

ABSTRAK

DEWI ANGGRAENI. Perbandingan Algoritma XGBoost dan Support Vector Regression (SVR) dalam Prediksi Kecepatan Angin untuk Mendukung Analisis Potensi Energi Angin di Kota Kupang. Di bawah bimbingan Dr. Meilia Nur Indah Susanti, S.T., M.Kom.

Energi angin merupakan salah satu sumber energi baru terbarukan yang berpotensi dikembangkan di Indonesia, khususnya di Kota Kupang yang memiliki kecepatan angin relatif tinggi. Karakteristik kecepatan angin yang fluktuatif menyebabkan proses prediksi menjadi kompleks sehingga diperlukan metode prediksi yang akurat. Penelitian ini bertujuan membandingkan performa algoritma Extreme Gradient Boosting (XGBoost) dan Support Vector Regression (SVR) dalam memprediksi kecepatan angin harian di Kota Kupang menggunakan 1.793 data meteorologi harian dari Stasiun Meteorologi El Tari periode 2016–2020 dengan menerapkan tahapan Cross-Industry Standard Process for Data Mining (CRISP-DM). Data dinormalisasi menggunakan Min-Max Scaling, kemudian dibagi menjadi data latih dan data uji dengan rasio 70:30, dilanjutkan dengan hyperparameter tuning untuk memperoleh konfigurasi model terbaik. Hasil prediksi dievaluasi menggunakan *Root Mean Square Error* (RMSE), *Mean Absolute Error* (MAE), *Coefficient of Determination* (R^2), dan Wilcoxon Signed-Rank Test. Hasil penelitian menunjukkan XGBoost memperoleh RMSE sebesar 0.7422, MAE sebesar 0.5542, dan R^2 sebesar 0.7765, sedangkan SVR memperoleh RMSE sebesar 0.7594, MAE sebesar 0.5757, dan R^2 sebesar 0.7661. Uji Wilcoxon Signed-Rank Test menunjukkan nilai Asymp. Sig. (2-tailed) sebesar 0.052, sehingga tidak terdapat perbedaan kinerja yang signifikan secara statistik antara kedua algoritma meskipun XGBoost sedikit lebih unggul berdasarkan ketiga metrik evaluasi. Oleh karena itu, kedua algoritma dapat digunakan sebagai alternatif model dalam prediksi kecepatan angin harian. Hasil penelitian ini diharapkan menjadi referensi dalam pengembangan sistem prediksi kecepatan angin untuk mendukung analisis potensi energi angin serta pengambilan keputusan dalam pengembangan energi baru terbarukan di Indonesia.

Kata Kunci: Energi Angin; *Extreme Gradient Boosting (XGBoost)*; Kecepatan Angin; *Support Vector Regression (SVR)*.

ABSTRACT

DEWI ANGGRAENI. Comparison of XGBoost and Support Vector Regression (SVR) Algorithms in Wind Speed Prediction to Support Wind Energy Potential Analysis in Kupang City. Under the guidance of Dr. Meilia Nur Indah Susanti, S.T., M.Kom.

Wind energy is one of the renewable energy sources with potential for development in Indonesia, particularly in Kupang City, which has relatively high wind speeds. The fluctuating characteristics of wind speed make the prediction process complex, thus requiring an accurate prediction method. This study aims to compare the performance of the Extreme Gradient Boosting (XGBoost) and Support Vector Regression (SVR) algorithms in predicting daily wind speed in Kupang City using 1,793 daily meteorological data from the El Tari Meteorological Station for the period 2016–2020, applying the Cross-Industry Standard Process for Data Mining (CRISP-DM) stages. The data were normalized using Min-Max Scaling, then divided into training and testing data with a ratio of 70:30, followed by hyperparameter tuning to obtain the best model configuration. The prediction results were evaluated using *Root Mean Square Error* (RMSE), *Mean Absolute Error* (MAE), Coefficient of Determination (R^2), and the Wilcoxon Signed-Rank Test. The results show that XGBoost obtained an RMSE of 0.7422, MAE of 0.5542, and R^2 of 0.7765, while SVR obtained an RMSE of 0.7594, MAE of 0.5757, and R^2 of 0.7661. The Wilcoxon Signed-Rank Test showed an Asymp. Sig. (2-tailed) value of 0.052, indicating no statistically significant difference in performance between the two algorithms, although XGBoost was slightly superior based on the three evaluation metrics. Therefore, both algorithms can be used as alternative models for daily wind speed prediction. The results of this study are expected to serve as a reference for developing wind speed prediction systems to support the analysis of wind energy potential and decision-making in the development of renewable energy in Indonesia.

Keywords: *Extreme Gradient Boosting (XGBoost); Support Vector Regression (SVR); Wind Energy; Wind Speed.*