2010 Mixed Integer Programming Workshop

July 26th - 29th

Georgia Institute of Technology, Atlanta, GA

Sponsors

We are grateful to the following sponsors for their support of MIP2010. The sponsors are listed in order of their contribution with ties broken alphabetically.

Welcome

Continuing with the vibrant tradition of the founding MIP workshop held at Columbia University in 2003, and the follow-up workshops: MIP 2005 (IMA, Minneapolis), MIP 2006 (University of Miami), MIP 2007 (Centre de Recherches Mathématiques at the University of Montreal), MIP 2008 (Columbia University) and MIP 2009 (UC Berkeley), it is our distinct pleasure to welcome you to the seventh MIP workshop at Georgia Tech in Atlanta.

MIP workshops run from the energy and direct contributions of mixed integer optimizers all over the world. While mixed integer programming has a long history, MIP workshops are relatively new. The workshop series is designed to bring together the integer programming research community in an annual meeting and pays particular attention to highlight the works of junior researchers. For more information on the MIP Workshop Series, please check our Google web site:

`http://sites.google.com/site/gimmemip/`

This year's workshop program includes 25 invited talks and 23 posters selected from a large number of submissions. The talks and posters represent the many diverse trends and challenges of our field. We hope you will have a stimulating workshop and enjoy your time in Atlanta.

We are thankful to several student and staff volunteers from ISyE, Georgia Tech for their help. In particular, we are indebted to Harry Sharp for logistical and administrative support and to Mike Alberghini for help with the MIP2010 website.

MIP 2010 Organizing Committee:

Shabbir Ahmed (Georgia Institute of Technology)
Ismael Regis de Farias Jr. (Texas Tech University)
Ricardo Fukasawa (University of Waterloo)
Matthias Koeppe (University of California, Davis)
Andrea Lodi (University of Bologna)

E-mail: `mip2010@isye.gatech.edu`
Webpage: `www2.isye.gatech.edu/mip2010`

Program and Abstracts

All talks and coffee breaks will be at the Georgia Tech student Center Theater (350 Ferst Drive, Atlanta, Georgia 30332). The Reception and Poster Presentation will be in the Atrium of the ISyE Building (765 Ferst Drive, Atlanta, Georgia 30332). The conference dinner will be at the Georgia Tech Hotel (800 Spring Street, Atlanta, GA 30308).

Monday July 26 8:00-8:45am
Registration

Monday July 26 8:45-9:00am
Welcome remarks

Monday July 26 9:00-9:30am
Speaker: Jon Lee

Matroid Matching: The Power of Local Search
We consider the classical *matroid matching* problem. Unweighted matroid matching for linear matroids was solved by Lovász, and the problem is known to be intractable for general matroids. We present a PTAS for unweighted matroid matching for general matroids. In contrast, we show that natural LP relaxations that have been studied have an $\Omega(n)$ integrality gap even for linear matroids and moreover, $\Omega(n)$ rounds of the Sherali-Adams hierarchy are necessary to bring the gap down to a constant. More generally, for any fixed $k \geq 2$ and $\epsilon > 0$, we obtain a $(k/2 + \epsilon)$-approximation for matroid matching in k-uniform hypergraphs, also known as the matroid k-parity problem. As a consequence, we obtain a $(k/2 + \epsilon)$-approximation for the problem of finding the maximum-cardinality set in the intersection of k matroids. We also design a $3/2$-approximation for the weighted version of a known special case of matroid matching, the *matchoid problem*.

This is joint work with Maxim Sviridenko and Jan Vondrák.

Monday July 26 9:30-10:15am
Speaker: Santosh Vempala

Implicit Hitting Sets for Discrete Optimization
A hitting set for a collection of sets T is a set that has a non-empty intersection with each set in T; the hitting set problem is to find a hitting set of minimum cardinality. Motivated by the fact that there are instances of the hitting set problem where the number of subsets to be hit is large, we introduce the notion of implicit hitting set problems. In an implicit hitting set problem the collection of sets to be hit is typically too large to list explicitly; instead, an oracle is provided which, given a set H, either determines that H is a hitting set or returns a set in T that H does not hit. Following a number of examples of classic implicit hitting set problems, we show how this framework is valuable in developing approximation algorithms. We illustrate this methodology by presenting a simple on-line algorithm for the minimum feedback vertex set problem. We will also discuss this approach in the context of integer programming.

This is joint work with Karthik Chandrasekaran, Richard Karp and Erick Moreno-Centeno.

Monday July 26 10:15-11:00am
Coffee Break

Monday July 26 11:00-11:45am
Speaker: Karen Aardal

Single-Row IP, Reformulations, and Volumes
We consider a single-row IP and compare lattice reformulations based on two different lattices. In particular, one of these lattices is explained in the light of the proof of Lenstra's IP-algorithm. We discuss the volume of the polytopes obtained by the reformulations, and illustrate with computational results.

Monday July 26 11:45am-12:15pm
Speaker: Michele Conforti

Perfect Formulations for Mixed-Integer Programs
We model a mixed-integer set S as a pure integer set by expressing each continuous variable as the average of k integral variables. We use these additional integral variables to strengthen the inequalities that describe S. For selected mixed-integer sets, like mixed-integer vertex covers in bipartite graphs, this strengthening yields an extended formulation for the convex hull of the feasible solutions. We discuss special cases for which we can explicitly project our extended formulation to yield a formulation in the original space. In particular we provide a characterization of the convex hull of the continuous mixing set with flows. This is joint work with Laurence Wolsey and Giacomo Zambelli.

Monday July 26 12:15-2:15pm
Lunch Break

Monday July 26 2:15-3:00pm
Speaker: Egon Balas

Lift-and-Project cuts as Intersection Cuts: The Geometric View
Lift-and-Project cuts generated from the optimal LP tableau start from a source row for a Gomory mixed integer (GMI) cut, and perform several pivots that result in a new, infeasible tableau, such that the GMI cut from the same source row of the new tableau is stronger than the one from the original tableau. Here stronger means more violated by the optimal LP solution to be cut off. As a result, k rounds of lift-and project cuts applied at the root node of a search tree close a substantially larger percentage of the integrality gap than k rounds of GMI cuts. This behavior also prevails when lift-and-project is applied to disjunctive cuts other than GMI cuts, for instance to Reduce-and-Split cuts. However, when a full branch-and-bound run is executed after adding the k rounds of cuts at the root node, there is a substantial variance in the outcomes. This suggests that cut strength as defined above is an imperfect measure of the overall usefulness of the cut. It is, in fact, a measure of local strength. A cut is globally stronger than another one if it dominates the latter, i.e. has smaller coefficients for the same righthand side, with at least one strictly smaller one. We examine ways of generating cuts that dominate a given cut, by using the intersection cut perspective, i.e. returning lift-and-project to its origins.

Monday July 26 3:00-3:30pm
Coffee Break

Monday July 26 3:30-4:00pm
Speaker: Pierre Bonami

Some Experiments on Computing the Lift-and-Project Closure
The lift-and-project closure is obtained by computing all lift-and-project cuts from the initial formulation of a MIP or equivalently by computing all Gomory cuts read from all tableaus corresponding to feasible and infeasible bases. In this talk, we present an algorithm for approximating the value of the lift-and-project closure. At the heart of the method is a separation linear programming problem which is obtained from the original linear relaxation by simply modifying the bounds on the variables and constraints. This separation LP can also be seen as the dual of the cut generation LP used in lift-and-project procedures with a particular normalization. We study some properties of this separation LP in particular relating it to the equivalence between lift-and-project cuts and Gomory cuts shown by Balas and Perregaard. Finally, we present some computational experiments and comparisons with recent related works.

Monday July 26 4:00-4:30pm
Speaker: Stefano Smriglio

Strong Lift-and-Project Cutting Planes for the Stable Set Problem
Given a graph $G = (V, E)$, QSTAB(G) denotes the polytope defined by the *clique* and *non-negativity inequalities*. The application of the Lovász-Schrijver $M(k, k)$ lifting operator to QSTAB(G) yields a strong non-compact linear relaxation of the stable set problem, as illustrated in Giandomenico et al.(2008). In particular, the upper bounds obtained by optimizing over $M(QSTAB(G), QSTAB(G))$ are comparable, sometimes better, than the Lovász theta number $\theta(G)$ as well as stronger bounds computed by semidefinite programming techniques (Burer, Vandenbussche 2006, Gruber and Rendl 2003, Dukanovic and Rendl 2007). In this talk we illustrate the projection of $M(QSTAB(G), QSTAB(G))$ onto the original space by the Benders decomposition. An extensive computational experience is presented showing that the resulting cutting planes are effective and the method promising for practical implementations.

Monday July 26 4:45-7:00pm
Poster presentations and Reception

Tuesday July 27 9:00-9:45am
Speaker: Ellis Johnson

Some Recent Results on Gomory's Group Polyhedra
The first result is a characterization of the adjacent facets of the mixed-integer cut on the group polytope. Another way to say this is a characterization of the facets of the mixed-integer cut polytope where we mean the polytope that is the face of the group polyhedron defined by the mixed-integer cut facet. The characterization is in terms of the facets of the knapsack polytope. The second result is two new, large classes of facets of the binary group problem. This result is proved using results of Araoz and Johnson on facets from morphic liftings, and some related lifting results are pointed out. The third result is a characterization of the facets of the subadditive polytope. This polytope is the convex hull of the facets of the group polyhedron. In other words, it is the convex hull of the vertices of the blocker of the group polyhedron, and it sharpens Gomory's subadditive characterization on facets. We relate this result to vertices of length three and characterize such vertices.

This is joint work with Sangho Shim, Yan Shu, and Steve Tyber.

Tuesday July 27 9:45-10:30am
Speaker: Matteo Fischetti

Gomory Reloaded
Gomory's Mixed-Integer Cuts (GMICs) are widely used in modern branch-and-cut codes for the solution of Mixed-Integer Programs. Typically, GMICs are iteratively generated from the optimal basis of the current Linear Programming (LP) relaxation, and immediately added to the LP before the next round of cuts is generated. Unfortunately, this approach is prone to instability.

In this talk we analyze a different scheme for the generation of rank-1 GMICs read from a basis of the original LP—the one before the addition of any cut. We adopt a relax-and-cut approach where the generated GMICs are not added to the current LP, but immediately relaxed in a Lagrangian fashion.

Various elaborations of the basic idea are presented, that lead to very fast—yet accurate—variants of the basic scheme. Very encouraging computational results are presented, with a comparison with alternative techniques from the literature also aimed at improving the GMIC quality. We also show how our method can be integrated with other cut generators, and successfully used in a cut-and-branch enumerative framework.

This is joint work with Domenico Salvagnin.

Tuesday July 27 10:30-11:00am
Coffee Break

Tuesday July 27 11:00-11:45am
Speaker: Zonghao Gu

MIP Domination
This talk considers the identification and use of domination information in MIP models. This information can be used to simplify a model in presolve, and to avoid unnecessary search in the branch-and-bound algorithm. We discuss different MIP domination techniques, such as variable domination, node domination and symmetry breaking, and present computational results to show that these techniques can significantly improve the performance of a MIP solver.

Tuesday July 27 11:45am-12:15pm
Speaker: Marc Pfetsch

Analyzing Infeasible MIPs
The analysis of infeasible MIPs is hard, since no "nice" characterization of infeasibility is known. Nevertheless, infeasible MIPs occur in practice and also in proofs of optimality. This talk takes a computational view on infeasibility detection and analysis. The first part of the talk deals with several techniques to speed up the infeasibility detection. This includes an investigation of the effect of branching rules and cutting planes. The second part treats methods to analyze the infeasibility. This includes computing a maximum feasible subsystem and a minimum infeasible subsystem. It turns out that minimal infeasible subsystems are much harder to handle than maximal feasible subsystems, which is in contrast to the LP case.

Tuesday July 27 12:15-2:15pm
Lunch Break

Tuesday July 27 2:15-3:00pm
Speaker: Daniel Espinoza

From Branching to Cutting (and back again)
While branching has been a successful scheme to solve very large MIP in general, It also has, by its very nature, a diminishing effect in the long run. For this very same reason, several iterated schemes have been proposed in different context. Applegate et. al used partial information of B&B trees in iterated runs to solve the largest instances from the TSPLIB. Balas et. al propose deriving cuts in an explicit way when the branching was based on variables. CPLEX use bounds on an initial B&B tree to iterate the pre-processing step and strengthen the formulation. In this talk we use the Local Cuts Procedure to (depending on the mapping, partially) summarize a B&B tree (possibly with locally valid cuts on the leafs) as cuts back at the root node. Thus allowing to iterate the process. Extended computational tests will be presenting on the quality.

This is joint work with Vašek Chvátal and William Cook.

Tuesday July 27 3:00-3:30pm
Coffee Break

Tuesday July 27 3:30-4:00pm
Speaker: Tobias Achterberg

LP Basis Selection and Cutting Planes
Typically, the LP relaxation of a MIP model has multiple optimal solutions. Experiments of Danna (2008) demonstrate that the choice of the optimal LP basis can have a significant impact on the total MIP solving time.

As a first step towards improving MIP solvers by selecting "good" LP bases, we describe a heuristic implemented in CPLEX 12 to produce an optimal LP solution with favorable properties during the cutting plane loop at the root node. This heuristic combines two ideas of Fischetti and co-authors: the Feasibility Pump plus decoupling cut separation from LP re-solves. The latter has been discussed in the context of Gomory cuts and solving the LPs using the lexicographic simplex.

Tuesday July 27 4:00-4:30pm
Speaker: Simge Küçükyavuz

Computations with the Cutting Plane Tree Algorithm
We give a finite disjunctive programming procedure to obtain the convex hull of general mixed-integer linear programs (MILP) with bounded integer variables. In addition, we propose a pure disjunctive cutting plane algorithm, which converges to an integral optimal solution in finitely many iterations, using cuts from multi-term disjunctions. We refer to this algorithm as the cutting plane tree algorithm, as the multi-term disjunctions used to generate cuts are guided by a tree. We present computational results with the cutting plane tree algorithm using MIPLIB instances. The computations compare the effect of alternative normalizations, as well as decomposition methods for the cut generation LP.

This is joint work with Binyuan Chen and Suvrajeet Sen.

Tuesday July 27 7:00-10:00pm
Conference Dinner

Wednesday July 28 9:00-9:45am
Speaker: Sanjeeb Dash

Two Dimensional Lattice-Free Cuts and Asymmetric Disjunctions for Mixed-Integer Polyhedra
In this talk, we study the relationship between 2D lattice-free cuts, the family of cuts obtained by taking two-row relaxations of a mixed-integer program (MIP) and applying intersection cuts based on maximal lattice-free sets in $\mathbb{R}^2$, and various types of disjunctions. Balas (2009) initiated the study of cuts for the two-row continuous group relaxation obtained from 2-branch split disjunctions. We study these cuts (and call them cross cuts) and also consider cuts obtained from asymmetric 2-branch disjunctions which we call crooked cross cuts. We show that all 2D lattice-free cuts, and some cutting planes in the literature for variants of the two-row continuous group relaxation, are crooked cross cuts. For general mixed integer sets, we extend results in Nemhauser and Wolsey (1990) on the equivalence of split cuts and mixed-integer rounding cuts. We prove that for the corner relaxation of an MIP, every crooked cross cut is a 2D lattice-free cut. This is joint work with Santanu Dey and Oktay Günlük. Finally, we present the result of some computational experiments with cross cuts and crooked cross cuts, performed jointly with Oktay Günlük and Juan Pablo Vielma.

Wednesday July 28 9:45-10:15am
Speaker: Quentin Louveaux

Sparse Two-Row Cuts and an Algorithm for the Separation Problem
We propose a systematic way to generate sparse cuts from multiple rows of the simplex tableau. We also discuss the question of separation for a multi-row model. To this end, we consideer the polar system allowing to generate valid inequalities. In order to avoid generating the large number of constraints of the polar, we consider a reduced version of it that we dynamically extend. Checking the validity of an inequality is done geometrically. Compuattional results showing the efficiency of the algorithm are presented. This is a joint work with Laurent Poirrier.

Wednesday July 28 10:15-11:00am
Coffee Break

Wednesday July 28 11:00-11:45am
Speaker: Andrea Tramontani

Two Row Tableau Cuts: How, Where and When!
Following the flurry of recent theoretical work on cutting planes from two row mixed integer group relaxations of an LP tableau, we report on some computational tests to evaluate the effectiveness of two row cuts based on lattice-free (type 2) triangles having more than one integer point on one side. A heuristic procedure to generate such triangles is presented, and then the coefficients of the integer variables are tightened by lifting.

In order to understand the effectiveness of the triangle cuts, we evaluate the gap closed at the root node by comparing Gomory mixed integer cuts, two row cuts based on lattice-free splits, and the triangle cuts generated by our heuristic. Our tests are carried out on different classes of randomly generated instances designed to represent different models in the literature, as well as on instances from the literature.

This is joint work with Santanu S. Dey, Andrea Lodi, and Laurence A. Wolsey.

Wednesday July 28 11:45am-12:15pm
Speaker: Giacomo Zambelli

Multi-Row Cuts for Mixed-Integer Programming
Cutting planes, most notably Gomory cuts, are among the most important components in state-of-the-art mixed-integer linear programming solvers. These cuts are traditionally derived from a single row of the optimal simplex tableau. However, recent innovation in considering multiple rows of the tableau to produce cutting planes (referred to as "multi-row cuts") has garnered significant interest in the community. In this talk, we consider multi-row cuts derived from relaxing the integrality condition of all non-basic variables in the simplex tableau. We give a closed-form formula to derive all such cuts and provide a precise geometric characterization. Finally, we will briefly discuss methodologies to strengthen these inequalities by "lifting" the coefficients of the original integer variables.

This is joint work with A. Basu, M. Conforti, and G. Cornuéjols.

Wednesday July 28 12:15-2:15pm
Lunch Break

Wednesday July 28 2:15-3:00pm
Speaker: Jim Ostrowski

Symmetry in Scheduling Problems
The presence of symmetry is common in certain types of scheduling problems. Symmetry can occur when one is scheduling a collection of jobs on multiple identical machines, or if one is determining production schedules for identical machines. General symmetry-breaking methods can be strengthened by taking advantage of the special structure of the symmetry group in scheduling problems. In this talk, we will present a strengthened version of orbital branching, and discuss when it should and should not be used in practice. Using operating room and power generator scheduling problems as sample problems, we will provide computational results comparing different methods of symmetry breaking.

This is joint work with Miguel Anjos and Anthony Vannelli.

Wednesday July 28 3:00-3:30pm
Coffee Break

Wednesday July 28 3:30-4:00pm
Speaker: Michele Monaci

Branching on Nonchimerical Fractionalities
In this talk we address methods for selecting the branching variable in a branch-and-bound algorithm. It is well-known that this is a crucial step for the effectiveness of the resulting solution method. Many criteria have been proposed in the literature, most of which are based on the impact of branching constraints on the LP solution values at the descendant nodes. Among them, strong branching and pseudocosts seem to be the most effective strategies. Indeed, the former requires the (possible approximate) solution of two LPs for each candidate variable, whereas the latter turns out to be more effective when some information on the problem is available, hence its applicability at the first nodes of a branch-and-bound tree is problematic. In this talk we present a heuristic way, that we call *Threshold Branching* (TB), to reduce the set of variables that are candidate for branching. TB is based on the solution of a few LPs and is intended to remove from the list of candidates all those variables whose fractionality is *chimerical*, in the sense that can be removed by allowing just a little worsening of the objective function. Preliminary computational results on instances from the literature will be discussed.

This is joint work with Matteo Fischetti.

Wednesday July 28 4:00-4:30pm
Speaker: Martin Savelsbergh

Finding Good MIP Solutions by Restricted Tree Search
Starting with the branch-and-bound tree associated with the solution of a restricted mixed integer program (MIP), i.e., a MIP in which some variables are fixed, we expand certain nodes of the search tree by using dual information to selectively free previously fixed variables in the hope of quickly finding improved solutions.

This is joint work with Menal Guzelsoy and George Nemhauser.

Wednesday July 28 5:00-6:00pm
Business Meeting

Thursday July 29 9:00-9:30am
Speaker: Jim Luedtke

Relaxations of Multilinear Functions in Mixed-Integer Nonlinear Programming
We study relaxations of multilinear functions appearing in mixed-integer nonlinear programming problems. Such functions appear in many applications, including blending and electricity transmission. A classical approach for relaxing problems containing these nonconvex functions is to construct McCormick envelopes for each product term. We show that for a single bilinear function, the relaxations obtained from this approach are provably close to the convex and concave envelopes of the functions. To our knowledge, this is the first approximation-ratio type result for the strength of a relaxation in a global optimization problem. We next consider problems with multilinear functions appearing in multiple places, and present an approach for obtaining relaxations that are stronger than the McCormick relaxation, but which are more compact than the (exponential-sized) formulations based on the convex and concave hulls of the functions. Computational results will be presented.

This is joint work with Jeff Linderoth and Mahdi Namazifar.

Thursday July 29 9:30-10:15am
Speaker: Andrew Miller

Strong Formulations for Multi-Linear Sets
We study the convex hull of the bounded, nonconvex set defined by a product of n variables: $M_n = \{(x_1, \ldots, x_n, x_{n+1}) \in \mathbb{R}^{n+1} : x_{n+1} = \prod_{i=1}^{n} x_i; \ell_i \leq x_i \leq u_i, i = 1, \ldots, n+1\}$, for any $n \geq 2$. We seek to derive strong valid formulations for M_n that can be used by exact solvers for nonconvex problems.

We first consider polyhedral relaxations, as these are employed by most spatial branch-and-bound solvers. We present a class of linear inequalities that, together with the well-known McCormick inequalities, defines the convex hull of M_2. This class of inequalities, which we call *lifted tangent inequalities*, is uncountably infinite, which is not surprising given that the convex hull of M_2 is not a polyhedron.

For $n > 2$, a number of questions remain open, even for the case in which $\ell_{n+1} = \prod_{i=1}^{n} \ell_i$ and $u_{n+1} = \prod_{i=1}^{n} u_i$ (i.e., in which the product is effectively unbounded). We discuss issues related to the complexity of optimizing and separating over this set. Among other results, we give extended formulations for some special cases, and discuss how the lifted tangent inequalities generalize to $n > 2$ when nontrivial bounds are imposed on the product. Time permitting, we will also discuss strong *nonlinear* formulations for M_n.

This is joint work with Pietro Belotti and Mahdi Namazifar.

Thursday July 29 10:15-11:00am
Coffee Break

Thursday July 29 11:00-11:45am
Speaker: J.-P. Richard

Explicit Convex and Concave Envelopes via Polyhedral Subdivisions
In this talk, We derive explicit convex and concave envelopes of several nonlinear functions over subsets of a hyper-rectangle. These envelopes are derived by identifying polyhedral subdivisions of the hyper-rectangle over which the envelopes can be developed easily. In particular, we use a classical result of Lovász to construct the concave envelopes of concave-extendable supermodular functions. We then use orthogonal disjunctions theory to develop the convex envelopes of disjunctive convex functions. Finally we utilize a result on convex extensions to convexify symmetric functions of binary variables. We show that many convex/concave envelope formulae in the literature are special cases of our constructions. We also introduce the convex/concave envelope of many new functions that have potential uses in factorable nonlinear programming. Throughout, we discuss the use of these results in the solution of mixed integer nonlinear programs.

This is joint work with Mohit Tawarmalani and Chuanhui Xiong (Krannert School of Management, Purdue).

Thursday July 29 11:45am-12:30pm
Speaker: Juan Pablo Vielma

The Chvátal-Gomory Closure of a Strictly Convex Body
In this paper, we prove that the Chvátal-Gomory closure of a set obtained as an intersection of a strictly convex body and a rational polyhedron is a polyhedron. Thus, we generalize a result of Schrijver which shows that the Chvátal-Gomory closure of a rational polyhedron is a polyhedron.

This is joint work with Daniel Dadush and Santanu S. Dey.

Posters

S. Coniglio, E. Amaldi, S. Gualandi. Exact Bi-Criteria Cutting Plane Generation for Inequalities with 0-1 Coefficients

C. D'Ambrosio, A. Frangioni, L. Liberti, A. Lodi. On Interval-Subgradient and No-Good Cuts

S. de Vries, O. Bastert, B. Hummel. A Generalized Wedelin Heuristic for Integer Programming

S. Drewes, S. Pokutta. Cuts for a Class of Mixed 0/1 Second Order Cone Programs

D. Gade, S. Küçükyavuz. Lot-sizing with Fixed Charges on Stocks and Backorders

S. Gollowitzer, L. Gouveia, I. Ljubic. MIP Approaches to the Two Level Network Design Problem with Facilities

A. Gupte. MIP Heuristics for Bilinear Programming Problems

Q. He, S. Ahmed, G.L. Nemhauser. A Probabilistic Comparison of Split Cuts and Type 1 Triangle Cuts

H. Jeon, J.T. Linderoth. Inequalities for a Nonseparable Quadratic Set

M. Kilinc, J.T. Linderoth, J. Luedtke, A. Miller. Practical Disjunctive Cuts for Convex Mixed Integer Nonlinear Programs

E. Kozyreff, I.R. de Farias JR., R. Gupta, Ming Zhao. Branch-and-Cut for Separable Piecewise Linear Optimization and Extensions

A. Mahajan. Intersection Cuts for Constraints with Concave Functions

H.A. Mahmoud, J.W. Chinneck. Achieving Integer Feasibility Quickly by Alternating Axis-Parallel and General Disjunctions

J. Marecek et al. Computational Experience with an Interior Point Method and Conic Cuts for Integer Least Squares

M. Namazifari, J.T. Linderoth, J. Luedtke, A. Miller. Strong Relaxations for Global Optimization Problems with Multilinear Terms

G. Nannicini, G. Cornuéjols. Reduce-And-Split Revisited: Efficient Generation of Split Cuts for Mixed-Integer Linear Programs

V. Narayanan. Split Closures of Convex Mixed-Integer Sets

L. Poirrier, Q. Louveaux. A Computational Survey of Best-Case Gap Closure for Various Relaxations

A. Qualizza, E. Balas. An Enhanced Monoidal Strengthening Procedure for Mixed Integer Cuts

S. Sanjeevi, K. Kianfar. A Polyhedral Study of Triplet Formulation for Single Row Facility Layout Problem

S. Shen, J.C. Smith, S. Ahmed. Expectation and Chance-constrained Models and Algorithms for Insuring Critical Paths

M. Tural, G. Pataki. Basis Reduction and the Complexity of Branch-and-Bound

K. Wolter, W. Cook, T. Koch, D. Steffy. Designing an Efficient Branch-and-Bound Approach for Exact Integer Programming

Useful Local Information

Venue

All talks and coffee breaks will be at the Georgia Tech student Center Theater (350 Ferst Drive, Atlanta, Georgia 30332). The Reception and Poster Presentation will be in the Atrium of the ISyE Building (765 Ferst Drive, Atlanta, Georgia 30332). The conference dinner will be at the Georgia Tech Hotel (800 Spring Street, Atlanta, GA 30308). See map on the next page.

Getting Around

The Tech Trolley provides service between Technology Square (Georgia Tech Hotel), the Midtown MARTA Station, and the main campus. The route extends to the ISyE building to the west, and runs through the heart of campus along Ferst Drive. To the east, the Trolley runs along 5th Street, with a smaller loop for the Technology Square/Midtown MARTA station. The loop includes Spring Street to the west, 10th Street to the north and West Peachtree Street to the east. The Trolley runs every 12 minutes between 5:45am-10:00pm on weekdays, and 10:00am-5:30pm on Saturdays and 3:00pm-9:00pm on Sundays. A map of the Tech Trolley route is available on the next page.

Some Dining Options

At the Georgia Tech Student Center (the workshop venue):

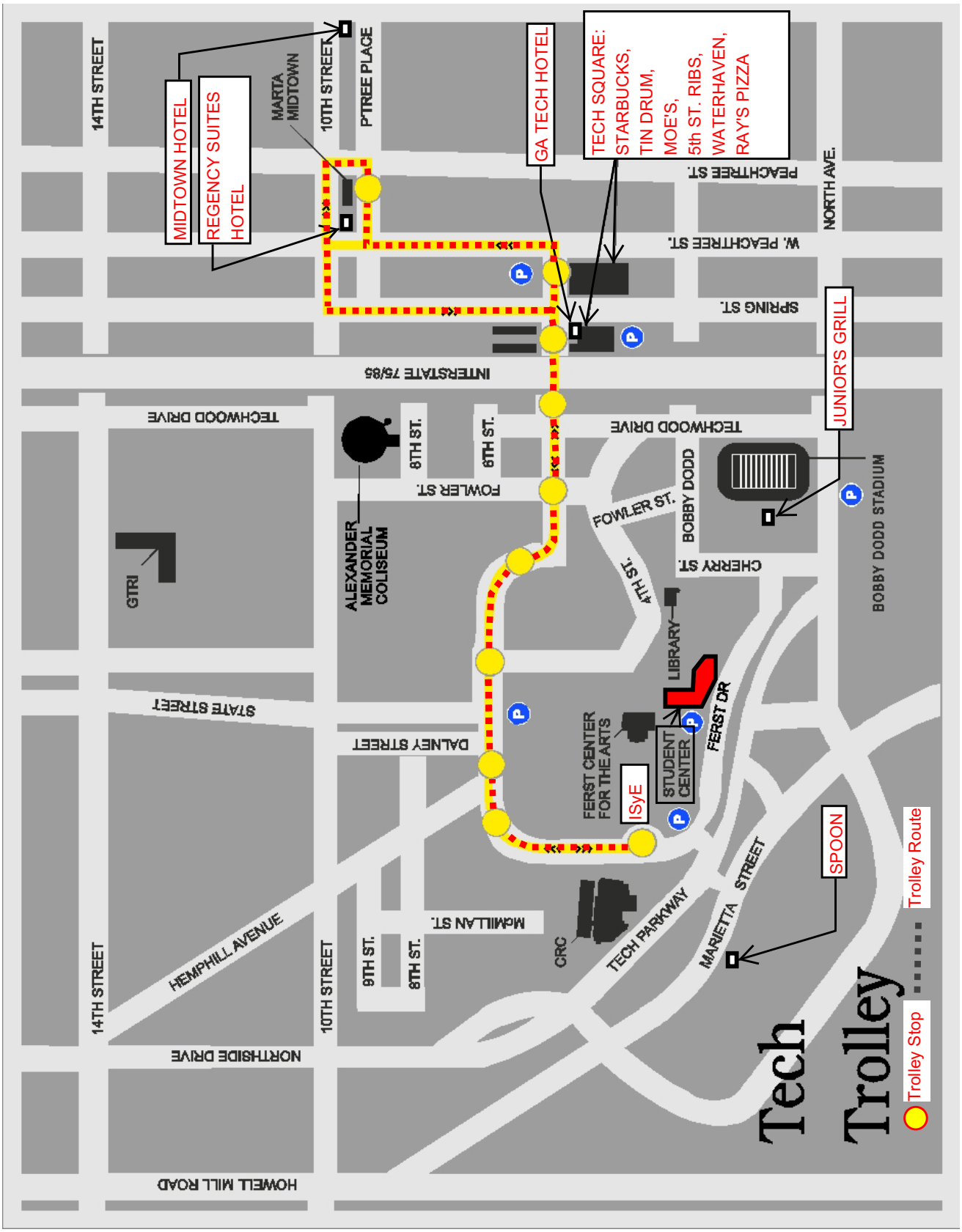
- Student Center Food Court: Salad bar, Mexican, Asian, Deli etc. Open: 7am-2:30pm M-F
- Ferst Place: Buffet, Salad bar. Open: 11am-1:30pm M-F
- Dunkin Donuts. Open: 7:30am-2:30pm M-F
- Einsteins Bros Bagels & Starbucks. Open: 7:30am-2pm M-F

At Technology Square:

- 5th Street Ribs n Blues: Barbeque. Open: 11am-9pm M-Sat
- Marble Slab Creamery: Ice cream and frozen yogurt. Open: 11:30am-10pm all days
- Moe's Southwestern Grill: Mexican. Open: 11am-8pm M-F, 11am-4pm weekends
- Rays Pizza/Cedars: Mediterranean, pizzas. Open: 11am-10pm all days
- St. Charles Deli: sandwiches. Open: 7am-2:30pm M-F
- Starbucks. Open: 7:00am-8:00pm M-F, 10am-6pm weekends
- Tin Drum Asia Cafe: Thai. Open: 11am-9pm M-F, 11am-3pm & 5pm-9pm weekends
- Water Haven: Urban bistro. Open: 11am-10pm M-Th, 11am-11pm F, 5pm-11pm Sat

Others:

- Spoon: Thai (On Marietta st.) Open: 11:30am-3pm & 5pm-10pm M-F, 4pm-10pm weekends
- Junior's Grill (On Campus behind Tech Tower) Open: 7:30am-7:30pm M-Th, 7:30am-2:30pm F


MIDTOWN HOTEL
REGENCY SUITES HOTEL
MARTA MIDTOWN
14TH STREET
10TH STREET
PTREE PLACE
GA TECH HOTEL
TECH SQUARE:
STARBUCKS,
TIN DRUM,
MOE'S,
5th ST. RIBS,
WATERHAVEN,
RAY'S PIZZA
PEACHTREE ST.
NORTH AVE.
W. PEACHTREE ST.
SPRING ST.
JUNIOR'S GRILL
INTERSTATE 75/85
TECHWOOD DRIVE
8TH ST.
6TH ST.
FOWLER ST.
BOBBY DODD
CHERRY ST.
BOBBY DODD STADIUM
ALEXANDER MEMORIAL COLISEUM
GTRI
4TH ST.
LIBRARY
FERST DR
STUDENT CENTER
FERST CENTER FOR THE ARTS
ISyE
STATE STREET
DALNEY STREET
MCMILLAN ST.
CRC
TECH PARKWAY
MARIETTA STREET
SPOON
HEMPHILL AVENUE
NORTHSIDE DRIVE
HOWELL MILL ROAD
Tech Trolley
Trolley Route
Trolley Stop

MIP2010 Program

Monday (7/26)		Tuesday (7/27)		Wednesday (7/28)		Thursday (7/29)	
Time	Speaker	Time	Speaker	Time	Speaker	Time	Speaker
8:00-8:45 8:45-9:00	Registration Opening Remarks						
9:00-9:30 9:30-10:15 10:15-11:00	Jon Lee Santosh Vempala *Coffee Break*	9:00-9:45 9:45-10:30 10:30-11:00	Ellis Johnson Matteo Fischetti *Coffee Break*	9:00-9:45 9:45-10:15 10:15-11:00	Sanjeeb Dash Quentin Louveaux *Coffee Break*	9:00-9:30 9:30-10:15 10:15-11:00	Jim Luedtke Andrew Miller *Coffee Break*
11:00-11:45 11:45-12:15 12:15-2:15	Karen Aardal Michele Conforti *Lunch Break*	11:00-11:45 11:45-12:15 12:15-2:15	Zonghao Gu Marc Pfetsch *Lunch Break*	11:00-11:45 11:45-12:15 12:15-2:15	Andrea Tramontani Giacomo Zambelli *Lunch Break*	11:00-11:45 11:45-12:30	J-P. Richard Juan Pablo Vielma
2:15-3:00 3:00-3:30	Egon Balas *Coffee Break*	2:15-3:00 3:00-3:30	Daniel Espinoza *Coffee Break*	2:15-3:00 3:00-3:30	Jim Ostrowski *Coffee Break*		
3:30-4:00 4:00-4:30	Pierre Bonami Stefano Smriglio	3:30-4:00 4:00-4:30	Tobias Achterberg Simge Kucukyavuz	3:30-4:00 4:00-4:30	Michele Monaci Martin Savelsbergh		
4:45-7:00	*Poster and Reception (ISyE Atrium)*	7:00-10:00	*Conference Dinner (Georgia Tech Hotel)*	5:00-6:00	*Business Meeting*		