

## A NOVEL HYBRID CLASSIFICATION METHOD WITH PARTICLE SWARM OPTIMIZATION AND K-NEAREST NEIGHBOR ALGORITHM FOR DIAGNOSIS OF CORONARY ARTERY DISEASE USING EXERCISE STRESS TEST DATA

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**ABSTRACT.** *The aim of this study is to investigate the effectiveness of a novel hybrid method, particle swarm optimization with k-nearest neighbor classifier (PSOkNN), on determination of coronary artery disease (CAD) existence upon exercise stress testing (EST) data. The PSOkNN method is composed of two steps. At the first step, one particle which demonstrates the whole samples optimally in training dataset is generated for both healthy and unhealthy patients. Then, at the second one, the class of the test sample is determined according to the distance of the test sample to the generated particles utilizing k-nearest neighbor algorithm. To demonstrate the effectiveness of this novel method, the results of PSOkNN are compared with the classification results of the artificial immune recognition system and k-nearest neighbor algorithm. Besides, reliability of the proposed method on determination of CAD existence upon EST data is examined by using classification accuracy, k-fold cross-validation method and Cohen's kappa coefficient.*

**Keywords:** Coronary artery disease, Exercise stress testing, Particle swarm optimization, Artificial immune recognition system

**1. Introduction.** Developing new insights for researchers, artificial intelligence and machine learning techniques are considered as the best available methods for development due to their common usage. Especially the studies carried out for the diagnosis in medical field are used effectively as a supplementary tool for the conventional methods due to their advantages in terms of speed or cost.

Considering widespread application of artificial intelligence and machine learning techniques in the diagnosis of heart diseases, several successful studies focusing on the diagnosis of the heart valve diseases were carried out in the past decade [1-6]. Artificial neural network (ANN) [1,2], support vector machine (SVM) [3-5] and hidden Markov model [6] methods were used in these studies regarding heart valve diseases which were certainly diagnosed by echocardiography, and these studies were usually intended for the classification of the signals obtained by using devices like Doppler. In addition to the studies regarding heart valve diseases, it is possible to reach many others evaluating the diagnosis of the arrhythmias [7-10]. These studies, in which SVM [7], ANN [8], artificial immune recognition system (AIRS) [9-11] and probabilistic artificial neural network methods were used as the classifiers, were implemented by being devoted to classifying