1. Record Nr. UNINA9910231246403321

Autore	ukasz Apiecionek
Titolo	Theory and Applications of Ordered Fuzzy Numbers [[electronic resource]] : A Tribute to Professor Witold Kosiski / / edited by Piotr Prokopowicz, Jacek Czerniak, Dariusz Mikoajewski, ukasz Apiecionek, Dominik lzak
Pubbl/distr/stampa	Springer Nature, 2017 Cham : , : Springer International Publishing : , : Imprint : Springer, , 2017
ISBN	3-319-59614-4
Edizione	[1st ed. 2017.]
Descrizione fisica	1 online resource (XVIII, 322 p. 156 illus., 106 illus. in color.)
Collana	Studies in Fuzziness and Soft Computing, , 1434-9922 ; ; 356
Disciplina	006.3
Soggetti	Computational intelligence Control engineering Operations research Decision making Management science Computational Intelligence Control and Systems Theory Operations Research/Decision Theory Operations Research, Management Science
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Intro -- Foreword -- Memories of Professor Witold Kosinski -- Scientific Development -- Scientific and Academic Achievements (Part I) -- Scientific and Academic Achievements (Part II) -- Scientific Collaboration -- Teaching and Supervision -- Scientific and Social Services -- Personality and Memoires -- Acknowledgements -- Contents -- Part I Background of Fuzzy Set Theory -- 1 Introduction to Fuzzy Sets -- 1.1 Classic and Fuzzy Sets -- 1.2 Fuzzy Sets---Basic Definitions -- 1.3 Extension Principle -- 1.4 Fuzzy Relations -- 1.5 Cylindrical Extension and Projection of a Fuzzy Set -- 1.6 Fuzzy Numbers -- 1.7 Summary -- References -- 2 Introduction to Fuzzy Systems -- 2.1 Introduction -- 2.2 Fuzzy Conditional Rules -- 2.3

Approximate Reasoning -- 2.3.1 Compositional Rule of Inference -- 2.3.2 Approximate Reasoning with Knowledge Base -- 2.3.3 Fuzzification and Defuzzification -- 2.4 Basic Types of Fuzzy Systems -- 2.4.1 Mamdani--Assilan Fuzzy Model -- 2.4.2 Takagi--Sugeno--Kang Fuzzy System -- 2.4.3 Tsukamoto Fuzzy System -- 2.5 Summary -- References -- Part II Theory of Ordered Fuzzy Numbers -- 3 Ordered Fuzzy Numbers: Sources and Intuitions -- 3.1 Introduction -- 3.2 Problems with Calculations on Fuzzy Numbers -- 3.3 Related Work -- 3.4 Decomposition of Fuzzy Memberships -- 3.5 Idea of Ordered Fuzzy Numbers -- 3.6 Summary -- References -- 4 Ordered Fuzzy Numbers: Definitions and Operations -- 4.1 Introduction -- 4.2 The Ordered Fuzzy Number Model -- 4.3 Basic Notions for OFNs -- 4.3.1 Standard Representation of OFNs -- 4.3.2 OFN Support -- 4.3.3 OFN Membership Function -- 4.3.4 Real Numbers as OFN Singletons -- 4.4 Improper OFNs -- 4.5 Basic Operations on OFNs -- 4.5.1 Addition and Subtraction -- 4.5.2 Multiplication and Division -- 4.5.3 General Model of Operations -- 4.5.4 Solving Equations -- 4.6 Interpretations of OFNs.
4.6.1 Direction as a Trend -- 4.6.2 Validity of Operations -- 4.6.3 The Meaning of Improper OFNs -- 4.7 Summary and Further Intuitions -- References -- 5 Processing Direction with Ordered Fuzzy Numbers -- 5.1 Introduction -- 5.2 Direction Measurement Tool -- 5.2.1 The PART Function -- 5.2.2 The Direction Determinant -- 5.3 Compatibility Between OFNs -- 5.4 Inference Sensitive to Direction -- 5.4.1 Directed Inference Operation -- 5.4.2 Examples -- 5.5 Aggregation of OFNs -- 5.5.1 The Aggregation's Basic Properties -- 5.5.2 Arithmetic Mean Directed Aggregation -- 5.5.3 Aggregation for Premise Parts of Fuzzy Rules -- 5.6 Summary -- References -- 6 Comparing Fuzzy Numbers Using Defuzzificators on OFN Shapes -- 6.1 Introduction -- 6.2 Formal Approach to the Problem -- 6.3 Defuzzification Methods -- 6.3.1 Defuzzification Methods for OFN -- 6.4 Definition of Golden Ratio Defuzzification Operator -- 6.4.1 Golden Ratio for OFN -- 6.5 Golden Ratio -- 6.6 Defuzzification Conditions for GR -- 6.6.1 Normalization -- 6.6.2 Restricted Additivity -- 6.6.3 Homogeneity -- 6.7 Definition of Mandala Factor Defuzzification Operator -- 6.8 Mandala Factor -- 6.9 Defuzzification Conditions for MF -- 6.9.1 Normalization -- 6.9.2 Restricted Additivity -- 6.9.3 Homogeneity -- 6.10 Catalogue of the Shapes of Numbers in OFN Notation -- 6.11 Conclusion -- References -- 7 Two Approaches to Fuzzy Implication -- 7.1 Introduction -- 7.2 Lattice Structure and Implications on SOFNs -- 7.2.1 Step-Ordered Fuzzy Numbers -- 7.2.2 Lattice on mathcalRK -- 7.2.3 Complements and Negation on calN -- 7.2.4 Fuzzy Implication on BSOFN -- 7.2.5 Applications -- 7.3 Metasets -- 7.3.1 The Binary Tree T and the Boolean Algebra mathfrakB -- 7.3.2 General Definition of Metaset -- 7.3.3 Interpretations of Metasets -- 7.3.4 Forcing -- 7.3.5 Set-Theoretic Relations for Metasets.
7.3.6 Applications of Metasets -- 7.3.7 Classical and Fuzzy Implication -- 7.4 Conclusions and Further Research -- References -- Part III Examples of Applications -- 8 OFN Capital Budgeting Under Uncertainty and Risk -- 8.1 Introduction -- 8.2 Ordered Fuzzy Numbers -- 8.3 Classic Capital Budgeting Methods -- 8.4 Fuzzy Approach to the Discount Methods -- 8.5 Computational Example of the Investment Project -- 8.6 Summary -- References -- 9 Input-Output Model Based on Ordered Fuzzy Numbers -- 9.1 Introduction -- 9.2 Input-Output Analysis -- 9.3 Example of Application of OFNs in the Leontief Model -- 9.4 Conclusions -- References -- 10 Ordered Fuzzy Candlesticks -- 10.1 Introduction -- 10.2 Ordered Fuzzy Candlesticks -- 10.3 Volume and Spread -- 10.3.1 Volume -- 10.3.2 Spread -- 10.4

Ordered Fuzzy Candlesticks in Technical Analysis -- 10.4.1 Ordered Fuzzy Technical Analysis Indicators -- 10.4.2 Ordered Fuzzy Candlestick as Technical Analysis Indicator -- 10.5 Ordered Fuzzy Time Series Models -- 10.6 Conclusion and Future Works -- References -- 11 Detecting Nasdaq Composite Index Trends with OFNs -- 11.1 Introduction -- 11.2 Application of OFN Notation for the Fuzzy Observation of NASDAQ Composite -- 11.3 Ordered Fuzzy Number Formulas -- 11.4 Conclusions -- References -- 12 OFNAnt Method Based on TSP Ant Colony Optimization -- 12.1 Introduction -- 12.2 Application of Ant Colony Algorithms in Searching for the Optimal Route -- 12.3 OFNAnt, a New Ant Colony Algorithm -- 12.4 Experiment -- 12.4.1 Experiment Execution Method -- 12.4.2 Software Used for Experiment -- 12.4.3 Experimental Data -- 12.5 Results of Experiment -- 12.6 Summary and Conclusions -- References -- 13 A New OFNBee Method as an Example of Fuzzy Observance Applied for ABC Optimization -- 13.1 Introduction -- 13.2 ABC (Artificial Bee Colony) Model -- 13.3 Selected OFN Issues.
13.4 New Hybrid OFNBee Method -- 13.5 Experimental Results -- 13.6 Conclusion -- References -- 14 Fuzzy Observation of DDoS Attack -- 14.1 Introduction -- 14.2 DDoS Attack Description and Recognition -- 14.3 The Idea of Attack Recognition and Prevention -- 14.4 Attack Observation Using OFNs -- 14.5 Experiment Test Results -- 14.5.1 Test Description -- 14.5.2 Attack Detection Using Proposed Method -- 14.6 Conclusions-Method Comparision -- References -- 15 Fuzzy Control for Secure TCP Transfer -- 15.1 Introduction -- 15.2 Multipath TCP -- 15.3 Multipath TCP Schedulers -- 15.3.1 Multipath TCP Standard Scheduler -- 15.3.2 Multipath TCP Secure Scheduler -- 15.3.3 Multipath TCP Scheduler with OFN Usage -- 15.3.4 OFN for Problem Detection -- 15.4 OFN Scheduler Algorithm -- 15.5 Simulation Test Results -- 15.6 Conclusions -- References -- 16 Fuzzy Numbers Applied to a Heat Furnace Control -- 16.1 Introduction -- 16.2 Selected Definitions -- 16.2.1 The Essence of Ordered Fuzzy Numbers -- 16.2.2 Fuzzy Controller -- 16.2.3 Control of the Stove on Solid Fuel -- 16.3 Classic Fuzzy Controller -- 16.4 The Controller for the OFNs -- 16.4.1 Directed OFN as a Combustion Trend -- 16.5 Modeling Trend in the Inference Process -- 16.6 Conclusions -- References -- 17 Analysis of Temporospatial Gait Parameters -- 17.1 Introduction -- 17.2 Methods -- 17.2.1 Subjects -- 17.2.2 Methods -- 17.2.3 Statistical Analysis -- 17.2.4 Fuzzy-Based Tool for Gait Assessment -- 17.2.5 Main Ideas of the OFN Model -- 17.2.6 OFN Model in Gait Assessment -- 17.3 Results -- 17.4 Discussion -- 17.5 Conclusions -- References -- 18 OFN-Based Brain Function Modeling -- 18.1 Introduction -- 18.2 State of the Art -- 18.2.1 Theory -- 18.2.2 Modeling Complex Ideas with Fuzzy Systems -- 18.2.3 Clinical Practice -- 18.2.4 Models for Linking Hypotheses and Experimental Studies -- 18.3 Concepts.
18.3.1 Data Ladder -- 18.3.2 Models of a Single Neuron -- 18.3.3 Models of Biologically Relevant Neural Networks -- 18.3.4 Models of Human Behavior -- 18.4 Traditional versus Fuzzy Approach -- 18.5 OFN as an Alternative Approach to Fuzziness -- 18.6 Patterns and Examples -- 18.6.1 Intuitive Modeling of the Complex Functions -- 18.6.2 Improving Policy Gradient Method -- 18.6.3 Modeling Learning Rate with the OFNs -- 18.7 Discussion -- 18.7.1 Results of Other Scientists -- 18.7.2 Limitations of Our Approach and Directions for Further Research -- 18.8 Conclusions -- References.

Sommario/riassunto

This book is open access under a CC BY 4.0 license. This open access book offers comprehensive coverage on Ordered Fuzzy Numbers, providing readers with both the basic information and the necessary expertise to use them in a variety of real-world applications. The

respective chapters, written by leading researchers, discuss the main techniques and applications, together with the advantages and shortcomings of these tools in comparison to other fuzzy number representation models. Primarily intended for engineers and researchers in the field of fuzzy arithmetic, the book also offers a valuable source of basic information on fuzzy models and an easy-to-understand reference guide to their applications for advanced undergraduate students, operations researchers, modelers and managers alike.