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ABSTRACT

Feed-forward neural networks are popular classification tools which are broadly used for early detection and diagnosis of breast cancer. Back Propagation Algorithm is the most common method used to train them. This learning algorithm is a gradient-descent based algorithm which suffers from some drawbacks such as getting trapped in local minima, slow convergence and network stagnancy. In recent years, a great attention has been paid to bio-inspired optimization techniques due to its robustness, simplicity and efficiency in solving complex optimization problems. Thus, this thesis investigates the prediction ability of neural networks trained by two of the most recent meta-heuristic algorithms inspired by the behaviors of natural phenomena, namely Bat algorithm and a Flower Pollination Algorithm for breast cancer diagnosis. Those algorithms are utilized for the first time to optimize the weights between layers and biases of the neuron of feed forward neural networks to achieve the minimum error for a Multi-Layer Perceptron neural network. The experiments performed on Wisconsin Breast Cancer Dataset using Matlab environment showed that the proposed approaches were capable of achieving the highest classification rate and the lowest mean squared error compared to other algorithms like Social Spider Optimization, Grey Wolf Optimization, Biogeography Based Optimization, Genetic Algorithm, Particle Swarm Optimization, Ant Colony Optimization, Evolutionary Strategy and Population-Based Incremental Learning. The influence of data preprocessing phase on performance has also been investigated. The simulation results show that the efficiency of training process is highly enhanced when combined with BAT algorithm and Flower Pollination Algorithm. It is also intended to introduce a Genetic Algorithm based Firefly Algorithm for training neural networks for optimizing weights and biases. The simulation results indicate that better performance of the Firefly Algorithm in is obtained when being hybridized with Genetic Algorithm.

The summary not more than ٥٠٠ words