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ARTICLE

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MACHINE LEARNING-DRIVEN NEUROPHYSIOLOGICAL BIOMARKER PREDICTION USING RESTING-STATE EEG DYNAMICS

ANUPAM DAS[1], PRASANT KUMAR PATTNAIK[2] AND PIYALI DE[1]*

Peak Alpha Frequency (PAF) is one of the key indicators of brain activity on EEG that correlates with cognition, memory and general brain health. But because of the nonlinear nature of the EEG signals, it is difficult to make accurate prediction of PAF automatically. In this study, a framework for predicting PAF from resting-state EEG data using machine learning is proposed, which includes preprocessing, artifact removal by ICA, spectral feature extraction, and demographic information. The models were trained through hyperparameter optimization, and the results were evaluated with cross-validation to identify the best model among three regression models: Polynomial Regression, Random Forest, and XGBoost. Ensemble methods performed better than traditional regression methods, and the highest performance was obtained by using XGBoost (R^2 = 0.827 and RMSE = 0.551). The proposed framework showcases the capability of machine learning to predict biomarkers of the neurophysiology, monitor cognition, and be used in future clinical applications on EEG.