INSTITUTE COLLOQUIUM

The Cognitive Neuroscience of Eye Movements.

Abstract

Cognitive neuroscience seeks to undertand how the mind emerges from the patterns of electrical activity distributed across different brain areas. Paraphrasing the old adage which says that “The eyes are the window to your soul”, I will describe how simultaneous monitoring of electrical activity from single neurons in the brain in conjunction with cognitive tasks involving eye movements can be used as a “window to cognition“. Such an approach allows cognitive neuroscientists to probe the relation between neural activity and mental processes, allowing insights into the computations that enable cognition. In the first half of the talk I will describe how such experiments have helped in our understanding of the cognitive neuroscience underlying motor preparation and decision-making. In the second half of the talk, I will focus on research in the laboratory that has extended these insights to study the computations that enable rapid sequential eye movements which contain multiple eye movements in close temporal proximity. The computations that specifically underly rapid sequential processing will be discussed at different levels of organization, ranging from single neurons, networks, and behavior. Taken together, these results identify computations that enable the planning and execution of multiple plans in serial order, allowing for the brain to encode complex actions that are a hallmark of intelligence.

Prof. Aditya Murthy

Prof. Murthy’s did his bachelors and master’s at St. Xavier’s college and Mumbai University studying biology. His doctoral training was in the Department of Neurobiology at the University of Pittsburgh where he examined the neural mechanisms involved in the processing of motion in the visual system. For his postdoctoral training he studied the primate visuomotor system to more directly relate neural activity to psychological functions and behaviour. His lab studies the neural and computational basis of movement planning and control with an emphasis to understand the basis of flexibility and control that is the hallmark of intelligent action. From the perspective of behaviour, his lab seeks to understand the nature of computations that enable motor control; from the perspective of the brain his lab seeks to understand the contribution of circumscribed neural circuits to motor behaviour; and by recording the electrical activity of neurons and muscles his lab seek to understand how such computational processes are implemented by the brain.

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