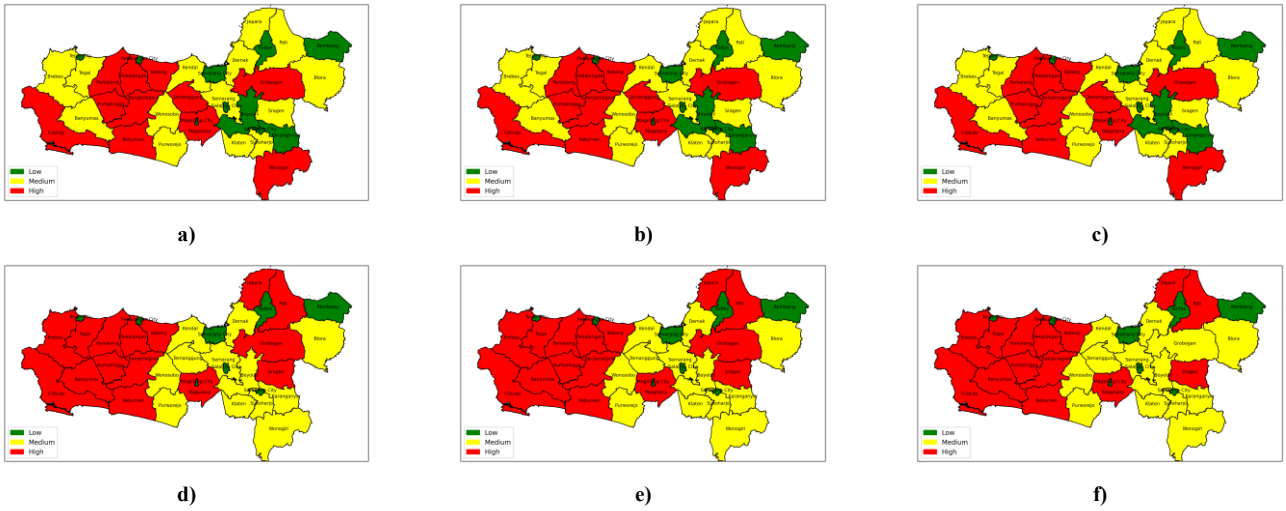
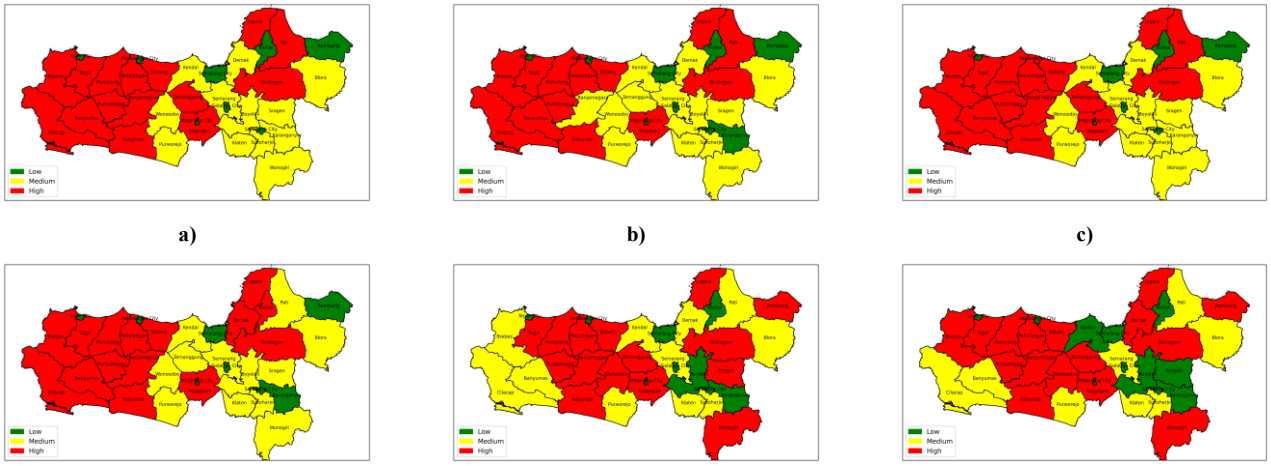


a) **b)** **c)**

d) **e)** **f)**

Fig. 5 Prediction maps with Random Forest Time-Based for **a)** 2024, **b)** 2025, **c)** 2026, **d)** 2027, **e)** 2028, **f)** 2029



a) **b)** **c)**

d) **e)** **f)**

Fig. 6 Prediction maps with Naïve Bayes Time-Based for **a)** 2024, **b)** 2025, **c)** 2026, **d)** 2027, **e)** 2028, **f)** 2029

IV. CONCLUSIONS

This research was conducted by utilizing Naïve Bayes Time-Based and Random Forest Time-Based to predict the classification of SWSR distribution in each district/city in Central Java. The performance between the two methods is similar, with an accuracy score of 85.71% for the best $t-k$ model. Then, in terms of prediction length, Naïve Bayes Time-Based can predict up to the next 10 years and better than Random Forest Time-Based which is able to predict for the next 9 years. This highlights both algorithms as superior methods for long-term prediction due to their ability to capture temporal patterns more effectively.

Suggestions for future research are to explore other methods to predict the classification of SWSR distribution. Future research can also consider adding more diverse features related to SWSR to enrich the analysis and find different factors that affect the level of SWSR. In addition, future research can process feature expansion with a combination of non-consecutive years, considering this research only focuses on a combination of consecutive years. This experiment can conducted to identify the temporal pattern of the data in non-consecutive years.

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REFERENCES

[1] K. S. R. Indonesia, Peraturan Menteri Sosial Nomor 3 Tahun 2021 tentang Pengelolaan Data Terpadu Kesejahteraan Sosial, Jakarta: Kementerian Sosial Republik Indonesia, 2021.

[2] "Persentase Penduduk Miskin (P0) Menurut Provinsi dan Daerah (Persen), 2023," [Online]. Available: https://www.bps.go.id/id/statistics-table/2/MTkyIzI=/persentase-penduduk-miskin--maret-2023.html. [Accessed 12 May 2024].

[3] "Data Pemerlu Pelayanan Kesejahteraan Sosial," [Online]. Available: https://caribdt.dinsos.jatengprov.go.id/progress-ppks. [Accessed 12 May 2024].

[4] J. A. Talingdan, "Performance Comparison of Different Classification Algorithms for Household," in *4th International Conference on Information Systems Engineering (ICISE)*, 2019, doi: 10.1109/ICISE.2019.00010.

[5] E. Firasari, N. Khasanah, U. Khultsum, D. N. Kholifah, R. Komarudin and W. Widyastuty, "Comparation of K-Nearest Neighboor (K-NN) and Naive Bayes Algorithm for the Classification of the Poor in Recipients of Social Assistance," *Journal of Physics:*

Conference Series, vol. 1641, pp. 1-6, 2020, doi: 10.1088/1742-6596/1641/1/012077.

[6] D. Utami and P. A. R. Devi, "Klasifikasi Kelayakan Penerima Bantuan Program Keluarga Harapan (PKH) Menggunakan Metode Weighted Naive Bayes dengan Laplace Smoothing," *JIPI (Jurnal Ilmiah Penelitian dan Pembelajaran Informatika)*, vol. 7, pp. 1373-1384, 2022, doi: 0.29100/jipi.v7i4.3592.

[7] N. Alfiah, "Klasifikasi Penerima Bantuan Sosial Program Keluarga Harapan," *Jurnal Teknologi Informasi*, vol. 16, pp. 32-40, 2021, doi: 10.35842/jtir.v16i1.386.

[8] N. N. Sholihah and A. Hermawan, "Implementation of Random Forest and SMOTE Methods for Economic Status Classification in Cirebon City," *Jurnal Teknik Informatika (JUTIF)*, vol. 4, pp. 1387-1397, 2023, doi: 10.52436/1.jutif.2023.4.6.1135.

[9] Sukarna, K. A. Notodiputro and B. Sartono, "Comparison of Logistic Model Tree and Random Forest on Classification for Poverty in Indonesia," *Media Statistika*, vol. 16, no. 2, pp. 112-123, 2023, doi: 10.14710/medstat.16.2.112-123.

[10] X. Zheng, W. Zhang, H. Deng and H. Zhang, "County-Level Poverty Evaluation Using Machine Learning," *Remote Sensing*, vol. 16, no. 962, pp. 1-18, 2024, doi: 10.3390/rs16060962.

[11] T. Niu, Y. Chen and Y. Yuan, "Measuring urban poverty using multi-source data and a random forest algorithm: A case study in Guangzhou," *Sustainable Cities and Society*, vol. 54, pp. 1-12, 2020, doi: 10.1016/j.scs.2020.102014.

[12] F. Y. Pritama, S. S. Prasetiyowati and Y. Sibaroni, "Enhancing SVM Performance for Time-Based Classification Prediction through Feature Expansion: A Comparative Analysis with LSTM," in *12th International Conference on Information and Communication Technology (ICoICT)*, Bandung, 2024, doi: 10.1109/ICoICT61617.2024.10698663.

[13] S. S. Prasetiyowati and Y. Sibaroni, "Unlocking the potential of Naive Bayes for spatio temporal classifcation: a novel approach to feature expansion," *Journal of Big Data*, vol. 11, no. 106, 2024, doi: 10.1186/s40537-024-00958-x.

[14] E. Ashok, S. S. Prasetiyowati and Y. Sibaroni, "DHF Incidence Rate Prediction Based on Spatial-Time with Random Forest Extended Features," *Jurnal RESTI (Rekayasa Sistem dan Teknologi Informasi)*, vol. 6, no. 4, pp. 612-623, 2022, doi: 10.29207/resti.v6i4.4268.

[15] H. Hanafi, A. H. Muhammad, I. Verawati and R. Hardi, "An Intrusion Detection System Using SDAE to Enhance Dimensional Reduction in Machine Learning," *JOIV : Int. J. Inform. Visualization*, vol. 6, no. 2, pp. 306-316, 2022, doi: 10.30630/joiv.6.2.990.

[16] K. P. Ajewole, S. O. Adejuwon and J. V. G, "Test for Stationarity on Inflation Rates in Nigeria using Augmented Dickey Fuller Test and Phillips-Persons Test," *IOSR Journal of Mathematics (IOSR-JM)*, vol. 16, no. 3, pp. 11-14, 2020.

[17] A. Alsharkawi, M. Al-Fetyani, M. Dawas, H. Saadeh and M. Alyaman, "Poverty Classification Using Machine Learning: The Case of Jordan," *Sustainability*, vol. 13, 2021, doi: 10.3390/su13031412.

[18] H. Hairani, T. Widiyaningtyas and D. D. Prasetya, "Addressing Class Imbalance of Health Data: a Systematic Literature Review on Modified Synthetic Minority Oversampling Technique (SMOTE) Strategies," *JOIV : Int. J. Inform. Visualization*, vol. 8, no. 3, pp. 1310-1318, 2024. , doi: 10.62527/joiv.8.3.2283.

[19] S. Wang, Y. Dai, J. Shen and J. Xuan, "Research on expansion and classification of imbalanced data based on SMOTE algorithm," *Scientific Reports*, vol. 11, 2021, doi: 10.1038/s41598-021-03430-5.

[20] F.-J. Yang, "An Implementation of Naive Bayes Classifier," *International Conference on Computational Science and Computational Intelligence (CSCI)*, pp. 301-306, 2018, doi: 10.1109/CSCI46756.2018.00065.

[21] A. E. K. Gunawan and A. Wibowo, "Stock Price Movement Classification Using Ensembled Model of Long Short-Term Memory (LSTM) and Random Forest (RF)," *JOIV : Int. J. Inform. Visualization*, vol. 7, no. 4, pp. 2255-2262, 2023, doi: 10.30630/joiv.7.4.01640.

[22] H. N. Irmanda, Ermatita, M. K. Awang and M. Adrezo, "Enhancing Weather Prediction Models through the Application of Random Forest Method and Chi-Square Feature Selection," *JOIV : Int. J. Inform. Visualization*, vol. 8, pp. 1506-1514, 2024, doi: 10.62527/joiv.8.3.2356.

[23] A. Parmar, R. Katariya and V. Patel, "A Review on Random Forest: An Ensemble Classifier," in *International Conference on Intelligent Data Communication Technologies and Internet of Things (ICICI)*, 2018, doi: 10.1007/978-3-030-03146-6_86.

[24] D. Krisbiantoro, R. Waluyo, U. Hasanah, I. Pratama and Sarmini, "Classification of Air Pollutant Index on Data with Outliers and Imbalance Class Problem," *JOIV : Int. J. Inform. Visualization*, vol. 8, pp. 1049-1054, 2024, doi: 10.62527/joiv.8.3.1993.

[25] M. Grandini, E. Bagli and G. Visani, "Metrics for Multi-Class Classification: An Overview," *A WHITE PAPER*, pp. 1-17, 2020.