



Advanced Signal Processing on Brain Event-Related Potentials: Filtering ERPs in Time, Frequency and Space Domains Sequentially and Simultaneously

Fengyu Cong, Tapani Ristaniemi, Heikki Lyytinen

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This book is devoted to the application of advanced signal processing on event-related potentials (ERPs) in the context of electroencephalography (EEG) for the cognitive neuroscience. ERPs are usually produced through averaging single-trials of preprocessed EEG, and then, the interpretation of underlying brain activities is based on the ordinarily averaged EEG. We find that randomly fluctuating activities and artifacts can still present in the averaged EEG data, and that constant brain activities over single trials can overlap with each other in time, frequency and spatial domains. Therefore, before interpretation, it will be beneficial to further separate the averaged EEG into individual brain activities. The book proposes systematic approaches pre-process wavelet transform (WT), independent component analysis (ICA), and nonnegative tensor factorization (NTF) to filter averaged EEG in time, frequency and space domains to sequentially and simultaneously obtain the pure ERP of interest. Software of the proposed approaches will be open-accessed.

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