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2.4.2 Area Under the ROC Curve; 2.5 Summary; References; 3 Label Semantics Theory; 3.1 Uncertainty Modeling with Labels; 3.1.1 Fuzzy Logic; 3.1.2 Computing with Words; 3.1.3 Mass Assignment Theory; 3.2 Label Semantics; 3.2.1 Epistemic View of Label Semantics; 3.2.2 Random Set Framework; 3.2.3 Appropriateness Degrees; 3.2.4 Assumptions for Data Analysis; 3.2.5 Linguistic Translation; 3.3 Fuzzy Discretization; 3.3.1 Percentile-Based Discretization; 3.3.2 Entropy-Based Discretization; 3.4 Reasoning with Fuzzy Labels
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3.4.2 Logical Expressions of Fuzzy Labels; 3.4.3 Linguistic Interpretation of Appropriate Labels; 3.4.4 Evidence Theory and Mass Assignment; 3.5 Label Relations; 3.6 Summary; References; 4 Linguistic Decision Trees for Classification; 4.1 Introduction; 4.2 Tree Induction; 4.2.1 Entropy; 4.2.2 Soft Decision Trees; 4.3 Linguistic Decision for Classification; 4.3.1 Branch Probability; 4.3.2 Classification by LDT; 4.3.3 Linguistic ID3 Algorithm; 4.4 Experimental Studies; 4.4.1 Influence of the Threshold; 4.4.2 Overlapping Between Fuzzy Labels
4.5 Comparison Studies
4.6 Merging of Branches; 4.6.1 Forward Merging Algorithm; 4.6.2 Dual-Branch LDTs; 4.6.3 Experimental Studies for Forward Merging; 4.6.4 ROC Analysis for Forward Merging; 4.7 Linguistic Reasoning; 4.7.1 Linguistic Interpretation of an LDT; 4.7.2 Linguistic Constraints; 4.7.3 Classification of Fuzzy Data; 4.8 Summary; References; 5 Linguistic Decision Trees for Prediction; 5.1 Prediction Trees; 5.2 Linguistic Prediction Trees; 5.2.1 Branch Evaluation; 5.2.2 Defuzzification; 5.2.3 Linguistic ID3 Algorithm for Prediction; 5.2.4 Forward Branch Merging for Prediction
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6.5 Bayesian Estimation Trees

Sommario/riassunto

Machine learning and data mining are inseparably connected with uncertainty. The observable data for learning is usually imprecise, incomplete or noisy. Uncertainty Modeling for Data Mining: A Label Semantics Approach introduces 'label semantics', a fuzzy-logic-based theory for modeling uncertainty. Several new data mining algorithms based on label semantics are proposed and tested on real-world datasets. A prototype interpretation of label semantics and new prototype-based data mining algorithms are also discussed. This book offers a valuable resource for postgraduates, researchers and other professionals in the fields of data mining, fuzzy computing and uncertainty reasoning. Zengchang Qin is an associate professor at the School of Automation Science and Electrical Engineering, Beihang University, China; Yongchuan Tang is an associate professor at the College of Computer Science, Zhejiang University, China.
