Memetic elitist pareto differential evolution algorithm based radial basis function networks for classification problems

Abstract:

This paper presents a new multi-objective evolutionary hybrid algorithm for the design of Radial Basis Function Networks (RBFNs) for classification problems. The algorithm, MEPDEN, Memetic Elitist Pareto evolutionary approach based on the Non-dominated Sorting Differential Evolution (NSDE) multi-objective evolutionary algorithm which has been adapted to design RBFNs, where the NSDE algorithm is augmented with a local search that uses the Back-propagation algorithm. The MEPDEN is tested on two-class and multiclass pattern classification problems. The results obtained in terms of Mean Square Error (MSE), number of hidden nodes, accuracy (ACC), sensitivity (SEN), specificity (SPE) and Area Under the receiver operating characteristics Curve (AUC), show that the proposed approach is able to produce higher prediction accuracies with much simpler network structures. The accuracy and complexity of the network obtained by the proposed algorithm are compared with Memetic Elitist Pareto Non-dominated Sorting Genetic Algorithm based RBFN (MEPGAN) through statistical tests. This study showed that MEPDEN obtains RBFNs with an appropriate balance between accuracy and simplicity, outperforming the other method considered.