CIRRELT

Centre interuniversitaire de recherche
sur les réseaux d'entreprise, la logistique et le transport

Interuniversity Research Centre
on Enterprise Networks, Logistics and Transportation

École printanière sur l'optimisation combinatoire en logistique

Spring School on Combinatorial Optimization in Logistics

17-20 mai 2010 / May 17-20, 2010

Université de Montréal

Bureaux de Montréal :

Université de Montréal
C.P. 6128, succ. Centre-ville
Montréal (Québec)
Canada H3C 3J7
Téléphone : 514 343-7575
Télécopie : 514 343-7121

Bureaux de Québec :

Université Laval
2325, de la Terrasse, bureau 2642
Québec (Québec)
Canada G1V 0A6
Téléphone : 418 656-2073
Télécopie : 418 656-2624

www.cirrelt.ca

Comité organisateur et commanditaires
Organizing Committee and Sponsors

Organisateurs / Organizers

Bernard Gendron, Université de Montréal

Louis-Martin Rousseau, École Polytechnique de Montréal

Soutien administratif / Administrative Support

Lucie-Nathalie Cournoyer, CIRRELT

Johanne Dubois, CIRRELT

Josée Vignola, CIRRELT

Commanditaires / Sponsors

CIRRELT

Direction des relations internationales

Université de Montréal

Canadian Operational Research Society

Société Canadienne de Recherche Opérationnelle

MITACS

Résumé du programme / Program Outline

Si non spécifié, toutes les activités se déroulent au pavillon André-Aisenstadt, 2920 chemin de la Tour.
If not specified, all activities take place at André-Aisenstadt Building, 2920 chemin de la Tour.

Lundi 17 mai / Monday, May 17

Heure / Hour	Séance / Session	Salle / Room
08h30 - 08h45	Inscriptions / Registration	1360
08h45 - 09h00	Séance d'ouverture / Opening Session	1360
09h00 - 10h15	Heuristics for Feasibility and Optimality in Mixed-Integer Programming - Part I	1360
10h15 - 10h45	Pause-café / Coffee Break	1221
10h45 - 12h00	Reprise / Resumption - Heuristics for Feasibility and Optimality in Mixed-Integer Programming - Part I	1360
12h00 - 14h00	Lunch	Agora Pavillon Jean-Coutu
14h00 - 15h15	Heuristics for Feasibility and Optimality in Mixed-Integer Programming - Part II	1360
15h15 - 15h45	Pause-café / Coffee Break	1221
15h45 - 17h00	Reprise / Resumption - Heuristics for Feasibility and Optimality in Mixed-Integer Programming - Part II	1360
17h00 - 19h30	Cocktail	Agora Pavillon Jean-Coutu

Mardi 18 mai / Tuesday, May 18

09h00 - 10h15	Applications in the Forest Sector	1360
10h15 - 10h45	Pause-café / Coffee Break	1221
10h45 - 12h00	Reprise / Resumption - Applications in the Forest Sector	1360
12h00 - 14h00	Lunch	Agora Pavillon Jean-Coutu
14h00 - 15h15	Stochastic and Robust Optimization in Logistics	1360
15h15 - 15h45	Pause-café / Coffee Break	1221
15h45 - 17h00	Reprise / Resumption - Stochastic and Robust Optimization in Logistics	1360

Mercredi 19 mai / Wednesday, May 19

09h00 - 10h15	Airline Crew Scheduling by Column Generation	1360
10h15 - 10h45	Pause-café / Coffee Break	1221
10h45 - 12h00	Reprise / Resumption - Airline Crew Scheduling by Column Generation	1360
12h00 - 14h00	Lunch	Salon Maurice Labbé, 6245
14h00 - 15h15	Latest Advances in Mixed-Integer Programming Solvers	1360
15h15 - 15h45	Pause-café / Coffee Break	1221
15h45 - 17h00	Reprise / Resumption - Latest Advances in Mixed-Integer Programming Solvers	1360

Jeudi 20 mai / Thursday, May 20

09h00 - 10h15	Branch-and-Cut and Branch-and-Price in Logistics Applications	1360
10h15 - 10h45	Pause-café / Coffee Break	1221
10h45 - 12h00	Reprise / Resumption - Branch-and-Cut and Branch-and-Price in Logistics Applications	1360

Programme / Program

Lundi 17 mai / Monday, May 17

09h00 Heuristics for Feasibility and Optimality in Mixed-Integer Programming - Part I

Salle / Room: 1360

Chinneck, John, Carleton University, chinneck@sce.carleton.ca
Lodi, Andrea, University of Bologna, andrea.lodi@unibo.it

Mixed-integer programs are normally solved using an overarching branch-and-bound framework coupled with numerous heuristics for generating a small search tree and for searching it efficiently. We provide an overview of important recent heuristics in three main categories related to MIP feasibility and optimality: (i) achieving the first integer-feasible solution quickly, (ii) reaching MIP optimality quickly, and (iii) analyzing infeasible MIPs. We describe the newer heuristics for reaching integer-feasibility including active-constraint branching variable selection, branching to force change, and the feasibility pump, and well as giving a brief overview of classical methods such as pivot-and-shift and OCTANE. We describe recent algorithms for reaching the MIP-optimum solution quickly, including new node selection rules, local branching, and RINS. Finally, we review the filtering methods for analyzing infeasible MIPS by isolating Irreducible Infeasible Subsets of constraints (IISs) as well as methods for repairing MIP infeasibility through local branching, which can also be used for infeasibility analysis.

14h00 Heuristics for Feasibility and Optimality in Mixed-Integer Programming - Part II

Salle / Room: 1360

Chinneck, John, Carleton University, chinneck@sce.carleton.ca
Lodi, Andrea, University of Bologna, andrea.lodi@unibo.it

Mixed-integer programs are normally solved using an overarching branch-and-bound framework coupled with numerous heuristics for generating a small search tree and for searching it efficiently. We provide an overview of important recent heuristics in three main categories related to MIP feasibility and optimality: (i) achieving the first integer-feasible solution quickly, (ii) reaching MIP optimality quickly, and (iii) analyzing infeasible MIPs. We describe the newer heuristics for reaching integer-feasibility including active-constraint branching variable selection, branching to force change, and the feasibility pump, and well as giving a brief overview of classical methods such as pivot-and-shift and OCTANE. We describe recent algorithms for reaching the MIP-optimum solution quickly, including new node selection rules, local branching, and RINS. Finally, we review the filtering methods for analyzing infeasible MIPS by isolating Irreducible Infeasible Subsets of constraints (IISs) as well as methods for repairing MIP infeasibility through local branching, which can also be used for infeasibility analysis.

Mardi 18 mai / Tuesday, May 18

09h00 Applications in the Forest Sector

Salle / Room: 1360

Rönnqvist, Mikael, Norwegian School of Economics and Business Administration, mikael.ronnqvist@nhh.no

The forest industry has many applications that can be formulated as combinatorial optimization problems. The solution methods are often integrated in decision support systems where optimization is an important tool. To be easy and efficient to use in practice, the models and methods must include special constraints and model possibilities. This includes for example feasibility with respect to potentially erroneous data, multiple objectives and not the least quick solution times. We will cover production planning at pulp mills, inverse shortest path problems to identify parameter values in road databases, integrated harvest and routing planning of harvest teams, strategic logistics planning for bio-energy and routing of logging trucks.

14h00 Stochastic and Robust Optimization in Logistics

Salle / Room: 1360

Erera, Alan, Georgia Institute of Technology, alerera@isye.gatech.edu

Many problems in logistics planning are best modeled using optimization models that use parameters with uncertain values. Stochastic optimization models will refer to those that seek solutions with best expected value of an objective or use chance constraints, while robust optimization approaches typically attempt to optimize solution quality under a worst-case scenario. This talk will discuss logistics optimization modeling under uncertainty, and present models and solution approaches for applied problems in vehicle routing, resource repositioning, and service network design.

Mercredi 19 mai / Wednesday, May 19

09h00 Airline Crew Scheduling by Column Generation

Salle / Room: 1360

Desaulniers, Guy, École Polytechnique de Montréal, Guy.Desaulniers@gerad.ca
Soumis, François, École Polytechnique de Montréal, francois.soumis@gerad.ca

Airline crew scheduling consists of determining, for a set of crew members, least-cost schedules that cover all flights and respect various working rules. A schedule is a sequence of pairings interspersed by rest periods that may contain days off. A pairing is a sequence of flights, connections, and rests starting and ending at the same crew base. Given its high complexity, the crew scheduling problem has been traditionally tackled using a sequential two-step approach, where a crew pairing problem is solved in the first step and a crew assignment problem in the second. Both problems are often solved using column generation. In this talk, we present these two problems and expose the basics of column generation for solving them. We also discuss a recent methodology, called dynamic constraint aggregation, that can be used to speed column generation and to solve the crew scheduling problem in a single step.

14h00 Latest Advances in Mixed-Integer Programming Solvers

Salle / Room: 1360

Bixby, Robert E., Gurobi Optimization Inc., bixby@gurobi.com

We will examine the design and features of the new Gurobi mixed-integer programming solver. This will include a discussion of the underlying tree-of-trees structure employed in the branch-and-bound search and the Gurobi implementation of deterministic parallelism. We will also discuss the new ideas that have been implemented in the Gurobi heuristics, cutting-plane routines, and presolve including a discussion of the general concept of domination.

Jeudi 20 mai / Thursday, May 20

09h00 Branch-and-Cut and Branch-and-Price in Logistics Applications

Salle / Room: 1360

Lysgaard, Jens, University of Aarhus, lys@asb.dk

The presentation contains two parts. The first part concerns the use of Branch-and-Cut in vehicle routing and focuses on selected issues in the use of Branch-and-Cut for three interrelated vehicle routing problems, namely CVRP (the Capacitated Vehicle Routing Problem), COVRP (the Capacitated Open Vehicle Routing Problem), and DCVRP-B (the Disrupted Capacitated Vehicle Routing Problem with Vehicle Breakdown). The second part focuses on selected issues in the use of Branch-and-Price for two other vehicle routing problems, namely the CVRP with Stochastic Demands and the Capacitated Arc Routing Problem with Stochastic Demands.