

Diagnosis of the Heart Rhythm Disorders by Using Hybrid Classifiers

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Abstract : In this study, it was tried to identify some heart rhythm disorders by electrocardiography (ECG) data that is taken from MIT-BIH arrhythmia database by subtracting the required features, presenting to artificial neural networks (ANN), artificial immune systems (AIS), artificial neural network based on artificial immune system (AIS-ANN) and particle swarm optimization based artificial neural network (PSO-NN) classifier systems. The main purpose of this study is to evaluate the performance of hybrid AIS-ANN and PSO-ANN classifiers with regard to the ANN and AIS. For this purpose, the normal sinus rhythm (NSR), atrial premature contraction (APC), sinus arrhythmia (SA), ventricular trigeminy (VTI), ventricular tachycardia (VTK) and atrial fibrillation (AF) data for each of the RR intervals were found. Then these data in the form of pairs (NSR-APC, NSR-SA, NSR-VTI, NSR-VTK and NSR-AF) is created by combining discrete wavelet transform which is applied to each of these two groups of data and two different data sets with 9 and 27 features were obtained from each of them after data reduction. Afterwards, the data randomly was firstly mixed within themselves, and then 4-fold cross validation method was applied to create the training and testing data. The training and testing accuracy rates and training time are compared with each other. As a result, performances of the hybrid classification systems, AIS-ANN and PSO-ANN were seen to be close to the performance of the ANN system. Also, the results of the hybrid systems were much better than AIS, too. However, ANN had much shorter period of training time than other systems. In terms of training times, ANN was followed by PSO-ANN, AIS-ANN and AIS systems respectively. Also, the features that extracted from the data affected the classification results significantly.

Keywords : AIS, ANN, ECG, hybrid classifiers, PSO

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