Federico Battista

Curriculum Vitæ

Harold S. Mohler Laboratory 200, West Packer Avenue
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Professional experience

from 2023.02 to Present	**Postdoctoral Researcher**, *Lehigh University, Dept. of Industrial and Systems Engineering*, Bethlehem, PA, USA, Advisor: Prof. Ted Ralphs Development of methods for solving general Mixed-Integer Bilevel Linear Programs.
from 2022.02 to 2022.08	**Visiting Ph.D. Student**, *Alpen-Adria-Universität, Institut für Mathematik*, Klagenfurt, Austria, Advisor: Prof. Angelika Wiegele Development of Alternating Directions Method of Multipliers for large-scale Semidefinite Programs.

Education

from 2019.11 to 2023.01	**Ph.D in Operations Research**, *Università degli Studi di Roma "La Sapienza"*, Rome, Italy, **Thesis:** On Semidefinite Lift-and-Project of Combinatorial Optimization Problems Supervisors: Prof. Marianna De Santis, Prof. Fabrizio Rossi, Prof. Stefano Smriglio
from 2017.10 to 2019.07	**Master's degree in Computer Science**, *Università degli Studi dell'Aquila*, L'Aquila, Italy, **Thesis:** Application of the Lovász-Schrijver M+ operator to compact stable set integer programs Supervisors: Prof. Fabrizio Rossi, Prof. Stefano Smriglio Final mark: 110/110 magna cum laude
from 2014.09 to 2017.10	**Bachelor's degree in Computer Science**, *Università degli Studi dell'Aquila*, L'Aquila, Italy, **Thesis:** Natural Language Processing and Machine Learning for Conversational Agents Supervisor: Prof. Giovanni De Gasperis Final mark: 110/110 magna cum laude

Software

Maintainer	**SDP_lift_and_project**, `Python,Matlab` https://github.com/febattista/SDP_lift_and_project An open-source software package for formulating and solving via a Cutting Plane method, Lovász and Schrijver's Lift-and-Project semidefinite relaxations. Although this software is designed to be as general as possible, allowing the application of the Lovász and Schrijver's operator to any Linear Programming (LP) formulation, a strong emphasis has been placed on LP relaxations of the Maximum Stable Set Problem (MSSP).
Maintainer	**ADAL-ineq**, `Python,Matlab` https://github.com/febattista/ADAL-ineq An open-source solver for large-scale Semidefinite Programs with inequality constraints, implementing an Alternating Direction Method of Multipliers. ADAL-ineq has several advanced features, such that the ability to provide safe estimate of the optimal solution value via the computation of multiple valid dual bounds throughout the iterations of the algorithm.
Contributor	**MibS: Mixed Integer Bilevel Solver**, `C++` https://github.com/coin-or/MibS A software package for solving mixed integer bilevel programs using branch-and-cut algorithm. Such programs arise in the analysis of hierarchical decision systems with multiple, independent decision-makers whose interests are not necessarily aligned.

Contributor **SYMPHONY**, *c*

An open-source generic MILP solver, callable library, and extensible framework for implementing customized solvers for mixed-integer linear programs (MILPs). SYMPHONY has a number of advanced capabilities, including the ability to solve multi-objective MILPs, the ability to warm start its solution procedure, and the ability to perform basic sensitivity analyses. SYMPHONY has has been deployed in a variety of application areas, including computational biology, wireless telecommunications, supply chain management, transportation services, and air transportation.

Refereed publications

2024 F. Battista, M. De Santis, **Dealing with Inequality Constraints in Large-Scale Semidefinite Relaxations for Graph Coloring and Maximum Clique Problems**, *4OR. A Quarterly Journal of Operations Research*, https://doi.org/10.1007/s10288-024-00569-5

F. Battista, T. Ralphs, **A Branch-and-Cut Algorithm for Mixed-Integer Bilevel Linear Optimization Based on Improving Directions**, *Working paper, COR@L Laboratory, Lehigh University*

F. Battista, F. Rossi, S. Smriglio, **Application of the Lovász-Schrijver Operator to Compact Stable Set Integer Programs**, *arXiv preprint arXiv:2407.19290*, https://doi.org/10.48550/arXiv.2407.19290

2023 F. Battista, **On Semidefinite Lift-and-Project of Combinatorial Optimization Problems**, *Ph.D. Thesis, Università di Roma Sapienza*, https://hdl.handle.net/11573/1668673

Technical reports and publications in review

2024 F. Battista, T. Ralphs, **A Branch-and-Cut Algorithm for Mixed-Integer Bilevel Linear Optimization Based on Improving Directions**, *Working paper, COR@L Laboratory, Lehigh University*

F. Battista, F. Rossi, S. Smriglio, **Application of the Lovász-Schrijver Operator to Compact Stable Set Integer Programs**, *arXiv preprint arXiv:2407.19290*, https://doi.org/10.48550/arXiv.2407.19290

Conference presentations and talks

2024 F. Battista, T. Ralphs, **A Branch-and-Cut Algorithm for Mixed-Integer Bilevel Linear Optimization Based on Improving Directions**, *International Symposium on Mathematical Programming, Montreal, Canada*

2023 F. Battista, T. Ralphs, **Exploiting Dual Functions in Mixed Integer Bilevel Linear Programs**, *INFORMS Annual Meeting, Phoenix, AZ*

2022 F. Battista, M. De Santis, F. Rossi, S. Smriglio, **On Semidefinite Lift-and-Project Relaxations for Combinatorial Optimization Problems**, *University of Pavia, Pavia, Italy*

F. Battista, F. Rossi, S. Smriglio, **Application of the Lovász-Schrijver Operator to Representative Formilation for Graph Coloring Problem**, *International Symposium on Combinatorial Optimization, Paris, France*

2021 F. Battista, M. De Santis, **Dealing with Inequalities in Large Scale Semidefinite Programs**, *International Conference on Optimization and Decision Science, Rome, Italy*