Joey Huchette

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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. B. Beach, R. Hildebrand, and J. Huchette. Compact mixed-integer programming relaxations in quadratic optimization.

Conference proceedings

C1. 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. In the proceedings of the Thirty-fourth Conference on Neural Information Processing Systems (**NeurIPS**), 2020.

C2. J. Huchette, H. Lu, H. Esfandiari, and V. Mirrokni. Contextual reserve price optimization in auctions via mixed-integer programming. In the proceedings of the Thirty-fourth Conference on Neural Information Processing Systems (**NeurIPS**), 2020.

C3. 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.

C4. 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.

C5. 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   *Piecewise linear optimization in machine learning.*

- IPAM, Workshop on Deep Learning and Combinatorial Optimization   Upcoming
- University of Houston, Department of Industrial Engineering   October 2020

Mathematical optimization in Julia: JuMP, and beyond.

- ExxonMobil   November 2020

PiecewiseLinearOpt.jl: Modeling piecewise linear functions in Julia.

- INFORMS Annual Meeting   November 2020
- JuMP Developers Workshop   June 2017

Contextual reserve price optimization in auctions via mixed-integer programming.

- INFORMS Annual Meeting   November 2020

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

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, *International Conference on Learning Representations* (ICLR) 2021, *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