Chapter 14
ANN Optimization Experiments for Classification

ABSTRACT

This chapter shows the application of PSO and GA algorithms for training the neural network using two datasets: XOR and Iris. Then the performance of both algorithms are compared and presented by figures. In addition, some of the other optimization algorithms such as Gravitation Search Algorithm (GSA) and Ant Colony Optimization (ACO) are explained.

1 CLASSIFICATION PROBLEM

From previous studies it is understood that ANN has solution for solving the classification problem and it has been successfully applied in many areas. In the study of Mohankrishnan et al. (1996) the MLP is used for classification of on- line signatures. In another study Wu and Chang (1991) used neural network for classification of protein and in another study (Saeed Khan, Al-Khatib, & Moinuddin, 2004) showed that suggested an approach by ANN that is successful in classifying speech and music. Results in all researches show that ANN has been successfully used in classifications problems. In this chapter, ANN using BP and PSO as training

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algorithms are used to classify three real world problems which are XOR and Iris dataset (see appendix C). This chapter is from the thesis of Nuzly (2006) entitled "Particle Swarm Optimization for Neural Network Learning Enhancement".

2 NEURAL NETWORK STRUCTURE FOR PSO-BASED NN AND GA-BASED NN

Song and Gu (2004) mentioned that PSO has potential performance for modification of weights of neural network and it can be an acceptable alternative for BP algorithm. In this chapter, the feedforward NN trained with PSO is compared with BP rained with GA. A 3-layer NN is applied for the classification task by GA and PSO as training algorithms. The architecture of networks has the input, hidden and output layer. In each classification task, depending on the problem the numebr of nodes in each layer are different. The number of selected features in each database determines the number of input nodes and the number of classes defines the number of nodes in the output layer. However, determining the number of rules in the hidden layer still has no standard rule or theory.

In this chapter, the feedforward network trained with the PSO has been implemented. Results show that the convergence rate is faster and classification result is better in the experiments. Even it avoids the problems of GA. Below the required steps for performing the experiment is provided as the guidance:

1. Construct PSONN based on PSO program for Sombrero function optimization.
2. Construct GANN.
3. Comparison between PSONN and GANN.
4. Evaluate performance of 2 and 3.

The experiment is performed in 2 stages: in the first stage the neural network is trained using PSO, and in the second stage GA is used for taring the neural network. The convergence time and the accuracy are calculated for comparing the performance of each approach in the classification (Nuzly, 2006).

3 EXPERIMENTS

Below the results of PSONN and GA results for classification of 2 databases are presented. 2 databases are XOR and Iris.

Prediction of L10 and Leq Noise Levels Due to Vehicular Traffic in Urban Area Using ANN and Adaptive Neuro-Fuzzy Interface System (ANFIS) Approach

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