

Special Issue on

## Rule Extraction from Neural Models: From Small Data to Big Data

# CALL FOR PAPERS

The primary disadvantage of artificial neural networks (ANNs) is that they have no clear declarative representation of knowledge. In addition, ANNs have considerable difficulty generating the necessary explanation structures, which limits their full potential because the ability to provide detailed characterizations of classification strategies would promote their acceptance. Expert systems benefit from a clear declarative representation of knowledge about the problem domain; therefore, a natural means to elucidate the knowledge embedded within ANNs is to extract symbolic rules, even though this problem is known to be NP-hard. Most current rule extraction algorithms are applied to multilayer perceptrons (MLPs) with one hidden layer. However, surprisingly, very little work has been conducted in relation to deep ANNs. Bridging this gap could be expected to contribute to the real-world utility of both deep MLPs and deep learning networks.

Rule extraction from NNs can also be considered an optimization problem because it involves a clear trade-off between accuracy and comprehensibility; although higher number of rules typically provides better accuracy, it also reduces comprehensibility. Another clear trade-off can be seen between the numbers of rules and uncovered samples. Specifically, in addition to reducing comprehensibility, higher number of rules reduces the number of uncovered samples. Rule extraction from neural models therefore remains an area in need of further innovation.

Potential topics include but are not limited to the following:

- ▶ Machine learning and computational intelligence applied to rule extraction
- ▶ Machine learning and computational intelligence applied to transparency of deep learning networks
- ▶ Rule extraction from medical, financial, and industrial Big Data
- ▶ Rule extraction from decision tree ensembles
- ▶ Accuracy-interpretability dilemma: high performance classifiers versus rule extraction

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