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Analysis and Comparison of Different Learning Algorithms for Pattern Association Problems

Authors:

J. Bernasconi

Abstract:

We investigate the behavior of different learning algorithms for networks of neuron-like units. As test cases we use simple pat(cid:173)

tern association problems, such as the XOR-problem and symmetry de(cid:173) tection problems. The algorithms considered are either versions of the

Boltzmann machine learning rule or based on the backpropagation of errors. We also propose and analyze a generalized delta rule

for linear threshold units. We find that the performance of a given learning algorithm depends strongly on the type of

units used. In particular, we observe that networks with ± 1 units quite generally exhibit a significantly better learning

behavior than

the correspon(cid:173) ding 0,1 versions. We also demonstrate that an adaption of the weight-structure to the

symmetries of the problem

can lead to a drastic increase in learning speed.

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