Dedicated to my beloved daughter Aadishree...
"A STUDY OF CLASSIFICATION TECHNIQUES USING SOFT COMPUTING"

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Abstract

The pattern classification is a fundamental task of most of the human activities where the decision or forecast is made on the basis of currently available information and a classification procedure is then some formal method for repeatedly making such judgments in new situations. There are a variety of real world problems such as Data mining, Pattern Recognition, Image processing, Voice recognition etc. for which, individual classification techniques are either inadequate or very tedious to apply. Soft computing techniques have been developed to fill this gap and have gained increasing popularity in the recent years. Leading examples of popular soft computing techniques are neural networks, genetic algorithms, nearest neighbor techniques, fuzzy systems, particle swarm optimization, ant colony optimization etc. In addition to solving such real world problems, soft computing techniques are also gaining acceptance in areas such as Meteorological forecasting System, Control Systems, IP routing systems etc. where the regular classification techniques are considered to be the de-facto standard. In this thesis, elementary concepts of pattern classification and the study of soft computing techniques such as neural network and its variants e.g. polynomial neural network, evolutionary algorithms like genetic algorithm, particle swarm optimization etc. and nearest neighbor techniques are given, followed by the research work available in the literature. Then, the author's contribution on Pattern Classification based upon nearest neighbor techniques such as k-NN, LI-k-NN, GI-k-NN and genetic algorithms are described. Then, a classifier based on a synergy between nearest neighbor techniques and genetic algorithm is proposed, which performs better than conventional nearest
neighbor techniques. This is followed by another synergistic approach between Polynomial Neural Net (PNN) and Genetic Algorithm (GA). This novel synergic approach performs better than the PNN and other synergic approaches of PNN such as PNN with Gradient Descent and PNN with PSO. The performances such as time and classification accuracy of the classifiers are illustrated on well known datasets from various repositories. In the final part, possible future directions for further research are discussed.

Key terms:

Pattern Classification, Soft Computing, Neural Network, Polynomial Neural Network, Nearest Neighbor Techniques, Evolutionary Optimizations Methods, Genetic Algorithm, Pattern Recognition.

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