangan Teknologi Informasi Dan Ilmu Komputer*, 4(4), 1141–1149.
- Pisner, D. A., & Schnyer, D. M. (2020). Support vector machine. *Machine Learning*, 101–121. doi:10.1016/b978-0-12-815739-8.00006-7
- Prabowo, W. A., & Azizah, F. (2020). Sentiment Analysis for Detecting Cyberbullying Using TF-IDF and SVM. *Jurnal RESTI (Rekayasa Sistem Dan Teknologi Informasi)*, 4(6). <https://doi.org/10.29207/resti.v4i6.2753>
- Prastyo, P. H., Ardiyanto, I., & Hidayat, R. (2020). Indonesian Sentiment Analysis: An Experimental Study of Four Kernel Functions on SVM Algorithm with TF-

- IDF. 2020 *International Conference on Data Analytics for Business and Industry: Way Towards a Sustainable Economy, ICDABI 2020*, 1–6. <https://doi.org/10.1109/ICDABI51230.2020.9325685>
- Pratiwi, R. W., H, S. F., Dairoh, D., Af'idah, D. I., A, Q. R., & F, A. G. (2021). Analisis Sentimen Pada Review Skincare Female Daily Menggunakan Metode Support Vector Machine (SVM). *Journal of Informatics, Information System, Software Engineering and Applications (INISTA)*, 4(1), 40–46. <https://doi.org/10.20895/inista.v4i1.387>
- Puh, K., & Bagić Babac, M. (2023). Predicting sentiment and rating of tourist reviews using machine learning. *Journal of Hospitality and Tourism Insights*, 6(3), 1188–1204. <https://doi.org/10.1108/JHTI-02-2022-0078>
- Rao, D., & McMahan, B. (2019). Natural language processing with PyTorchlow. Sebastopol, CA: O'Reilly Media.
- Ray, B., Garain, A., & Sarkar, R. (2021). An ensemble-based hotel recommender system using sentiment analysis and aspect categorization of hotel reviews. *Applied Soft Computing*, 98, 106935. <https://doi.org/10.1016/j.asoc.2020.106935>
- Riani, N. K. (2021). Pariwisata Adalah Pisau Bermata 2. *Jurnal Inovasi Penelitian*, 2(5), 1469–1474. <https://doi.org/10.47492/jip.v2i5.923>
- Ruz, G. A., Henríquez, P. A., & Mascareño, A. (2020). Sentiment analysis of Twitter data during critical events through Bayesian networks classifiers. *Future Generation Computer Systems*, 106, 92–104. <https://doi.org/10.1016/j.future.2020.01.005>
- Samah, K. A. F. A., Azharludin, N. M. N., Riza, L. S., Jono, M. N. H. H., & Moketar, N. A. (2023). Classification and visualization: Twitter sentiment analysis of Malaysia's private hospitals. *IAES International Journal of Artificial Intelligence*, 12(4), 1793–1802. <https://doi.org/10.11591/ijai.v12.i4.pp1793-1802>
- Samah, K. A. F. A., Jailani, N. S., Hamzah, R., Aminuddin, R., Abidin, N. A. Z., & Riza, L. S. (2024). Aspect-Based Classification and Visualization of Twitter Sentiment Analysis Towards Online Food Delivery Services in Malaysia.

- Journal of Advanced Research in Applied Sciences and Engineering Technology*, 37(1), 139–150. <https://doi.org/10.37934/araset.37.1.139150>
- Sanjaa, B., & Chuluun, E. (2013). Malware detection using linear SVM. Ifost, 2, 136-138.
- Savoy, J., & Gaussier, E. (2020). Information Retrieval. In *Handbook of natural language processing* (2nd ed., pp. 455–486). Philadelphia, PA: Chapman & Hall/CRC.
- Setiawan, A., & Sukmana, F. H. (2023). Mengurai Pengalaman Positif Tamu Saat Menginap di Sheraton Senggigi Beach Resort. *Jurnal Kepariwisataan Indonesia: Jurnal Penelitian Dan Pengembangan Kepariwisataan Indonesia*, 17(1), 64–84. <https://doi.org/10.47608/jki.v17i12023.64-84>
- Sharef, N. M., Zin, H. M., & Nadali, S. (2016). Overview and future opportunities of Sentiment Analysis approaches for big data. *Journal of Computer Science*, 12(3), 153–168. <https://doi.org/10.3844/jcssp.2016.153.168>
- Sigala, M., Rahimi, R., & Thelwall, M. (2019). Big data and innovation in tourism, travel, and hospitality: Managerial approaches, techniques, and applications. In *Big Data and Innovation in Tourism, Travel, and Hospitality: Managerial Approaches, Techniques, and Applications*. Springer Singapore. <https://doi.org/10.1007/978-981-13-6339-9>
- Singh, P., Singh, N., Singh, K. K., & Singh, A. (2021). Diagnosing of disease using machine learning. In *Machine Learning and the Internet of Medical Things in Healthcare* (pp. 89–111). Elsevier. <https://doi.org/10.1016/B978-0-12-821229-5.00003-3>
- Sinuraya, S. I., & Wismaningtyas, T. A. (2024). Pendampingan Penyusunan Unique Selling Point di Desa Wisata Borobudur, Kabupaten Magelang. *Jurnal Komunitas : Jurnal Pengabdian Kepada Masyarakat*, 6(2), 146–157. <https://doi.org/10.31334/jks.v6i2.3530>
- Soekmono, R. (1976). *Chandi Borobudur: A monument of mankind*. Assen : Van Gorcum ; Paris : The Unesco Press.
- Sontayasara, T., Jariyapongpaiboon, S., Promjun, A., Seelpipat, N., Saengtabtim, K., Tang, J., & Leelawat, N. (2021). Twitter Sentiment Analysis of Bangkok Tourism During COVID-19 Pandemic Using Support Vector Machine

- Algorithm. *Journal of Disaster Research*, 16(1), 24–30.
<https://doi.org/10.20965/jdr.2021.p0024>
- Spillane, J. J. (1987). *Pariwisata Indonesia: Sejarah dan Prospeknya*. Kanisius.
- Steven, C., & Wella, W. (2020). The Right Sentiment Analysis Method of Indonesian Tourism in Social Media Twitter. *IJNMT (International Journal of New Media Technology)*, 7(2), 102–110.
<https://doi.org/10.31937/ijnmt.v7i2.1732>
- Styawati, S., Nurkholis, A., Aldino, A. A., Samsugi, S., Suryati, E., & Cahyono, R. P. (2022). Sentiment Analysis on Online Transportation Reviews Using Word2Vec Text Embedding Model Feature Extraction and Support Vector Machine (SVM) Algorithm. *2021 International Seminar on Machine Learning, Optimization, and Data Science (ISMODE)*, 163–167.
<https://doi.org/10.1109/ISMODE53584.2022.9742906>
- Suwena, I. K., & Widyatamaja, I. G. N. (2017). Pengetahuan Dasar Ilmu Pariwisata. Pustaka Larasan.
- Tan, M., Wang, L., & Tsang, I.W. (2010). Learning Sparse SVM for Feature Selection on Very High Dimensional Datasets. International Conference on Machine Learning.
- Tedeschi, A., & Benedetto, F. (2015). A cloud-based big data sentiment analysis application for enterprises' brand monitoring in social media streams. *2015 IEEE 1st International Forum on Research and Technologies for Society and Industry, RTSI 2015 - Proceedings*, 186–191.
<https://doi.org/10.1109/RTSI.2015.7325096>
- Theobald, O. (2018). Machine learning for absolute beginners. Independently Published.
- Tran, N., et. al. (2020). Improving SVM classification on imbalanced datasets for EEG-based person authentication. In International Joint Conference: 12th International Conference on Computational Intelligence in Security for Information Systems (CISIS 2019) and 10th International Conference on European Transnational Education (ICEUTE 2019) Seville, Spain, May 13th-15th, 2019 Proceedings 12 (pp. 57-66). Springer International Publishing.

- Vajjala, S., et. al. (2020). Practical natural language processing. Sebastopol, CA: O'Reilly Media.
- Vijayaragavan, P., Ponnusamy, R., & Aramudhan, M. (2020). An optimal support vector machine based classification model for sentimental analysis of online product reviews. *Future Generation Computer Systems*, 111, 234–240. <https://doi.org/10.1016/j.future.2020.04.046>
- Wankhade, M., et. al. (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>
- Widagdo, B. W., Adiguna, M. A., & Anggraeni. (2023). Brand Reputation Monitoring System Based on Sentiment Analysis Using the K-Nearest Neighbor Method. *JUPIK: Jurnal Penelitian Ilmu Komputer*, 1(1), 22–27. <https://doi.org/10.5281/zenodo.7720440><https://mypublikasi.com/>
- Widodo, E., Nursyafitri, G. D., Putri, O. N., & NurmalaSari, Y. (2020). Sentiment Analysis of Visitors in Borobudur Temple With Support Vector Machine Based on TripAdvisor Review. *Proceedings of the 2nd International Seminar on Science and Technology (ISSTEC 2019)*. <https://doi.org/10.2991/assehr.k.201010.009>
- Xia, H., Yang, Y., Pan, X., Zhang, Z., & An, W. (2020). Sentiment analysis for online reviews using conditional random fields and support vector machines. *Electronic Commerce Research*, 20(2), 343–360. <https://doi.org/10.1007/s10660-019-09354-7>
- Yuniarti, R., & Ruldeviyani, Y. (2023). Sentiment Analysis of Banking Risk Profile Determination: The Case Study of Bank XYZ. *AIP Conference Proceedings*, 2865(1), 050002. <https://doi.org/10.1063/5.0181966>
- Yustihan, S. R., Adikara, P. P., & Indriati. (2021). Analisis Sentimen berbasis Aspek terhadap Data Ulasan Rumah Makan menggunakan Metode Support Vector Machine (SVM). *Jurnal Pengembangan Teknologi Informasi Dan Ilmu Komputer*, 5(3), 1017–1023. <http://j-ptiik.ub.ac.id>
- Zahoor, K., Bawany, N. Z., & Hamid, S. (2020). Sentiment Analysis and Classification of Restaurant Reviews using Machine Learning. *2020 21st*

- International Arab Conference on Information Technology (ACIT), 1–6.*
<https://doi.org/10.1109/ACIT50332.2020.9300098>
- Zhu, S., et. al. (2013). Chinese Microblog Sentiment Analysis Based on Semi-supervised Learning. *Semantic Web and Web Science*, 325–331.
doi:10.1007/978-1-4614-6880-6_28
- Zuheros, C., Martínez-Cámarra, E., Herrera-Viedma, E., & Herrera, F. (2021). Sentiment Analysis based Multi-Person Multi-criteria Decision Making methodology using natural language processing and deep learning for smarter decision aid. Case study of restaurant choice using TripAdvisor reviews. *Information Fusion*, 68, 22–36. <https://doi.org/10.1016/j.inffus.2020.10.019>