| Record Nr. | UNINA9910639897103321 |
|-------------------------|--|
| Autore | Bloch Isabelle |
| Titolo | Fuzzy sets methods in image processing and understanding : medical imaging applications / / Isabelle Bloch, Anca Ralescu |
| Pubbl/distr/stampa | Cham, Switzerland : , : Springer, , [2023] ©2023 |
| ISBN | 3-031-19425-X |
| Descrizione fisica | 1 online resource (311 pages) |
| Disciplina | 910.5 |
| Soggetti | Fuzzy sets |
| Lingua di pubblicazione | Inglese |
| Formato | Materiale a stampa |
| Livello bibliografico | Monografia |
| Nota di bibliografia | Includes bibliographical references and index. |
| Nota di contenuto | Intro Acknowledgments Contents 1 Introduction 1.1 Fuzzy Sets and Image Understanding Under Imprecision 1.1.1 Sources of Imprecision 1.1.2 Advantages and Usefulness of Fuzzy Sets 1.1.3 Semantic Gap 1.1.4 A Short Review of Existing Books 1.2 Representations 1.3 Low Level-Clustering, Enhancement, Filtering, Edge Detection 1.4 Intermediate Level 1.5 Higher Level 1.5.1 Representations of Structural Information 1.5.2 Fusion 1.5.3 Scene Understanding 1.6 Emerging Topics 1.6.1 Mining and Retrieval 1.6.2 Towards Bipolarity 1.6.3 Towards More Interactions Between Knowledge and Image Information 1.6.4 Deep Neuro-Fuzzy Systems References 2 Preliminaries 2.1 Imprecision in Images and Related Knowledge 2.2 Basic Definitions of Fuzzy Sets Theory 2.2.1 Fuzzy Sets 2.2.2 Set Theoretical Operations: Original Definitions of L. Zadeh 2.2.3 Structure and Types of Fuzzy Sets 2.2.4 -Cuts 2.2.5 Cardinality 2.2.6 Convexity 2.2.7 Fuzzy Number 2.3 Main Operators on Fuzzy Sets 2.3.1 Fuzzy Complementation 2.3.2 Triangular Norms and Conorms 2.3.3 Mean Operators 2.3.4 Symmetric Sums 2.3.5 Adaptive Operators 2.3.6 Logical Connectives 2.4 Linguistic Variable 2.4.1 Definition 2.4.2 Example of Linguistic Variable 2.4.3 Modifiers 2.5 Translating a Crisp Operation into a Fuzzy Operation 2.5.1 Extension Principle Definition Application to the Compatibility of Two Fuzzy Sets Application to Fuzzy Numbers |

1.

-- 2.5.2 Combination of Results on -Cuts -- Reconstruction from -Cuts -- Extension Principle Based on -Cuts -- 2.5.3 Translating Binary Terms into Functional Ones -- 2.5.4 Comparison -- 2.6 Summary of the Main Notations -- References -- 3 Fuzzy Spatial Objects -- 3.1 Fuzzy Sets in the Spatial Domain -- 3.2 Set Theoretical Operations.

3.2.1 Degree of Intersection -- Crisp Case -- Direct Extension --Introducing the Volume of the Overlapping Domain -- Properties --Application to the Non-contradiction Principle -- 3.2.2 Degree of Union and Covering -- 3.2.3 Degree of Inclusion -- Inclusion from Other Set Operations -- Inclusion from Fuzzy Implication -- Other Axiomatic Definitions for the Fuzzy Inclusion -- Inclusion and Fuzzy Entropy --3.2.4 Degree of Equality -- 3.3 Topology: Neighborhood, Boundary, and Connectedness of a Fuzzy Set -- 3.3.1 Fuzzy Neighborhood --3.3.2 Boundary of a Fuzzy Set -- 3.3.3 Connectedness -- 3.4 Fuzzy Geometry -- 3.4.1 Fuzzy Points and Lines -- 3.4.2 Fuzzy Rectangles and Fuzzy Convex Polygons -- 3.4.3 Fuzzy Disks -- 3.4.4 Fuzzy Geometrical Measures -- Area of a Fuzzy Set -- Perimeter of a Fuzzy Set -- Compactness of a Fuzzy Set -- Height, Width, and Diameter of a Fuzzy Set -- Intersection and Parallelism Between Fuzzy Lines --Geometrical Measures as Fuzzy Numbers -- 3.5 Fuzzy Geometric Transformations -- 3.5.1 Transformation of a Fuzzy Set by a Crisp Operation -- 3.5.2 Transformation of a Fuzzy Set by a Fuzzy Operation -- References -- 4 Fuzzy Mathematical Morphology -- 4.1 Lattice Structure of ps: [/EMC pdfmark [/Subtype /Span /ActualText (script upper F) /StPNE pdfmark [/StBMC pdfmarkFps: [/EMC pdfmark [/StPop pdfmark [/StBMC pdfmark -- 4.2 Algebraic Operators -- 4.3 Structuring Elements and Basic Morphological Operators -- 4.4 An Example in Medical Imaging -- 4.5 Towards a Fuzzy Mathematical Morphology Toolbox -- 4.5.1 Neighborhood and Boundary from Fuzzy Dilation and Erosion -- 4.5.2 Fuzzy Morphological Filters -- 4.5.3 Conditioning and Fuzzy Geodesic Operators -- 4.5.4 Fuzzy Skeleton and Skeleton by Influence Zones -- Distance-Based Approaches --Morphological Approaches to Compute the Centers of Maximal Balls --Morphological Thinning.

Fuzzy Skeleton of Influence Zones -- Discussion -- 4.5.5 Fuzzy Median, Application to Interpolation Between Fuzzy Sets -- 4.5.6 Extensions -- References -- 5 Fusion -- 5.1 Definitions -- 5.2 Fusion Systems and Architectures Types -- 5.3 Fuzzy Modeling in Fusion --5.4 Defining and Estimating Membership Functions -- 5.5 Fuzzy Combination -- 5.6 Decision in Fuzzy Fusion -- 5.7 Exploiting Spatial Information -- 5.8 Illustrative Examples -- References -- 6 Spatial Relations -- 6.1 Set Theoretical and Topological Relations -- 6.1.1 Adjacency -- 6.1.2 Fuzzy Region Connection Calculus -- 6.2 Distances Between Image Regions or Objects -- 6.2.1 Representations -- 6.2.2 Comparison of Membership Functions -- 6.2.3 Combination of Spatial and Membership Comparisons -- 6.2.4 Discussion and Examples --6.3 Fuzzy Hamming Distance -- 6.4 Directional Relations -- 6.4.1 Fuzzy Relations Describing Relative Position -- 6.4.2 Centroid Method -- 6.4.3 Histogram of Angles: Compatibility Method -- 6.4.4 Aggregation Method -- 6.4.5 Histogram of Forces -- 6.4.6 Projection Based Approach -- 6.4.7 Morphological Approach -- 6.4.8 Discussion and Examples -- 6.5 Complex Relations: Surround, Between, Along, Across, Parallel, Aligned -- 6.5.1 Surround -- 6.5.2 Between -- 6.5.3 Across -- 6.5.4 Along -- 6.5.5 Aligned -- 6.5.6 Parallel -- 6.6 Fuzzy Perceptual Organization for Image Understanding -- 6.6.1 Fuzzy Grouping Operator to Produce Straight LineSegments -- 6.6.2 Discrimination: Overlap of Two Segments -- 6.6.3 Obtaining Junctions

-- 6.6.4 Obtaining Symmetric Line Structures -- Symmetry of Nonparallel Line Segments -- Symmetry of Parallel Line Structures -- 6.6.5 Obtaining Curves and Closed Regions -- 6.7 Comparison of Spatial Relations -- 6.7.1 Relations Represented as Numbers or Intervals --6.7.2 Relations Represented as Distributions. 6.7.3 Relations Represented as Spatial Fuzzy Sets -- References -- 7 Fuzzy Sets and Machine Learning -- 7.1 Fuzzy IF-THEN Rules -- 7.2 Unsupervised Learning -- 7.2.1 Fuzzy Clustering -- 7.2.2 Spatial Information and Bias -- 7.3 Fuzzy Sets and Connectionist Approaches -- 7.3.1 Conventional 2D Hopfield Neural Network -- 7.3.2 Fuzzy Sets and Deep Learning -- References -- 8 Structural and Linguistic Representations -- 8.1 Fuzzy Representation of Image Information and of Related Knowledge -- 8.1.1 Image Features -- 8.1.2 Knowledge and Semantics -- 8.1.3 Semantic Gap -- 8.2 Linguistic Representations --8.2.1 Description of Some Properties or Characteristics -- 8.2.2 Quantifiers -- 8.2.3 Associating Linguistic Representations and the Spatial Domain -- 8.3 Knowledge-Based Systems -- 8.4 Fuzzy Graphs and Hypergraphs -- 8.5 Fuzzy Logics and Fuzzy Rules -- 8.6 Ontologies -- 8.7 Fuzzy Decision Trees -- 8.8 Fuzzy Association Rules -- 8.9 Fuzzy Formal Concept Analysis -- References -- 9 Structural and Linguistic Reasoning for Image Understanding -- 9.1 From Linguistic Descriptions to Image Understanding -- 9.1.1 Representations of Structural Information -- 9.1.2 Fusion -- 9.1.3 Scene Understanding -- 9.2 From Image Analysis to Image Content Descriptions -- 9.3 A Few Examples in Medical Image Understanding --9.3.1 Interpretation as Graph Reasoning -- 9.3.2 Interpretation as Constraint Satisfaction Problem -- 9.3.3 Recognition Based on Ontological Reasoning -- 9.3.4 Interpretation as Abductive Reasoning -- 9.3.5 Deriving Linguistic Descriptions -- 9.4 Interpretability and Explainability -- References -- Index.