*Article*

# Combining constructed artificial neural networks with parameter constraint techniques to achieve better generalization properties

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**Abstract:** A machine learning technology that has been used in a wide range of everyday problems is the recently proposed technique of constructing artificial neural networks with the assistance of Grammatical Evolution. This technique was utilized in problems from the fields of physics, chemistry, medicine, etc., in which it had excellent performance compared to other machine learning models. A key feature of these machine learning models is that they can both construct the structure of an artificial neural network efficiently and identify optimal values of the parameters of this network at the same time. However, in many cases the optimization process can become trapped in local minima of the error function, resulting in the construction of the artificial neural network not being able to be completed satisfactorily, which will lead to poor results in terms of test error. In this work, the combination of the artificial neural network construction method with an adapted genetic algorithm is proposed, which preserves the structure of the neural network that has been constructed and, in addition, appropriately adapts the parameters of the artificial neural network in order to avoid overfitting problems. The proposed method was applied on a wide series of datasets from real world problems that include classification and regression problems and it was compared against traditional machine learning models and the results are reported.

**Keywords:** Grammatical Evolution; Genetic Programming; Neural networks; Local Optimization

# References

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