Mathematical Analysis of Learning Behavior of Neuronal Models

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Abstract:

In this paper, we wish to analyze the convergence behavior of a number of neuronal plasticity models. Recent neurophysiological research

suggests that the neuronal behavior is adaptive. In particular, memory stored within a neuron is associated with the synaptic weights

which are varied or adjusted to achieve learning. A number of adaptive neuronal models have been proposed in the literature.

Three specific models will be analyzed in this paper, specifically the Hebb model, the Sutton-Barto model, and the most recent

trace model. In this paper we will examine the conditions for convergence, the position of conver(cid:173) gence and the rate

at convergence, of these models as they applied to classical conditioning. Simulation results are also presented to verify

the analysis.