

ACKNOWLEDGMENT

We thank PT. Bank Riau Kepri for permits to use some of the data and DIKSI funded for this project.

REFERENCES

- [1] Badan Pusat Statistik, "Proporsi Kredit UMKM Terhadap Total Kredit (Triliun Rupiah), 2017-2019," pp. 2–3, 2020.
- [2] O. J. KEUANGAN and REPUBLIK INDONESIA, "Peraturan Otoritas jasa keuangan republik indonesia No. 42 /POJK.03/2019," vol. 42 /POJK.0, 2019.
- [3] V. K. J. Pongilatan et al., "Evaluation Of The Suitability Of The Allowance For Impairment Losses On Credit With Sfas 55 At Sulutgo Bank Branch Ratahan Oleh: Jurusan Akuntansi , Fakultas Ekonomi dan Bisnis E-mail: Keywords: SFAS 55 , recognition and measurement , allowance for impa," vol. 9, no. 55, pp. 625–632, 2021.
- [4] L. C. Thomas, "A survey of credit and behavioural scoring: forecasting financial risk of lending to consumers," *International Journal of Forecasting*, vol. 16, no. 2, pp. 149–172, Apr. 2000, doi:10.1016/s0169-2070(00)00034-0.
- [5] Y. Religia, A. Nugroho, and W. Hadikristanto, "Analisis Perbandingan Algoritma Optimasi pada Random Forest untuk Klasifikasi Data Bank Marketing," *J. RESTI (Rekayasa Sist. dan Teknol. Informasi)*, vol. 5, no. 1, pp. 187–192, 2021.
- [6] E. Dumitrescu, S. Hue, C. Hurlin, and S. Tokpavi, "Machine learning for credit scoring: Improving logistic regression with non-linear decision-tree effects," *Eur. J. Oper. Res.*, vol. 297, no. 3, pp. 1178–1192, 2022.
- [7] Peng Du and Hong Shu, "Exploration of financial market credit scoring and risk management and prediction using deep learning and bionic algorithm," *Journal of Global Information Management (JGIM)*, 30(9), 1-29, 2022.
- [8] B. Charbuty and A. Abdulazeez, "Classification Based on Decision Tree Algorithm for Machine Learning," *Journal of Applied Science and Technology Trends*, vol. 2, no. 01, pp. 20–28, Mar. 2021, doi:10.38094/jastt20165.
- [9] H. K. Yaseen and A. M. Obaid, "Big Data: Definition, Architecture & Applications," *JOIV : International Journal on Informatics Visualization*, vol. 4, no. 1, pp. 45–51, Feb. 2020, doi: 10.30630/joiv.4.1.292.
- [10] M. Aljanabi et al., "Large Dataset Classification Using Parallel Processing Concept," pp. 1–4, 2020.
- [11] H. Park and J. Jeon, "Optimal Data Transmission and Improve Efficiency through Machine Learning in Wireless Sensor Networks," *JOIV : International Journal on Informatics Visualization*, vol. 6, no. 2–2, p. 463, Aug. 2022, doi: 10.30630/joiv.6.2-2.1125.
- [12] D. Lee, J.-Y. Hwang, Y. Lee, and S.-W. Kim, "Informatics and Artificial Intelligence (AI) Education in Korea: Situation Analysis Using the Darmstadt Model," *JOIV : International Journal on Informatics Visualization*, vol. 6, no. 2, p. 427, Jun. 2022, doi:10.30630/joiv.6.2.1000.
- [13] T. Wellem, Y. Nataliani, and A. Iriani, "Academic Document Authentication using Elliptic Curve Digital Signature Algorithm and QR Code," *JOIV : International Journal on Informatics Visualization*, vol. 6, no. 3, p. 667, Sep. 2022, doi: 10.30630/joiv.6.2.872.
- [14] S. Irawan and R. Firsandaya Malik, "Credit Scoring Menggunakan Algoritma Classification And Regression Tree (CART)," vol. 2, no. 1, pp. 82–85, 2017.
- [15] F. Irawan and F. Samopa, "A Comparative Assessment of the Random Forest and SVM Algorithms Using Combination of Principal Component Analysis and SMOTE For Accounts Receivable Seamless Prediction case study company X in Surabaya," 2018.
- [16] F. Sodik, B. Dwi, and I. Kharisudin, "Perbandingan Metode Klasifikasi Supervised Learning pada Data Bank Customers Menggunakan Python," *Jurnal Matematika*, vol. 3, pp. 689–694, 2020.
- [17] H. Lu and X. Ma, "Hybrid decision tree-based machine learning models for short-term water quality prediction," *Chemosphere*, vol. 249, p. 126169, Jun. 2020, doi: 10.1016/j.chemosphere.2020.126169.
- [18] S. Misra and H. Li, "Noninvasive fracture characterization based on the classification of sonic wave travel times," *Machine Learning for Subsurface Characterization*, pp. 243–287, 2020, doi: 10.1016/b978-0-12-817736-5.00009-0.
- [19] P. Palimkar, R. N. Shaw, and A. Ghosh, "Machine Learning Technique to Prognosis Diabetes Disease: Random Forest Classifier Approach," *Lecture Notes in Networks and Systems*, pp. 219–244, Jul. 2021, doi:10.1007/978-981-16-2164-2_19.
- [20] Y. Christian, "Predicting Consumer Interest in All You Can Eat Restaurants with Gradient Boosting Algorithm," *Journal of Informatics and Telecommunication Engineering*, vol. 6, no. 1, pp. 91–100, Jul. 2022, doi: 10.31289/jite.v6i1.7209.
- [21] M. Fatih Yuruk, "Xgboost (Extreme Gradient Boosting) Tabanli Algoritma Ile Gümüş Fiyatlarının Tahmin Edilmesi Some of the authors of this publication are also working on these related projects: Prediction of Silver Prices With Xgboost (Extreme Gradient Boosting) Based Algorithm View project," 2022. [Online]. Available: <https://www.ispecongress.org/sosyal-bilimler>
- [22] A. Deharja, M. W. Santi, M. Yunus, and E. Rachmawati, "Sistem Prototype Klasifikasi Risiko Kehamilan Dengan Algoritma k-Nearest Neighbor (k-NN)," *JTIM: Jurnal Teknologi Informasi dan Multimedia*, vol. 4, no. 1, pp. 66–72, May 2022, doi:10.35746/jtim.v4i1.229.
- [23] S. Styawati, A. Nurkholis, A. A. Aldino, S. Samsugi, E. Suryati, and R. P. Cahyono, "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), Jan. 2022, doi: 10.1109/ismode53584.2022.9742906.
- [24] R. Saedudin, I. T. Riyadi Yanto, A. Budiono, S. Novita Sari, M. Mat Deris, and N. Senan, "Data Clustering for Identification of Building Conditions Using Hybrid Multivariate Multinomial Distribution Soft Set (MMDS) Method," *JOIV : International Journal on Informatics Visualization*, vol. 6, no. 2, p. 284, Jun. 2022, doi:10.30630/joiv.6.2.986.
- [25] - Sarmini, A. Alhabeeb, M. M. Abusharhah, T. Hariguna, and A. R. Hananto, "An Investigation into Indonesian Students' Opinions on Educational Reforms through the Use of Machine Learning and Sentiment Analysis," *JOIV : International Journal on Informatics Visualization*, vol. 6, no. 3, p. 604, Sep. 2022, doi:10.30630/joiv.6.3.894.
- [26] A. N. Iffah'da and A. Desiani, "Implementasi Algoritma K-Nearest Neighbor (K-NN) dan Single Layer Perceptron (SLP) Dalam Prediksi Penyakit Sirosis Biliari Primer," *J. Ilm. Inform.*, vol. 7, no. 1, pp. 65–74, 2022.
- [27] C. Schröer, F. Kruse, and J. M. Gómez, "A systematic literature review on applying CRISP-DM process model," *Procedia Comput. Sci.*, vol. 181, pp. 526–534, 2021.
- [28] E. Kristoffersen, O. O. Aremu, F. Blomsma, P. Mikalef, and J. Li, "Exploring the relationship between data science and circular economy: an enhanced CRISP-DM process model," in *Conference on e-Business, e-Services and e-Society*, 2019, pp. 177–189.
- [29] V. Singh, A. Singh, and K. Joshi, "Fair CRISP-DM: Embedding Fairness in Machine Learning (ML) Development Life Cycle.," in *HICSS*, 2022, pp. 1–10.
- [30] A. Pradhan and M. P. Biswal, "Linear fractional programming problems with some multi-choice parameters," *International Journal of Operational Research*, vol. 34, no. 3, p. 321, 2019, doi:10.1504/ijor.2019.098310.
- [31] S. K. Singh and S. P. Yadav, "Scalarizing fuzzy multi-objective linear fractional programming with application," *Computational and Applied Mathematics*, vol. 41, no. 3, Mar. 2022, doi: 10.1007/s40314-022-01798-2.
- [32] X. Dastile, T. Celik, and M. Potsane, "Statistical and machine learning models in credit scoring: A systematic literature survey," *Applied Soft Computing*, vol. 91, p. 106263, Jun. 2020, doi:10.1016/j.asoc.2020.106263.
- [33] N. Kozodoi, S. Lessmann, K. Papakonstantinou, Y. Gatsoulis, and B. Baensens, "A multi-objective approach for profit-driven feature selection in credit scoring," *Decision Support Systems*, vol. 120, pp. 106–117, May 2019, doi: 10.1016/j.dss.2019.03.011.
- [34] E. S. Kamimura, A. R. F. Pinto, and M. S. Nagano, "A recent review on optimisation methods applied to credit scoring models," *Journal of Economics, Finance and Administrative Science*, vol. 28, no. 56, pp. 352–371, Jun. 2023, doi: 10.1108/jefas-09-2021-0193.
- [35] H. He, Z. Wang, H. Jain, C. Jiang, and S. Yang, "A privacy-preserving decentralized credit scoring method based on multi-party information," *Decision Support Systems*, vol. 166, p. 113910, Mar. 2023, doi:10.1016/j.dss.2022.113910.