

# Training neural networks with a procedure guided by BNF grammars

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**Abstract:** Artificial neural networks are parametric machine learning models that have been applied successfully to an extended series of classification and regression problems found in the recent literature. For the effective identification of the parameters of the artificial neural networks, a series of optimization techniques have been proposed in the relevant literature, which, although they present good results in many cases, either the optimization method used is not efficient and the training error of the network is trapped in sub-optimal values, or the neural network exhibits the phenomenon of over-training which means that it has poor results when applied to data that was not present during the training. This paper proposes an innovative technique for constructing the weights of artificial neural networks based on appropriate BNF grammars, used in the evolutionary process of Grammatical Evolution. The new procedure locates an interval of values for the parameters of the artificial neural network, and the optimization method effectively locates the network parameters within this interval. The new technique was applied to a wide range of data classification and adaptation problems covering a number of scientific areas and the experimental results were more than promising.

**Keywords:** Neural networks; Genetic algorithms; Grammatical Evolution; Evolutionary algorithms

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