Hopfield Networks: Modeling Memory

Maria Gabriela Navas Zuloaga [1]

[1] *Simon A. Levin Mathematical, Computational and Modeling Sciences Center, School of Human Evolution and Social Change, Arizona State University, Tempe, AZ 85281*

mnavaszu@asu.edu

In 1982, John Hopfield wrote a classical paper with a simple mathematical representation of the general mechanisms of memory storage and recovery in the human brain. He proposed a model for the construction of artificial neural networks with the ability to store "memories" (network states) and recover them from fragments of their content. The collective behavior of the set of neurons defines a dynamical system in which the network state converges to one of the stored memories. The structure of the net resembles that of the hippocampus and captures some of the fundamental processes occurring in it. The model went through multiple variations in the following years, and some versions of it are now implemented in neuroscience studies related to learning and memory. This work is a brief historical review of the Hopfield model, from its original version to recent applications.