RNDr. Zuzana Petříčková:
ARTIFICIAL NEURAL NETWORKS AND THEIR USE FOR KNOWLEDGE EXTRACTION
Review of the PhD. dissertation

The dissertation of RNDr. Zuzana Petříčková submitted in the study branch of THEORETICAL COMPUTER SCIENCE of the PhD Programme COMPUTER SCIENCE is devoted to the theoretical background of knowledge extraction, network topology design and network structure optimization. The work presents detail description of theoretical problems related to specific aspects of back-propagation algorithms and discussion of selected experiments. The work presents both the summary of known algorithms and the own approach to these problems.

Submitted dissertation of RNDr. Zuzana Petříčková is devoted to very interesting, modern and useful theoretical problems of artificial neural networks construction and optimization. The precise definition of problems to be solved and goals of the thesis presented in its initial part are followed by the very well organized overview of selected methods.

The main part of the dissertation of RNDr. Zuzana Petříčková presents detail theoretical analysis for fast training of BP networks, feature selection techniques and methodological analysis of neural networks structure optimization, generalization and network structure creation. It is possible to appreciate a logical structure of results achieved including fast knowledge extraction and topology simplification. RNDr. Zuzana Petříčková has proved in these sections of the dissertation a very good knowledge of all methods used in this research area.

Description of experiments is also very well structured. Experiments presented include generalization, speed analysis and structure optimization as well. It is necessary to appreciate results achieved.

I have the following comments and notes to the dissertation:

- Page 6, Section Introduction - a brief history of artificial neural networks and computational intelligence should be presented together with changing opinions to their efficiency
- Page 7, Figure 1 - both here and in further figures the reference to the source should be presented in the figure caption. Were results presented here evaluated by the author?
- Page 11, Figure 1.1 - the block structure of the neuron should correspond to generally accepted notation with a separate block for the activation (transfer) function
- Page 11, Section Artificial neural networks - problems of network coefficients initialization, local and global minima detection and recurrent neural networks construction should be discussed into more details
- Page 114, Experiments - the computational environment and software tools should be described into more details. Were computational tools created by the author? Was parallel processing studied to increase the speed of the optimization process as well? Were methods proposed applied to some own datasets as well?

- Page 123, Generalization - the analysis of sensitivity to noise and generalization abilities are very important. Experiments with the noise level (page 124, r.19 from the top) should be described into more details. How the percentage of noise (Fig. 5.2) is defined?

- Page 175, Bibliography - own publications should be summarized in a special section. In which scientific journals research results were published or are submitted for publication?

The formal part of the dissertation is very good having a precise logical structure and the list of figures, tables, algorithms and abbreviations. I would expect these lists at the beginning of the dissertation only. The language level is also very good. It is necessary to appreciate relatively extensive list of references published till 2012 and I would suggest to include recently published works as well.

The dissertation is carefully written describing all main research topics, results of own studies and presentation of own original methods. It is possible to summarize that the dissertation is both from the research and formal points of view very good and it clearly presents all methods used to solve the given problem. Selected research topics have been moreover published and presented during international conferences after the review process by independent reviewers already. The list of own publications of RNDr. Zuzana Petříčková should be added.

The dissertation of RNDr. Zuzana Petříčková forms an interesting contribution to the theoretical research in the very important area of artificial neural networks for knowledge extraction.

Owing to facts presented above it is possible to state that the dissertation of RNDr. Zuzana Petříčková agrees with the generally accepted international demands for a dissertation and it is possible to recommend its defence.

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