

1. Record Nr.	UNINA9910482999203321
Autore	Dombi Jozsef
Titolo	Explainable neural networks based on fuzzy logic and multi-criteria decision tools // Jozsef Dombi, Orsolya Csiszar
Pubbl/distr/stampa	Cham, Switzerland : , : Springer, , [2021] ©2021
ISBN	3-030-72280-5
Descrizione fisica	1 online resource (186 pages)
Collana	Studies in fuzziness and soft computing ; ; Volume 408
Disciplina	006.32
Soggetti	Fuzzy logic Neural networks (Computer science) Machine learning Artificial intelligence Xarxes neuronals (Informàtica) Lògica difusa Aprenentatge automàtic Llibres electrònics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Intro -- Foreword -- Preface -- Introduction-Aggregation and Intelligent Decision -- Contents -- List of Figures -- List of Tables -- Elements of Nilpotent Fuzzy Logic -- 1 Connectives: Conjunctions, Disjunctions and Negations -- 1.1 Introduction -- 1.2 Preliminaries -- 1.2.1 Negations -- 1.2.2 Triangular Norms and Conorms -- 1.3 Characterization of Strict Negation Operators -- 1.4 Nilpotent Connective Systems -- 1.4.1 Structural Properties of Connective Systems -- 1.4.2 Consistent Connective Systems -- 1.5 Summary -- References -- 2 Implications -- 2.1 Introduction -- 2.2 Preliminaries -- 2.3 R-Implications in Bounded Systems -- 2.4 S-Implications in Bounded Systems -- 2.4.1 Properties of iS_n , iS_d and iS_c -- 2.4.2 S-Implications and the Ordering Property -- 2.5 A Comparison of Implications in Bounded Systems -- 2.6 Min and Max Operators in Nilpotent Connective Systems -- 2.7 Summary -- References -- 3 Equivalences -- 3.1 Introduction -- 3.2 Preliminaries -- 3.3

Equivalences in Bounded Systems -- 3.3.1 Properties of $ec(x,y)$ and $ed(x,y)$ -- 3.4 Dual Equivalences -- 3.4.1 Properties of $bared$ and $barec$ -- 3.5 Arithmetic Mean Operators in Bounded Systems -- 3.6 Aggregated Equivalences -- 3.6.1 Properties of the Aggregated Equivalence Operator -- 3.7 Applications -- 3.8 Summary -- References -- 4 Modifiers and Membership Functions in Fuzzy Sets -- 4.1 Introduction -- 4.2 Unary Operators in Nilpotent Logical Systems -- 4.2.1 Possibility and Necessity as Unary Operators Derived from Multivariable Operators -- 4.2.2 Drastic Unary Operators -- 4.2.3 Composition Rules -- 4.2.4 Multivariable Operators Derived from Unary Operators -- 4.2.5 A General Framework: The $\langle \cdot, \cdot \rangle$ -Model -- 4.3 Unary Operators Induced by Negation Operators -- 4.4 Membership Functions -- 4.5 Non-membership Functions -- 4.6 Summary -- References -- Decision Operators.

5 Aggregative Operators -- 5.1 Introduction -- 5.2 Preliminaries -- 5.3 Shifting Transformations on the Generator Functions - A General Parametric Formula -- 5.4 The Weighted General Operator -- 5.5 Properties of the General and the Weighted General Operator -- 5.5.1 The De Morgan Property -- 5.5.2 Bisymmetry -- 5.6 The Two-Variable General and Weighted Aggregative Operator -- 5.7 Summary -- References -- 6 Preference Operators -- 6.1 Introduction -- 6.2 Operators of Nilpotent Systems - A General Framework -- 6.2.1 Normalization of the Generator Functions -- 6.2.2 The General Parametric Operator -- 6.2.3 The Unary Operators: Negation, Modifiers and Hedges -- 6.3 Preference Modeling -- 6.4 Properties of the Preference Operator -- 6.4.1 Basic Properties -- 6.4.2 Ordering Properties -- 6.4.3 Preference and Negation -- 6.4.4 Preference, Conjunction and Disjunction -- 6.4.5 Preference and Aggregation -- 6.4.6 Additive Transitivity -- 6.4.7 Bisymmetry and the Common Base Property -- 6.4.8 Preference and Unary Operators -- 6.5 Summary -- References -- Learning and Neural Networks -- 7 Squashing Functions -- 7.1 Introduction -- 7.2 $ukasiewicz$ Operators -- 7.3 Approximation of the Cutting Function -- 7.3.1 The Sigmoid Function -- 7.3.2 The Interval $[a,b]$ Squashing Function -- 7.3.3 The Error of the Approximation -- 7.4 Approximation of Piecewise Linear Membership Functions -- 7.5 Summary -- References -- 8 Learning Rules -- 8.1 Introduction -- 8.2 Problem Definition and Solution Outline -- 8.3 Preliminaries -- 8.4 The Structure and Representation of the Rules -- 8.5 The Optimization Process -- 8.5.1 Rule Optimization by GA -- 8.5.2 A Gradient-Based Local Optimization of Memberships -- 8.6 Applications -- 8.7 Summary -- References -- 9 Interpretable Neural Networks Based on Continuous-Valued Logic and Multi-criteria Decision Operators -- 9.1 Introduction. 9.2 Related Work -- 9.3 Nilpotent Logical Systems and Multicriteria Decision Tools -- 9.4 Nilpotent Logic-Based Interpretation of Neural Networks -- 9.5 Playground Examples -- 9.5.1 XOR -- 9.5.2 Preference -- 9.6 Summary -- References -- 10 Conclusions.
