Khalid Saeed
Jiří Dvorský (Eds.)

LNCS 13293

Computer Information Systems and Industrial Management

21st International Conference, CISIM 2022
Barranquilla, Colombia, July 15–17, 2022
Proceedings

Lecture Notes in Computer Science 13293

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ISSN 0302-9743 ISSN 1611-3349 (electronic)
Lecture Notes in Computer Science
ISBN 978-3-031-10538-8 ISBN 978-3-031-10539-5 (eBook)
https://doi.org/10.1007/978-3-031-10539-5

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The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

CISIM 2022 was the 21st event in a series of conferences dedicated to computer information systems and industrial management applications. The conference was held during July 15–17, 2022, in Barranquilla, Colombia, at the Universidad de la Costa.

Total number of papers were submitted to CISIM by researchers and scientists from a number of reputed universities around the world. These scientific and academic institutions belong to Brazil, Bulgaria, Chile, Colombia, India, Mexico, Pakistan, Peru, Poland, Spain, and Venezuela. Most of the papers were of high quality, but only Number of reviewed papers of them were sent for open peer review. Each paper was assigned to at Number of minimal reviews initially, and the acceptance decision was taken after receiving at least two positive reviews. In cases of conflicting decisions, another expert's review was sought for the respective papers. In total, about 180 reviews and comments were collected from the referees for the submitted papers. In order to maintain the guidelines of Springer's Lecture Notes in Computer Science series, the number of accepted papers was limited. Furthermore, a number of electronic discussions were held among the Program Committee (PC) chairs to reach a consensus on papers with conflicting reviews. After the discussions, the PC chairs decided to accept the 28 best papers for publication in the proceedings book the best Number of accepted papers. Briefly, a total of 55 papers were reviewed and 28 of them were accepted. The open peer review process was used, where 3+ reviews per paper were considered. The main topics covered by the chapters in this book are biometrics, security systems, multimedia, classification and clustering, and industrial management. Besides these, the reader will find interesting papers on computer information systems as applied to wireless networks, computer graphics, and intelligent systems. We are grateful to the three esteemed speakers for their keynote addresses. The authors of the keynote talks were Witold Pedrycz, University of Alberta, Canada; Diana G. Ramirez-Rios, University at Buffalo, USA; and Anita Pal, Durgapur National Institute of Technology, India.

We would like to thank all the members of the PC and the external reviewers for their dedicated efforts in the paper selection process. Special thanks are extended to the members of the Organizing Committees (both International and Local) for their great efforts to make the conference another success. We are also grateful to Andrei Voronkov, whose EasyChair system eased the submission and selection process. Finally, we would like to thank the Springer team for their help with this publication.

We hope that the reader's expectations will be met and that both the on-line and on-site participants benefited from the conference.

September 2022

Khalid Saeed
Jiří Dvorský

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Keynotes

A Study of Fuzzy and Neutrosophic Economic Order Quantity Model Allowing Delay in Payment

Anita Pal

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Abstract. The inventory control problem is one of the most fundamental and well-known optimization problems in operation research. In this study, we develop two inventory control models under the assumption of trade credit policy. Firstly, we consider an interval type-2 fuzzy inventory control model that involves a delay in payment on the premise of a tacit agreement between retailer and supplier to obtain an entire trade credit order. In this model, we include time dependent deterioration rate. We have also introduced a fuzzy method to find maximum profit in the retailer's inventory policy for deteriorating items in a supply chain. Finally, a sensitivity analysis is carried out to get the sensitiveness of the tolerance of different input parameters. Later, we establish a neutrosophic economic order quantity (EOQ) inventory model, assuming that the market demand is sensitive to the retail price and promotional effort. The supplier and retailer both adopt a partial trade credit policy. We include preservation technology to restrict the normal deterioration. We analyse the crisp model first, and then neutrosophic logic is implemented in the proposed model, considering demand, retail cost, ordering cost, carrying cost, promotional cost, and cost for preservation technology as a triangular neutrosophic number. De-neutrosophication of total neutrosophic profit has been done based on the removal area method. The present investigation shows that the de-neutrosophic and defuzzification values of the total profit function are convex, which assures the existence of unique solution. Mathematical theorems are developed to determine the optimal inventory policy for the retailer efficiently. Finally, numerical illustrations are also provided to justify the models, and the results in this study generalize some already published results in the crisp sense.

Federated Learning and Knowledge Distillation with Granular Computing

Witold Pedrycz

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Abstract. With the rapid progress encountered in data analytics, we have been witnessing important challenges. The visible and pressing requirements are inherently associated with the data and a way they are addressed in system modeling. In the landscape of data analytics, we identify three ongoing quests with far-reaching methodological implications, namely (i) modeling in the presence of existing constraints of privacy and security, (ii) efficient model building with limited data of varying quality, and (iii) deployment of advanced and computationally demanding models on computing platforms of limited computing resources. To address these challenges, federated learning and knowledge distillation have emerged as conceptual and algorithmic sound directions.

In the talk, we demonstrate how various ways of conceptualization of information granules as fuzzy sets, sets, rough sets, and others may lead to innovative augmentations of the above stated paradigms leading to interesting and efficient solutions. It is also advocated that Granular Computing enriches and augments the principles of federated learning and knowledge distillation.

To establish a sound conceptual modeling setting, we include a brief discussion of information granules-oriented design of rule-based architectures. A way of forming the rules through unsupervised federated learning is discussed along with algorithmic developments. A granular characterization of the model formed by the server vis-a-vis data located at individual clients is presented. It is demonstrated that the quality of the rules at the client's end is described in terms of granular parameters and subsequently the global model becomes represented as a granular model. The roles of granular augmentations of models in the realm of logic-oriented knowledge distillation are discussed.

Socially Optimal Solutions in Freight and Disaster Response Logistics

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Abstract. Today's society faces numerous challenges exacerbated by climate change, globalization, and socio-economic inequities, to name a few. These issues include heavy congestion, pollution, noise, and parking conflicts from the freight transportation perspective. In disaster logistics, the distribution of relief supplies encounters additional challenges because resources are mostly or entirely destroyed in the affected area after a disaster, and local relief supplies may not be available. In both scenarios, society is affected by the negative externalities of the movement of goods. Thus, logistical solutions must account for these negative impacts by aiming at the socially optimal.

This seminar focuses on the research developed in the disaster response logistics field, where the optimal minimizes the social costs of human suffering. This research considers the Facility Location problem, where disaster relief organizations aim for optimal points of distribution (PODs) to distribute the relief supplies to the people in need after a disaster occurs. Given a fixed distribution center where relief supplies are stored, the problem considers identifying the districts' shapes and the location of the PODs inside the district, such that it minimizes the total social costs. The social costs consider the private or logistics costs (i.e., the fixed cost of setting the POD, the transportation, and inventory holding costs) and the externalities of the distribution in the form of deprivation costs. The deprivation cost is the cost experienced by the impacted individual for the time spent without the relief. The analytical and numerical results provide unique insights that can serve as guidelines for disaster responders at the planning stage to allocate resources better and alternative distribution strategies of relief in the affected regions.

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