

# A new type of Structured Artificial Neural Networks based on the Matrix Model of Computation

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## Abstract

The recently introduced Turing-complete Matrix Model of Computation (MMC) is a connectionist, massively parallel, formal mathematical model that can be set up as a network of artificial neurons and represent any other ANN. The model is hierarchically structured and has a natural ontology determined by the information stored in the model. The MMC is naturally self-organizing and dynamically stable. The Lyapunov energy function is interpreted as a measure of biological resources, the attractors correspond to the objects in the natural ontology. The Scope Constriction Algorithm (SCA) minimizes the energy by systematically switching the network connections and reveals the ontology. In this paper we consider the MMC as a modeling tool for applications in Neuroscience. We prove as a theorem that MMC can represent ANNs. We present a new, more efficient version of SCA, discuss the advantages of MMC ANNs, and illustrate with a small example.

**Keywords:** neural networks, dynamic systems, ontologies, self-organizing systems, artificial intelligence, semantic web.