

1. Record Nr.	UNINA9910141473803321
Autore	Doumpos Michael
Titolo	Multicriteria decision aid and artificial intelligence [[electronic resource] ] : links, theory and applications // edited by Michael Doumpos and Evangelos Grigoroudis
Pubbl/distr/stampa	Hoboken, N.J., : Wiley-Blackwell, 2013
ISBN	1-118-52251-6 1-299-15953-2 1-118-52250-8
Descrizione fisica	1 online resource (369 p.)
Altri autori (Persone)	GrigoroudisEvangelos
Disciplina	658.4/033
Soggetti	Multiple criteria decision making Artificial intelligence
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Machine generated contents note: List of Contributors Preface Part One The Contributions of Intelligent Techniques in Multicriteria Decision Aiding 1 Computational Intelligence Techniques for Multicriteria Decision Aiding: An Overview 1.1 Introduction 1.2 The MCDA Paradigm 1.2.1 Modeling Process 1.2.2 Methodological Approaches 1.3 Computational Intelligence in MCDA 1.3.1 Statistical Learning and Data Mining 1.3.2 Fuzzy Modeling 1.3.3 Metaheuristics 1.4 Conclusions References 2 Intelligent Decision Support Systems 2.1 Introduction 2.2 Fundamentals of Human Decision Making 2.3 Decision Support System 2.4 Intelligent Decision Support Systems 2.4.1 Artificial Neural Networks for Intelligent Decision Support 2.4.2 Fuzzy Logic for Intelligent Decision Support 2.4.3 Expert Systems for Intelligent Decision Support 2.4.4 Evolutionary Computing for Intelligent Decision Support 2.4.5 Intelligent Agents for Intelligent Decision Support 2.5 Evaluating Intelligent Decision Support Systems 2.5.1 Determining Evaluation Criteria 2.5.2 Multi-Criteria Model for IDSS Assessment 2.6 Summary and Future Trends References Part Two Intelligent Technologies for Decision Support and Preference Modeling 3 Designing Distributed Multi-Criteria Decision Support Systems for Complex and Uncertain Situations 3.1 Introduction 3.2 Example

Applications 3.3 Key Challenges 3.4 Making Trade-offs: Multi-criteria Decision Analysis 3.4.1 Multi-attribute Decision Support 3.4.2 Making Trade-offs Under Uncertainty 3.5 Exploring the Future: Scenario-based Reasoning 3.6 Making Robust Decisions: Combining MCDA and SBR 3.6.1 Decisions Under Uncertainty: The Concept of Robustness 3.6.2 Combining Scenarios and MCDA 3.6.3 Collecting, Sharing and Processing Information: A Distributed Approach 3.6.4 Keeping Track of Future Developments: Constructing Comparable Scenarios 3.6.5 Respecting Constraints and Requirements: Scenario Management 3.6.6 Assisting Evaluation: Assessing Large Numbers of Scenarios 3.7 Discussion 3.8 Conclusion References 4 Preference Representation with Ontologies 4.1 Introduction 4.1.1 Structure of the Chapter 4.2 Ontology-based Preference Models 4.3 Maintaining the User's Profile up to Date 4.4 Decision Making Methods Exploiting the Preference Information Stored in Ontologies 4.4.1 Recommendation Based on Aggregation 4.4.2 Recommendation Based on Similarities 4.4.3 Recommendation Based on Rules 4.5 Discussion and Open Questions References Part Three Decision Models 5 Neural Networks in Multicriteria Decision Support 5.1 Introduction 5.2 Basic Concepts of Neural Networks 5.2.1 Neural Networks for Intelligent Decision Support 5.3 Basics in Multicriteria Decision Aid 5.3.1 MCDM Problems 5.3.2 Solutions of MCDM Problems 5.4 Neural Networks and Multicriteria Decision Support 5.4.1 Review of Neural Network Applications to MCDM Problems 5.4.2 Discussion 5.5 Summary and Conclusions References 6 Rule-Based Approach to Multicriteria Ranking 6.1 Introduction 6.2 Problem Setting 6.3 Pairwise Comparison Table (PCT) 6.4 Rough Approximation of Outranking and Non-outranking Relations 6.5 Induction and Application of Decision Rules 6.6 Exploitation of Preference Graphs 6.7 Illustrative Example 6.8 Summary and Conclusions References 7 About the Application of Evidence Theory in MultiCriteria Decision Aid 7.1 Introduction 7.2 Evidence Theory: Some Concepts 7.2.1 Knowledge Model 7.2.2 Combination 7.2.3 Decision Making 7.3 New Concepts in Evidence Theory for MCDA 7.3.1 First Belief Dominance 7.3.2 RBBD Concept 7.4 Multicriteria Methods modeled by Evidence Theory 7.4.1 Evidential Reasoning Approach 7.4.2 DS/AHP 7.4.3 DISSET 7.4.4 A Choice Model Inspired by ELECTRE I 7.4.5 A Ranking Model Inspired by Xu et al.'s Method 7.5 Discussion 7.6 Conclusion References Part Four Multiobjective Optimization 8 Interactive Approaches Applied to Multiobjective Evolutionary Algorithms 8.1 Introduction 8.1.1 Methods Analyzed in this Chapter 8.2 Basic Concepts and Notation 8.2.1 Multiobjective Optimization Problems 8.2.2 Classical Interactive Methods 8.3 MOEAs Based on Reference Point Methods 8.3.1 A Weighted Distance Metric 8.3.2 Light Beam Search Combined with NSGA-II 8.3.3 Controlling the Accuracy of the Pareto Front Approximation 8.3.4 Light Beam Search Combined with PSO 8.3.5 A Preference Relation Based on a Weighted Distance Metric 8.3.6 The Chebyshev Preference Relation 8.4 MOEAs Based on Value Function Methods 8.4.1 Progressive Approximation of a Value Function 8.4.2 Value Function by Ordinal Regression 8.5 Miscellaneous Methods 8.5.1 Desirability Functions 8.6 Conclusions and Future Work References 9 Generalized DEA and Computational Intelligence in Multiple Criteria Decision Making 9.1 Introduction 9.2 Generalized Data Envelopment Analysis 9.2.1 Basic DEA Models: CCR, BCC and FDH Models 9.2.2 GDEA Model 9.3 Generation of Pareto Optimal Solutions using Generalized DEA and Computational Intelligence 9.3.1 GDEA in Fitness Evaluation 9.3.2 GDEA in Deciding the Parameters of Multi-objective PSO 9.3.3 Expected Improvement for Multi-objective Optimization Using GDEA 9.4 Summary References 10 Fuzzy

Multiobjective Optimization 10.1 Introduction 10.2 Solution Concepts for Multiobjective Programming 10.3 Interactive Multiobjective Linear Programming 10.4 Fuzzy Multiobjective Linear Programming 10.5 Interactive Fuzzy Multiobjective Linear Programming 10.6 Interactive Fuzzy Multiobjective Linear Programming with Fuzzy Parameters 10.7 Interactive Fuzzy Stochastic Multiobjective Linear Programming 10.8 Related Works and Applications References Part Five Applications in Management and Engineering 11 MCDA & Agents: Supporting Effective Resource Federation in Virtual Organizations 11.1 Introduction 11.2 The Intuition of Multiple Criteria Decision Aid in Multi-agent Systems 11.3 Resource Federation Applied 11.3.1 Describing the Problem in a Cloud Computing Context 11.3.2 Problem Modeling 11.3.3 Assessing Agents' Value Function for Resource Federation 11.4 An Illustrative Example 11.5 Conclusions References 12 Fuzzy AHP Using Type II Fuzzy Sets: An Application to Warehouse Location Selection 12.1 Introduction 12.2 Multicriteria Selection 12.2.1 The ELECTRE (Elimination Et Choix Traduisant la Realite) Method 12.2.2 PROMETHEE (Preference Ranking Organization Method for Enrichment Evaluations) 12.2.3 TOPSIS (Technique for Order Preference by Similarity to Ideal Situation) 12.2.4 The WSM (Weighted Sum Model) Method 12.2.5 MAUT (Multi-attribute Utility Theory) 12.2.6 AHP (Analytic Hierarchy Process) 12.3 Literature Review on Fuzzy AHP 12.4 Buckley's Type-1 Fuzzy AHP 12.5 Type-2 Fuzzy Sets 12.6 Type-2 Fuzzy AHP 12.7 An Application: Warehouse Location Selection 12.8 Conclusion References 13 Applying Genetic Algorithms to Optimize Energy Efficiency in Buildings 13.1 Introduction 13.2 State-of-the-Art Review 13.3 An Example Case Study 13.3.1 Basic Principles and Problem Definition 13.3.2 Decision Variables 13.3.3 Decision Criteria 13.3.4 Decision Model 13.4 Development and Application of a Genetic Algorithm for the Example Case Study 13.4.1 Development of the Genetic Algorithm 13.4.2 Application of the Genetic Algorithm, Analysis of Results and Discussion 13.5 Conclusions References 14 Nature-Inspired Intelligence for Pareto Optimality Analysis in Portfolio Optimization 14.1 Introduction 14.2 Literature Review 14.3 Methodological Issues 14.4 Pareto Optimal Sets in Portfolio Optimization 14.4.1 Pareto Efficiency 14.4.2 Mathematical Formulation of the Portfolio Optimization Problem 14.5 Computational Results 14.5.1 Experimental Setup 14.5.2 Efficient Frontier 14.6 Conclusion References Index.

---

## Sommario/riassunto

"Presents recent advances in both models and systems for intelligent decision making. Organisations often face complex decisions requiring the assessment of large amounts of data. In recent years Multicriteria Decision Aid (MCDA) and Artificial Intelligence (AI) techniques have been applied with considerable success to support decision making in a wide range of complex real-world problems. The integration of MCDA and AI provides new capabilities relating to the structuring of complex decision problems in static and distributed environments. These include the handling of massive data sets, the modelling of ill-structured information, the construction of advanced decision models, and the development of efficient computational optimization algorithms for problem solving. This book covers a rich set of topics, including intelligent decision support technologies, data mining models for decision making, evidential reasoning, evolutionary multiobjective optimization, fuzzy modelling, as well as applications in management and engineering. Multicriteria Decision Aid and Artificial Intelligence: Covers all of the recent advances in intelligent decision making. Includes a presentation of hybrid models and algorithms for preference modelling and optimisation problems. Provides illustrations of new

intelligent technologies and architectures for decision making in static and distributed environments. Explores the general topics on preference modelling and learning, along with the coverage of the main techniques and methodologies and applications. Is written by experts in the field. This book provides an excellent reference tool for the increasing number of researchers and practitioners interested in the integration of MCDA and AI for the development of effective hybrid decision support methodologies and systems. Academics and post-graduate students in the fields of operational research, artificial intelligence and management science or decision analysis will also find this book beneficial"--

---