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MACHINE LEARNING-BASED PREDICTION OF EMERGENCY DEPARTMENT WAITING TIMES: A COMPARATIVE ANALYSIS

SHYAMASHREE SINGHA[1*] AND RAHUL KUMAR GHOSH[1]

Timely treatment requires effective patient management in Emergency Departments (ED) which suffers from lengthy wait times because of overcrowding and insufficient resources. This study estimates waiting times in emergency rooms using machine learning. analysis of a dataset containing 5000 emergency room visits. The researchers excluded time-related variables which had deterministic properties to stop label leakage from occurring. The scikit-learn framework supports a pre-processing pipeline which includes three processes: data imputation and one-hot encoding and standardization. The three models of Linear Regression(LR) and Random Forest(RD) and Gradient Boosting(GD) received evaluation through MAE and RMSE and R^2 metrics. Gradient Boosting achieved the best performance (RMSE ≈ 15.07 minutes, R^2 ≈ 0.951) which demonstrates how machine learning can can accurately forecast waiting time and assist in healthcare planning activities.