

IMPLEMENTASI METODE RANDOM FOREST UNTUK PREDIKSI OMZET DI APOTEK MITRA MEDICAL

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ABSTRAK

Apotek Mitra Medical menghadapi tantangan dalam merencanakan strategi bisnis dan pengelolaan operasional akibat fluktuasi omzet harian yang sulit diperkirakan secara manual. Ketidakpastian ini dipengaruhi oleh pola perilaku konsumen serta faktor eksternal seperti perubahan cuaca yang berdampak pada mobilitas pelanggan. Untuk mengatasi permasalahan tersebut, dikembangkan sistem prediksi omzet berbasis web menggunakan algoritma *Random Forest Regression*. Penelitian ini mengintegrasikan data historis transaksi internal dengan data cuaca sekunder (suhu dan curah hujan) dari satelit NASA POWER. Untuk mengatasi keterbatasan algoritma *Random Forest* dalam mengenali dimensi waktu, diterapkan teknik *feature engineering* berupa pembentukan fitur waktu lampau (*lag features*) yang merujuk pada pemodelan *Autoregressive Random Forest*. Hasil pengujian menunjukkan nilai *Mean Absolute Percentage Error* (MAPE) sebesar 11,17%, yang dikategorikan sebagai peramalan baik (*good forecasting*). Namun, nilai Koefisien Determinasi R^2 yang diperoleh relatif rendah, yaitu 0,023. Rendahnya nilai R^2 ini mengindikasikan bahwa meskipun model mampu memberikan estimasi nominal yang model menghasilkan tingkat kesalahan yang rendah secara rata-rata, model memiliki keterbatasan dalam menjelaskan variabilitas ekstrem akibat tingginya faktor acak (*noise*) harian. Temuan penelitian menunjukkan bahwa curah hujan ekstrem cenderung berperan sebagai hambatan fisik (*physical barrier*) bagi konsumen, bukan pemicu pembelian instan. Temuan penelitian menunjukkan bahwa sistem mampu memberikan prediksi omzet berbasis data historis sebagai referensi kuantitatif dalam mendukung pengambilan keputusan strategis di Apotek Mitra Medical.

Kata kunci : Prediksi Omzet, *Random Forest*, Apotek, Cuaca, NASA POWER.

IMPLEMENTATION OF RANDOM FOREST ALGORITHM FOR REVENUE FORECASTING AT MITRA MEDICAL PHARMACY

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ABSTRACT

Apotek Mitra Medical faces challenges in planning business strategies and operational management due to daily revenue fluctuations that are difficult to estimate manually. This uncertainty is influenced by consumer behavior patterns and external factors such as weather changes, which impact customer mobility. To address this problem, a web-based revenue prediction system was developed using the Random Forest Regression algorithm. This study integrates internal historical transaction data with secondary weather data (temperature and rainfall) from NASA POWER satellites. To overcome the inherent limitation of the Random Forest algorithm in recognizing temporal dimensions, a feature engineering technique was applied by creating time-lagged variables (lag features), referring to the Autoregressive Random Forest modeling approach.

The model performance evaluation using testing data showed a Mean Absolute Percentage Error (MAPE) of 11.17%, which is categorized as good forecasting. However, the obtained Coefficient of Determination R^2 was relatively low at 0.023. This low R^2 value indicates that while the model provides accurate nominal estimates on average, it has limitations in explaining extreme variability due to high daily noise. The findings suggest that extreme rainfall tends to act as a physical barrier to consumer mobility rather than an instant purchase trigger. Nevertheless, the findings indicate that the system is capable of providing daily revenue predictions based on historical data as a quantitative reference to support strategic decision-making at Apotek Mitra Medical.

Keywords: Revenue Prediction, Random Forest, Pharmacy, Weather, NASA POWER.