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A Learning Algorithm for Feedforward Networks
with Inhibitory Lateral Connections

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Maria P. Alvarez

Dr. Arnulfo P. Azcarraga
Thesis Adviser

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ABSTRACT

Artificial neural network models, particularly the perceptron and the backpropagation network, do not perform lateral inhibition, a function commonly performed by biological neural networks. This study provides an artificial neural network model that performs lateral inhibition. The model is called a feedforward network with inhibitory lateral connections. A supervised learning algorithm for the said model is developed where weight-update rules, both for the feedforward weights and the inhibitory lateral weights, are derived using the gradient descent method. The mathematical derivation of the said weight-update rules are presented. Simulations are conducted to validate the derived supervised learning algorithm. Results of the simulation provide solutions to the XOR problem, the 3-input palindrome problem and the T-C problem. For these problems, a single hidden layer with two nodes are used. The derived learning algorithm is also generalized for multilayered feedforward networks with inhibitory lateral connections. The generalized supervised learning algorithm is simulated using the XOR problem and the T-C problem and solutions with two hidden layers are obtained, each hidden layer with a variable number of nodes.
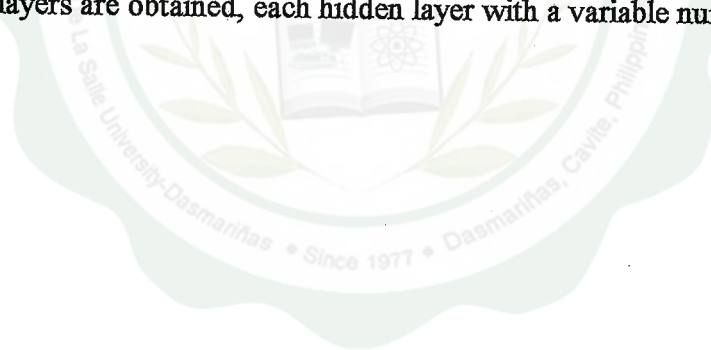
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