COPING WITH TRIAL−TO−TRIAL VARIABILITY OF EVENT RELATED SIGNALS: A BAYESIAN INFERENCE APPROACH (TueAmOR5)

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Abstract :

In electroneurophysiology, single−trial brain responses to a sensory stimulus or a motor act are commonly assumed to result from the linear superposition of a stereotypic event−related signal (e.g. the event−related potential or ERP) that is invariant across trials and some ongoing brain activity often referred to as noise. To extract the signal, one performs an ensemble average of the brain responses over many identical trials to attenuate the noise. To date, this simple signal−plus−noise (SPN) model has been the dominant approach in cognitive neuroscience. Mounting empirical evidence has shown that the assumptions underlying this model may be overly simplistic. More realistic models have been proposed that account for the trial−to−trial variability of the event−related signal as well as the possibility of multiple differentially varying components within a given ERP waveform.
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Abstract : (cont.)

The variable−signal−plus−noise (VSPN) model, which has been demonstrated to provide the foundation for separation and characterization of multiple differentially varying components, has the potential to provide a rich source of information for questions related to neural functions that complement the SPN model. Thus, being able to estimate the amplitude and latency of each ERP component on a trial−by−trial basis provides a critical link between the perceived benefits of the VSPN model and its many concrete applications. In this paper we describe a Bayesian approach to deal with this issue and the resulting strategy is referred to as the differentially Variable Component Analysis (dVCA).

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*** Abstract : (cont.)**

We compare the performance of dVCA on simulated data with Independent Component Analysis (ICA) and analyze neurobiological recordings from monkeys performing cognitive tasks.