Memory Sequencing and Prediction: Neuronal and Neural System Insights

Abstract: There is substantial interest in identifying neural signals that carry mnemonic traces of the sensory past and predictions about the future, in order to understand cognitive function and how neural systems establish internal models of the world. In this presentation, Chris will first overview recent structural and functional connectivity studies that establish closer cross-species correspondences between human and nonhuman primates than previously understood. Neuronal recordings including with neurosurgery patients being monitored for intractable epilepsy identify prediction-related signals and the mnemonic traces that they contain, providing important insights on a language and memory system that is regularly affected in neurology and neurosurgery patients. He will present a unifying perspective on relational coding in the human brain, supported by results that reveal decodable maintenance activity in the frontal and auditory cortex and which provide insights into sequence replay activity in the hippocampus. New research work focuses on laminar array recordings in both species and optogenetic perturbation in the primate model. This program of work has the potential to instill a change in thinking about evolutionary correspondences and sheds light on the neuronal and neural system mechanisms establishing internal models of the sensory world.