

ABSTRAK

KINERJA *SUPPORT VECTOR REGRESSION* DAN *RANDOM FOREST REGRESSION* DALAM PREDIKSI KONSUMSI BAHAN BAKAR KENDARAAN

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Permasalahan lingkungan dan efisiensi energi menjadi perhatian global. Salah satu sumber emisi terbesar berasal dari sektor transportasi, khususnya konsumsi bahan bakar kendaraan. Oleh karena itu, dibutuhkan sistem prediksi yang akurat untuk membantu pengambilan keputusan dalam perencanaan energi dan kebijakan transportasi.

Penelitian ini bertujuan untuk membandingkan kinerja *Support Vector Regression* (SVR) dan *Random Forest Regression* (RFR) dalam memprediksi konsumsi bahan bakar kendaraan berdasarkan data *Fuel Consumption Ratings*. Fokus prediksi mencakup konsumsi bahan bakar di wilayah perkotaan (CITY), jalan raya (HWY), dan gabungan keduanya (COMB). Evaluasi dilakukan menggunakan metrik *Mean Absolute Error* (MAE), *Root Mean Square Error* (RMSE), dan koefisien determinasi (R^2). Hasil penelitian menunjukkan bahwa RFR memberikan performa prediksi yang lebih akurat dibandingkan SVR, terutama pada data CITY dengan nilai R^2 sebesar 0,9402, HWY sebesar 0,8988, dan COMB sebesar 0,9311.

Keunggulan RFR terletak pada kemampuannya menangani data kompleks serta mengidentifikasi variabel yang paling berpengaruh melalui analisis *feature importance*. Sementara itu, SVR menunjukkan performa yang kompetitif pada pola data yang cenderung linier, namun kurang stabil saat menghadapi variabel yang bersifat fluktuatif.

Kata Kunci: konsumsi bahan bakar, prediksi, *Random Forest Regression*, *Support Vector Regression*, *Grid Search*

ABSTRACT

PERFORMANCE OF SUPPORT VECTOR REGRESSION AND RANDOM FOREST REGRESSION IN PREDICTING VEHICLE FUEL CONSUMPTION

By

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Environmental issues and energy efficiency have become a global concern. One of the largest sources of emissions comes from the transportation sector, particularly vehicle fuel consumption. Therefore, an accurate prediction system is needed to assist in decision-making for energy planning and transportation policies.

This study aims to compare the performance of Support Vector Regression (SVR) and Random Forest Regression (RFR) in predicting vehicle fuel consumption based on Fuel Consumption Ratings data. The prediction focuses on fuel consumption in urban areas (CITY), highways (HWY), and a combination of both (COMB). Evaluation is performed using metrics such as Mean Absolute Error (MAE), Root Mean Square Error (RMSE), and the coefficient of determination (R^2). The results show that RFR provides more accurate prediction performance compared to SVR, especially on CITY data with an R^2 value of 0.9402, HWY at 0.8988, and COMB at 0.9311.

The strength of RFR lies in its ability to handle complex data and identify the most influential variables through feature importance analysis. Meanwhile, SVR demonstrates competitive performance on data patterns that tend to be linear but becomes less stable when faced with fluctuating variables.

Keywords: *fuel consumption, prediction, Random Forest Regression, Support Vector Regression, Grid Search*