

Dr Byron Yu presents *Extracting single-trial views of brain activity*

Abstract:

Advances in neural recording technologies (including multi-electrode arrays and optical imaging techniques) have transformed systems neuroscience from a field that is data-limited to one that is limited by the available analytical methods. While we have well-established methods for studying the activity of one or perhaps a pair of neurons, we are currently unprepared to deal with the activity of the tens to hundreds of neurons that we can now monitor simultaneously. To make further scientific progress with the ever-growing volume of neural data being collected, new analytical methods are needed that can leverage the simultaneous recording of large populations of neurons. In this talk, I will take a step in this direction by describing how low-dimensional "neural trajectories" can be extracted on a single-trial basis from the noisy, high-dimensional recorded activity. Using premotor cortical activity, I will show how the developed methods provide a powerful way to study neural population dynamics and their relationship to the subject's behavior on a single-trial basis. Such an approach has the potential to further our understanding of neural mechanisms and uncover computational principles employed by the brain. I will then discuss how such basic scientific discoveries have important biomedical implications -- in particular for the development of brain-computer interfaces, which aim to assist paralyzed patients by translating their thoughts into actions in the real world.