A model of semantic completion in generative episodic memory

Abstract

Many different studies have suggested that episodic memory is a generative process, but most computational models adopt a storage view. In this talk based on our work, we propose a computational model for generative episodic memory. It is based on the central hypothesis that the hippocampus stores and retrieves selected aspects of an episode as a memory trace, which is necessarily incomplete. At recall, the neocortex reasonably fills in the missing information based on general semantic information in a process we call semantic completion. The model is able to complete missing parts of a memory trace in a semantically plausible way up to the point where it can generate plausible images from scratch. Due to the combinatorics in the index matrix, the model generalizes well to images not trained on. Compression as well as semantic completion contribute to a strong reduction in memory requirements and robustness to noise. Finally we also model an episodic memory experiment and can reproduce that semantically congruent contexts are always recalled better than incongruent ones, high attention levels improve memory accuracy in both cases, and contexts that are not remembered correctly are more often remembered semantically congruently than completely wrong.

Zahra Fayyaz

Ruhr University Bochum

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