

Gonzalo Muñoz

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Profile

I am currently an IVADO Post-doctoral Fellow working in Polytechnique Montréal. I obtained my Ph.D. degree in October 2017 from the Industrial Engineering and Operations Research department at Columbia University.

My main interests include the theory and development of optimization algorithms for Mixed Integer, Combinatorial and Polynomial Optimization. I have worked on general optimization methodologies as well as computational techniques tailored to Power Grid operations and Mining scheduling problems. Other topics I am interested in are polyhedral theory and the application of non-linear programming to data-driven optimization problems.

Publications

- Faenza Y., **Muñoz G.** and Pokutta S. **“Limits of Treewidth-based tractability in Optimization”**.
ArXiv 1807.02551. Submitted.
- Rivera O., Espinoza D., Goycoolea M., Moreno E. and **Muñoz G.** **“Production scheduling for strategic open pit mine planning: A mixed integer programming approach”**.
Submitted.
- Bienstock D., Chen C. and **Muñoz G.** **“Outer-Product-Free Sets for Polynomial Optimization and Oracle-Based Cuts”**.
ArXiv 1610.04604. Submitted.
- Bienstock D. and **Muñoz G.** **“LP formulations for polynomial optimization problems”**.
SIAM Journal on Optimization 28 (2), pp. 1121-1150, 2018.
- **Muñoz G.**, Espinoza D., Goycoolea M., Moreno E., Queyranne M. and Rivera O. **“A study of the Bienstock-Zuckerberg algorithm, Applications in Mining and Resource Constrained Project Scheduling”**.
Computational Optimization and Applications, 69 (2), pp. 501-534, 2018.
- Matke C., Bienstock D., **Muñoz G.**, Yang S., Kleinhans D. and Sager S. **“Robust optimization of power network operation: storage devices and the role of forecast errors in renewable energies”**.
Complex Networks & Their Applications V. Studies in Computational Intelligence, vol 693, pp. 809-820, 2017.
- Bienstock D. and **Muñoz G.** **“Approximate method for AC transmission switching based on a simple relaxation for AC-OPF problems”**.
Power & Energy Society General Meeting, IEEE pp. 1-5, July 2015.

- Espinoza D., Goycoolea M., Moreno E., **Muñoz G.**, and Queyranne M. **“Open Pit Mine Scheduling under uncertainty: a robust approach”**.

Proceedings of APCOM 2013, pp. 433-444. 2013.

Theses

- **“Integer Programming techniques for Polynomial Optimization”**.

Ph.D. Thesis. Columbia University Academic Commons, 2017.

- **“Linear Integer Programming Models and Applications to Mining”**.

Engineering Degree Thesis. Academic Repository of University of Chile, 2012.

Academic Achievements

MIP “Best Poster” Award

[2017]

“Best Poster” Award of the Mixed Integer Programming Workshop with poster “Outer-Product-Free Sets for Polynomial Optimization and Oracle-Based Cuts”

IOS “Student Paper” Prize

[2016]

INFORMS Optimization Society “Student Paper Prize” with paper “LP formulations for Mixed-Integer Polynomial Optimization Problems”

MIP “Best Poster” Award

[2015]

“Best Poster” Award of the Mixed Integer Programming Workshop with poster “On Optimization Problems with bounded Tree-width”

1st place in “Becas Chile” Fellowship

[2012]

4-year fellowship from the Science and Technology National Commission of Chile for PhDs abroad. Selected in first place among more than 580 applicants

INFORMS “Best Paper in Sponsored Sessions” Award

[2011]

“Best Paper in Sponsored Sessions” Award of the Mining Section at the INFORMS 2011 National Meeting

Outstanding Student

[2009, 2010]

“Outstanding student” of Mathematical Engineering. Acknowledgment given to students with high academic performance

Outstanding Student

[2005, 2006]

“Outstanding student” of the Common Engineering Plan. Acknowledgment given to students with high academic performance

Education

Industrial Engineering and Operations Research Ph.D.

[2012 – 2017]

IEOR Department, Columbia University

Master of Science

[2012]

IEOR Department, Columbia University

Mathematical Engineering [2007 – 2012]

School of Mathematics and Physics Sciences, University of Chile

Bachelor in Sciences of Engineering [2005 – 2007]

School of Mathematics and Physics Sciences, University of Chile

Work and Research Experience

Research Scientist Intern [2016]

Three-months research internship conducted at Amazon.com, in the Modeling and Optimization Team.

Research Assistant [2010 – 2012]

Anillo ACT-88 project: "Mathematical Modeling for Industrial and Management Science Applications: An Interdisciplinary Approach", Adolfo Ibáñez University.

Professional Internship III [2010]

Three-month professional internship conducted at Adolfo Ibáñez University. This internship was focused on studying a scheduling problem in an open-pit mine.

Research Assistant [2009]

FONDEF-D06I1031 project: "Complex Systems, Evolutionary Computation, and Mine Scheduling Applications", Adolfo Ibáñez University.

Professional Internship II [2009]

One-month professional internship conducted at Adolfo Ibáñez University. During this internship, an efficient algorithm was developed to compute the set of predecessors of a block in a block model of an open-pit mine.

Professional Internship I [2007 – 2008]

Two-months professional internship conducted in "Invertec Natural Juice". During this internship, a set of tools were developed to register and analyze the Idle Machine Time.

Teaching Experience

Teaching Assistant, "Intro to OR: Deterministic Models" [2012 – 2013]

Teacher Assistant in M.S in Operations Research at Columbia University

Teaching Assistant, "Advanced Operations" [2011]

Teacher Assistant in the Master in Management Science at the University Adolfo Ibáñez for the course "Advanced Operations" during 1 trimester

Teaching Assistant, "Optimization" [2009 – 2010]

Teacher Assistant in the Master in Management Science at the University Adolfo Ibáñez for the course "Optimization" during 2 trimesters

Teaching Assistant, "Advanced Calculus" [2009]

Teacher Assistant in the School of Engineering at the University of Chile for the course "Advanced Calculus" during 1 semester

Teaching Assistant, “Ordinary Differential Equations”**[2008 – 2009]**

Teacher Assistant in the School of Engineering at the University of Chile for the course “Ordinary Differential Equations” during 2 semesters.

Additional Information

Languages: Native Spanish and fluent English.

Programming Skills: Experienced in different programming languages such as Java, C/C++, MATLAB and Python.

Extensive experience in Optimization tools such as CPLEX, Gurobi, SCIP and XPRESS including their interfaces with C/C++, Python and Java.