

Hierarchical Clique Analysis in Social Networks Due to Common Knowledge of Proverbs

In session [Social Networks](#), stream [Knowledge Discovery and Data Mining](#).

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Abstract

We present the Hierarchical Clique Analysis, a new algorithm for social networks analysis. The algorithm is exemplified with data about the recognition of proverbs collected in interviews in all Azorean islands and also in three Azorean emigration locations in the USA. Interpreting the set of this data as an incidence matrix of a graph, we obtain 8 oriented and isolated sub-graphs which distinguish the society in a kind of different families of proverbial users. The Hierarchical Clique Analysis finds distinct clusters with a high inner homogeneity.

Keywords

- Data Mining
- Complex Societal Problems

Status: accepted

3 - Improving Execution Time and Accuracy for IP Classification Problems in Large Data Sets

Jaime Miranda, Department of Management Control and Information Systems, Universidad de Chile, Diagonal Paraguay 257, Chile, jmirandap@fen.uchile.cl, Richard Weber, Daniel Espinoza

Many data mining applications require the analysis and classification of large data sets. Several methods exist for this task, being of particular interest Integer Programming (IP) models. However, these models' weakness is the required computational time limiting their applicability to small data sets. We present a heuristic that uses cluster analysis as preprocessing for a reduced IP model achieving both, significantly lower computational time and less classification errors.

4 - A 3PL providers classification model considering categorical variables on the use of information and communication technologies

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ICT have greatly benefited the logistics industry, allowing high levels of connectivity between partners, promoting its differentiation and specialization. To characterize the service offer, a statistics and data mining based third-party logistics providers classification model which exclusively considers the presence of technological solutions through Yes/No statements is suggested. The results identified 3PL homogeneous clusters in the Brazilian market, equivalent to those models that make use of quantitative variables, usually associated with unreliability and difficult acquisition.

■ WE-19

Wednesday, 15:40-17:00

1.3.20

Nonsmooth Global Optimization

Stream: Nonsmooth Optimization

Invited session

Chair: Alexander Kruger, Graduate School of Information Technology & Mathematical Sciences, University of Ballarat, University Drive, Mount Helen, P.O. Box 663, 3353, Ballarat, Victoria, Australia, a.kruger@ballarat.edu.au

1 - Asymptotic stability in optimal control problems with time delay

Musa Mammadov, Graduate School of Information Technology and Mathematical Sciences, University of Ballarat, University Drive, Mount Helen, P.O. Box 663, 3353, Ballarat, Victoria, Australia, m.mammadov@ballarat.edu.au

The problem of qualitative analysis of optimal trajectories for a special class of optimal control problems described by differential delay equations is considered. This kind of equations has attracted a significant interest in recent years due to their frequent appearance in a wide range of applications. They serve as mathematical models describing various real life phenomena in mathematical biology, population dynamics and physiology, electrical circuits and laser optics, economics, life sciences and others.

2 - Using extended cutting angle and penalty methods for solving semi-infinite programming problems

Albert Ferrer, Dpt. of Applied Mathematics I, Technological University of Catalonia, Av. Doctor Marañón, 44-50, 08028, Barcelona, Catalunya, Spain, alberto.ferrer@upc.edu

Recently a unified framework concerning to Remez-type algorithms and integral methods coupled with penalty and smoothing methods has been introduced for solving convex semi-infinite programming. The framework is theoretical and no computational results are reported. Nevertheless, it suggests new methods with interesting computational properties. We propose a specific implementation that use the Extended Cutting Angle Method as an auxiliary method of the main procedure. Computational results are reported.

3 - Direct Search Filter Methods

Aldina Correia, Mathematics, ESTGF-IPP, Edifício do Salto, nº4., blc 6, 5º esq, 4600-281, Amarante, Portugal, aic@estgf.ipp.pt, João Matias, Pedro Mestre, Carlos Seródio

Filter methods have been widely used in several areas of Constrained Nonlinear Optimization. These methods treat optimization problems as bi-objective attempts to minimize the objective function and a continuous function that aggregates the constraint violation functions. But, when the involved functions are non smooth, Unconstrained Derivative-free Methods must be used. This work presents results obtained by combining Filter method with other direct search methods and are proposed some alternatives to aggregate the constraint violation functions.

■ WE-20

Wednesday, 15:40-17:00

1.3.33A

Social Networks

Stream: Knowledge Discovery and Data Mining

Invited session

Chair: Armando Mendes, Mathematics, Azores University, Rua da Mãe de Deus, 9501-801, Ponta Delgada, Azores, Portugal, amendes@uac.pt

Chair: Matthias Funk, Mathematic, University of the Azores, Rua Gonçalves, 9500, Ponta Delgada, mfunk@uac.pt

1 - Large Social Networks Visualization Using the Algorithm of the Spanning Tree with Maximum Number of Leaves

Luís Caviq, DCeT, Universidade Aberta, Rua da Escola Politécnica 147, 1269-01, Lisboa, Portugal, lcaviq@univ-ab.pt, Armando Mendes

In the web 2.0, social networks easily reach of thousands or millions of actors. A clear view of a small number of vertexes is easy to obtain. However, when the number of vertexes and edges increases, the view becomes incomprehensible. In this work, we intend to find the skeleton of the social network, by transforming the graph into a tree with the largest possible number of leaves, using the spanning tree algorithm with additional constraints.

2 - Combining Data Mining Algorithms for Web Recommendation

A. Jorge Morais, Department of Science and Technology, Universidade Aberta, Universidade Aberta - Delegação do Porto, Rua do Amial, 752, 4200-055, Porto, Portugal, ajorgemorais@gmail.com

Data mining algorithms are used for recommendation of pages that might be useful for the user according to past behavior (of a given user or a group of users). Combining several algorithms to optimize user satisfaction within a multi-agent environment can be done in two ways: a competitive approach, where each agent fights for grabbing user's attention, or a cooperative approach, where all agents play for the same side. In this work, both approaches were tested and a comparison of both against a single algorithm approach is presented.

3 - Integration of different Cliques of Proverbial Knowledge

Matthias Funk, Mathematic, University of the Azores, Rua Gonçalves, 9500, Ponta Delgada, mfunk@uac.pt, Luís Caviq

By using 14 distinct inquiries we were able to analyze the knowledge of a huge number of proverbs inside the cultural space of Azores. At Euro 2009, we developed a pattern matching algorithm by using an incidence matrix resulting from the pair wise common knowledge on the best-known proverbs. By randomly picked an inquiry and it was possible to identify an intrinsic correlation between the paremiological competence and the person's provenance. But these results must be validated with more data. Therefore, we now analyze all 14 inquiries with the same method in order to compare results.

4 - Hierarchical Clique Analysis in Social Networks Due to Common Knowledge of Proverbs

Armando Mendes, Mathematics, Azores University, Rua da Mãe de Deus, 9501-801, Ponta Delgada, Azores, Portugal, amendes@uac.pt, Matthias Funk

We present the Hierarchical Clique Analysis, a new algorithm for social networks analysis. The algorithm is exemplified with data about the recognition of proverbs collected in interviews in all Azorean islands and also in three Azorean emigration locations in the USA. Interpreting the set of this data as an incidence matrix of a graph, we obtain 8 oriented and isolated sub-graphs which distinguish the society in a kind of different families of proverbial users. The Hierarchical Clique Analysis finds distinct clusters with a high inner homogeneity.

■ WE-21

Wednesday, 15:40-17:00

6.2.47

Education and Sustainable Development

Stream: Education, and Social Policy

Invited session

Chair: *Hanife Akar*, Department of Educational Sciences, Middle East Technical University, Orta Dogu Teknik Universitesi, Egitim Fakultesi EF 316, 06531, Ankara, Turkey, hanif@metu.edu.tr

1 - Mind the gap: modelling learning in a professional curriculum

Jo Smedley, Newport Business School, University of Wales, Newport, Allt-yr-yn Avenue, NP20 5DA, Newport, United Kingdom, jo.smedley@newport.ac.uk

In an increasingly litigious society, a legal understanding is often required to support learning in non-related areas. Accessibility can be assured through a range of technological and non-technological learning approaches with information appropriately 'packaged' to engage with a widened range of learners. This presentation will reflect on lessons learned during project development and implementation and present a model for action learning involving a professional curriculum. Outcomes reflect the differences in user expectations between academic and professional subjects.

2 - Unemployment Similarities among Portuguese Regions — a Cluster Analysis Approach

Elisa Barros, Escola Superior de Tecnologia e Gestão, Instituto Politécnico de Bragança, Campus de Sta Apolónia, Apartado 1134, 5301-857, Bragança, Bragança, Portugal, ebarros@ipb.pt, *Alcina Nunes*

The regional distribution of the unemployed individual characteristics is of core importance for the development of public policies that can fight the unemployment phenomenon, especially in times of crises. The data mining cluster methodology allows finding groups of regional areas that share the same characteristics for the register unemployed and, therefore, helps in a better understanding of the problem and possible solutions. Preliminary results for the Portuguese regions show a clear division of the territory among four regions — north and south and urban and rural areas of the country — concerning individual characteristics such as the gender, age, education or unemployment duration. These results have policy consequences.

3 - Need for educational policy-making for the sustainable development of children living in poverty

Hanife Akar, Department of Educational Sciences, Middle East Technical University, Orta Dogu Teknik Universitesi, Egitim Fakultesi EF 316, 06531, Ankara, Turkey, hanif@metu.edu.tr, *Aysegul Ozsoy*

Improving educational opportunities for children of poverty may have a positive impact on their lives, especially, it may lead them to an upward social mobility to enhance a sustainable future. This talk is based on data drawn from a nationwide study whose participants are parents and children from squatter neighborhoods. Findings rate financial issues at the top of needs, and urge schools to provide children with poor households better school quality facilities to receive equality of opportunity in education. Also, social adaptation to urban live emerges as a need for social policy-making.

■ WE-22

Wednesday, 15:40-17:00

3.1.10

Maritime Logistics: Theory and Practice

Stream: Maritime Logistics

Invited session

Chair: *Heng-Soon Gan*, Mathematics and Statistics, University of Melbourne, Australia, Department of Mathematics and Statistics, University of Melbourne, 3010, Parkville, VIC, Australia, hsg@unimelb.edu.au

1 - Robust short-sea ship routing and scheduling

Cristina Requejo, DMat-CIDMA, University of Aveiro, 3810-193, Aveiro, Portugal, crequejo@ua.pt, *Agostinho Agra*, *Marielle Christiansen*, *Rosa Maria Figueiredo*, *Lars Magnus Hvattum*

A fleet of ships must service a given set of cargoes. Several ports are closed for service during nights and weekends, the loading or discharging may take several days, and it is important to avoid ships waiting in ports during the weekend before finishing the service. Maritime transportation is associated with a high degree of uncertainty, mainly due to bad weather and unpredictable service times. We discuss how to design robust ship routes and schedules and present mathematical models.

2 - Optimizing Schedules for Cooperative Engagements from a United States Navy Sea Base

Javier Salmeron, Operations Research, Naval Postgraduate School, 1411 Cunningham Rd, 93943, Monterey, CA, United States, jsalmeron@nps.edu, *Jeffrey Kline*, *Greta S. Densham*

This work presents Global Fleet Station Mission Planner (GFSMP), an optimization tool to aid in planning and scheduling of humanitarian-assistance and other theater-security cooperation missions for the U.S. Navy. GFSMP helps fleet staffs to examine how one naval ship deployed for six months with embarked teams can best meet its mission and logistical requirements. We illustrate the application of GFSMP in the U.S. Second Fleet's Trident Warrior 2009 exercise. Solutions significantly improve total mission value achieved and reduce costs compared to manual planning.

3 - Discrete time models for an Inventory Ship Routing Problem

Agostinho Agra, Matemática, Universidade de Aveiro, campus universitário de santiago, 3810-193, Aveiro, Portugal, aagra@ua.pt, *Marielle Christiansen*, *Henrik Andersson*

We consider an Inventory Ship Routing Problem that combines routing and inventory management at all ports of a single product. The product is produced and stored at production ports and transported by a heterogeneous fleet of ships to the consumption ports. Inventory capacities are considered on the production and consumption ports. We present a mathematical formulation of the problem where the time is discretized to easily take the varying production and consumption rates into account. Then we discuss different approaches to strengthen that formulation and report computational results.

4 - A Multi-Product Inventory Routing Problem with Varying Consumption Rates

Heng-Soon Gan, Mathematics and Statistics, University of Melbourne, Australia, Department of Mathematics and Statistics, University of Melbourne, 3010, Parkville, VIC, Australia, hsg@unimelb.edu.au, *Henrik Andersson*, *Marielle Christiansen*

We consider here a maritime inventory routing problem with varying consumption rates minimising total shipment, inventory and purchasing costs. There are draft limitations on ships entering production and consumption ports. More than one product can be loaded onto a ship. We will present an arc-based formulation for this problem and report on some preliminary results, including a decomposition attempt.