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Krzysztof Cpałka

Design of Interpretable Fuzzy Systems

Springer

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Preface

Fuzzy systems are well suited for advanced scientific and engineering applications. They are universal approximators and the knowledge stored in them is represented in the form of fuzzy rules. Initially, such rules were thought to be inherently interpretable. That resulted, among others, from the theory of fuzzy sets proposed by Prof. Lotfi Zadeh, which assumed that fuzzy rules used fuzzy sets and interpretation of a fuzzy set is intuitive. However, in the 1990s researchers drew attention to the fact that the use of a large number of fuzzy rules and sets increases accuracy of system operation but significantly reduces readability of a rule-based notation. Therefore, solutions associated with the term "interpretability" began to appear. Currently, this term goes far beyond the notions of the fuzzy set and the fuzzy rule. The purpose of this book is to show different aspects of interpretable fuzzy systems design in various fields of applications. This book addresses issues of fuzzy sets and systems theory, machine learning, evolutionary algorithms inspired by nature, multi-criterion optimization, classification, biometrics, automatics and control theory.

The book is the result of collaboration with colleagues from the Institute of Computational Intelligence at Częstochowa University of Technology. The author would like to thank Dr. Łukasz Bartczuk, Dr. Krystian Łapa, Dr. Andrzej Przybył and Dr. Marcin Zalasiński for their cooperation. The author specially thanks Prof. Leszek Rutkowski for his invaluable help and great kindness, which contributed to the writing of this book. The author also thanks his wife Agnieszka, children, Malwina and Patryk, and his parents, Wanda and Józef, for inspirational motivation, heartfelt support and patience.

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Contents

1 Introduction 1
References 5

2 Selected Topics in Fuzzy Systems Designing 11
2.1 Fuzzy System Description 11
2.1.1 Fuzzy System Implementing Mamdani-Type Inference 14
2.1.2 Fuzzy System Implementing Logical-Type Inference 15
2.2 Fuzzy System Learning Methods 16
2.3 Methods for Evaluation of Fuzzy System Accuracy 20
2.3.1 Accuracy Evaluation of the Systems Used for Modelling 20
2.3.2 Accuracy Evaluation of the Systems Used for Classification 20
2.3.3 Accuracy Evaluation in the Context of Interpretable Fuzzy Systems Designing 21
2.4 Summary 22
References 22

3 Introduction to Fuzzy System Interpretability 27
3.1 Fuzzy System Accuracy, Complexity and Interpretability 28
3.2 An Overview of Solutions for Fuzzy Systems Interpretability 30
3.3 Attempts to Systematize Solutions for Fuzzy Systems Interpretability 30
3.4 Basic Fuzzy System Interpretability Criteria 31
3.5 Summary 34
References 34

4 Improving Fuzzy Systems Interpretability by Appropriate Selection of Their Structure 37
4.1 Precise Aggregation and Inference Operators 38
4.1.1 Parameterized Triangular Norms 38
4.1.2 Triangular Norms with Weights of Arguments 42
4.1.3 Switchable Triangular Norms 44
4.1.4 Hybrid Aggregation and Inference Operators 46
4.2 Precise Defuzzification Operators 47
4.3 Flexible-Type Fuzzy Systems 49
4.4 Extended Interpretability Criteria of Fuzzy Systems 52
4.5 Simulation Results 55
4.6 Summary 58
References 58

5 Interpretability of Fuzzy Systems Designed in the Process of Gradient Learning 61
5.1 Initialization of Fuzzy Systems 62
5.2 Gradient Learning of Fuzzy Systems 65
5.3 Fuzzy System Tuning Aimed at Increasing Accuracy 69
5.4 Fuzzy System Reduction Aimed at Maximum Simplification of the Structure 72
5.4.1 Method of Consecutive Eliminations 72
5.4.2 Method of Consecutive Merging 75
5.5 Fuzzy Systems Reduction Aimed at Structure Simplification and Increase of Accuracy 78
5.5.1 Method of the Most Favorable Local Eliminations 79
5.5.2 Method of the Most Favorable Global Eliminations 81
5.6 Simulation Results 83
5.7 Summary 87
References 88

6 Interpretability of Fuzzy Systems Designed in the Process of Evolutionary Learning 91
6.1 Initializing a Population in Evolutionary Learning 92
6.2 Evolutionary Learning of Fuzzy Systems 94
6.2.1 Evolutionary Learning of Fuzzy Systems Using Single Population 95
6.2.2 Evolutionary Learning of Fuzzy Systems Using Many Populations 106
6.3 Taking into Account Interpretability Criteria of Fuzzy Systems 110
6.3.1 Complexity Evaluation Criterion 110
6.3.2 Fuzzy Sets Position Evaluation Criterion 111
6.3.3 Criterion for Assessing Similarity of Fuzzy Sets Width . . . 113

6.3.4 Criterion for Assessing Coverage of the Data Space by Input Fuzzy Sets . . . 114
6.3.5 Criterion for Assessing Fuzzy Rules Activity . . . 114
6.3.6 Criterion for Assessing the Readability of Weight Values in the Fuzzy Rule Base . . . 115
6.3.7 Criterion for Assessing the Readability of Aggregation and Inference Operators . . . 115
6.3.8 Criterion for Assessing the Defuzzification Mechanism . . . 116
6.4 Simulation Results . . . 116
6.5 Summary . . . 119
References . . . 127

7 Case Study: Interpretability of Fuzzy Systems Applied to Nonlinear Modelling and Control . . . 131
7.1 Nonlinear Objects Modelling . . . 131
7.1.1 Description of a Given Class of Objects . . . 132
7.1.2 Description of the Method . . . 135
7.1.3 Simulation Results . . . 137
7.1.4 Conclusions . . . 141
7.2 Control of CNC Machines with a Jerk Limit . . . 141
7.2.1 Description of the Problem . . . 146
7.2.2 Description of the Method . . . 152
7.2.3 Simulation Results . . . 156
7.2.4 Conclusions . . . 159
7.3 Summary . . . 159
References . . . 160

8 Case Study: Interpretability of Fuzzy Systems Applied to Identity Verification . . . 163
8.1 Identity Verification on the Basis of Characteristic Partitions of the Dynamic Signature . . . 163
8.1.1 Description of the Method . . . 165
8.1.2 Simulation Results . . . 177
8.1.3 Conclusions . . . 181
8.2 Identity Verification on the Basis of Characteristic Features of the Dynamic Signature . . . 182
8.2.1 Description of the Method . . . 182
8.2.2 Simulation Results . . . 185
8.2.3 Conclusions . . . 186
8.3 Summary . . . 186
References . . . 187

9 Concluding Remarks and Future Perspectives . . . 191
References . . . 193

Index . . . 195