

Optimization of type-2 fuzzy weights in backpropagation learning for neural networks using MOPSO

H.Rezapour¹, F.Simriz

Abstract

In this paper, the problem of Type-2 Fuzzy Inference System's optimization using Multi-Objective Particle Swarm Optimization (MOPSO) algorithm is presented. In order to optimize the type-2 fuzzy inference systems, we use the type-2 fuzzy weights of back-propagation neural networks. Comparing the results of the neural networks with type-2 fuzzy weights without optimization of the type-2 fuzzy inference systems, the neural networks with optimized type-2 fuzzy weights using the MOPSO algorithm, and the neural networks with type-2 fuzzy weights, we show that the bio-inspired methods have the superior performance. The comparative study is based on the Mackey-Glass time series problem for $\tau = 17$.

Keywords: type-2 fuzzy, neural network, time series, MOPSO algorithm.

1. Introduction:

In this paper, the optimization of type-2 fuzzy inference systems with multi-objective particle swarm optimization (MOPSO) algorithm to achieve appropriate fuzzy weights in the neural networks are discussed. The optimization of type-2 fuzzy inference systems is used to estimate type-2 fuzzy weights in the neural network using a back-propagation learning algorithm [1], [2]. In this work, the bio-inspired methods are optimized using the management of weights of neural network type-2 and the fuzzy receiving systems [3]. These weights are important in the learning process in an influential neural network, and the use of type-2 fuzzy weights are significant in the process of training and managing the real-time decentralized data. Neural networks are applicable in prediction of The Mackey-Glass time series using optimization of the type-2 fuzzy weights [4], [5]. Therefore, we aim to obtain the minimum prediction error for the time series of the data. This is similar to the work of Ahmadi et al. to predict asphaltene precipitation using a neural network optimized by the competitive algorithm [6], [7]. In this paper, the differences between the neural networks with type-2 fuzzy weights (without any optimization) and the neural networks with optimized type-2 fuzzy weights are discussed. Determination of the weights is important because these weights are effective in the performance of the learning process of the neural network and thus in obtaining better results. The same architecture and learning algorithm in the neural models are used to achieve a fair comparison.

¹ - HamidReza.Rezapour@Yahoo.com