2 - Dominance-based rough set analysis for understanding the drivers of urban development agreements

Marta DellOvo, Alessandra Oppio, Francesca Torrieri, Milosz Kadzinski, Grzegorz Miebs

The rise of neoliberalism in the context of urban development has encouraged the cooperation between public and private parties. This co-operation is structured by contracts, generally called Urban Development Agreements (DAs). Being part of the urban regeneration strategies, these projects aim at achieving a durable improvement of an area according to sustainability principles. Thus, within the negotiation between private and public, multiple and conflicting instances have to be faced case by case. Despite the uniqueness of each DA, it is possible to define a set of pertinent characteristics that play a crucial role in determining the fairness and appropriateness of the public-private partnership. Given this context, the work proposes the Dominance Rough Set Approach (DRSA) for exploring the relationship between condition attributes or criteria and decision with the aim of supporting negotiations on the basis of specific features of the DA under evaluation. Specifically, DRSA has been applied on a sample of DAs recently concluded in the Lombardy Region, and tested on the other sample of DAs under the negotiation phase. The analysis has accounted for the characteristics referring to the following five contexts: urban, institutional, negotiation, development, and economic. The inferred decision rules provide useful knowledge for supporting complex decision processes such as DAs.

3 - A multicriteria framework based on the Choquet integral and the analytic hierarchy process for evaluating scenarios of adaptive reuse

Francesca Abastante, Salvatore Corrente, Salvatore Greco, Isabella Lami, Elena Sezenna

The research aims to test an assessment framework based on the Choquet integral and Analytic Hierarchy Process (AHP). The Choquet integral is a well-known MCDA method taking into account interactions between criteria but it shows two main problems: the need to determine a capacity that assigns a weight not only to single criteria but also to subsets of criteria; the need to express on the same scale evaluations of different criteria. To handle the first problem we adopt the Non Additive Robust Ordinal Regression (NAROR) that simultaneously considers the capacities compatible with the indirect preference information provided by the Decision Maker (DM). With respect to the second problem, we apply the AHP. The proposed methodology is here applied to a current topic: the adaptive reuse of the abandoned thermoelectric power plants due to inefficiency. According to this problem, the main Italian distributor of electricity (ENEL) launched the "Futur-e Project" in order to provide new sustainable activities. In the context of this project, the case study here presented concerns the simulation of a process aimed at selecting the most appropriate development scenario for the former thermoelectric power plant of Bari (Italy) considering different point of views. In this perspective, the framework proposed can result very useful, in particular because of the presence of a number of interacting criteria and alternatives, as the situation of several urban and territorial problems.

4 - GAHP II Sorting method: an application to the vineyard landscape of Langhe, Roero and Monferrato (Italy)

Vanessa Assumma, Marta Bottero, Alessio Ishizaka

The economic assessment of landscape represents a complex task where different monetary and non-monetary aspects and values have to be considered. Integrated approaches are therefore needed in order to properly take into account all the relevant dimensions for the evaluation and to provide a framework able to support decision-making processes in the context of landscape planning and management. The present contribution illustrates the development of a multicriteria evaluation model to sort different municipalities in the Piedmont Region (Italy) with reference to their attractiveness in terms of Landscape Economic Value. This evaluation considers the case of the vineyard landscape of Langhe, Roero and Monferrato, that has been recently included in the World Heritage List of UNESCO (2014). The evaluation model has been based on a system of landscape economic indicators that represents the main economic characteristics of the 101 municipalities belonging to the UNESCO site. Municipalities are sorted with the AHP

II method (Ishizaka et al. 2012) which is a new classification method based on AHP that requires less pairwise comparisons with respect to the traditional AHP sorting method. In particular, the present work proposes a further extension of the AHP Sort II method, namely the GAHP II Sorting method, which allows the opinion of different experts to be included in the evaluation, thus providing a multi-stakeholders view of the decision problem.

■ WA-11

Wednesday, 8:30-10:00 - SOUTH BUILDING UV S111

Novel Applications of Analytics

Stream: Business Analytics
Chair: *Wouter Verbeke*

1 - The beneficial effect of ensemble learning in predicting student drop-out in online learning environment

Trung Hoai Minh Phan, Kristof Coussement, Dries Benoit, Arno De Caigny, Annelies Raes

Online learning has been an educational revolution in the recent years especially after the successful introduction of the Massive Open Online Course (MOOC). Despite having many advantages of high flexibility, unlimited participation and low access fee, online learning has been suffered from student retention. Therefore, to maximize online learning experience, it is crucial to build a student drop-out prediction model as accurate as possible. This study focuses on one special type of online learning data: the MOOCs with monthly subscription plan, where the student decides to pay the subscription fee at the beginning of each month to be able to access to unlimited MOOCs on the learning platform. In order to predict the student drop-out (subscription plan cancellation), 6 groups of features have been constructed to capture the student's learning activities, i.e. student's information, learning motivation, learning difficulty, student interaction, goal orientation and student cluster. Moreover, a benchmarking section between standard statistical models and the most recent Logit Leaf Model (LLM) has been implemented to select the best accuracy model. Finally, insights into the impact of each feature group on the student drop-out is given as a suggestion for student retention strategy for this online learning platform.

2 - Higher order mining for incremental root cause analysis

Eduardo e Oliveira, Vera Miguéis, José Borges

Root Cause Analysis (RCA) aims at identifying the true origin of a problem. It is an intricate problem, especially in complex manufacturing systems, which produce large amounts of data. Data Mining (DM) techniques have been proposed as a solution for tackling RCA in complex systems. However, these techniques usually focus on the analysis of data from discrete periods of time. The analysis of the datasets corresponding to each period is usually developed separately, and there is not a concern for managing the root causes knowledge in the long term. We propose an approach that focuses on this concern, by developing a technique for incremental RCA using Higher Order Mining (HOM). In the proposed solution, we mine the rules extracted using C5.0 algorithm from several samples. These rules describe the possible root causes of certain problems. By mining the rules, the proposed approach is able to identify the most prevalent variables and propositions related to those problems, therefore identifying the true root causes. This solution allows rules to be analyzed incrementally, actively managing the knowledge on root causes, and providing continuous learning of the problems analyzed. The proposed solution is validated through a case study developed in the context of semiconductor manufacturing.

3 - Motivating creativity with a carrot and a stick - creativity-weighted productivity, relative performance information, and perceived competition

Peter Rötzel, Burkhard Pedell