Federico Battista

Curriculum Vitæ

Harold S. Mohler Laboratory 200, West Packer Avenue
Bethlehem, PA 18015-1582
USA
✳ *03 September 1995*
✉ *feb223@lehigh.edu*
🌐 *febattista.github.io*

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*

`https://github.com/coin-or/SYMPHONY`

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`

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

2025 F. Battista, T. Ralphs, S. Fallah, **The Restricted Value Function of MILPs and Its Construction with SYMPHONY**, *18th INFORMS Computing Society (ICS) Conference, Toronto, Canada*

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*