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Identification of Autism Using Resting State FMRI Analysis

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Autism Spectrum Disorder (ASD) is a neurodevelopmental condition that impairs social interaction, communication, and cognitive development. Resting-state Functional Magnetic Resonance Imaging (rs-fMRI) enables the non-invasive assessment of spontaneous neural activity in the human brain by measuring blood-oxygen-level fluctuations. Dynamic Functional Connectivity (DFC), estimated through sliding-window correlations, captures temporal variations in functional interactions between brain regions, offering a more discriminative representation for ASD characterization compared to static connectivity. In this study, an optimized DFC-based machine learning pipeline is proposed, in which features are extracted using Pearson and Precision correlation metrics, dimensionality reduction is performed through statistical selection techniques, and classification is carried out using a Linear Support Vector Machine (SVM). Experiments were conducted on the KKI Autism dataset consisting of 55 subjects, and evaluation was performed using 5-fold cross-validation. The proposed model achieved an accuracy of 81.8%, which demonstrates a 14.8% improvement compared to previously reported results of 67% on similar rs-fMRI data. The findings confirm that dynamic connectivity patterns derived solely from rs-fMRI can serve as effective biomarkers for ASD identification, strengthening the potential for objective neuroimaging-assisted diagnosis.

Keywords: Autism Spectrum Disorder, Resting-State fMRI, Dynamic Functional Connectivity, Sliding Window, Machine Learning, Linear SVM.