Decoding the computational role of adult neurogenesis in hippocampus

Hippocampus - the center for learning and memory, is thought to undergo **adult neurogenesis** to aid with formation of new memories and learning of novel tasks. The current state-of-the-art research supports this hypothesis by providing some correlational evidence for ’how’ this phenomenon occurs at the cellular level in the dentate gyrus (DG) of the rodent brain. With the help of various studies, we now know about the types of cells generated during adult neurogenesis, length of their maturation cycles, and how they get incorporated into the already-existing neural circuits. What the field now needs is to understand ’why’ the brain devised these cellular strategies, **effects of the adult-born (a-b) neurons in the DG on the downstream and upstream circuits, and their computational role in various memory processes,** and thus get a deeper understanding of various hippocampal memory processes.

To answer such questions, we employ ***in-vivo*** **chronic neuroelectrophysiology**, and read out the electrical signal from the mouse DG, while the animal is freely-behaving and performing various memory tasks. Using the techniques previously developed in the lab, we increase a-b neurons in mice, and further excite or inhibit them, to study the effects of these neurons on various different memory processes.

We are looking for a Ph.D. candidate with a background in Neuroscience/ Physics/ Mathematics/ Computer Science who would be interested in the development of computational and statistical analysis for this project. This project will include signal processing of electrophysiological data, development of linear regression models for cellular spiking analyses, and correlating these neural characteristics with animal's behavior. The candidate will also participate in designing of the experiment, handling and training of mice, surgical implantation and data acquisition.