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Inferring functional interaction and transition patterns via dynamic Bayesian variable partition model

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Abstract

Static pair-wise functional connectivity has been widely used in the neuro imaging field. In contrast, higher-order functional interactions among brain networks and their temporal dynamic transition patterns have been rarely explored. This paper presents a novel dynamic Bayesian variable partition model (DBVPM) that simultaneously considers and models high-order functional interactions and their dynamics via a unified Bayesian framework. Then, we modeled and characterized these temporal state transitions as finite-state machines, and quantitatively compared their transition patterns between post-traumatic stress disorder (PTSD) patients and healthy controls. We found that these interaction patterns are hopping among a finite number of states, and PTSD patients have a different functional interaction state-space and their temporal transition patterns are substantially different in comparison with healthy controls. This work discovered interesting phenomena that cannot be revealed by static pair-wise functional connectivity, thus offering novel opportunities for deciphering the working mechanisms of brain networks in the future.

Biography

Jing Zhang has completed her Ph.D in 2009 from Harvard University and postdoctoral studies from Harvard University. She is an assistant professor of Yale University, Department of Statistics. She has published about 20 papers in reputed journals and serving as an editorial board member of repute.