

Fixed Point Analysis for Recurrent Networks

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Abstract: This paper provides a systematic analysis of the recurrent backpropagation (RBP) algorithm, introducing a number of new results. The main limitation of the RBP algorithm is that it assumes the convergence of the network to a stable fixed point in order to backpropagate the error signals. We show by experiment and eigenvalue analysis that this condition can be violated and that chaotic behavior can be avoided. Next we examine the advantages of RBP over the standard backpropagation algorithm. RBP is shown to build stable fixed points corresponding to the input patterns. This makes it an appropriate tool for content addressable memories, one-to-many function learning, and inverse problems.