

EURO 2021

Program

All times are Athens time (EEST / UTC + 3 hours)

January 4, 2022

2 - A Search Algorithm for the Menu Planning Program

Francisco Martos-Barrachina, Laura Delgado Antequera, Monica Hernandez, Rafael Caballero

The menu planning problem has often been regarded as an NP-Complete combinatorial problem. Without eluding complexity, and therefore, regarding it as a complete n-day menu for a person or group of people where recipes are the variables of the problem, semi fixing the rations, so avoiding continuity, it becomes an integer combinatorial problem. In this context, classic linear programming is off the table, and current trends in operational research are dominated by the search and implementation of different heuristic algorithms to find feasible solutions to it. These algorithms include Genetic, Bacterial Foraging, Branch and Bound or Branch and Cut. In this case, operationally, the search for an ample feasible space presents a great challenge. Finding a rich feasible set and thoroughly studying it becomes crucial, in order to being able to find an optimal solution. In our work, we propose a hybrid Greedy Randomized Adaptive Search Procedure (GRASP) algorithm combined with a Variable Neighbourhood Search (VNS) to rapidly generate a vast pool of candidate solutions as a first step before optimizing an objective function. We generate an array of random seeds, and using an extended Tchebycheff objective function where we measure the distance to the feasible region, we push the best seeds towards it. Local searches allows us to find multiple feasible solutions and then we densify the feasible region by combining different candidates.

3 - HR Analytics in Determining Employees for Stress Management Counseling

Biljana Panic, Ivana Kovacevic, Achilleas Anagnostopoulos

Even medium-sized companies use employees' e-databases in order to collect and store valuable data about employees, using different decision support systems for retrieving relevant information in the decision making process. Our database covers a sample of 1527 employees' gathered in the period of the economic crisis in Greece that provokes the need for different strategies for employees to cope with stress brought in an organizational setting. Along with "usual suspects" of workplace stress, there is an additive effect of the financial crisis and situation in the labor market.

Employees are facing the fact that their job brings additional stress and organizations ought to provide strategies for stress relief and employees' health preservation. Meta-analyses of the studies of stress management in work settings corroborate the fact that the effect of the interventions might be reduced due to the non-selective approach to stress management training deliverance. To deliver the optimal decision while targeting and recruiting candidates for stress management counseling, we are offering the decision making model provided by KNIME Analytics Platform. The employees' data are collected by using WERS 2011 Questionnaire. To provide a decision making model we extracted factors covering demographics, job characteristics, workplace features, attitudes toward work, the possibility to participate in decision making, and income.

■ WC-40

Wednesday, 12:30-14:00 - Virtual Room 40

Governance Analytics

Stream: Governance Analytics
Invited session

Chair: Cathal MacSwiney Brugha

1 - Introduction to Autonomous Weapon Systems - An Ethical Point of View

Marcus Frølich, Mo Mansouri

Autonomous Weapon Systems (AWS) represent both the present and future of modern warfare. With them comes both desirable advantages

and a wide range of new challenges, especially concerning the ethics of war. We seek to highlight some of the most relevant advantages and challenges with AWS in order to get a more well-informed discussion. The paper comprises a wide range of contexts for the systems. By creating a causal loop diagram, the dynamics of what influences the use of AWS in warfighting and acceptance by the general public is modeled. Key leverage points and suggestions for dampening factors to some of the challenges are highlighted.

2 - Refugee Allocation Mechanisms: Theory and Applications for the European Union

Petros Xepapadeas, Yiannis Mourtos

We study a relocation problem which consists of allocating a given number of refugees – who are heterogeneous with respect to country of origin and characteristics such as gender, age or educational level – from Greece to other European Union countries which have pledged to accept a certain number of refugees. To study this problem, we developed a conceptual framework consisting of three allocation methods: sequential multi-agent resource allocation, simultaneous allocation, and two-stage allocation. In these methods we incorporate preferences by assuming that the destination countries have their own preferences regarding refugee characteristics, but that they also try to consider the refugees' preferences for the destination countries. While these methods vary in design and execution, all three aim to create a more equitable allocation methodology for both the refugees and the destination countries. These methods could also be applied to other similar types of allocation problems.

3 - Sectorization problems - ongoing research

José Soeiro Ferreira, Ana Maria Rodrigues

Sectorization refers to dividing a whole into smaller parts, the sectors, achieving some goals, or facilitating an activity. Generally, several criteria are involved, which makes the optimisation problems more complex. Typical applications occur in several contexts, such as political, health and school districting, social networks and sales territory or airspace assignment.

The presentation will introduce Sectorization, current and new criteria, and focus on the current research project's ideas. We will refer to novel solution methods based on Genetic Algorithms, Integer Programming, and Non-dominated Sorting Genetic Algorithm-II and III. Moreover, we will outline a new Web-based Decision Support System for Sectorization. A mention of concrete implementations involved in the project concludes the presentation.

■ WC-41

Wednesday, 12:30-14:00 - Virtual Room 41

OR Meets Computation 1

Stream: OR Meets Computation
Invited session

Chair: Burcu Gürbüz

Chair: Aydin Teymourifar

1 - New Models for Solving Resectorization Problems

Aydin Teymourifar, Ana Maria Rodrigues, José Soeiro Ferreira

In sectorization problems (SPs), a large territory is divided into smaller sectors according to some criteria like equilibrium and compactness. SPs have many applications in different areas such as transportation, healthcare management, energy and irrigation. In the resectorization problems (ReSPs), there is an obtained solution for the previous moment and it is aimed to acquire a new solution according to some changing conditions. We propose new models to solve ReSPs, which cover basic sectorization problems as well as the models with service centres. It is assumed that between moments some changes occur in the coordinates, demands of some points. Also, some points are added into or removed from the problem. The basic idea of the models is that the difference between the two solutions for two different moments should

be minimized or limited to an upper limit. The first case is defined as an objective function, while the second one is managed with a constraint. We also generate new benchmarks, for which a new solution method is developed.

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2 - Linear Optimization for Electron Tomography Reconstructions

Juan Manuel Muñoz-Ocaña, Jose J. Calvino, Elena Fernandez, Miguel López-Haro, Antonio Manuel Rodriguez-Chia

Electron tomography is a technique for imaging three-dimensional structures of materials at nanometer scale. This technique consists on reconstructing nano-objects thanks to projections provided by a microscope from different tilt angles. These projections are a group of parallel electron beams which go through the particle to modify their intensities. These intensities, which are called sinograms, are the inputs of our reconstruction models.

The idea behind this reconstruction model is to solve an optimization model that minimizes the norm of the difference between the sinogram and the theoretical projection. Among them, nowadays, most popular reconstruction models are based on total variation minimization considering the sum of the L2-norm of the image gradient as well as the deviation of the reconstructed sinogram with respect to the original data, measured with the L2-norm. We consider an l1-norm total variation model which provides good quality reconstructions. The model we propose removes a high level of noise from the reconstruction recovered. Furthermore, some linear programming techniques are used to provide one efficient way of solving the resulting complex model for real situations.

■ WC-42

Wednesday, 12:30-14:00 - Virtual Room 42

Banking risk management I

Stream: Enterprise risk management
Invited session

Chair: Ioannis Thanos

1 - M&A in Greek banking and their impact on the financial system

Ioannis Thanos, Ioannis Katsamposakis, Apostolos Christopoulos

This paper examines the impact that some possible mergers between the four largest Greek banks may have on the stability and competition of the Greek banking sector. In order to be able to draw conclusions about the impact that an increase in the concentration of the banking sector will have on its competitiveness and stability, we consider the relationships concentration - competition and concentration - competition - stability for the period 2008-2018. For the purpose of measuring competition, we used as a proxy the Lerner index and for the concentration and stability, the Herfindahl-Hirschman and Bank Z score indicators respectively. The results in the model that studied the first relationship show no significance between the two which favors the theory of Effective Structure. In the model that studies the other relationships we found that the competition has a positive and linear relationship with stability while for the concentration we found again not a significant relationship with stability. Our deduction from these results is that an increase in concentration due to mergers or acquisitions has no effect on the market power of the banks or their stability and if banks focus more on being more effective in their results than being bigger to increase their market power, this may have a positive effect on stability.

2 - What "fair interest" should mean for the retail loan market?

Darie Moldovan

In this work we build and compare two application scorecards based on data gathered from two different financial institutions from Romania: a retail bank and a non-banking financial institution (NBFi). While both provide loans for individuals, there is a wide spread between interests charged, presumably based on the default risk. Traditionally, the NBFIs are charging high interests to their clients, who usually don't qualify for a loan with a bank, but is this practice entirely justified by the high risk of default? Our approach tries to quantify the fair interest spread between the two types of loans for the Romanian market and to evaluate the current status of this market.

3 - PreBit: an NLP enhanced prediction model for Bitcoin price using Twitter

Yanzhao Zou, Dorien Herremans

Bitcoin, with its ever-growing popularity, has also demonstrated unparalleled price volatility since its origin. This volatility, together with its decentralised nature, make Bitcoin highly subjective to speculative trading as compared to more traditional assets. We are interested in studying whether social media discussions from the general public on Bitcoin have predictive power for extreme future price movements. To obtain such discussion contents, a dataset of 5,000 daily Tweets (or the maximum number available that day) were collected from 2015 to 2019 containing the keyword "bitcoin". Previous studies have used the Bag of Words (BoW) approach with logistic regression to show that a link exists between Twitter sentiment and daily price on a short time frame of twenty-one days (Colliani, 2015). In our study, sentence-level BERT embeddings pre-trained on financial lexicons were utilised in an attempt to capture not only the sentiment but also the contents of the tweets. By combining these embeddings with a Convolutional Neural Network, we closely examine the link between the public tweet contents and significant market movement over a much longer period of time. We also propose an ensemble of our NLP model and a baseline price model to explore how we can augment the performance of traditional price models with NLP based on Tweets for extreme price movement prediction.

4 - Why do not firms shift risk near distress? A theoretical explanation

Katarzyna Romaniuk

It is generally accepted that theoretically, firms near distress should shift risk. However, it seems that the opposite behavior occurs in practice: firms rather decrease risk-taking. The main argument put forward by the literature to explain this behavior is that the risk-shifting incentive is being opposed by the risk-management incentive. We propose a novel argument based on the interplay of Ross's (2004) effects of convexity, translation and magnification, applied in a continuous-time portfolio setting a la Merton (1971).

■ WC-43

Wednesday, 12:30-14:00 - Virtual Room 43

Sports analytics

Stream: OR in Sports
Invited session

Chair: Dimitris Karlis

1 - Make it to the podium - predicting biathlon pursuit outcomes based on sprint race performance

Christoph Herrmann, Thomas Kirschstein