An Optimization Methodology for Neural Network Weights and Architectures

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Abstract An Optimization Methodology for Neural Network Weights and Architectures This talk introduces a methodology for neural network global optimization. The aim is the simultaneous optimization of multilayer perceptron (MLP) network weights and architectures, in order to generate topologies with few connections and high classification performance for any data sets. The approach combines the advantages of simulated annealing, tabu search and the backpropagation training algorithm in order to generate an automatic process for producing networks with high classification performance and low complexity. Experimental results obtained with four classification problems and one prediction problem has shown to be better than those obtained by the most commonly used optimization techniques. Considering the data sets used in the work presented in this talk, the methodology was able to generate automatically MLP topologies with many fewer connections than the maximum number allowed. The results also generate interesting conclusions about the importance of each input feature in the classification and prediction task. The proposed methodology was originally not designed to deal with different number of hidden layers but it does work with different numbers of hidden layers. Some experiments were made with more than one hidden layer. In any case, a decision needs to be made about the size of the initial topology. So in the experiments made, the initial topologies have only one hidden layer with all possible feedforward connections.