



A.M.A.S.E.S. XLV

September 13-18, 2021 – “Distributed” Remote Mode

Plenary Sessions : Reggio Calabria, September 13-14, 2021
“Distributed” Parallel Sessions : September 15-18, 2021

Parallel Session “Multiple Criteria Decision Aiding”

BOOK OF ABSTRACTS

September 15th, 2021

9:00 am – 11:40 am

ZOOM link

<https://unitn.zoom.us/j/84019793902>

Meeting ID: 840 1979 3902

Passcode: 273718

Program:

9:00-9:20

ABSTRACT TITLE: Assessing risk of disruption of supply chains due to Covid-19 with Fuzzy VIKORSort.

AUTHORS: Jehangir Khan and Alessio Ishizaka

SPEAKER: Jehangir Khan

9:20-9:40

ABSTRACT TITLE: Online Information Retrieval Processes: Formalization, Simulation and Pattern Recognition.

AUTHORS: Debora Di Caprio and Francisco Javier Santos Arteaga

SPEAKER: Francisco Javier Santos Arteaga

9:40-10:00

ABSTRACT TITLE: A new model for multiobjective portfolio selection problems.

AUTHORS: Maria Barbati, Salvatore Greco and José Figueira

SPEAKER: Maria Barbati

10:00-10:20

ABSTRACT TITLE: Combination of MCDA and Multi-objective optimization problem for handling production issues in complex environments.

AUTHORS: Gerarda Fattoruso, Maria Barbati and Alessio Ishizaka

SPEAKER: Gerarda Fattoruso

10:20-10:40

ABSTRACT TITLE: Scoring alternatives from pairwise winning indices.

AUTHORS: Sally Giuseppe Arcidiacono, Salvatore Corrente and Salvatore Greco

SPEAKER: Salvatore Corrente

10:40-11:00

ABSTRACT TITLE: Non-parametric estimation of subjective preferences via uncertain information.

AUTHORS: Sally Giuseppe Arcidiacono, Salvatore Corrente and Salvatore Greco

SPEAKER: Sally Giuseppe Arcidiacono

11:00-11:20

ABSTRACT TITLE: Supporting the robust ordinal regression approach to multiple criteria decision aiding with a set of representative value functions.

AUTHORS: Sally Giuseppe Arcidiacono, Salvatore Corrente and Salvatore Greco

SPEAKER: Salvatore Greco

11:20-11:40

ABSTRACT TITLE: School study-programs' performance and their determinants.

AUTHORS: Anna Mergoni and Kristof De Witte

SPEAKER: Anna Mergoni

Assessing risk of disruption of supply chains due to Covid-19 with Fuzzy VIKORSort

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Abstract

The rapid spread of the COVID19 pandemic disrupts many economic activities around the world. The complete and partial lockdown policies integrated with the closure of borders by many countries disrupted the whole supply chain network. Like many other countries, different economic sectors of Pakistan also bore high economic losses due to these disruptions. Multiple studies have been performed on the economic losses in Pakistan due to the COVID19 pandemic. However, no study has been performed on sorting economic sectors based on disruptions in the supply chain due to this epidemic. Therefore, this study aims to observe the resilience of different economic sectors and perform sorting using three predefined classes' i.e. severe disruptions, moderate disruptions, and low disruptions. For this purpose, a novel methodology i.e. fuzzy VIKORSORT is proposed which is the major contribution of our study towards literature. The proposed methodology evaluates six economic sectors of Pakistan based on ten criteria. The results of the study revealed that the accommodation and food sector along with the construction sector experienced severe disruptions followed by manufacturing, wholesale and retailer, and energy sector as moderate disruption whereas, the information and communication sector bear low disruptions. The proposed methodology will help the researchers and authorities to deal with sorting and decision problems to priorities the preventive measures under such undesirable events.

Keywords

COVID19; Supply chain disruptions; fuzzy VIKORSORT; economic sectors; Pakistan

References

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Online Information Retrieval Processes: Formalization, Simulation and Pattern Recognition

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Extended abstract ¹

We define a computable benchmark framework that replicates the behavior of users as they proceed through the alternatives ranked by a search engine and highlights the problems faced by artificial intelligence techniques to categorize the retrieval patterns generated by users endowed with different information assimilation capacities. The research is developed through three specific stages.

First, we define a decision theoretical model that relates the threshold values determining the retrieval behavior of decision makers (DMs) to the distance in terms of semantic similarity between the descriptions observed in the snippets and the ideal ones considered by the user. The model is designed to highlight the complexity of the search process defined by DMs, who must consider combinations of the variables defining the alternatives, both observed and expected, together with the number of satisficing alternatives aimed to be observed.

Second, we design a set of heuristic algorithms that mimic the online information retrieval behavior of DMs as reflected in their click through rates (CTRs). We illustrate how requiring DMs to observe two satisficing

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alternatives provides a sufficient approximation to their CTRs. Adding a third alternative delivers an almost identical set of CTRs to those displayed by DMs ([1], [2]). The mimicking quality of the heuristic algorithms prevails as alternatives are added up to include the ten ranked within the first page of search results.

Third, the set of heuristic algorithms provides two different strings of data, the pages clicked by the DMs and, more importantly, a numerical representation of each of the observations and evaluations that determine the retrieval behavior of DMs. We illustrate how, even when providing several artificial intelligence techniques with both strings of data, the models face considerable problems categorizing DMs correctly as their information assimilation capacities are enhanced.

Keywords

Information retrieval; Satisficing; Click Through Rates; Uncertainty; Heuristics; Artificial intelligence.

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A new model for multiobjective portfolio selection problems

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Extended abstract¹

Multiobjective Portfolio models have been developed in order to select a set of projects according to a multitude of objectives [1]. To implement those projects, some elements are required such as human resources or capital. Often, only some elements can be selected and they need to be shared among several projects. Even more, the elements can be evaluated according to some criteria and only elements of a given level of “quality” can be selected to be assigned to a specific project. Consequently, the selection of the portfolio of projects can depend on the selection of the elements and on their “quality”.

In this paper we propose a multiobjective model that takes into account how a portfolio selection can be related to the selection of a portfolio of elements. In particular, we aim to attain:

- a portfolio of projects that optimizes some objectives;
- a portfolio of elements to be assigned to each of the selected projects;
- the portfolios of elements allocated to each project need to satisfy some given thresholds on some criteria.

The “quality” of the projects in the portfolio is determined by the “quality” of the

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portfolios of elements that are allocated to each project. In particular, a project can be selected and therefore contributing to the objectives to optimise, only when enough elements that are contributing above a specified threshold for each given criterion are allocated to it.

The model is able to take into account temporal and stochastic considerations and can be easily customized for a variety of applications such as selecting a portfolio of research projects and a portfolio of researchers to allocate to each of the projects.

To handle our model, several methodologies could be implemented. We show how the model could be managed thanks to an interactive methodologies adapted by [2], that benefits from the interaction with the stakeholders and from the learning process that the stakeholders develop throughout the interaction [3].

Keywords

Multi-objective Problems ; Portfolio Problems; Interactive Methodologies.

References

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Session

Multiple Criteria Decision Aiding: Debora Di Caprio, Massimo Squillante

Combination of MCDA and Multi-objective optimization problem for handling production issues in complex environments

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Extended abstract¹

This paper proposes a new approach to handle production issues in manufacturing organizations and, in particular, this work analyzes the case of a major automotive company. The problem investigated concerns the errors that occur in the production process and the processes involved. Automotive companies have the goal of (a) identifying the errors that cause product defects and (b) identifying in which part of the manufacturing process the errors occurred. The purpose of this work is to classify the errors that occur during a production process in an automotive company and, consequently, to select the portfolio of the most critical processes and, therefore, which require more attention from the management. Our approach consists of two steps. First, by adopting a multi-criteria decision support method [1], we classify errors into priority classes on the basis of a series of criteria in accordance with the management of the company. The errors that belong to the highest priority class are the most urgent and serious for the company. To obtain such classification we adopt a Multi-Criteria Decision Aiding (MCDA) method [5]. In particular, the method we use is the AHPSort II [2]. Secondly, we have structured a multi-objective portfolio problem that selects a portfolio [3] of the most critical processes based on the number of errors that occur in each of these processes and according to their priority and at the same time satisfying some budget

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constraints [4]. The work we propose provides both a methodological and an applicative contribution to real-life problems. In fact, this paper proposes a combination of several methodologies, MCDA and a multi-objective portfolio problem, providing an innovative contribution in contexts of scarcity of resources and in which there is the need to act on the basis of priorities.

Keywords

MCDA; Multi-objective portfolio approach; AHPSort II; Production Problems.

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Session

Multiple Criteria Decision Aiding: Debora Di Caprio, Massimo Squillante

Scoring alternatives from pairwise winning indices

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Extended abstract ¹

In this paper we revise in a critical way the procedures used to summarize the pairwise winning indices results. Pairwise winning indices are provided by Stochastic Multicriteria Acceptability Analysis and they represent the frequency with which an alternative is preferred to another on the basis of same sampled instances of the assumed preference model compatible with the preferences provided by the Decision Maker. The scoring procedures provide a single value to each alternative being representative of the goodness of the alternative itself taking into account the frequency with which it is preferred to the others or, vice versa, the others are preferred to it. The score given to the alternatives gives the possibility to rank them from the best to the worst. A comparison between different methods is performed to look at their strong and weak points.

Keywords

1

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Multiple Criteria Decision Aiding; Stochastic Multicriteria Acceptability Analysis; Robustness concerns.

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Non-parametric estimation of subjective preferences via uncertain information

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Extended abstract

Robust ordinal regression is based on the idea that there is a plurality of value functions compatible with the preferences expressed by the decision maker [1]. Originally, the set of compatible value functions was used to define the necessary and possible preference relations holding when the preference between two alternatives holds for all value functions or for at least one of them, respectively. After, probability of preference and probability of getting a certain rank position taking randomly a compatible value function was introduced by Stochastic Multicriteria Acceptability Analysis. Recently a methodology to build a probability distribution in the space of value function was proposed [2]. In view of this, we aim to investigate basic principles and main aspects of a multicriteria decision aiding procedure based on the probability distribution in the space of compatible value functions.

Keywords

Multiple Criteria Decision Aiding, Subjective Stochastic Ordinal Regression, Uncertain preference information.

References

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Multiple Criteria Decision Aiding: Debora Di Caprio, Massimo Squillante

Supporting the robust ordinal regression approach
to multiple criteria decision aiding
with a set of representative value functions

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Extended abstract ¹

In this paper we propose a new methodology to represent the results of the robust ordinal regression approach [1, 2, 3] by means of a family of representative value functions for which, taken two alternatives a and b , the following two conditions are satisfied: 1) if for all compatible value functions a is evaluated not worse than b and for at least one value function a has a better evaluation, then the evaluation of a is greater than the evaluation of b for all representative value functions; 2) if there exists one compatible value function giving a an evaluation greater than b and another compatible value function giving a an evaluation smaller than b , then there are also at least one representative function giving a better evaluation to a and another representative value function giving a an evaluation smaller than b . This family of representative value functions intends to provide the Decision

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Maker (DM) a more clear idea of the preferences obtained by the compatible value functions, with the aim to support the discussion in constructive approach of Multiple Criteria Decision Aiding.

Keywords

Multiple Criteria Decision Aiding; Robust Ordinal Regression; Representative value function.

References

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Session

Multiple Criteria Decision Aiding: Debora Di Caprio, Massimo Squillante

School study-programs' performance and their determinants

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Extended Abstract

In this paper we investigate the relationship between student's educational performance in secondary and higher education and the specific study program attended in secondary education. The data are provided by the Flemish Minister of Education and contain student-level information for the cohort of students born from 1991 to 1996 and attending a secondary school in Flanders. A 'Benefit of the Doubt' composite indicator is constructed to benchmark the study programs and to evaluate them in the best possible light. To individuate possible determinants of the study programs' performances a robust and conditional version of the indicator is also implemented. By conditioning for the socio-economic status of the students, we also avoid the bias caused by the self-selection of students coming from a higher background in specific study programs. Additionally, we investigate the determinants of the school's ability in teaching specific study programs by comparing the educational outcomes for cohorts of students in the same study program.

Keywords

School Subjects, Secondary Education, Benefit of the Doubt, Performance Evaluation, Composite Indicator.