

GEORGIA



Department of Statistics

UNIVERSITY OF GEORGIA

Colloquium Series

A Regularized Blind Source Separation Method for Disentangling Dynamic Functional Connectome

When and Where:

11/14/2024

4:00 PM – 5:00PM

Room 204 Caldwell Hall

Abstract:

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 present a regularized blind source separation (BSS) framework for reliable mapping of neural circuits underlying dynamic brain functional connectome. Compared to existing decomposition methods that ignore the dependence structure in brain networks, dyna-LOCUS achieves more efficient and reliable source separation for dynamic connectivity matrices using low-rank factorization, a novel angle-based sparsity regularization, and a temporal smoothness regularization. We present a highly efficient iterative Node-Rotation algorithm that solves the non-convex optimization problem for learning dyna-LOCUS. Simulation studies demonstrate that dyna-LOCUS has better accuracy in retrieving latent connectivity traits compared to existing methods. Application of dyna-LOCUS 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 insights on gender differences in the neurodevelopment of brain circuits.

Ying Guo



About the Speaker:

Ying Guo is Professor in the Department of Biostatistics and Bioinformatics at Emory University, an appointed Graduate Faculty of the Emory Neuroscience Program and an Associate Faculty in Emory Department of Computer Science. She is the Director of the Center for Biomedical Imaging Statistics (CBIS) at Emory University. Dr. Guo's research focus on developing analytical methods for neuroimaging and mental health studies. Her main research areas include statistical methods for brain network analysis, multimodal neuroimaging, imaging-based prediction methods, and agreement and reproducibility studies. Dr. Guo is a Fellow of American Statistical Association (ASA) and 2023 Chair of the ASA Statistics in Imaging Section. She has served as a Standing Member of NIH Emerging Imaging Technologies in Neuroscience (EITN) Study Section and served on the editorial boards of several scientific journals in statistics and psychiatry.