BIOSTATISTICS SEMINAR

Statistical learning with neuroimaging for reliable mapping of human brain connectome

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Brain connectomics has become increasingly popular in neuroimaging studies to advance understanding of neural circuits and their association with neurodevelopment, mental illnesses, and aging. These analyses often face major challenges, including the high dimensionality of brain networks, unknown latent sources underlying the observed connectivity, and the large number of brain connections leading to spurious findings. In this talk, we will present a regularized blind source separation (BSS) framework, LOCUS, for reliable mapping of neural circuits underlying both static and dynamic functional connectome. The proposed framework uses neurocircuitry motivated statistical strategies to improve the reliability in whole-brain connectomics. Specifically, we propose a low-rank factorization to achieve more efficient and accurate source separation, a novel angle-based sparsity method that demonstrates better performance than the existing sparsity controls and a temporal smoothness regularization motivated by the temporal features in dynamic brain connectivity. We develop an efficient iterative Node-Rotation algorithm that solves the non-convex optimization problem for learning LOCUS. Application of the LOCUS methods to the Philadelphia Neurodevelopmental Cohort (PNC) neuroimaging study uncovers various neural circuits and their dynamic expression profiles, reveals key brain regions that drive each of these circuits, and generates new findings on gender differences in the neurodevelopment of brain circuits.

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133 Rosenau Hall

Virtual using link and info below.

https://unc.zoom.us/j/91249030964?pwd=UXloTWlHajdQbkRqd1d5TnRaMitYdz09

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