CDB SEMINAR

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Tuesday, January 9, 2018
16:00~17:00   Seminar Room A7F

Dopamine's role in learning from reward and punishment

Summary

Dopamine was originally thought to be a pleasure molecule based on the observation that animals would press a lever to self-stimulate dopamine axon bundles. This hypothesis was updated based on the finding that dopamine signals do not encode reward values, but rather encode reward prediction error – the actual reward value minus the predicted reward value. It is now widely accepted that dopamine broadcasts the error term in a reinforcement learning signal that guides behaviors to maximize reward in many brain regions. On the other hand, accumulating evidence suggests that there may be exceptions to this rule, because some dopamine neurons respond to aversive stimuli or novel stimuli. To understand the organization of dopamine signals, we first focused on the anatomical organization of dopamine neurons by finding the distribution of inputs to dopamine neurons with different projection targets. Based on this initial screening, we found that dopamine neurons projecting to the posterior tail of the striatum (TS) are anatomically unique compared to other dopamine neurons. Next, we systematically examined the activity of dopamine axons in different regions of the striatum. We observed that dopamine axons in TS respond to aversive stimuli and novel stimuli, unlike dopamine axons in many other regions of the striatum which respond primarily to reward. Currently, we are characterizing the function of TS-projecting dopamine neurons. This talk will end with a discussion focused on the organization of dopamine signals in the striatum and how these signals relate to a new framework for reinforcement learning.

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