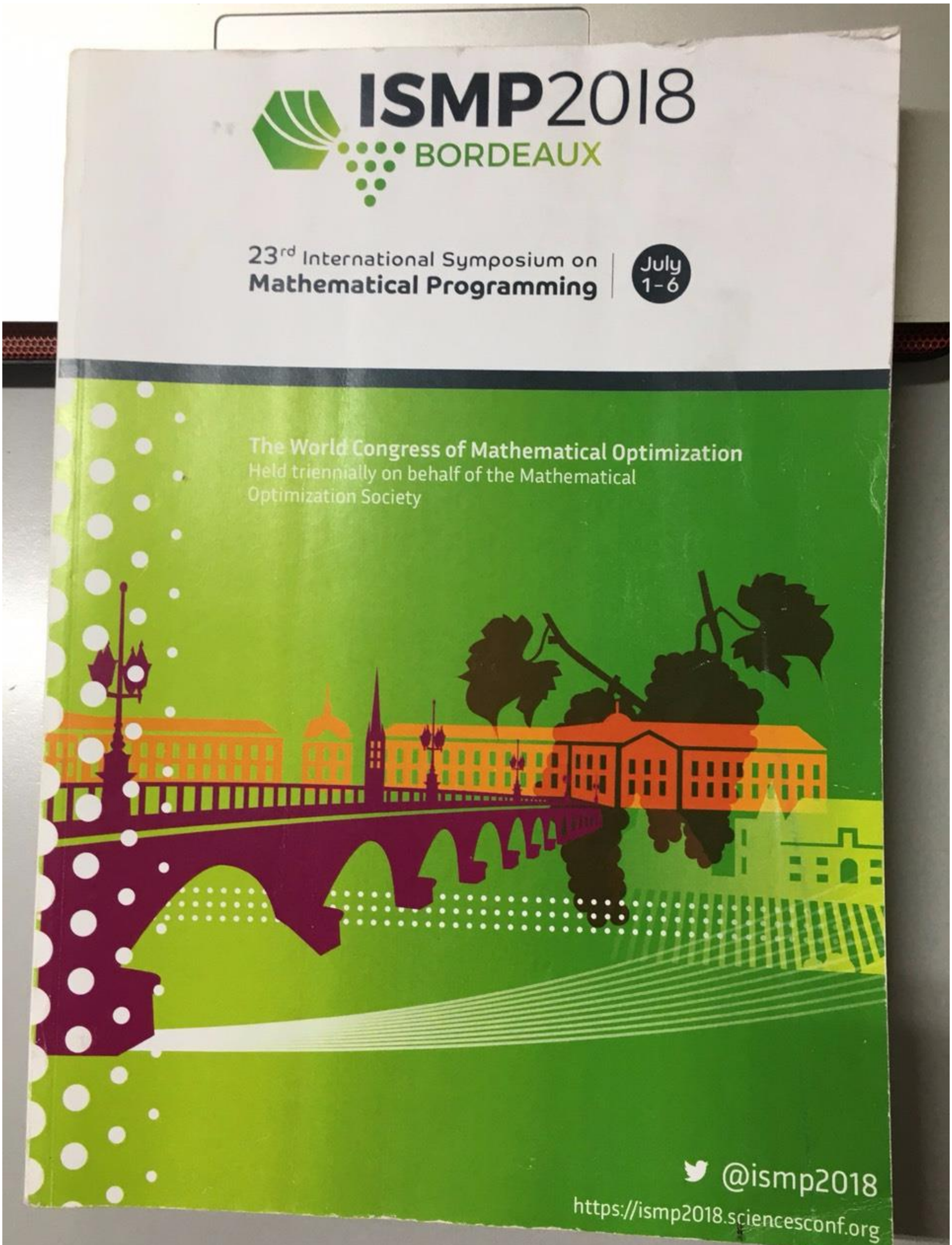
ISMP2018
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bounded by two in absolute value. We show that efficient SFM is possible even for a significantly larger class than parity constraints, by introducing a new approach that combines techniques from Combinatorial Optimization, Combinatorics, and Number Theory. In particular, we can show that efficient SFM is possible over all sets of cardinality r mod m, as long as m is a constant prime power. This covers generalizations of the odd-cut problem with open complexity status, and with relevance in the context of integer programming with higher subdeterminants. Moreover, our results settle two open questions raised by Geelen and Kapadia [Combinatorica, 2017] in the context of computing the girth and cogirth of certain types of binary matroids.

2 - The *b*-bibranching Problem: TDI System, Packing, and Discrete Convexity
Speaker: Kenjiro Takazawa, Hosei University, JP, talk 55
We introduce the *b*-bibranching problem in digraphs, which is a common generalization of the bibranching and *b*-branching problems. The bibranching problem, introduced by Schrijver (1982), is a common generalization of the branching and bipartite edge cover problems. Previous results on bibranchings include polynomial algorithms, a linear programming formulation with total dual integrality, a packing theorem, and an M-convex submodular flow formulation. The *b*-branching problem, recently introduced by Kakimura, Kamiyama, and Takazawa (2018), is a generalization of the branching problem admitting higher indegree, i.e., each vertex v can have indegree at most $b(v)$. For *b*-branchings, a combinatorial algorithm, a linear programming formulation with total dual integrality, and a packing theorem for branchings are extended. Our main contribution is to extend those previous results on bibranchings and *b*-branchings to *b*-bibranchings. That is, we present a linear programming formulation with total dual integrality, a packing theorem, and an M-convex submodular flow formulation for *b*-bibranchings. In particular, the linear program and M-convex submodular flow formulations respectively imply polynomial algorithms for finding a shortest *b*-bibranching.

3 - Index Reduction via Unimodular Transformations
Speaker: Satoru Iwata, University of Tokyo, JP, talk 1177
Co-Authors: *Mizuyo Takamatsu*,
This talk presents an algorithm for transforming a matrix pencil $A(s)$ into another matrix pencil $U(s)A(s)$ with a unimodular matrix $U(s)$ so that the resulting Kronecker index is at most one. The algorithm is based on the framework of combinatorial relaxation, which combines graph-algorithmic techniques and matrix computation. Our algorithm works for index reduction of linear constant coefficient differential-algebraic equations, including those for which the existing index reduction methods based on Pantelides' algorithm or the signature method are known to fail.

Linear Optimization III

Continuous Optimization
NLP - Tu 3:15pm-4:45pm, Format: 3x30 min
Room: Salle 9 Building: N, 4th floor, Zone: 12
Contributed Session 439
Chair: Rodrigo Mendoza Smith, University of Oxford, GB

1 - Neural constraint selection in Linear Programming
Speaker: Rodrigo Mendoza Smith, University of Oxford, GB, talk 1546
Co-Authors: *Pawan Kumar*,
Some problems of practical interest like neural network verification require the solution of a set of overdetermined linear programs, which can yield the application computationally impractical when the number of constraints is considerably large. We consider the problem of reducing the number of constraints in a linear program by training a message-passing neural network classifier that learns to predict whether a constraint is active or not. Our approach is designed to capture the structure of underlying LP data generated by a particular application, so the resulting networks can be used as a pre-processing step to reduce the number of constraints before passing the data to an LP solver.

2 - New station cone algorithm variant for linear programming and computing experiment
Speaker: Chu Nguyen, Viet Power Ltd Company, VN, talk 1665
Co-Authors: *Hue Thanh*,
"A New Variant of Station Cone Algorithm for Linear Programming and Its Computational Experiments" Abstract: In this paper we introduce a new variant of station cone algorithm to solve linear programmimg problems. It uses a series of interior points Ok to determine the entering variables. The number of these interior points is finite and they move toward the optimal point. The proposed algorithm will be a polynomial time algorithm if the number of points Ok is limited by a polynomial function. The second objective of this paper is to carry out experimental calculations and compare with simplex methods and dual simplex method. The results show that the number of pivots of the station cone algorithm is less than 30 to 50 times that of the dual algorithm. And with the number of variables n and the number of constraints m increasing, the number of pivots of the dual algorithm is growing much faster than the number of pivots of the station cone algorithm.This conclusion is drawn from the coputational experiments with n <= 500 and m <= 2000. In particular we also test for cases where n = 2, m = 100 000 and n = 3, m = 200 000. For case where n = 2 and m = 100 000, station cone algorithm is given no more than 16 pivots. In case of n = 3, m = 200 000, station cone algorithm has a pivot number less than 24. Keywords Linear programming, simplex method, dual problem, station cone

3 - A predictor-corrector algorithm for lp problems using the mixed penalty approach
Speaker: Khalid El Yassini, Moulay Ismail University, MA, talk 1458
Co-Authors: *Kenza Oufaska, Ahmed El Ghali*,
Interior-exterior penalty algorithms for linear programming (LP) were presented in last recent decades by many authors. By using similar steps and adapting the process used by El Yassini et al., we give a new predictor-corrector algorithm based on a mixed penalty approach with two distinct parameters. The proposed algorithm is inspired from the path following method. At each iteration, there is an updating of penalty parameters. An approximate solution, of Karush-Kuhn-Tucker system of equations which characterizes a solution of the mixed penalty function, is computed by using Newton directions for both prediction and correction steps. The generated approximate solution gives a feasible dual point and a pseudo-feasible primal point. Since the primal solution is infeasible, a new pseudo-duality gap definition is