Takagi-Sugeno-Kang(zero-order) model for diagnosis hepatitis disease

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Abstract

The aim of this paper is to use **Takagi-Sugeno-Kang(zero-order)** model as fuzzy neural network for the medical diagnosis of hepatitis diseases which represent a major public health problem all around the world . For further improve the accuracy and the speed of the diagnosis, the ***Microarray Attribute Reduction Scheme (MARS)*** for reduction features (or attributes) and ***Mean Imputation (MI)*** method for treatment the missing values were used in this work. The used data source of hepatitis diseases was taken from ***UCI machine learning repository***.

After treat the missing values problem by apply MI method, the dataset is partitioned into three training–testing partitions (***30%–70%, 40–60%*** and ***20%–80%*** respectively) and apply MARS with different values of ***thr***(from 0.1-0.9) in order to determine the number attributes (that represent the number of inputs to the fuzzy neural network), the results record in each case of ***thr*** values and each case of partitions. The high diagnosis accuracy has been achieved for the ***40–60%*** training–testing, namely, ***100%*** for training and ***95.77%*** for testing with ***thr*** equal to 0.4 and with less training cycle and fuzzy sets number. This work was implemented in MATLAB 7.0 environment.

Keywords: medical diagnosis, Fuzzy logic, fuzzy neural network, *Microarray Attribute* Reduction Scheme, Mean Imputation.

1. Introduction

Medical Diagnosis can be stated as the process of determining or identifying a possible disease or a disorder. A clinician uses several sources of data and classifies this data in order to find the disorder. A medical diagnosis is made by a physician based on assessment of symptoms and diagnostic tests [1].

Nowadays, the use of computer technology in the field of medicine has highly increased [2]. The use of intelligent systems such as neural network, fuzzy logic, genetic algorithm and fuzzy neural systems has highly helped in complex and uncertain medical tasks such as diagnosis of diseases [3]. Over the last few decades, neural networks and fuzzy systems have established their reputation as alternative approaches to intelligent information processing systems. Both have certain advantages over classical methods, especially when vague data or prior knowledge is involved. However, their applicability suffered from several weaknesses of the individual models. Therefore, combinations of neural networks with fuzzy systems have been proposed, where both models complement each other.

Fuzzy neural hybridization results in a hybrid intelligent system that synergizes these two techniques by combining the human-like reasoning style of fuzzy systems with the learning and connectionist structure of neural networks [4]. The basic idea of combining fuzzy systems and neural networks is to design an architecture that uses a fuzzy system to represent knowledge in an interpretable