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Biography

Chee-Ming Ting is currently a Senior Lecturer in the School of Biomedical Engineering & Health Sciences, Faculty of Engineering, Universiti Teknologi Malaysia (UTM). He is also a Visiting Research Scientist for the Biostatistics Group at the King Abdullah University of Science and Technology (KAUST), Saudi Arabia. He received the B.Eng. and M.Eng. degrees both in electrical engineering, and the Ph.D. degree in mathematics from the UTM. He held visiting research positions at University of Edinburgh, University of Melbourne, University of California, Irvine. His research interests include statistical signal processing, state-space methods and time series analysis with applications to neuroimaging and biomedical signal processing.

Title: Estimating Dynamic Brain Functional Connectivity from fMRI: A State-Space Approach

Abstract

Recent neuroimaging studies suggest the temporal dynamics of brain connectivity where interactions between distinct brain regions exhibit changes over time, in both resting state and response to tasks or stimuli. Characterizing and inferring different types of changing connectivity patterns from brain signals for a large number of nodes are classical statistical challenges in modelling non-stationarity and high-dimensionality in time series data. The commonly-used sliding-window approach is limited by the choice of the optimal window length. In this talk, I will introduce state-space representations for a few variants of vector autoregressive (VAR) models for analyzing dynamic brain functional connectivity with directionality. (1) The time-varying parameter vector autoregressive (TV-VAR) models for capturing instantaneous changes over time. (2) The Markov-switching VAR (SVAR) models for connectivity dynamics that alternate between a set of re-occurring latent brain states. (3) Some extensions to account for high-dimensional connectivity based on the factor modeling, and heterogeneity across subjects or replicated trials of experiment. In the state-space framework, the time-evolving connectivity metrics are derived from model parameters estimated by the Kalman filtering and expectation-maximization algorithm. The methods are illustrated with some applications to fMRI and EEG data.