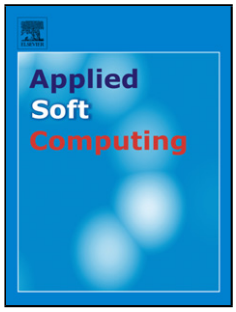

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Symbolic interpretation of artificial neural networks based on multiobjective genetic algorithms and association rules mining

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Highlights

- Multiobjective genetic algorithm based on Pareto-optimal set is used to extract knowledge from ANN.
- The rule set should satisfy high fidelity, high accuracy and a high comprehensibility.
- Invalid rules having low values of support, confidence and lift are removed.
- Redundant rules are also removed by using the sequential covering method.
- The lift allows extracting the interesting rare rules in the case of unbalanced datasets.

Abstract – *Rule extraction from neural networks is an important task. In practice, decision makers often settle for using less accurate, but comprehensible models, typically decision trees where the solutions are given in graphical form easily interpretable. The black-box rule extraction techniques, operating directly on the input-output relationship, are clearly superior to the restricted open-box methods, normally tailored for a specific architecture. This is especially important since most data miners today will use some kind of ensemble (instead of a single model) to maximize accuracy. Consequently, the ability to extract rules from any opaque model is a key demand for rule extraction techniques. This paper proposes a new multiobjective genetic method to extract knowledge from trained artificial neural network by using the association rules technique. The main aim of this hybridization is to extract the optimal rules from the neural network for further classification. The algorithm consists of two stages: the rule filtering phase which eliminates misleading rules by taking into account the support, the confidence and the lift measures, then, rule set optimization phase which finds the set of optimal rule sets by considering fidelity, coverage and complexity measures. The algorithm is evaluated on 05 UCI datasets. The experimental results show that the proposal provides interesting rules. Accuracy and comprehensibility are clearly improved, and subsequently, it can become a challengeable and trustful research field in the area of neural network rule extraction.*

Keywords*: Neural Networks, Class Association Rules, Genetic Algorithm, Multiobjective optimization*

1. Introduction

Artificial Neural Networks (ANNs) are powerful machine learning techniques. They have been successfully used in wide array of domains such as medical, industry, science, financial, economy, etc….The reason of their popularity is their ability to learn from examples, their high degree of accuracy on generalization, their ability to solve both unsupervised and supervised problem, their ability to approximate the nonlinear relationship between the inputs and outputs, their pattern classification abilities [1] and their ability to provide solution of noisy input data.