# Computational EEG Analysis for Characterizing Cognitive Activity: Methods and Applications

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## Abstract

Electroencephalography (EEG) analysis exploits mathematical signal analysis methods to identify how brain regions' interactions result in cognition and behavior. Combining computer technology with traditional inferential statistics and then applying these to multichannel EEG data makes it possible to accurately identify and describe hidden patterns and correlations in functional brain networks. In this talk, we present an overview of the analysis approaches, including event-related potential analysis, spectral perturbation analysis, EEG source-imaging approaches, signal separation by independent component analysis (ICA), and Electromagnetic Spatiotemporal Independent Component Analysis (EMSICA). We also demonstrate that integrating these techniques enables a depth of understanding of complex brain dynamics that is not possible by other functional brain imaging methods to underscore human cognition.