

Soft Rough Sets Applied To Multicriteria Group Decision Making

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.

The objective of this book is two-fold. Firstly, it is aimed at bringing to gether key research articles concerned with methodologies for knowledge discovery in databases and their applications. Secondly, it also contains articles discussing fundamentals of rough sets and their relationship to fuzzy sets, machine learning, management of uncertainty and systems of logic for formal reasoning about knowledge. Applications of rough sets in different areas such as medicine, logic design, image processing and expert systems are also represented. The articles included in the book are based on selected papers presented at the International Workshop on Rough Sets and Knowledge Discovery held in Banff, Canada in 1993. The primary methodological approach emphasized in the book is the mathematical theory of rough sets, a relatively new branch of mathematics concerned with the modeling and analysis of classification problems with imprecise, uncertain, or incomplete information. The methods of the theory of rough sets have applications in many sub-areas of artificial intelligence including knowledge discovery, machine learning, formal reasoning in the presence of uncertainty, knowledge acquisition, and others. This spectrum of applications is reflected in this book where articles, although centered around knowledge discovery problems, touch a number of related issues. The book is intended to provide an important reference material for students, researchers, and developers working in the areas of knowledge discovery, machine learning, reasoning with uncertainty, adaptive expert systems, and pattern classification.

Rough set approach to reasoning under uncertainty is based on inducing knowledge representation from data under constraints expressed by discernibility or, more generally, similarity of objects. Knowledge derived by this approach consists of reducts, decision or association rules, dependencies, templates, or classifiers. This monograph presents the state of the art of this area. The reader will find here a deep theoretical discussion of relevant notions and ideas as well as rich inventory of algorithmic and heuristic tools for knowledge discovery by rough set methods. An extensive bibliography will help the reader to get an acquaintance with this rapidly growing area of research.

Contributors to current issue (listed in papers ' order): Ibrahim Yasser, Abeer Twakol, A. A. Abd El-Khalek, A. A. Salama, Ahmed Sharaf Al-Din, Issam Abu Al-Qasim, Rafif Alhabib, Magdy Badran, Remya P. B, Francina Shalini, Masoud Ghods, Zahra Rostami, A. Sahaya Sudha, Luiz Flavio Autran Monteiro Gomes, K.R. Vijayalakshmi, Prakasam Muralikrishna, Surya Manokaran, Nidhi Singh, Avishek Chakraborty, Soma Bose Biswas, Malini Majumdar, Rakhal Das, Binod Chandra Tripathy, Nidhi Singh, Avishek Chakraborty, Nilabhra Paul, Deepshikha Sarma, Akash Singh, Uttam Kumar Bera, Fatimah M. Mohammed, Sarah W. Raheem, Muhammad Riaz, Florentin Smarandache, Faruk Karaaslan, Masooma Raza Hashmi, Iqra Nawaz, Kousik Das, Sovan Samanta, Kajal De, Xavier Encarnacion, Nivetha Martin, I. Pradeepa, N. Ramila Gandhi, P. Pandiammal, Aiman Muzaffar, Md Tabrez Nafis, Shahab Saquib Sohail, Abhijit Saha, Jhulaneswar Baidya, Debjit Dutta, Irfan Deli, Said Broumi, Mohsin Khalid, Neha Andaleeb Khalid, Md. Hanif Page, Qays Hatem Imran, Shilpi Pal, S. Satham Hussain, Saeid Jafari, N. Durga, Hanieh Shambayati, Mohsen Shafiei Nikabadi, Seyed Mohammad, Ali Khatami Firouzabadi, Mohammad Rahmanimanesh, Mujahid Abbas, Ghulam Murtaza, K. Porselvi, B. Elavarasan, Y. B. Jun, Chinnadurai V, Sindhu M P, K.Radhika, K. Arun Prakash, Malayalan Lathamaheswari, Ruipu Tan, Deivanayagampillai Nagarajan, Talea Mohamed, Assia Bakali, Nivetha Martin, R. Dhavaseelan, Ali Hussein Mahmood Al-Obaidi, Suman Das, Surapati Pramanik, Madad Khan, Muhammad Zeeshan, Saima Anis, Abdul Sami Awan, M. Sarwar Sindhu, Tabasam Rashid, Agha Kashif, Rajesh Kumar Saini, Atul Sangal, Manisha.

10th Anniversary - Honoring Professor Zdzisław Pawlak's Life and Legacy & 35 Years of Rough Sets

Soft Sets

Neutrosophic Sets and Systems

Rough Sets

Hybrid Structure and Applications

Proceedings of the International Workshop on Rough Sets and Knowledge Discovery (RSKD ' 93), Banff, Alberta, Canada, 12–15 October 1993

Rough Set Theory, introduced by Pawlak in the early 1980s, has become an important part of soft computing within the last 25 years. However, much of the focus has been on the theoretical understanding of Rough Sets, with a survey of Rough Sets and their applications within business and industry much desired. Rough Sets: Selected Methods and Applications in Management and Engineering provides context to Rough Set theory, with each chapter exploring a real-world application of Rough Sets. Rough Sets is relevant to managers striving to improve their businesses, industry researchers looking to improve the efficiency of their solutions, and university researchers wanting to apply Rough Sets to real-world problems.

This book offers a self-contained guide to the theory and main applications of soft sets. It introduces readers to the basic concepts, the algebraic and topological structures, as well as hybrid structures, such as fuzzy soft sets and intuitionistic fuzzy sets. The last part of the book explores a range of interesting applications in the fields of decision-making, pattern recognition, and data science. All in all, the book provides graduate students and researchers in mathematics and various applied science fields with a comprehensive and timely reference guide to soft sets.

Big Data Analytics is on the rise in the last years of the current decade. Data are overwhelming the computation capacity of high performance servers. Cloud, grid, edge and fog computing are a few examples of the current hype. Computational Intelligence offers

two faces to deal with the development of models: on the one hand, the crisp approach, which considers for every variable an exact value and, on the other hand, the fuzzy focus, which copes with values between two boundaries. This book presents 114 papers from the 4th International Conference on Fuzzy Systems and Data Mining (FSDM 2018), held in Bangkok, Thailand, from 16 to 19 November 2018. All papers were carefully reviewed by program committee members, who took into consideration the breadth and depth of the research topics that fall within the scope of FSDM. The acceptance rate was 32.85% . Offering a state-of-the-art overview of fuzzy systems and data mining, the publication will be of interest to all those whose work involves data science.

“Neutrosophic Sets and Systems” has been created for publications on advanced studies in neutrosophy, neutrosophic set, neutrosophic logic, neutrosophic probability, neutrosophic statistics that started in 1995 and their applications in any field, such as the neutrosophic structures developed in algebra, geometry, topology, etc. Some articles in this issue: Neutrosophic Soft Fixed Points, Selection of Alternative under the Framework of Single-Valued Neutrosophic Sets, Application of Single Valued Trapezoidal Neutrosophic Numbers in Transportation Problem.

7th International Workshop, RSFDGrC'99, Yamaguchi, Japan, November 9–11, 1999 Proceedings

New Directions in Rough Sets, Data Mining, and Granular-Soft Computing

Handbook of Research on Fuzzy and Rough Set Theory in Organizational Decision Making

Rough Set Methods and Applications

On Soft Rough Topology with Multi-Attribute Group Decision Making

Neutrosophic Sets and Systems, Book Series, Vol. 35, 2020. An International Book Series in Information Science and Engineering

This book constitutes the refereed proceedings of the 7th International Workshop on Rough Sets, Fuzzy Sets, Data Mining, and Granular-Soft Computing, RSFDGrC'99, held in Yamaguchi, Japan, in November 1999. The 45 revised regular papers and 15 revised short papers presented together with four invited contributions were carefully reviewed and selected from 89 submissions. The book is divided into sections on rough computing: foundations and applications, rough set theory and applications, fuzzy set theory and applications, nonclassical logic and approximate reasoning, information granulation and granular computing, data mining and knowledge discovery, machine learning, and intelligent agents and systems.

To handle indeterminate and incomplete data, neutrosophic logic/set/probability were established. The neutrosophic truth, falsehood and indeterminacy components exhibit symmetry as the truth and the falsehood look the same and behave in a symmetrical way with respect to the indeterminacy component which serves as a line of the symmetry. Soft set is a generic mathematical tool for dealing with uncertainty. Rough set is a new mathematical tool for dealing with vague, imprecise, inconsistent and uncertain knowledge in information systems. This paper introduces a new rough set model based on neutrosophic soft set to exploit simultaneously the advantages of rough sets and neutrosophic soft sets in order to handle all types of uncertainty in data. The idea of neutrosophic right neighborhood is utilised to define the concepts of neutrosophic soft rough (NSR) lower and upper approximations. Properties of suggested approximations are proposed and subsequently proven. Some of the NSR set concepts such as NSR-definability, NSR-relations and NSR-membership functions are suggested and illustrated with examples. Further, we demonstrate the feasibility of the newly rough set model with decision making problems involving neutrosophic soft set. Finally, a discussion on the features and limitations of the proposed model is provided.

Rough set approaches encounter uncertainty by means of boundary regions instead of membership values. In this paper, we develop the topological structure on soft rough set (SR-set) by using pairwise SR-approximations.

“ Neutrosophic Sets and Systems ” has been created for publications on advanced studies in neutrosophy, neutrosophic set, neutrosophic logic, neutrosophic probability, neutrosophic statistics that started in 1995 and their applications in any field, such as the neutrosophic structures developed in algebra, geometry, topology, etc.

Transactions on Rough Sets V

Mathematical Foundations

19th International Conference on Web-Based Learning, ICWL 2020, and 5th International Symposium on Emerging Technologies for Education, SETE 2020, Ningbo, China, October 22 – 24, 2020, Proceedings

Recent Advances and Applications

Rough Sets and Fuzzy Sets

Theory and Applications

Software is an essential enabler for science and the new economy. It creates new markets and directions for a more reliable, flexible and robust society and empowers the exploration of the world in ever more depth, but it often falls short of our expectations. Current software methodologies, tools, and techniques are still neither robust nor reliable enough for the constantly evolving market, and many promising approaches have so far failed to deliver the solutions required. This book presents the keynote 'Engineering Cyber-Physical Systems' and 64 peer-reviewed papers from the 16th International Conference on New Trends in Intelligent Software Methodology Tools, and Techniques, (SoMeT_17), held in Kitakyushu, Japan, in September 2017, which brought together researchers and practitioners to share original research results and practical development experience in software science and related new technologies. The main objective of the SoMeT conferences is to capture the essence of the new state-of-the-art in software science and its supporting technology and to identify the challenges such technology faces. The book explores new trends and theories which illuminate the direction of developments in this field, and will be of interest to anyone whose work involves software science and its integration into tomorrow's global information society.

Along the years, rough set theory has earned a well-deserved reputation as a sound methodology for dealing with imperfect knowledge in a simple though mathematically sound way. This edited volume aims at continue stressing the benefits of applying rough sets in many real-life situations while still keeping an eye on topological aspects of the theory as well as its linkage with other soft computing paradigms. The volume comprises 11 chapters and is organized into three parts. Part 1 deals with theoretical contributions while Parts 2 and 3 deal with several real world data mining applications. Chapters authored by pioneers were selected on the basis of fundamental ideas/concepts rather than the thoroughness of techniques. Academics, scientists as well as engineers working in the rough set, computational intelligence, soft computing and data mining research area will find the comprehensive coverage of the book invaluable.

Earlier fuzzy set, vague set, intuitionistic fuzzy set, L-fuzzy set etc are used as a mathematical tools for solving problems based on uncertainties or ambiguous in nature. But due to the complexity involves in problems exist in nature, traditional tools are unable to handle those in a systematic manner. So we need a tool which is more flexible to handle those problems. This leads to the invention of soft set which was introduced by Molodtsov in 1999. Soft set (SS) theory is a mathematical tool deals with parametric data which are imprecise in nature. It is a generalization of fuzzy set theory. On the other hand Rough set (RS) theory and Neutrosophic set (NS) theory both rising as a powerful tool to handle these uncertain, incomplete, and imprecise information in an effective manner. Actually Neutrosophic set is a generalization of intuitionistic fuzzy set. Sometimes it is not possible to handle all sorts of uncertain information with a single mathematical tool. Fusion of two or more mathematical tools give rise to a new mathematical concept which gives an idea how to solve such type of problems in a more sophisticated ways. Which leads to the introduction of fuzzy soft set, rough soft set, intuitionistic fuzzy soft set, soft rough set etc. Neutrosophic soft set (NSS) was established as a generalization of the concept of Soft set and Neutrosophic set. In this paper, using the concept of Rough set and Neutrosophic soft set a new concept known as Rough neutrosophic soft set (RNS) is developed. Some properties and operations on them are introduced.

This book offers a timely overview of fuzzy and rough set theories and methods. Based on selected contributions presented at the International Symposium on Fuzzy and Rough Sets (ISFUROS 2017, held in Varadero, Cuba, on October 24-26, 2017, the book also covers related approaches, such as hybrid rough-fuzzy sets and hybrid fuzzy-rough sets and granular computing, as well as a number of applications, from big data analytics, to business intelligence, security, robotics, logistics, wireless sensor networks and many more. It is intended as a source of inspiration for PhD students and researchers in the field, fostering not only new ideas but also collaboration between young researchers and institutions and established experts.

A Novel Approach to Neutrosophic Soft Rough Set under Uncertainty

Transactions on Rough Sets II

Hybrid Soft Computing Models Applied to Graph Theory

Single Valued Neutrosophic Soft Approach to Rough Sets, Theory and Application

Proceedings of FSDM 2018

The LNCS journal Transactions on Rough Sets is devoted to the entire spectrum of rough sets related issues, starting from logical and mathematical foundations, through all aspects of rough set theory and its applications, such as data mining, knowledge discovery, and intelligent information processing, to relations between rough sets and other approaches to uncertainty, vagueness and incompleteness, such as fuzzy sets and theory of evidence. This second volume of the Transactions on Rough Sets presents 17 thoroughly reviewed revised papers devoted to rough set theory, fuzzy set theory; these papers highlight important aspects of these theories, their interrelation and application in various fields.

This book describes a set of hybrid fuzzy models showing how to use them to deal with incomplete and/or vague information in different kind of decision-making problems. Based on the authors' research, it offers a concise introduction to important models, ranging from rough fuzzy digraphs and intuitionistic fuzzy rough models to bipolar fuzzy soft graphs and neutrosophic graphs, explaining how to construct them. For each method, applications to different multi-attribute, multi-criteria decision-making problems, are presented and discussed. The book, which addresses computer scientists, mathematicians, and social scientists, is intended as concise yet complete guide to basic tools for constructing hybrid intelligent models for dealing with some interesting real-world problems. It is also expected to stimulate readers' creativity thus offering a source of inspiration for future research.

In this paper, we apply the notion of soft rough neutrosophic sets to graph theory. We develop certain new concepts, including soft rough neutrosophic graphs, soft rough neutrosophic influence graphs, soft rough neutrosophic influence cycles and soft rough neutrosophic influence trees. We illustrate these concepts with examples, and investigate some of their properties. We solve the decision-making problem by using our proposed algorithm.

This book constitutes the refereed conference proceedings of the 29th International Conference on Industrial, Engineering and Other Applications of Applied Intelligent Systems, IEA/AIE 2016, held in Morioka, Japan, in August 2-4, 2016. The 80 revised full papers presented were carefully reviewed and selected from 168 submissions. They are organized in topical sections: data science; knowledge base systems; natural language processing and sentiment analysis; semantic Web and social networks; computer vision; medical diagnosis system and bio-informatics; applied neural networks; innovations in intelligent systems and applications; decision support systems; adaptive control; soft computing and multi-agent systems; evolutionary algorithms and heuristic search; system integration for real-life applications.

Rough Sets: Selected Methods and Applications in Management and Engineering

About Rough Neutrosophic Soft Sets Theory and Study Their Properties

Fuzzy Systems and Data Mining IV

Rough Sets and Knowledge Technology

Generalized Rough Sets

On single valued neutrosophic refined rough set model and its application

Zadeh's fuzzy set theory incorporates the impreciseness of data and evaluations, by imputting the degrees by which each object belongs to a set. Its success fostered theories that codify the subjectivity, uncertainty, imprecision, or roughness of the evaluations. Their rationale is to produce new flexible methodologies in order to model a variety of concrete decision problems more realistically. This Special Issue garners contributions addressing novel tools, techniques and methodologies for decision making (inclusive of both individual and group, single- or multi-criteria decision making) in the context of these theories. It contains 38 research articles that contribute to a variety of setups that combine fuzziness, hesitancy, roughness, covering sets, and linguistic approaches. Their ranges vary from fundamental or technical to applied approaches.

A comprehensive introduction to mathematical structures essential for Rough Set Theory. The book enables the reader to systematically study all topics of rough set theory. After a detailed introduction in Part 1 along with an extensive bibliography of current research papers. Part 2 presents a self-contained study that brings together all the relevant information from respective areas of mathematics and logics. Part 3 provides an overall picture of theoretical developments in rough set theory, covering logical, algebraic, and topological methods. Topics covered include: algebraic theory of approximation spaces, logical and set-theoretical approaches to indiscernibility and functional dependence, topological spaces of rough sets. The final part gives a unique view on mutual relations between fuzzy and rough set theories (rough fuzzy and fuzzy rough sets). Over 300 exercises allow the reader to master the topics considered. The book can be used as a textbook and as a reference work.

Neutrosophic sets (NSs) handle uncertain information while fuzzy sets (FSs) and intuitionistic fuzzy sets (IFs) fail to handle indeterminate information. Soft set theory, neutrosophic set theory, and rough set theory are different mathematical models for handling uncertainties and they are mutually related.

This book is a printed edition of the Special Issue "Neutrosophic Multi-Criteria Decision Making" that was published in Axioms Multi-Attribute Decision-Making Method Based on Neutrosophic Soft Rough Information

Proceedings of the 16th International Conference SoMeT_17

International Joint Conference, IJCRS 2019, Debrecen, Hungary, June 17-21, 2019, Proceedings

Neutrosophic Sets and Systems, Vol. 41, 2021

Theoretical Aspects of Reasoning about Data

9th International Conference, RSKT 2014, Shanghai, China, October 24-26, 2014, Proceedings

This special book is dedicated to the memory of Professor Zdzisław Pawlak, the father of rough set theory, in order to commemorate both the 10th anniversary of his passing and 35 years of rough set theory. The book consists of 20 chapters distributed into four sections, which focus in turn on a historical review of Professor Zdzisław Pawlak and rough set theory; a review of the theory of rough sets; the state of the art of rough set theory; and major developments in rough set based data mining

approaches. Apart from Professor Pawlak's contributions to rough set theory, other areas he was interested in are also included. Moreover, recent theoretical studies and advances in applications are also presented. The book will offer a useful guide for researchers in Knowledge Engineering and Data Mining by suggesting new approaches to solving the problems they encounter.

This LNAI 11499 constitutes the proceedings of the International Joint Conference on Rough Sets, IJCRS 2019, held in Debrecen, Hungary, in June 2019. The 41 full papers were carefully reviewed and selected from 71 submissions. The IJCRS conferences aim at bringing together experts from universities and research centers as well as the industry representing fields of research in which theoretical and applicational aspects of rough set theory already find or may potentially find usage. The papers are grouped in topical sections on core rough set models and methods; related methods and hybridization; areas of application.

This paper introduces a new rough set model based on neutrosophic soft set to exploit simultaneously the advantages of rough sets and neutrosophic soft sets in order to handle all types of uncertainty in data.

This book constitutes the thoroughly refereed conference proceedings of the 9th International Conference on Rough Sets and Knowledge Technology, RSKT 2014, held in Shanghai, China, in October 2014. The 70 papers presented were carefully reviewed and selected from 162 submissions. The papers in this volume cover topics such as foundations and generalizations of rough sets, attribute reduction and feature selection, applications of rough sets, intelligent systems and applications, knowledge technology, domain-oriented data-driven data mining, uncertainty in granular computing, advances in granular computing, big data to wise decisions, rough set theory, and three-way decisions, uncertainty, and granular computing.

Trends in Applied Knowledge-Based Systems and Data Science

Uncertainty Management with Fuzzy and Rough Sets

Fuzzy Techniques for Decision Making 2018

Neutrosophic Sets and Systems, Vol. 35, 2020

Neutrosophic Soft Rough Graphs with Application

Rough Set Theory and Granular Computing

After 20 years of pursuing rough set theory and its applications a look on its present state and further prospects is badly needed. The monograph *Rough Set Theory and Granular Computing* edited by Masahiro Inuiguchi, Shoji Hirano and Shusaku Tsumoto meets this demand. It presents the newest developments in this area and gives fair picture of the state of the art in this domain. Firstly, in the keynote papers by Zdzislaw Pawlak, Andrzej Skowron and Sankar K. Pal the relationship of rough sets with other important methods of data analysis -Bayes theorem, neuro computing and pattern recognitio- is thoroughly examined. Next, several interesting generalizations of the the ory and new directions of research are presented. Furthermore application of rough sets in data mining, in particular, rule induction methods based on rough set theory is presented and discussed. Further important issue dis cussed in the monograph is rough set based data analysis, including study of decisions making in conflict situations. Last but not least, some recent engi neering applications of rough set theory are given. They include a proposal of rough set processor architecture organization for fast implementation of ba sic rough set operations and discussion of results concerning advanced image processing for unmanned aerial vehicle. Thus the monograph beside presenting wide spectrum of ongoing research in this area also points out new emerging areas of study and applications, which makes it a valuable source of information to all interested in this do main.

Neutrosophic set (NS) theory was originally established by Smarandache for handling indeterminate and inconsistent information.

The book introduces the concept of “ generalized interval valued intuitionistic fuzzy soft sets ” . It presents the basic properties of these sets and also, investigates an application of generalized interval valued intuitionistic fuzzy soft sets in decision making with respect to interval of degree of preference. The concept of “ interval valued intuitionistic fuzzy soft rough sets ” is discussed and interval valued intuitionistic fuzzy soft rough set based multi criteria group decision making scheme is presented, which refines the primary evaluation of the whole expert group and enables us to select the optimal object in a most reliable manner. The book also details concept of interval valued intuitionistic fuzzy sets of type 2. It presents the basic properties of these sets. The book also introduces the concept of “ interval valued intuitionistic fuzzy soft topological space (IVIFS topological space) ” together with intuitionistic fuzzy soft open sets (IVIFS open sets) and intuitionistic fuzzy soft closed sets (IVIFS closed sets).

This paper aims to introduce a single valued neutrosophic soft approach to rough sets based on neutrosophic right minimal structure. Some of its properties are deduced and proved. A comparison between traditional rough model and suggested model, by using their properties is concluded to show that Pawlak ’ s approach to rough sets can be viewed as a special case of single valued neutrosophic soft approach to rough sets.

Neutrosophic Soft Rough Topology and its Applications to Multi-Criteria Decision-Making

An International Book Series in Information Science and Engineering, vol. 20, 2018

Rough Sets, Fuzzy Sets and Knowledge Discovery

Learning Technologies and Systems

Hybrid Rough Sets and Applications in Uncertain Decision-Making

Rough Set Theory: A True Landmark in Data Analysis

This book constitutes the refereed conference proceedings of the 19th International Conference on Web-Based Learning, ICWL 2020, and 5th International Symposium on Emerging Technologies for Education, SETE 2020, held in Ningbo, China in October 2020. Together for the ICWL 2020 Conference and SETE 2020 Symposium 39 full papers were accepted together with 31 short papers out of 233 submissions. The papers focus on the following subjects: Semantic Web for E-Learning, through Learning Analytics, Computer-Supported Collaborative Learning, Assessment, Pedagogical Issues, E-learning Platforms, and Tools, to Mobile Learning and much more.

To-date computers are supposed to store and exploit knowledge. At least that is one of the aims of research fields such as Artificial Intelligence and Information Systems. However, the problem is to understand what knowledge means, to find ways of representing knowledge, and to specify automated machineries that can extract useful information from stored knowledge. Knowledge is something people have in their mind, and which they can express through natural language. Knowledge is acquired not only from books, but also from observations made during experiments; in other words, from data. Changing data into knowledge is not a straightforward task. A set of data is generally disorganized, contains useless details, although it can be incomplete. Knowledge is just the opposite: organized (e.g. laying bare dependencies, or classifications), but expressed by means of a poorer language, i.e. pervaded by imprecision or even vagueness, and assuming a level of granularity. One may say that knowledge is summarized and organized data - at least the kind of knowledge that computers can store.

This book constitutes the thoroughly refereed post-conference proceedings of the third International Symposium on Intelligent Systems Technologies and Applications (ISTA'17), September 13-16, 2017, Manipal, Karnataka, India. All submissions were evaluated on the basis of their significance, novelty, and technical quality. This proceedings contains 34 papers selected for presentation at the Symposium.

The LNCS journal Transactions on Rough Sets is devoted to the entire spectrum of rough sets related issues, from logical and mathematical foundations, through all aspects of rough set theory and its applications, such as data mining, knowledge discovery, and intelligent information processing, to relations between rough sets and other approaches to uncertainty, vagueness, and incompleteness, such as fuzzy sets and theory of evidence. This fifth volume of the Transactions on Rough Sets is dedicated to the monumental life, work and creative genius of Zdzisław Pawlak, the originator of rough sets, who passed away in April 2006. It opens with a commemorative article that gives a brief coverage of Pawlak's works in rough set theory, molecular computing, philosophy, painting and poetry. Fifteen papers explore the theory of rough sets in various domains as well as new applications of rough sets. In addition, this volume of the TRS includes a complete monograph on rough sets and approximate Boolean reasoning systems that includes both the foundations as well as applications of data mining.

29th International Conference on Industrial Engineering and Other Applications of Applied Intelligent Systems, IEA/AIE 2016, Morioka, Japan, August 2-4, 2016, Proceedings

New Developments in Knowledge Discovery in Information Systems

New Trends in Intelligent Software Methodologies, Tools and Techniques

Thriving Rough Sets

Soft Rough Neutrosophic Influence Graphs with Application

Intelligent Systems Technologies and Applications

As a powerful approach to data reasoning, rough set theory has proven to be invaluable in knowledge acquisition, decision analysis and forecasting, and knowledge discovery. With the ability to enhance the advantages of other soft technology theories, hybrid rough set theory is quickly emerging as a method of choice for decision making under uncertain conditions. Keeping the complicated mathematics to a minimum, Hybrid Rough Sets and Applications in Uncertain Decision-Making provides a systematic introduction to the methods and application of the hybridization for rough set theory with other related soft technology theories, including probability, grey systems, fuzzy sets, and artificial neural networks. It also: Addresses the variety of uncertainties that can arise in the practical application of knowledge representation systems Unveils a novel hybrid model of probability and rough sets Introduces grey variable precision rough set models Analyzes the advantages and disadvantages of various practical applications The authors examine the scope of application of the rough set theory and discuss how the combination of variable precision rough sets and dominance relations can produce probabilistic preference rules out of preference attribute decision tables of preference actions. Complete with numerous cases that illustrate the specific application of hybrid methods, the text adopts the latest achievements in the theory, method, and application of rough sets.

In this manuscript, we introduce the notion of neutrosophic soft rough topology (NSR-topology) defined on neutrosophic soft rough set (NSR-set). We define certain properties of NSR-topology including NSR-interior, NSR-closure, NSR-exterior, NSR-neighborhood, NSR-limit point, and NSR-bases. Furthermore, we aim to develop some multi-criteria decision-making (MCDM) methods based on NSR-set and NSR-topology to deal with ambiguities in the real-world problems. For this purpose, we establish algorithm 1 for suitable brand selection and algorithm 2 to determinencore issues to control crime rate based on NSR-lower approximations, NSR-upper approximations, matrices, core, and NSR-topology.

Rough Sets Mathematical Foundations Springer Science & Business Media

Soft sets (SSs), neutrosophic sets (NSs), and rough sets (RSs) are different mathematical models for handling uncertainties, but they are mutually related. In this research paper, we introduce the notions of soft rough neutrosophic sets (SRNSs) and neutrosophic soft rough sets (NSRSs) as hybrid models for soft computing.

Neutrosophic Multi-Criteria Decision Making