# CONTENTS

## Chapter 1

### INTRODUCTION

1.1 Elementary Concepts  
1.2 Why classification  
1.3 Classification Accuracy: Evaluation Index of Classification  
1.4 Categories of Classifications  
1.5 Pattern Classifications in Important Areas of Application  
1.5.1 Classifications in Data Mining  
1.5.2 Classifications in Dimensionality Reduction  
1.5.3 Classifications in Feature Selection  
1.6 Salient Objectives of Present Research  
1.7 Scope and Expectations of the Research work  
1.8 Organization of Thesis

## Chapter 2

### TYPES OF CLASSIFICATION

2.1 Classification: Interpretation and Meaning  
2.2 Issues Concerned with Classifications  
2.3 Class Definitions  
2.4 Types of Classification  
2.4.1 Supervised Classification  
2.4.2 Unsupervised Classification  
2.5 Classification Methodologies  
2.5.1 Case based Methods  
2.5.2 Logical Inference  
2.5.3 Statistical Methods  
2.5.4 Artificial Neural Network Methods  
2.5.5 Evolutionary Methods
2.5.6 Hybrid Methods

(a) Synergy of Neural Network and Genetic Algorithm 34
(b) Synergy of Polynomial Neural Net and Genetic Algorithm 34
(c) Synergy of k-Nearest Neighbor and Genetic Algorithm 35
(d) Synergy of Neural Network and Fuzzy Logic 36
(e) Synergy of Fuzzy Logic and Genetic Algorithm 37
(f) Synergy of Neural Network and Belief Network 37
(g) Synergy of Genetic Algorithm and Belief Network 37
(h) Synergy of Neural Net, fuzzy and Genetic Algorithm 38

Chapter 3

SOFT COMPUTING TECHNIQUES 39-49

3.1 Meaning of Soft Computing 39
3.2 Soft Computing Tools 41
3.2.1 Artificial Neural Network 41
3.2.2 Genetic Algorithm 42
3.2.3 Nearest Neighbor Techniques 43
3.2.3.1 k-Nearest Neighbor (k-NN) 43
3.2.3.2 Locally Informative k-NN (LI-KNN) 44
3.2.3.3 Globally Informative k-NN (GI-KNN) 45
3.2.4 Polynomial Neural Network (PNN) 46
3.2.5 Fuzzy Logic 47
3.2.6 Particle Swarm Optimization (PSO) 49

Chapter 4

CLASSIFICATION USING NEURAL NETWORK 50-84

4.1 Introduction 50
4.2 Fundamentals of Biological Neural Network 51
4.3 Network Topologies 53
4.4 Brief History and Land Marks of Neural Network 54
4.5 Architecture of Neural Network 56
4.5.1 Supervised Neural Network 56
4.5.2 Unsupervised Neural Network
4.6 PNN for Pattern Classification
4.6.1 Algorithm of PNN
4.7 Neural Network in Pattern Classification-A Review

Chapter 5
THE ROLE OF EVOLUTIONARY APPROACH IN PATTERN CLASSIFICATION
5.1 Introduction
5.2 Genetic Algorithm-An Overview
5.2.1 Analogy of Genetic Algorithms
5.2.2 The Genetic Algorithm Operators
5.2.5 Selection
5.2.6 Crossover
5.2.7 Mutation
5.2.3 Implementation
5.2.4 Fitness Function
5.3 Feature Selection Using GA
5.3.1 Procedure of Feature Selection Using GA
5.4 Particle Swarm Optimization
5.4.1 PSO Neighborhood topologies
5.5 Ant Colony Optimization Systems

Chapter 6
A NOVEL SYNERGIC APPROACH OF NEAREST NEIGHBOR TECHNIQUES WITH GENETIC ALGORITHM FOR CLASSIFICATION
6.1 Introduction
6.2 Review of earlier work
6.3 Proposed Scheme
6.4 Various Classifier and their accuracies used in the proposed scheme
6.4.1 KNN Classifier
6.4.2 Locally Informative k-NN (LIKNN) 115
6.4.3 Gobally Informative k-NN (GIKNN) 117
6.4.4 Boosting with LI-KNN Classifier 119
6.5 Simulation Studies and result analysis 119

Chapter 7
AN EVOLUTIONARY FEATURE SELECTION TECHNIQUE USING POLYNOMIAL NEURAL NETWORK 126-136

7.1 Introduction 126
7.2 Review of the work done 128
7.3 Proposed Scheme 131
7.4 Simulation Studies 132
7.5 Results and Discussion 134

Chapter 8
CONCLUSION AND SUGGESTION FOR FURTHER RESEARCH 137-142

8.1 Summary 137
8.2 Future Research 141

BIBLIOGRAPHY 143-171

APPENDIX 172-178

A Description of Data Sets 172
B List of Figures 174
C List of Tables 176
D Derived Publications 177