

Title: Artificial Neural Networks and Their Usage For Knowledge Extraction

Author: RNDr. Zuzana Petříčková

Department: Department of Theoretical Computer Science and Mathematical Logic

Supervisor: doc. RNDr. Iveta Mrázová, CSc., Department of Theoretical Computer Science and Mathematical Logic

Abstract:

The model of multi/layered feed/forward neural networks is well known for its ability to generalize well and to find complex non/linear dependencies in the data. On the other hand, it tends to create complex internal structures, especially for large data sets. Efficient solutions to demanding tasks currently dealt with require fast training, adequate generalization and a transparent and simple network structure.

In this thesis, we propose a general framework for training of BP/networks. It is based on the fast and robust scaled conjugate gradient technique. This classical training algorithm is enhanced with analytical or approximative sensitivity inhibition during training and enforcement of a transparent internal knowledge representation. Redundant hidden and input neurons are pruned based on internal representation and sensitivity analysis.

The performance of the developed framework has been tested on various types of data with promising results. The framework provides a fast training algorithm, robust to tunable parameters. Furthermore, it outperforms the reference techniques in the achieved generalization ability and robustness to noise in the data. It is very likely to identify redundant input features and create a simple and transparent network structure during training. In such a way it simplifies knowledge extraction from the model.

Keywords: feed-forward neural networks, condensed internal representation, sensitivity analysis, feature selection, pruning, generalization