



CoCo Seminar Series Spring 2016

CoCo/CAS Joint Seminar:

Modeling and Control of Brain Networks

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Thursday April 28th, 2016
10:00-11:00am
University Union (UU) 206



Understanding the brain as a complex network of interacting components allows for useful insights into brain function, and computational modeling provides a controlled environment to test theoretical predictions of brain network structure. In this talk, I'll describe work using data-driven computational modeling of brain dynamics to test the relationship between regional network controllability calculations and the ability of stimulation to impart change in global functional network configurations. The computational model is built on structural brain networks derived from diffusion spectrum imaging (DSI) data, and regional brain dynamics are modeled using biologically motivated nonlinear Wilson-Cowan oscillators, coupled through the observed structural connectivity. By mapping brain regions to cognitive systems and systematically applying a regional stimulation protocol, we observe that the default mode system imparts large global change despite being highly constrained by structural connectivity, highlighting its role in quickly moving the system between multiple different states. By elucidating the link between regional stimulation and global system effects, our modeling approach provides insight into how single regions drive global brain dynamics and opens the door for the development of individualized stimulation protocols for personalized medical treatments or performance enhancements.

Dr. Sarah Muldoon is Assistant Professor of Mathematics at the University at Buffalo, SUNY. Her research interests are in the understanding and quantification of the role of network organization in brain function.

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