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Fuzzy Multi-Criteria Decision Making - Cengiz Kahraman 2000-08-09 This work examines all the fuzzy multicriteria methods recently developed, such as fuzzy AHP, fuzzy TOPSIS, interactive fuzzy multiobjective stochastic linear programming, fuzzy multiobjective dynamic programming, grey fuzzy multiobjective optimization, fuzzy multiobjective geometric programming, and more. Each of the 22 chapters includes practical applications along with new developments/results. This book may be used as a textbook in graduate operations research, industrial engineering, and economics courses. It will also be an excellent resource, providing new suggestions and directions for further research, for computer programmers, mathematicians, and scientists in a variety of disciplines where multicriteria decision making is needed.

Fuzzy Multi-Criteria Decision Making - Cengiz Kahraman 2010-11-23 This work examines all the fuzzy multicriteria methods recently developed, such as fuzzy AHP, fuzzy TOPSIS, interactive fuzzy multiobjective stochastic linear programming, fuzzy multiobjective dynamic programming, grey fuzzy multiobjective optimization, fuzzy multiobjective geometric programming, and more. Each of the 22 chapters includes practical applications along with new developments/results. This book may be used as a textbook in graduate operations research, industrial engineering, and economics courses. It will also be an excellent resource, providing new suggestions and directions for further research, for computer programmers, mathematicians, and scientists in a variety of disciplines where multicriteria decision making is needed.

Fuzzy Multi-criteria Decision Making - Ozerk Mehmet Gogus 1997

Fuzzy Multi-criteria Decision-Making Using Neutrosophic Sets - Cengiz Kahraman 2018-11-03 This book offers a comprehensive guide to the use of neutrosophic sets in multiple criteria decision making problems. It shows how neutrosophic sets, which have been developed as an extension of fuzzy and paraconsistent logic, can help in dealing with certain types of uncertainty that classical methods could not cope with. The chapters, written by well-known researchers, report on cutting-edge methodologies they have been developing and testing on a variety of engineering problems. The book is unique in its kind as it reports for the first time and in a comprehensive manner on the joint use of neutrosophic sets together with existing decision making methods to solve multi-criteria decision-making problems, as well as other engineering problems that are complex, hard to model and/or include incomplete and vague data. By providing new ideas, suggestions and directions for the solution of complex problems in engineering and decision making, it represents an excellent guide for researchers, lecturers and postgraduate students pursuing research on neutrosophic decision making, and more in general in the area of industrial and management engineering.

Fuzzy Multi-criteria Decision Problem Making - Natesan Thillaigovindan 2017-07-19

Fuzzy Intelligent Systems - E. Chandrasekaran 2021-09-08 Fuzzy Intelligent Systems: Methodologies, Techniques and Applications comprises state-of-the-art chapters detailing how expert systems are built and the fuzzy logic resembling human reasoning powering them. Hybrid and neuro-fuzzy intelligent systems are discussed along with Evolutionary and, in particular, Genetic Algorithms. This approach has been extended by using Multiobjective Evolutionary Algorithms, which can consider multiple conflicting objectives instead of a single one. The book also discusses the hybridization between Multiobjective Evolutionary Algorithms and Fuzzy Systems which is known as Multiojective Evolutionary Fuzzy Systems.

Multi-criteria Decision Making Methods - Evangelos Triantaphyllou 2013-03-09 Multi-Criteria Decision Making (MCDM) has been one of the fastest growing problem areas in many disciplines. The central problem is how to evaluate a set of alternatives in terms of a number of criteria. Although this problem is very relevant in practice, there are few methods available and their quality is hard to determine. Thus, the question ‘Which is the best method for a given problem?’ has become one of the most important and challenging ones. This is exactly what this book has as its focus and why it is important. The author extensively compares, both theoretically and empirically, real-life MCDM issues and makes the reader aware of quite a number of surprising ‘abnormalities’ with some of these methods. What makes this book so valuable is the analyses are rigorous, the results can be understood even by the non-specialist. Audience: Researchers, practitioners, and students; it can be used as a textbook for senior undergraduate or graduate courses in business and engineering.

Aggregation Functions Considering Criteria Interrelationships in Fuzzy Multi-Criteria Decision Making: State-of-the-Art - LE SUN Aggregation function is an important component in an information aggregation or information fusion system. Interrelationships usually exist between the input arguments (e.g., the criteria in the multicriteria decision making) of an aggregation function. In this paper, we make a comprehensive survey on the aggregation operators (AOs) that consider the argument interrelationships in crisp and fuzzy settings. In particular, we discuss the mechanisms of modeling the argument interrelationships of the Choquet integral (CI), the power average (PA), the Bonferroni mean (BM), the Heronian mean (HM), and the Maclaurin symmetric mean (MSM) operators, and introduce their extended (e.g., generalized or weighted) forms and their applications in different fuzzy settings. In addition, we compare these [ve types of operators and summarize their advantages and disadvantages. Furthermore, we discuss the applications of these operators. Finally, we identify some future research directions in the AOs considering the argument interrelationships. The reviewed papers are mainly about the development of the CI, the PA, the BM, the HM, and the MSM in (fuzzy) MCDMs, most of which fall in the period of 2009-2018.

Development of Fuzzy Multi-criteria Decision Analysis Approach for Contaminated Site Management - Mohammad Habibur Rahman 2008 Selection of a proper remediation alternative is an important task in the decision making process of contaminated site management. The number of available remediation alternatives is increasing over the years as a result of perpetual development in scientific research. Decision makers face a confounded situation to select the best acceptable alternative by satisfying various preferences of different stakeholders.
Fuzzy Multi-criteria Decision Making Applications - Adeleh Asemi, 2014

An Integrated Fuzzy Multi-criteria Decision Making Method for Supplier Evaluation - Peh Sang Ng, 2014


Multi-criteria Decision Analysis in Management - Behl, Abhishek, 2020-02-01

Multi-criteria decision making (MCDM) has been extensively used in diverse disciplines, with a variety of MCDM techniques used to solve complex problems. A primary challenge faced by research scholars is to decode these techniques using detailed step-by-step analysis with case studies and data sets. The scope of such work would help decision makers to understand the process of using MCDM techniques appropriately to solve complex issues without making mistakes. Multi-Criteria Decision Analysis in Management provides innovative insights into the rationale behind using MCDM techniques to solve decision-making problems and provides comprehensive discussions on these techniques from their inception, development, and growth to their advancements and applications. The content within this publication advances hybrid multicriteria models, value theory, and data envelopment. Ideal for researchers, management professionals, students, operations scholars, and academicians, this scholarly work supports and enhances the decision-making process.

Applications of Multi-Criteria Decision-Making Theories in Healthcare and Biomedical Engineering - liker Ozsahin, 2021-03-25

Applications of Multi-Criteria Decision-Making Theories in Healthcare and Biomedical Engineering contains several practical applications on how decision-making theory could be used in solving problems relating to the selection of best alternatives. The book focuses on assisting decision-makers (government, organizations, companies, general public, etc.) in making the best and most appropriate decision when confronted with multiple alternatives. The purpose of the analytical MCDM techniques is to support decision makers under uncertainty and conflicting criteria while making logical decisions. The knowledge of the alternatives of the real-life problems, properties of their parameters, and the priority given to the parameters have a great effect on consequences in decision-making. In this book, the application of MCDM has been provided for the real-life problems in health and biomedical engineering issues. Provides a comprehensive analysis and application multi-criteria decision-making methods. Presents detailed information about MCDM and its usage.

Generalised Hybrid Fuzzy Multi Criteria Decision Making Based on Intuitive Multiple Centroid Defuzzification - Ku Muhammad Nain Ku Khalil, 2016

Fuzzy Multiple Objective Decision Making - Gwo-Hshiung Tzeng, 2016-04-19

Multi-objective programming (MOP) can simultaneously optimize multi-objectives in mathematical programming models, but the optimization of multi-objectives triggers the issue of Pareto solutions and complicates the derived answers. To address these problems, researchers often incorporate the concepts of fuzzy sets and evolutionary algorithms into MOP models. Focusing on the methodologies and applications of this field, Fuzzy Multiple Objective Decision Making presents mathematical tools for complex decision making. The first part of the book introduces the most popular methods used to calculate the solution of MOP in the field of multiple objective decision making (MOM). The authors describe multi-objective evolutionary algorithms; expand de novo programming to changeable spaces, such as decision and objective spaces; and cover network data envelopment analysis. The second part focuses on various applications, giving readers a practical, in-depth understanding of MDM. A follow-up to the authors’ Multiple Attribute Decision Making: Methods and Applications, this book guides practitioners in using MDM methods to make effective decisions. It also extends students’ knowledge of the methods and provides researchers with the foundation to publish papers in operations research and management science journals.

Intuitionistic Fuzzy Multi-criteria Decision-making Approach for Landfill Siting - Nur Syibrarah Muhammad Naim, 2009

A Fuzzy Multi-criteria Decision-making Model for Contractor Prequalification for Corporate Fitout Projects in Hong Kong - 2013

Advances in Intelligent Information and Database Systems - Ngoc Thanh Nguyen, 2010-04-09

Intelligent information and database systems are two closely related and well-established subfields of modern computer science. They focus on the integration of artificial intelligence and classic database technologies in order to create the next generation information systems. The major target of this new-generation systems is to provide end-users with intelligent behavior: simple and/or advanced learning, problem solving, uncertain and certain reasoning, organization, cooperation, etc. Such intelligent abilities are implemented in classic information systems to make them autonomous and user-oriented, in particular when advanced problems of multimedia information and knowledge discovery, access, retrieval and manipulation are to be solved in the context of large, distributed and heterogeneous environments. It means that intelligent knowledge-based information and database systems are used to solve basic problems of large-collaborations management, carry out knowledge discovery from large data collections, reason about information under uncertain conditions, support users in their formulation of complex queries etc. Topics discussed in this volume include but are not limited to the foundations and principles of data, information, and knowledge models, methodologies for intelligent information and database systems, analysis, design, implementation, validation, maintenance and evolution.

Multi-objective Group Decision Making - Jie Lu, 2007

This book proposes a set of models to describe fuzzy multi-objective decision making (MODM), fuzzy multi-criteria decision making (MCDM), fuzzy group decision making (GDM) and fuzzy multi-objective group decision-making problems, respectively. It also gives a set of related methods (including algorithms) to solve these problems. One distinguishing feature of this book is that it provides two decision support systems software for readers to apply these proposed methods. A set of real-world applications and some new directions in this area are then described to further instruct readers how to use these methods and software in their practice.

Intuitionistic Fuzzy Multi-criteria Decision-making Approach for Landfill Siting - Nur Syibrarah Muhammad Naim, 2009

A Fuzzy Multi-criteria Decision-making Model for Contractor Prequalification for Corporate Fitout Projects in Hong Kong - 2013

Stakeholders (e.g., industry, government, public) in this research, a fuzzy multi-criteria decision analysis (FMCDM) approach was developed. Since most information available in the decision making process is non-deterministic, fuzzy-set theory was used to deal with such uncertainty. The developed FMCDM approach ranks the candidate alternatives according to the utility value which then assists decision makers in selecting more proper remediation options. Different stakeholders' opinions were effectively incorporated in the developed approach, allowing for a robust decision making for contaminated site management. A user friendly decision support system based on the FMCDM approach was also developed in this research. The developed method was then applied to the management of a site in northern British Columbia to examine its applicability. As well, existing multi-criteria decision making methods were also applied to the remediation selection of this site. The results suggest that the developed FMCDM method is more capable of considering uncertainty issues and it is a helpful means of integrating various interests from different stakeholders.

Multi-Criteria Decision Making Methods—Evangelos Triantaphyllou 2014-01-15

Handbook of Research on Fuzzy and Rough Set Theory in Organizational Decision Making—Sangaiah, Arun Kumar 2016-10-17 Soft computing techniques are innovative tools that use nature-inspired algorithms to run predictive analysis of industries from business to software measurement. These tools have gained momentum in recent years for their practicality and flexibility. The Handbook of Research on Fuzzy and Rough Set Theory in Organizational Decision Making collects both empirical and applied research in the field of fuzzy set theory, and bridges the gap between the application of soft computational approaches and the organizational decision making process. This publication is a pivotal reference for business professionals, IT specialists, software engineers, and advanced students of business and information technology.

Fuzzy Multicriteria Decision-Making—Witold Pedrycz 2011-06-15 Fuzzy multicriteria Decision-Making: Models, Algorithms and Applications addresses theoretical and practical gaps in considering uncertainty and multicriteria factors encountered in the design, planning, and control of complex systems. Including all prerequisite knowledge and augmenting some parts with a step-by-step explanation of more advanced concepts, the authors provide a systematic and comprehensive presentation of the concepts, design methodology, and detailed algorithms. These are supported by many numeric illustrations and a number of application scenarios to motivate the reader and make some abstract concepts more tangible. Fuzzy Multicriteria Decision-Making: Models, Algorithms and Applications will appeal to a wide audience of researchers and practitioners in disciplines where decision-making is paramount, including various branches of engineering, operations research, economics and management; it will also be of interest to graduate students and senior undergraduate students in courses such as decision making, management, risk management, operations research, numerical methods, and knowledge-based systems.

Operations Research for Military Organizations—Tozan, Hakam 2018-07-27 The study of operations research arose during World War II to enhance the effectiveness of weapons and equipment used on the battlefield. Since then, operations research techniques have also been used to solve several sophisticated and complex defense-related problems. Operations Research for Military Organizations is a critical scholarly resource that examines the issues that have an impact on aspects of contemporary quantitative applications of operations research methods in the military. It also addresses innovative applications, techniques, and methodologies to assist in solving defense and military-related problems. Featuring coverage on a broad range of topics such as combat planning, tactical decision aids, and weapon system simulations, this book is geared towards defense contractors, military consultants, military personnel, policy makers, and government departments seeking current research on defense methodologies.

Development of Multi Criteria Decision Making with Fuzzy Data—Qiông Wu 2004

A Fuzzy multi criteria decision making approach to software life cycle model selection—Mümin Hiçdurmaz 2011

Explainable Neural Networks Based on Fuzzy Logic and Multi-criterion Decision Tools—József Dombi 2021-06-03 The research presented in this book shows how combining deep neural networks with a special class of fuzzy logical rules and multi-criteria decision tools can make deep neural networks more interpretable – and even, in many cases, more efficient. Fuzzy logic together with multi-criteria decision-making tools provides very powerful tools for modeling human thinking. Based on their common theoretical basis, we propose a consistent framework for modeling human thinking by using the tools of all three fields: fuzzy logic, multi-criteria decision-making, and deep learning to help reduce the black-box nature of neural models; a challenge that is of vital importance to the whole research community.

Decision Making with Spherical Fuzzy Sets—Cengiz Kahraman 2020-05-27 This book introduces readers to the novel concept of spherical fuzzy sets, showing how these sets can be applied in practice to solve various decision-making problems. It also demonstrates that these sets provide a larger preference volume in 3D space for decision-makers. Written by authoritative researchers, the various chapters cover a large amount of theoretical and practical information, allowing readers to gain an extensive understanding of both the fundamentals and applications of spherical fuzzy sets in intelligent decision-making and mathematical programming.

Fuzzy Optimization and Multi-Criteria Decision Making in Digital Marketing—Kumar, Anil 2015-10-27 Abstract: “This book applies fuzzy theory and multi-criteria decision making principles for better practice in the digital business environment through the use of timely research and case studies on practical implementation of such theories in the digital marketplace”—Provided by publisher

Hybridized Integrated Methods in Fuzzy Multi-criteria Decision Making (with Case Studies)—2016

Evaluation of Sports Center Performance Using a Fuzzy Multi-Criteria Decision-Making Model—Chen-Yang Wang 2014 The main purpose of this study is to evaluate the performance of sports centers using the fuzzy analytical hierarchy process (FAHP). Our empirical results provide two main insights: first, sports center business management strategies comprise six dimensions and 23 indexes; second, the FAHP analysis shows that the six dimensions are (in order of priority) service prices, site conditions, operations management, traffic conditions, sports products, and staff quality. This study uses the FAHP along with mathematical computing to provide sports center managers with a reliable decision-making reference, and to assist them in formulating the most effective business strategy.

Mathematical Models for Decision Support—Harvey J. Greenberg 2012-12-06 It is quite an onerous task to edit the proceedings of a two week long institute with learned contributors from many parts of the world. All the same, the editorial team has found the process of refereeing and reviewing the contributions worthwhile and completing the volume has proven to be a satisfying task. In setting up the institute we had considered models and methods taken from a number of different disciplines. As a result the whole institute - preparing for it, attending it and editing the proceedings - proved to be an intense learning experience for us. Here I speak on behalf of the committee and the editorial team. By the time the institute took place, the papers were delivered and the delegates exchanged their views, the structure of the topics covered and their relative positioning appeared in a different light. In editing the volume I felt compelled to introduce a new structure in grouping the papers. The contents of this volume are organised in eight main sections set out below: 1. Abstracts. 2. Review Paper. 3. Models with Multiple Criteria and Single Objective Decision Makers. 4. Use of Optimisation Models as Decision Support Tools. 5. Role of Information Systems in Decision Making: Database and Model Management Issues. 6. Methods of Artificial Intelligence in Decision Making: Intelligent Knowledge Based Systems. 7. Representation of Uncertainty in Mathematical Models and Knowledge Based Systems. 8. Mathematical Basis for Constructing Models and Model Validation.

Fuzzy Multiple Attribute Decision Making—Shu-Jen Chen 2012-12-06 This monograph is intended for an advanced undergraduate or graduate course as well as for researchers, who want a compilation of developments in this rapidly growing field of operations research. This is a sequel to our previous works: “Multiple Objective Decision Making—Methods and Applications: A state-of-the-Art Survey” (No.164 of the Lecture Notes); “Multiple Attribute Decision Making—Methods and Applications: A State-of-the-Art Survey” (No.166 of the Lecture Notes); and “Decision Making Under Multiple Criteria—Methods and Applications” (No.281 of the Lecture Notes). In this monograph, the literature on methods of fuzzy Multiple Attribute Decision Making (MADM) has been reviewed thoroughly and critically, and classified systematically. This study provides readers with a capsule look into the existing methods, their characteristics, and applicability to the analysis of fuzzy MADM problems. The
basic concepts and algorithms from the classical MADM methods have been used in the development of the fuzzy MADM methods. We give an overview of the classical MADM in Chapter II. Chapter III presents the basic concepts and mathematical operations of fuzzy set theory with simple numerical examples in an easy-to-read and easy-to-follow manner. Fuzzy MADM methods basically consist of two phases: (1) the aggregation of the performance scores with respect to all the attributes for each alternative, and (2) the rank ordering of the alternatives according to the aggregated scores.

Logistics 4.0-Turan Paksoy 2020-12-18 Industrial revolutions have impacted both, manufacturing and service. From the steam engine to digital automated production, the industrial revolutions have conduced significant changes in operations and supply chain management (SCM) processes. Swift changes in manufacturing and service systems have led to phenomenal improvements in productivity. The fast-paced environment brings new challenges and opportunities for the companies that are associated with the adaptation to the new concepts such as Internet of Things (IoT) and Cyber Physical Systems, artificial intelligence (AI), robotics, cyber security, data analytics, block chain and cloud technology. These emerging technologies facilitated and expedited the birth of Logistics 4.0. Industrial Revolution 4.0 initiatives in SCM has attracted stakeholders’ attentions due to it is ability to empower using a set of technologies together that helps to execute more efficient production and distribution systems. This initiative has been called Logistics 4.0 of the fourth Industrial Revolution in SCM due to its high potential. Connecting entities, machines, physical items and enterprise resources to each other by using sensors, devices and the internet along the supply chains are the main attributes of Logistics 4.0. IoT enables customers to make more suitable and valuable decisions due to the data-driven structure of the Industry 4.0 paradigm. Besides that, the system’s ability of gathering and analyzing information about the environment at any given time and adapting itself to the rapid changes add significant value to the SCM processes. In this peer-reviewed book, experts from all over the world, in the field present a conceptual framework for Logistics 4.0 and provide examples for usage of Industry 4.0 tools in SCM. This book is a work that will be beneficial for both practitioners and students and academicians, as it covers the theoretical framework, on the one hand, and includes examples of practice and real world.

Fuzzy Preference Modelling and Multicriteria Decision Support-J.C. Fodor 2013-03-14 This book provides in-depth coverage of the most important results about fuzzy logic including negations, conjunctions, disjunctions, implications and gives the interrelations between those different connectives. The work brings together multiple results about valued binary relations satisfying diverse transitivity-type conditions. The authors propose the first sound introduction to valued preference modelling through the systematic use of fuzzy set theory and functional equations and derive the possible foundations for multicriteria decision aid using aggregation, ranking and choice procedures on the basis of axiomatic results. The text presents a unified view of various multicriteria decision making tools that have been independently derived in the past, dealing with pairwise comparisons. The monograph is mathematically oriented but the results will be of the greatest interest for engineers and economists who design and implement decision support systems in practice. It is also supplied with a sufficient number of examples to make it attractive to nonspecialists.


Weighting Methods and their Effects on Multi-Criteria Decision Making Model Outcomes in Water Resources Management-Noorul Hassan Zardari 2014-10-30 This book provides a systematic way of how to make better decisions in water resources management. The applications of three weighting methods namely rating, ranking, and ratio are discussed in this book. Additionally, data mining on keywords is presented using three popular scholarly databases: Science Direct, Scopus, and SciVerse. Four abbreviated keywords (MCDM, MCDA, MCA, MADM) representing multi-criteria decision-making were used and these three databases were searched for different popular weighting methods for a period of 13 years (2000-2012). The book provides also a review of weighting methods applied in various multi-criteria decision-making (MCDM) methods and also presents survey results on priority ranking of watershed management criteria undertaken by 30 undergraduate and postgraduate students from the Faculty of Civil Engineering, Universiti Teknologi Malaysia.

Applying Fuzzy Similarities Between Evaluation Alternatives and Extreme Solutions for Fuzzy Multi-Criteria Decision-Making-Yu-Jie Wang 2015 Many researchers generalize classical multi-criteria decision-making (MCDM) methods under fuzzy environment into fuzzy multi-criteria decision-making (FMCDM) for solving decision-making problems, such as the approaches of Chen, Liang, Raj and Kumar, Wang, and Wang et al. However, some problems occurred in the approaches above. For instance, the intersection of fuzzy numbers is a null set, the calculation for pooled fuzzy numbers is complex work, or the criteria values of anti-ideal/ideal solutions or lower/upper boundaries may not exist in feasible alternatives. In addition, there are too many computation steps to be realized and utilized for decision-makers. Recently, Wang proposed a method-associating technique for order preference by similarity to ideal solution (TOPSIS) with a relative preference relation to solve the above drawbacks of FMCDM. Wang resolved most of the problems with the above approaches, but we still desired to develop a method that was simpler than Wang's on computation. Therefore, we proposed an FMCDM method applying fuzzy similarities between evaluation alternatives and extreme solutions in this paper. The fuzzy similarities between evaluation alternatives and extreme solutions are based on a similarity relation between two fuzzy numbers, and this similarity relation was converted from Lee's extended preference relation. With the fuzzy similarities between evaluation alternatives and extreme solutions, alternative performance indices are easily yielded and then FMCDM are easily and efficiently finished in practice. Furthermore, the computation steps of FMCDM were simplified and reduced through the fuzzy similarities. Furthermore, we compared the proposed method with other methods including Wang's to demonstrate the feasibility and rationality of the method.