

## **Classification of children with ADHD through task-related EEG recordings via Swarm-Decomposition-based Phase Locking Value**

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Attention Deficit/Hyperactivity Disorder (ADHD) is a common neurodevelopmental disorder mainly affecting children. ADHD children brain activity is reported to present alterations from neurotypically developed children, yet establishment of an EEG biomarker, which is of high importance in clinical practice and research, has not been achieved. In this work, task-related EEG recordings from 61 ADHD and 60 age-matched non-ADHD children are analyzed to examine the underlying Cross-Frequency Coupling phenomena. The proposed framework introduces personalized brain rhythm extraction in the form of oscillatory modes via Swarm Decomposition, allowing for the transition from sensor-level connectivity to source-level connectivity. Oscillatory modes are then subjected to a phase locking value-based feature extraction and the efficiency of the extracted features in separating ADHD from non-ADHD individuals is evaluated by means of a nested 5-fold cross validation scheme. The experimental results of the proposed framework (Area Under the Receiver Operating Characteristics Curve-AUROC: 0.9166) when benchmarked against the commonly used filter-based brain rhythm extraction (AUROC: 0.8361) underscore its efficiency and demonstrate its overall superiority over other state-of-the-art functional connectivity approaches in this classification task for this dataset