# The Hopfield Model with Multi-Level Neurons

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**Abstract:**

The Hopfield neural network. model for associative memory is generalized. The generalization replaces two state

neurons by neurons taking a

richer set of values. Two classes of neuron input output relations are developed guaranteeing convergence to stable

states. The first

is a class of "continuous" rela- tions and the second is a class of allowed quantization rules for the neurons.

The information capacity for networks from the second class is fOWld to be of order N 3 bits for a

network with N neurons. A generalization of the sum of outer products learning rule is developed and investigated as

well.