



THE UNIVERSITY OF
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Scaling Laws of Memory Retrieval

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133 Eckhart Hall, 5734 S. University Avenue

Refreshments following the seminar in Eckhart 110

ABSTRACT

Most people have great difficulty in recalling unrelated items. The “free recall” paradigm probes the ability of human subjects to retrieve words or images from a list selected by the experimenter. Strikingly, the number of items that can be retrieved by the subjects is extremely limited, scaling only sub-linearly with the number of items in the list. The mechanisms underlying retrieval of information from memory are yet to be clarified. We suggest that the sub-linear scaling of retrieved items with the list length is a natural consequence of associative retrieval.

We study cue-less retrieval within a general theoretical framework inspired by the hypothesis of population coding of information. Items in memory are represented by overlapping groups of neurons, whose activations are a proxy for retrieval. The number of neurons participating conjunctively in the representation of two items defines the ‘similarity’ between those items. Each retrieved item acts as a trigger for the following one according to the metric of similarities between the neuronal encoding of different items in memory.

The model dynamics can be mapped to a graph search algorithm, allowing its analysis. Key predictions of the model are verified in a large experimental dataset. We suggest that the validity of our results extends beyond the classic free recall paradigm.

This is joint work with Itai Pinkoviezky, Alon Rubin, Misha Katkov and Misha Tsodyks.

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