CARNEGIE MELLON UNIVERSITY
BME 2020 SUMMER SEMINAR SERIES

Decoding local and global cognitive signals from neuronal populations

PRESENTED BY

Matthew Smith, Ph.D.
Associate Professor
Biomedical Engineering and
Carnegie Mellon Neuroscience
Institute
Carnegie Mellon University

SCHEDULE

Tuesday, July 7 2020
(9:00 AM-10:00AM)

Neural activity observed within a brain area may reflect local computations within the area, inputs from another area, or shared computations/inputs across many areas. Ideally, these distinct mechanisms could be studied separately. However, because multiple processes can influence groups of neurons, it is not obvious how to separate the neural signals that should be attributed to each process. We investigated the different behavioral roles of neural variability shared across hemispheres and neural variability local to each hemisphere. To do this, we applied dimensionality reduction methods to bilateral prefrontal cortex (PFC) array recordings. We were able to identify latent variables representing activity shared across hemispheres, as well as latent variables representing activity local to each hemisphere. We found that variability shared across hemispheres was dominated by a process that slowly evolved across trials and was highly correlated with trial-to-trial fluctuations in mean pupil diameter - a potential neural correlate of fluctuations in arousal. By decoding this signal from neuronal population activity, we were able to predict a constellation of aspects of the animal's task and eye movement behavior. Overall, our work demonstrates how distributed cognitive processes and states can be hidden in subtle shifts in the responsivity of individual neurons, but accessed and decoded from simultaneously recorded populations of neurons.

BIOMEDICAL
ENGINEERING
Carnegie Mellon University