

NMST611 *Advanced Statistics Seminar*

Tensor decomposition of human brain activity in frequency, space and time

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Abstract

Many brain processes in health and disease are associated with modulation of narrowband brain oscillations (NBOs) in the scalp-recorded electroencephalography (EEG) signals, which exhibit specific frequency spectra and scalp topography. In my talk, I will discuss powerful parallel factor analysis (PARAFAC) and Tucker tensor decomposition methods for identifying and tracking NBO activity over time or conditions, which we successfully applied and modified. First, I will theoretically introduce the models and discuss why they are suitable for the latent representation of EEG signals. I will follow with the practical implementation of models, their parameters setting and tuning, and other essential aspects of the models' use. Finally, I will demonstrate their excellent performance on simulated and real EEG and their superior utility in real-time brain-computer interface (BCI) applications.