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Enhanced Mobile Coverage Prediction using Stacking and Voting Classifiers

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Abstract: *In the age of 5G advancements, accurately forecasting coverage zones has become essential for maximizing network efficiency and ensuring dependable connectivity. This research delivers a detailed evaluation of multiple machine learning techniques aimed at predicting 5G coverage using RF signal data. The prediction models are assessed based on the target attribute, Band Width, to determine their accuracy levels. A wide range of conventional algorithms—such as Logistic Regression, K-Nearest Neighbours (KNN), Naive Bayes, Random Forest, Support Vector Machine (SVM), XG Boost, Light GBM, Ada Boost, Bayesian Network Classifier, Multi-Layer Perceptron (MLP), and Long Short-Term Memory (LSTM)—are compared with more sophisticated methods like Stacking, Voting Classifiers, and Convolutional Neural Networks (CNN). The main goal is to pinpoint the most influential feature parameters that affect 5G coverage prediction. By applying various models, the study sets out to establish a benchmark for prediction performance and reliability. The comparative results shed light on the advantages and limitations of each technique, offering practical insights for both researchers and network planners. Findings reveal that ensemble strategies, particularly Stacking and Voting Classifiers combined with CNN, deliver improved accuracy and resilience, making them strong candidates for optimizing 5G network design and implementation.*

Keywords: 5G Signal Forecasting, Machine Learning Models, RF Signal Analysis, Stacking Ensemble, Voting Ensemble, Convolutional Neural Network, Feature Importance, Predictive Accuracy, Network Performance, Ensemble Learning

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