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Paper Title: Resting EEG State, an Insight into Motor Imagery Signal Characteristics

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Abstract

Electroencephalography (EEG) is one of the most popular neural acquisition techniques in the engineering field. Motor Imagery (MI), the paradigm of interest herein, has received extensive attention in application-oriented studies; however, fewer researchers have been interested in its signal characteristics and how they relate to resting-state EEG signals. This study provides an early investigation into this topic and highlights the potential use of rest EEG signals to offer a more practical approach for applying the MI paradigm outside lab settings. A publicly available dataset for 20 subjects was used in this study. First, we developed a classification pipeline consisting of Principal Component Analysis (PCA), Independent Component Analysis (ICA), Common Spatial Patterns (CSP), and Linear Discriminant Analysis (LDA) to verify the legitimacy of the dataset. This model achieved an average of 88% accuracy across the subjects, which deemed the dataset suitable for further work. Then, using the signals' Power Spectral Density (PSD) both at rest and during MI tasks, for both the alpha and beta rhythms, all 20 subjects have shown a positive strong and medium Pearson correlation between rest and MI states. And lastly, we finish the paper by addressing the best strategy moving forward in integrating the obtained results into the body of existing MI-EEG research.