

# **A novel hybrid classification model of genetic algorithms, modified k-Nearest Neighbor and developed backpropagation neural network**

## **Abstract**

Among numerous artificial intelligence approaches, k-Nearest Neighbor algorithms, genetic algorithms, and artificial neural networks are considered as the most common and effective methods in classification problems in numerous studies. In the present study, the results of the implementation of a novel hybrid feature selection-classification model using the above mentioned methods are presented. The purpose is benefitting from the synergies obtained from combining these technologies for the development of classification models. Such a combination creates an opportunity to invest in the strength of each algorithm, and is an approach to make up for their deficiencies. To develop proposed model, with the aim of obtaining the best array of features, first, feature ranking techniques such as the Fisher's discriminant ratio and class separability criteria were used to prioritize features. Second, the obtained results that included arrays of the top-ranked features were used as the initial population of a genetic algorithm to produce optimum arrays of features. Third, using a modified k-Nearest Neighbor method as well as an improved method of backpropagation neural networks, the classification process was advanced based on optimum arrays of the features selected by genetic algorithms. The performance of the proposed model was compared with thirteen well-known classification models based on seven datasets. Furthermore, the statistical analysis was performed using the Friedman test followed by post-hoc tests. The experimental findings indicated that the novel proposed hybrid model resulted in significantly better classification performance compared with all 13 classification methods. Finally, the performance results of the proposed model was benchmarked against the best ones reported as the state-of-the-art classifiers in terms of classification accuracy for the same data sets. The substantial findings of the comprehensive comparative study revealed that performance of the proposed model in terms of classification accuracy is desirable, promising, and competitive to the existing state-of-the-art classification models.

**Keyword:** k-Nearest Neighbor algorithms; Genetic algorithms; Artificial neural networks