SHAONING HAN

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RESEARCH INTERESTS

- **Methodologies:** mixed-integer programming, nonconvex and nonsmooth optimization, submodular optimization, variational inequality, (parametric) pivoting methods
- **Applications:** inference problems with combinatorial structures in statistics and machine learning, portfolio optimization and risk, data science, signal denoising, revenue management

ACADEMIC EMPLOYMENT

Postdoctoral Scholar, University of Southern California, August 2022 - June 2024
• Advisor: Jong-Shi Pang

EDUCATION

Ph.D in Industrial Engineering, University of Southern California, August 2022
• Advisor: Andrés Gómez

B.S. in Mathematics, University of Science and Technology of China, June 2017

HONORS & AWARDS

- Third Place, 2023 INFORMS Junior Faculty Interest Group (JFIG) Paper Competition
- Honorable Mention, 2023 Journal of Global Optimization Best Paper Award

JOURNAL PAPERS

1. On the Number of Pivots of Dantzig's Simplex Methods for Linear and Convex Quadratic Programs.
   Shaoning Han, Xinyao Zhang, and Jong-Shi Pang.
   Operations Research Letters (2024).

2. Continuous Selections of Solutions to Parametric Variational Inequalities.
   Shaoning Han, and Jong-Shi Pang.
   SIAM Journal on Optimization (Accepted) (2023).

3. Comparing Solution Paths of Sparse Quadratic Minimization with a Stieltjes Matrix.
   Ziyu He, **Shaoning Han**, Andrés Gómez, Ying Cui, and Jong-Shi Pang.
   Mathematical Programming (2024), Vol. 204, pp. 517–566.

4. 2×2-Convexifications for Convex Quadratic Optimization with Indicator Variables.
   Shaoning Han, Andrés Gómez, and Alper Atamtürk.
   Mathematical Programming (2023), Vol. 202, pp. 95–134.

5. Some Strongly Polynomially Solvable Convex Quadratic Programs with Bounded Variables.
   Jong-Shi Pang, and **Shaoning Han**.
   SIAM Journal on Optimization (2023), Vol. 33 (2), pp. 899–920.

6. The Equivalence of Optimal Perspective Formulation and Shor's SDP for Quadratic Programs with Indicator variables.
   Shaoning Han, Andrés Gómez, and Alper Atamtürk.
   Operations Research Letters (2022), Vol. 50 (2), pp. 195–198.

7. Fractional 0-1 Programming and Submodularity.
   Shaoning Han, Andrés Gómez, and Oleg A. Prokopyev.
   Journal of Global Optimization (2022), Vol. 84, pp. 77–93.
   • Honorable Mention, Journal of Global Optimization Best Paper Award (2023)
8. Sparse and Smooth Signal Estimation: Convexification of ℓ_0-Formulations.
   Alper Atamtürk, Andrés Gómez, and **Shaoning Han**. [alphabetical order]
   Journal of Machine Learning Research (2021), Vol. 22 (52), pp. 1–43.

PREPRINTS

1. Robust Support Vector Machines via Conic Optimization.
   Valentina Cepeda, Andrés Gómez, and **Shaoning Han**.
   Submitted (2024).
2. Analysis of a Class of Minimization Problems Lacking Lower Semicontinuity.
   Shaoning Han, Ying Cui, and Jong-Shi Pang.
   Submitted (2023).
3. On Polynomial-Time Solvability of Combinatorial Markov Random Fields.
   Shaoning Han, Andrés Gómez, and Jong-Shi Pang.
   Submitted (2022).
4. Compact Extended Formulations for Low-rank Functions with Indicator Variables.
   Shaoning Han, and Andrés Gómez.
   Submitted (2023).
   • Third Place, INFORMS JFIG Paper Competition (2023).
5. Single-Neuron Convexifications for Binarized Neural Networks.
   Shaoning Han, and Andrés Gómez.
   Technical Report (2021).

TEACHING EXPERIENCE

Course Instructor

- *ISE 530* (MS)
  Optimization Methods for Data Analytics, University of Southern California, Fall 2023
  – Student Evaluation: **4.5/5.0**

Teaching Assistant

- *ISE 599* (PhD)
  Mixed-Integer Programming, University of Southern California, Spring 2021
- *ISE 530* (MS)
  Optimization Methods for Analytics, University of Southern California, Fall 2019
- *ENGR 0020* (BS)
  Prob & Stat for Engineers, University of Pittsburgh, Spring & Fall 2018 / Spring 2019
- *IE 2086* (MS)
  Decision Models, University of Pittsburgh, Fall 2017

INVITED TALKS

- *Polynomial-time solvability of combinatorial Markov random fields.* INFORMS Optimization Society Conference, Houston, TX, March 2024
- *On the convex hull of mixed-integer nonlinear submodular minimization.* INFORMS Annual Meeting, Phoenix, AZ, October 2023

- *Mixed-binary convex quadratic optimization and its applications in inference with sparsity.* The Academy of Mathematics and Systems Science (AMSS) of the Chinese Academy of Sciences, March 2023
- *On polynomial-time solvability of combinatorial Markov random fields.* INFORMS Annual Meeting, Indianapolis, IN, October 2022
- *Convexification for low-rank functions with indicator variables.* International Conference on Continuous Optimization, Bethlehem, PA, July 2022
- *Strongly polynomial algorithm for box-constrained quadratic programs with H_0-matrix.* INFORMS Optimization Society Conference, Greenville, SC, March 2022
- *Fractional 0-1 programming and submodularity.* INFORMS Annual Meeting, Anaheim, CA, October 2021
- *On SDP formulations for quadratic optimization with indicator variables.* INFORMS Annual Meeting, virtual, November 2020

SERVICE & PROFESSIONAL ACTIVITIES

Journal/Conference Reviewer

- Mathematical Programming (Series A and B)
- SIAM Journal on Optimization
- Operations Research
- Mathematics of Operations Research
- Journal of Global Optimization
- Computational Optimization and Applications
- Optimization Letters
- Conference on Integer Programming and Combinatorial Optimization (IPCO)

Invited Session Chair

- Recent algorithmic advances in nonsmooth optimization, 2024 INFORMS Optimization Society Conference, Houston, TX, March 2024
- Recent advances in convex and mixed-integer conic optimization, 2024 INFORMS Optimization Society Conference, Houston, TX, March 2024
- Recent advances in nonsmooth optimization, 2023 INFORMS Annual Meeting, Phoenix, AZ, October 2023
- Recent advances in mixed-integer nonlinear programming, 2023 INFORMS Annual Meeting, Phoenix, AZ, October 2023
- Algorithms for discrete optimization problems, 2022 INFORMS Optimization Society Conference, Greenville, SC, March 2022

Professional Member

- Institute for Operations Research and the Management Sciences (INFORMS)
- Society for Industrial and Applied Mathematics (SIAM)
- Mathematical Optimization Society (MOS)
- Association for Computing Machinery (ACM)

VOLUNTEER EXPERIENCE

Virtual volunteer at INFORMS Annual Meeting, Anaheim, CA, October 2021. Responsible for five rooms during one shift day to ensure the smooth progress of meetings.