Joey Huchette

Rice University
Department of Computational and Applied Mathematics
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Interests

Technology (algorithms and software) for mathematical optimization, integer programming, operations research, machine learning

Experience

Rice University, Department of Computational and Applied Mathematics
Assistant Professor — July 2019 – present

Google Research, Operations Research Group
Postdoctoral Researcher — July 2018 – June 2019

Akamai Technologies
Data Science Intern — June 2016 – August 2016

Argonne National Laboratory, Mathematics and Computer Science Division
Visiting Researcher — June 2014

Lawrence Berkeley National Laboratory, National Energy Research Scientific Computing Center
SULI Research Intern — June 2012 – August 2012

Education

Massachusetts Institute of Technology
PhD in Operations Research — September 2013 – June 2018
Advisor: Prof. Juan Pablo Vielma
Committee: Prof. Michel X. Goemans, Prof. James B. Orlin, Prof. Juan Pablo Vielma

Rice University
B.A. in Computational and Applied Mathematics — August 2009 – May 2013
Cum laude with Distinction in Research

Honors

- 2018 INFORMS Optimization Society Student Paper Prize (second place) — 2018
- MIP Workshop Best Poster Award (honorable mention) — 2017
- INFORMS Computing Society Prize — 2016
- MIT Operations Research Center Best Student Paper Award — 2016
- COIN-OR INFORMS Cup — 2015
- NSF Graduate Fellowship — 2013 – 2016
- Rice Engineering Alumni Senior Merit Award — 2013
- CAAM-Chevron Undergraduate Prize for Research — 2012

Papers

Journal articles

J1. J. Huchette and J. P. Vielma. Nonconvex piecewise linear functions: Advanced formulations and simple modeling tools. Forthcoming in **Operations Research**.

- A preliminary version received an honorable mention for the *Best Poster Award* at the 2017 MIP Workshop.

J2. R. Anderson, J. Huchette, W. Ma, C. Tjandraatmadja, and J. P. Vielma. Strong mixed-integer programming formulations for trained neural networks. **Mathematical Programming**, 2020.

J3. J. Huchette and J. P. Vielma. A geometric way to build strong mixed-integer programming formulations. **Operations Research Letters**, 2019.

J4. J. Huchette and J. P. Vielma. A combinatorial approach for small and strong formulations of disjunctive constraints. **Mathematics of Operations Research**, 2019.

- Second place in the 2018 INFORMS Optimization Society Student Paper Prize.

J5. C. Petra, F. Qiang, M. Lubin, and J. Huchette. On efficient Hessian computation using the edge pushing algorithm in Julia. **Optimization Methods and Software** 2018.

J6. J. Huchette, S. S. Dey, and J. P. Vielma. Beating the SDP bound for the floor layout problem: A simple combinatorial idea. **INFOR: Information Systems and Operational Research**, 2018.

J7. J. Huchette, S. S. Dey, and J. P. Vielma. Strong mixed-integer formulations for the floor layout problem. **INFOR: Information Systems and Operational Research**, 2018.

J8. I. Dunning, J. Huchette, and M. Lubin. JuMP: A modeling language for mathematical optimization. **SIAM Review**, 2017.

- Winner of the 2016 INFORMS Computing Society Prize.
- Co-winner of the 2016 MIT Operations Research Center Best Student Paper Award.
- The work described in this paper received the 2015 COIN-OR INFORMS Cup.

J9. J. P. Vielma, I. Dunning, J. Huchette, and M. Lubin. Extended formulations in mixed integer conic quadratic programming. **Mathematical Programming Computation**, 2017.

Preprints

S1. C. Tjandraatmadja, R. Anderson, J. Huchette, W. Ma, K. Patel, and J. P. Vielma. The convex barrier, revisited: Tightened single-neuron relaxations for neural network verification.

S2. J. Huchette, H. Lu, H. Esfandiari, and V. Mirrokni. Contextual reserve price optimization in auctions.

Conference proceedings

C1. R. Anderson, J. Huchette, C. Tjandraatmadja, and J. P. Vielma. Strong mixed-integer programming formulations for trained neural networks. In the proceedings of the 20th Conference on Integer Programming and Combinatorial Optimization (**IPCO**), 2019.

C2. J. Huchette, M. Lubin, and C. Petra. Parallel algebraic modeling for stochastic optimization. In the proceedings of the First Workshop for High Performance Technical Computing in Dynamic Languages (**HPTCDL**), 2014.

C3. B. Behzad, H. Luu, J. Huchette, S. Byna, R. Aydt, Q. Koziol, and M. Snir. Taming parallel I/O complexity with auto-tuning. In the Proceedings of the International Conference on High Performance Computing, Networking, Storage and Analysis (**SC**), 2013.

Expository writing

O1. I. Dunning, J. Huchette, and M. Lubin JuMP: An algebraic modeling language in Julia. **Optima: Mathematical Optimization Society Newsletter** (103) 2017: p. 3-4.

Teaching

Rice University, Houston, TX

- CAAM 471/571 - Linear and Integer Programming — Fall 2020, Spring 2020
- CAAM 519 - Computational Science I — Fall 2019

Massachusetts Institute of Technology, Cambridge, MA

- 15.083J – Integer Programming and Combinatorial Optimization — Spring 2016
  Teaching assistant.
- 15.S60 – Software Tools for Operations Research — January 2016, January 2015
  Organized a month-long course (8 sessions) on software tools relevant for graduate students in operations research.
- Various ad-hoc guest lectures and software tutorials — 2014-2018
  A total of 10 sessions across 15.081J, 15.083J, 15.093, and 15.093J.

Presentations

Strong mixed-integer programming formulations for trained neural networks.

- INFORMS Annual Meeting — October 2019
- Virginia Tech, Department of Industrial and Systems Engineering — September 2019
- Rice University, Machine Learning Seminar — September 2019
- Conference on Discrete Optimization and Machine Learning — July 2019
- MIP Workshop — July 2019
- Conference on Integer Programming and Combinatorial Optimization (IPCO) — May 2019
- University of Chile, Department of Industrial Engineering — March 2019
- INFORMS Computing Society — January 2019

A mixed-integer branching approach for very small formulations of disjunctive constraints.

- International Symposium on Mathematical Programming (ISMP) — July 2018

Systematically building mixed-integer programming formulations using JuMP and Julia.

- JuMP Developers Workshop — June 2018
- INFORMS Annual Meeting — November 2018

Advanced Mixed Integer Programming Formulation Techniques.

- International Symposium on Combinatorial Optimization (ISCO) — April 2018
  - Two day spring school, joint with J. P. Vielma

Nonconvex piecewise linear functions: Advanced formulations and simple modeling tools.

- Google NYC, Algorithms Seminar — September 2018
- INFORMS Optimization Society Conference — March 2018
- INFORMS Annual Meeting — October 2017
- MIP Workshop (poster) — June 2017

Advanced mixed-integer programming formulations: Methodology, computation, and application.

- Argonne National Laboratory, Mathematics and Computer Science Division — February 2018
- Cornell University, School of Operations Research and Information Engineering — January 2018
- Rice University, Department of Computational and Applied Mathematics — January 2018
- University of Toronto, Department of Mechanical and Industrial Engineering — January 2018
- Cornell Young Researchers Workshop — October 2017

PiecewiseLinearOpt.jl: Solving optimization problems containing piecewise linear functions.

- JuMP Developers Workshop — June 2017

Mixed-integer sum of squares optimization: Computation and application.

- SIAM Conference on Optimization — May 2017

A combinatorial approach for small and strong formulations of disjunctive constraints.

- INFORMS Annual Meeting — November 2016
- MIP Workshop (poster) — May 2016

Strong mixed-integer formulations for the floor layout problem.

- INFORMS Annual Meeting — November 2015
- Argonne National Laboratory, LANS Seminar — August 2015
- International Symposium on Mathematical Programming (ISMP) — July 2015
- MIP Workshop (poster) — June 2015
- INFORMS Annual Meeting — November 2014
- MIP Workshop (poster) — July 2014

Modeling optimization problems with JuMP in Julia.

- Carnegie Mellon, Tepper School of Business (joint with M. Lubin) — March 2015
- Georgia Tech, DOS Seminar — November 2014
- UC Berkeley, Mechanical Engineering (joint with I. Dunning and M. Lubin) — November 2014

JuliaOpt - Optimization packages for Julia.

- JuliaCon (workshop, joint with I. Dunning, M. Lubin, and M. Udell) — June 2015
- JuliaCon (joint with I. Dunning) — June 2014

External Service

- JuliaCon (2015) Program Committee
- Award Committee Member: INFORMS COIN-OR Cup (2016)
- Program Committee Member: INFORMS Computing Society Conference (2019)
- Local Organizing Committee Member: MIP Workshop (2019)
- Chair of Program Committee: JuMP-dev Workshop (2019)
- Member of the JuMP Steering Committee
- Reviews for: *Management Science*, *Operations Research*, *Mathematical Programming*, *Mathematical Programming Computation*, *Mathematics of Operations Research*, *INFORMS Journal on Computing*, *SIAM Journal on Optimization*, *Operations Research Letters*, *Discrete Optimization*, *Annual Reviews in Control*, *International Conference on Integer Programming and Combinatorial Optimization* (IPCO) 2017, *Computers and Operations Research*, *Computational Optimization and Applications*, *Optimization Letters*.

- Member of INFORMS and SIAM
- Session chair: INFORMS Annual Meeting 2018, INFORMS Optimization Society Conference 2018, Conference on Discrete Optimization and Machine Learning 2019