Notification No.: F.NO.COE/PhD. /(Notification)/527/2023

Date of Award: 19/01/2023

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Topic of Research: Optimization of ANN Architecture Using Nature Inspired Techniques

Findings

The Artificial neural network (ANN) is the generalized mathematical model of a biological neural system inspired by the human brain. The ANN comprises many processing units (neurons), layers (input layer, hidden layers, output layer), and connections. The reasons for the popularity of ANN are flexibility in structure and good representation capability. Despite the popularity of ANN across different disciplines, the performance of ANN in terms of time complexity and accuracy is one primary concern. The ANN's performance depends on its architecture and the learning rule. In the first contribution towards of this work first we completed a laborious literature recapitulation and then for second contribution proposed a Bat algorithm-based approach to find optimal ANN architecture having a single hidden layer. We select optimal architecture based on minimal testing error. The proposed Bat methodology has been tested over two benchmark datasets and shown better results than the random trial.

In the third contribution we proposed a new technique that combines the advantage of Tabu search and Gradient descent with a momentum backpropagation (GDM) training algorithm to find optimal architecture. This work optimizes deep feedforward neural network (DFNN). Another work as forth contribution we proposed a hybrid methodology named as BatTS to design DFNN topology correctly. BatTS combines the advantages of the Bat algorithm and Tabu search with GDM, searching hidden layers and their respective neurons simultaneously. The proposed approach shows that the architecture can be improved by using such kind of nature inspired techniques.

Keywords: Artificial Neural Network, Optimization, Tabu Search, Bat Algorithm, Gradient descent with a momentum backpropagation (GDM)