

# Perbandingan Kinerja Metode Extreme Gradient Boosting dan Support Vector Regression dalam Memprediksi Usia Biologis pada Data Pemeriksaan Medis = Performance Comparison of Extreme Gradient Boosting and Support Vector Regression Methods in Predicting Biological Age on Medical Examination

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## Abstrak

Penuaan merupakan kumpulan perubahan biologis pada tubuh manusia yang terjadi secara bertahap dan dapat meningkatkan risiko terjadinya penyakit bahkan kematian. Hingga saat ini, usia kronologis menjadi indikator penuaan yang paling umum digunakan dalam dunia kesehatan. Akan tetapi, munculnya konsep usia biologis diyakini mampu memberikan pengukuran yang lebih akurat terkait penuaan pada manusia dibandingkan dengan usia kronologis. Usia biologis dipengaruhi oleh berbagai faktor yang disebut biomarker. Penelitian ini berfokus pada prediksi usia biologis berdasarkan usia kronologis dan fitur (biomarker) lainnya dengan memanfaatkan metode machine learning Extreme Gradient Boosting (XGBoost) dan Support Vector Regression (SVR). Dataset yang digunakan berupa data pemeriksaan medis oleh Kementerian Kesehatan RI. Pada dataset tersebut dilakukan data preprocessing, seleksi fitur menggunakan Spearman's Rank Correlation Coefficient, dan pembangunan model. Model dievaluasi menggunakan metrik evaluasi pada model regresi yaitu Root Mean Square Error (RMSE), Coefficient of Determination, dan Adjusted. Ketiga metrik ini masing-masing menghitung selisih nilai prediksi dengan nilai aktual dan menunjukkan seberapa baik variabel dependen dapat dijelaskan oleh variabel independen pada model. Dengan metode XGBoost diperoleh nilai RMSE 8,0560, 0,2894, dan Adjusted 0,2006 untuk data pria, serta RMSE 6,3851, 0,4252, dan Adjusted 0,3938 untuk data wanita. Dengan metode SVR, diperoleh RMSE 8,0697, 0,2870, dan Adjusted 0,1979 untuk data pria, serta RMSE 6,7147, 0,3643, dan Adjusted sebesar 0,3296. Metode XGBoost lebih unggul dalam memprediksi usia biologis baik pada model pria maupun wanita dibandingkan metode SVR. Usia kronologis dan biomarker (fitur) lainnya terkait kesehatan juga ditemukan berpengaruh positif terhadap usia biologis seorang individu.

.....Aging is a collection of biological changes in the human body that occur gradually and can increase the risk of disease and even death. Until now, chronological age is the most commonly used indicator of aging in the medical sector. However, the emergence of the concept of biological age is believed to be able to provide a more accurate measurement of aging in humans compared to chronological age. Biological age is influenced by various factors called biomarkers. This research focuses on predicting biological age based on chronological age and other features (biomarkers) by utilizing the Extreme Gradient Boosting (XGBoost) and Support Vector Regression (SVR) machine learning methods. The dataset used is medical examination data by the Indonesian Ministry of Health. Data preprocessing was performed on this dataset, followed by feature selection using the Spearman Rank Correlation Coefficient, and subsequent model development. The model is evaluated using evaluation metrics in the regression model, namely Root Mean Square Error (RMSE), Coefficient of Determination, and Adjusted. These three metrics each calculate the difference between the predicted and actual values and indicate how well the dependent variable can be explained by the independent variables in the model. Using the XGBoost method, RMSE values were obtained of

8,0560, 0,2894, and Adjusted 0,2006 for male data, as well as RMSE 6,3851, 0,4252, dan Adjusted 0,3938 for female's data. Using the SVR method, RMSE 8,0697, 0,2870, and Adjusted 0,1979 were obtained for male data, as well as RMSE 6.7147, 0.3643, and Adjusted of 0,3296 for female's data. The XGBoost method demonstrates better performance in predicting biological age for both male and female models compared to the SVR method. Chronological age and other health-related biomarkers (features) were also found to have a positive impact on an individual's biological age.