

ABSTRAK

Penelitian ini mengeksplorasi pemanfaatan algoritma *random forest regression* (RFR) dalam memprediksi tingkat kriminalitas berdasarkan faktor-faktor sosial di wilayah Kabupaten Banyumas. Data yang digunakan terbatas pada 12 entri tahunan, sehingga diterapkan teknik augmentasi data untuk memperkaya variasi dan mengatasi kendala deret waktu. Hasil model menunjukkan performa prediktif yang cukup andal, dengan nilai *mean absolute percentage error* (MAPE) stabil di kisaran 11–15%. Meskipun nilai *R-squared* (R^2) menunjukkan fluktuasi, model tetap relevan sebagai alat bantu analisis awal. Analisis *feature importance* mengidentifikasi bahwa kemiskinan dan pengangguran memiliki kontribusi paling signifikan terhadap prediksi kriminalitas. Temuan ini mendukung teori bahwa kondisi sosial ekonomi berperan penting dalam dinamika kriminalitas. Penelitian ini menegaskan potensi pendekatan *machine learning*, khususnya RFR, dalam memahami fenomena sosial kompleks, namun tetap menekankan pentingnya interpretasi hasil secara kritis serta perlunya penelitian lanjutan dengan data yang lebih representatif.

Kata Kunci: *Random Forest Regression, Prediksi Kriminalitas, Faktor Sosial Ekonomi, Machine Learning, Kabupaten Banyumas.*

IMPLEMENTATION OF RANDOM FOREST REGRESSION FOR PREDICTING CRIME LEVELS BASED ON SOCIAL FACTORS IN BANYUMAS THROUGH A WEB-BASED SYSTEM

ABSTRACT

This study explores the use of the random forest regression (RFR) algorithm to predict crime rates based on socio factors in a data-constrained region, such as Banyumas Regency. The data used is limited to 12 entries per year, so data augmentation techniques are applied to enrich variations and overcome time constraints. The model results show fairly reliable predictive performance, with mean absolute percentage error (MAPE) values stable in the range of 11–15%. Although the R-squared (R^2) value shows fluctuations, the model remains relevant as an initial analysis tool. Feature importance analysis identified that poverty and deprivation have the most significant contribution to crime prediction. This finding supports the theory that socioeconomic conditions play a significant role in crime dynamics. This study confirms the potential of machine learning approaches, particularly RFR, in understanding complex social phenomena, but emphasizes the importance of critically interpreting the results and the need for further research with more representative data.

Keywords: *Banyumas Regency, Crime Prediction, Machine Learning, Random Forest Regression, Socioeconomic Factors*