Programme Doctoral en Recherche Opérationnelle

Zinal Autumn Seminar 2014, August 31–September 3

	Sunday 31	Monday 1	Tuesday 2	Wednesday 3
07:30 - 08:30		Breakfast	Breakfast	Breakfast
08:30 - 10:00		Frejinger	Frejinger	Frejinger
10:00 - 10:30		Coffee	Coffee	Coffee
10:30 - 12:00		Minner	Minner	Peer-review Workshop: Baumann (Chair: Frejinger)
12:00 - 15:30		Sport and discussions	Zinal: 13:21 Moiry: 13:59 Visit Moiry: 14:00 - 15:30 Moiry: 15:53 Zinal: 16:32	
15:30 - 17:00		Frejinger		
17:00 - 17:30		Coffee		
17:30-19:00	Minner	Minner	Peer-review Workshop: Maknoon (Chair: Minner)	
19:00-19:30	Apéro			
19:30	Dinner	Dinner	Dinner	

Venue:
Hotel Europe
3961 Zinal
Tel.: 027 475 44 04

Public transport:
Station *Zinal Poste*

Keynote presentations

Stefan Minner (TUM): **Large scale optimization under uncertainty**

This mini course will give an overview on uncertainty modeling and stochastic optimization methods with a particular focus on the capability to solve large scale problems. The methods are illustrated using examples from multi-echelon inventory optimization and supply network design.

Title: **Markov Decision Processes and Approximate Dynamic Programming - Algorithms, approximations and decomposition schemes**

Abstract: Techniques for solving large Markov Decision Processes based on Linear Programming techniques and Approximate Programming are presented as generic methods to deal with large state space stochastic dynamic programs.

Title: **Applications in multi-echelon inventory theory**

Abstract: Various real world applications involve a magnitude of state variables (inventory levels of different ages and at different stages) and are therefore subject to the curses of dimensionality. Modeling and algorithmic strategies for stochastic lot-scheduling problems, multiple sourcing inventory models, perishable item inventory control and multi-echelon problems without a simple policy structure are solved by the approximation and decomposition algorithms presented in Session 1.

Title: **Stochastic programming - Algorithms and sampling strategies**

Abstract: Two and Multi-stage Stochastic Programming is introduced and primal and dual decomposition techniques are illustrated for solving large scale problems. An overview on different sampling strategies and their performance is provided.

Title: **Applications in supply network design**

Abstract: Applications of stochastic programming including different sources of operational and strategic uncertainty like customer demands, transportation freight rates, exchange rates and legislation and decisions on locations, capacities, and process flexibility will be presented.

Emma Robert Frejinger (UdeM): **Demand modelling using static and dynamic discrete choice models**

Probabilistic models for demand are used in various fields to understand and forecast demand. These lectures focus on the demand for discrete alternatives and present some of the theory behind static and dynamic discrete choice models. In the first lecture we give an overview of the different aspects of discrete choice modelling (data, models, estimation and forecasting) presenting examples of applications from various fields. In the second lecture we cover maximum likelihood estimation in more detail and present non-linear optimization algorithms used in this context. The third lecture is dedicated to different types of discrete choice models focusing on ways to model correlation and we present how to apply the models to forecast demand. The last lecture covers dynamic discrete choice models (parametric Markov decision processes) and challenges for using and estimating these models.

Sessions

Title: **Introduction to discrete choice modelling**
Title: **Maximum likelihood estimation**
Title: **Modelling correlation and forecasting**
Title: **Dynamic discrete choice models**

PhD presentations

Mohammad Yousef Maknoon (POLYMTL)

Title: **An integer programming approach to scheduling internal transhipment at cross-docks in less-than-truckload industry**

Abstract: This paper introduces an exact method for solving the problem of material handling at cross-docks in less-than-truckload industries. The scheduling model synchronizes products' transhipments with a consolidation process to reduce operational costs. Some families of valid inequalities are presented to strengthen the formulation. A specialized branching algorithm is developed.Several structural properties and heuristic methods are proposed to enhance the algorithm. Computational experiments of up to 40 trucks illustrate the efficiency of the developed approach. Moreover, this demonstrates a possible reduction in cross-dock operational costs by allowing for flexibilities with processing trucks.

Key words: Cross-Dock, Material Handling, Scheduling, Branch and Bound

Review group 1: Adrian Zimmermann, Tom Rihm, Oliver Strub
Review group 2: Antonin Danalet, Farzaneh Abbaspourtorbati, Iliya Markov, Stefan Binder

Philipp Baumann (UNIBE)

Title: **Efficient symmetry-breaking formulations for grouping customer orders in a printing shop**

Abstract: This paper deals with a real-world printing shop, where the offset-printing technology is used to imprint customer-specific designs on napkin pouches. The optimization problem consists of allocating the designs corresponding to the customer orders to the slots of some printing plates such that the given demand for each design is fulfilled at minimum total overproduction and setup costs; thereby, various technological and organizational constraints arising from the production equipment are to be met. We present two alternative mixed-binary linear programming formulations; a structural difference between the two formulations is that they eliminate symmetric solutions explicitly or implicitly, respectively, from the search space. The computational results for a set of problem instances devised from real-world data indicate that both formulations are able to find optimal solutions for small instances in short CPU times. However, for larger instances, the implicit formulation performs significantly better in terms of average integrality gap and number of instances solved to feasibility.

Key words: Real-world production process, Mixed-binary linear programming, Symmetry-breaking formulations

Review group 1: Evanthia Kazagli, Florian Lücker, Marija Nikolic, Stefano Moret
Review group : Anna Fernández Antolín, Francesco Gallmann, Napat Rujeerapaiboon, Tomas Robenek