Table of Contents

Part I
Credit Risk Analysis with Computational Intelligence: An Analytical Survey **1**

1 Credit Risk Analysis with Computational Intelligence: A Review **3**
1.1 Introduction 3
1.2 Literature Collection 5
1.3 Literature Investigation and Analysis 7
1.3.1 What is Credit Risk Evaluation Problem? 8
1.3.2 Typical Techniques for Credit Risk Analysis 8
1.3.3 Comparisons of Models 17
1.4 Implications on Valuable Research Topics 23
1.5 Conclusions 24

Part II
Unitary SVM Models with Optimal Parameter Selection for Credit Risk Evaluation **25**

2 Credit Risk Assessment Using a Nearest-Point-Algorithm-based SVM with Design of Experiment for Parameter Selection **27**
2.1 Introduction 27
2.2 SVM with Nearest Point Algorithm 29
2.3 DOE-based Parameter Selection for SVM with NPA 33
2.4 Experimental Analysis 35
2.5 Conclusions 38

3 Credit Risk Evaluation Using SVM with Direct Search for Parameter Selection **41**
3.1 Introduction 41
3.2 Methodology Description 43
3.2.1 Brief Review of LSSVM 43
3.2.2 Direct Search for Parameter Selection 45
3.3 Experimental Study 47
3.3.1 Research Data 47

Bibliografische Informationen
http://d-nb.info/989187985

digitalisiert durch DEUTSCHE NATIONAL BIBLIOTHEK

3.3.2 Parameter Selection with Genetic Algorithm 48
3.3.3 Parameters Selection with Grid Search 49
3.3.4 Experimental Results 50
3.4 Conclusions 54

Part III
Hybridizing SVM and Other Computational Intelligent Techniques for Credit Risk Analysis 57

4 Hybridizing Rough Sets and SVM for Credit Risk Evaluation 59
4.1 Introduction 59
4.2 Preliminaries of Rough Sets and SVM 61
4.2.1 Basic Concepts of Rough Sets 61
4.2.2 Basic Ideas of Support Vector Machines 62
4.3 Proposed Hybrid Intelligent Mining System 63
4.3.1 General Framework of Hybrid Intelligent Mining System 63
4.3.2 2D-Reductions by Rough Sets 64
4.3.3 Feature Selection by SVM 65
4.3.4 Rule Generation by Rough Sets 66
4.3.5 General Procedure of the Hybrid Intelligent Mining System ... 67
4.4 Experiment Study 68
4.4.1 Corporation Credit Dataset 69
4.4.2 Consumer Credit Dataset 70
4.5 Concluding Remarks 72

5 A Least Squares Fuzzy SVM Approach to Credit Risk Assessment 73
5.1 Introduction 73
5.2 Least Squares Fuzzy SVM 74
5.2.1 SVM 74
5.2.2 FSVM 77
5.2.3 Least Squares FSVM 79
5.3 Experiment Analysis 81
5.4 Conclusions 84

6 Evaluating Credit Risk with a Bilateral-Weighted Fuzzy SVM Model 85
6.1 Introduction 85
6.2 Formulation of the Bilateral-Weighted Fuzzy SVM Model 89
6.2.1 Bilateral-Weighting Errors 89
6.2.2 Formulation Process of the Bilateral-weighted fuzzy SVM 91
6.2.3 Generating Membership 93
6.3 Empirical Analysis 95

6.3.1 Dataset 1: UK Case 96
6.3.2 Dataset 2: Japanese Case 98
6.3.3 Dataset 3: England Case 100
6.4 Conclusions 102

7 Evolving Least Squares SVM for Credit Risk Analysis 105
7.1 Introduction 105
7.2 SVM and LSSVM 108
7.3 Evolving LSSVM Learning Paradigm 111
7.3.1 General Framework of Evolving LSSVM Learning Method . 111
7.3.2 GA-based Input Features Evolution 113
7.3.3 GA-based Parameters Evolution 117
7.4 Research Data and Comparable Models 119
7.4.1 Research Data 119
7.4.2 Overview of Other Comparable Classification Models 121
7.5 Experimental Results 123
7.5.1 Empirical Analysis of GA-based Input Features Evolution 123
7.5.2 Empirical Analysis of GA-based Parameters Optimization ... 126
7.5.3 Comparisons with Other Classification Models 129
7.6 Conclusions 131

Part IV
SVM Ensemble Learning for Credit Risk Analysis 133

8 Credit Risk Evaluation Using a Multistage SVM Ensemble Learning Approach 135
8.1 Introduction 135
8.2 Previous Studies 138
8.3 Formulation of SVM Ensemble Learning Paradigm 140
8.3.1 Partitioning Original Data Set 140
8.3.2 Creating Diverse Neural Network Classifiers 142
8.3.3 SVM Learning and Confidence Value Generation 143
8.3.4 Selecting Appropriate Ensemble Members 144
8.3.5 Reliability Value Transformation 146
8.3.6 Integrating Multiple Classifiers into an Ensemble Output 146
8.4 Empirical Analysis 148
8.4.1 Consumer Credit Risk Assessment 149
8.4.2 Corporation Credit Risk Assessment 151
8.5 Conclusions 154

9 Credit Risk Analysis with a SVM-based Metamodeling Ensemble Approach 157

9.1 Introduction 157
9.2 SVM-based Metamodeling Process 160
9.2.1 A Generic Metalearning Process 160
9.2.2 An Extended Metalearning Process 163
9.2.3 SVM-based Metamodeling Process 165
9.3 Experimental Analyses 173
9.3.1 Research Data and Experiment Design 173
9.3.2 Experimental Results 174
9.4 Conclusions 177

10 An Evolutionary-Programming-Based Knowledge Ensemble Model for Business Credit Risk Analysis 179
10.1 Introduction 179
10.2 EP-Based Knowledge Ensemble Methodology 181
10.2.1 Brief Introduction of Individual Data Mining Models 182
10.2.2 Knowledge Ensemble based on Individual Mining Results . 185
10.3 Research Data and Experiment Design 188
10.4 Experiment Results 189
10.4.1 Results of Individual Models 189
10.4.2 Identification Performance of the Knowledge Ensemble 191
10.4.3 Identification Performance Comparisons 193
10.5 Conclusions 195

11 An Intelligent-Agent-Based Multicriteria Fuzzy Group Decision Making Model for Credit Risk Analysis 197
11.1 Introduction 197
11.2 Methodology Formulation 201
11.3 Experimental Study 206
11.3.1 An Illustrative Numerical Example 206
11.3.2 Empirical Comparisons with Different Credit Datasets 208
11.4 Conclusions and Future Directions 221

References 223

Subject Index 239

Biographies of Four Authors of the Book 243