Hamilton Institute

Sequence Learning and Consolidation in a Probabilistic Model of Hippocampal Coding

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Abstract

In a familiar environment, an animal can learn a new route to a goal extremely quickly. n contrast, learning sequential information by trial and error using traditional machine learning algorithms is typically a slow, iterative process. Some models incorporate a rapid caching mechanism to achieve greater learning efficiency. In this talk, I address the neural mechanisms which may underlie such a memory system.

The hippocampus has unique circuitry and physiology ideally suited for rapid sequence caching. A probabilistic model of hippocampal sequence coding is proposed, based on recent developments of the Restricted Boltzmann Machine by Hinton and colleagues. The model accounts for a wide range of neurobiological data not explained by previous hippocampal models, including the role of: 1) neurogenesis in the dentate gyrus, 2) feedback connections from CA3 to the dentate gyrus, 3) dynamic modes of firing within the hippocampal circuit (theta oscillations and sharp wave / ripple events), 4) phasic changes in the direction of plasticity between LTP and LTD during the theta cycle, and 5) forward and reverse sequence replay during REM sleep and sharp wave events.

This is joint work with Geoffrey Hinton.

Venue: Seminar Room, Hamilton Institute, Rye Hall
NUI Maynooth

Time: **2.00 - 3.00pm** (followed by tea/coffee)

Travel directions are available at www.hamilton.ie

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