

# 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, quality control

## ACADEMIC EMPLOYMENT

<b>National University of Singapore</b>	Singapore
Department of Mathematics	
<i>Assistant Professor</i>	July 2024 - Present
<b>University of Southern California</b>	Los Angeles, CA, USA
Department of Industrial & Systems Engineering	
<i>Postdoctoral Scholar</i>	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. Compact Extended Formulations for Low-rank Functions with Indicator Variables.  
**Shaoning Han**, and Andrés Gómez.  
**Mathematics of Operations Research (Accepted)** (2024).  
• Third Place, INFORMS JFIG Paper Competition (2023).
2. Continuous Selections of Solutions to Parametric Variational Inequalities.  
**Shaoning Han**, and Jong-Shi Pang.  
**SIAM Journal on Optimization** (2024), Vol. 34 (1), pp. 870–892.
3. 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).
4. 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.
5.  $2 \times 2$ -Convexifications for Convex Quadratic Optimization with Indicator Variables.  
**Shaoning Han**, Andrés Gómez, and Alper Atamtürk.  
**Mathematical Programming** (2023), Vol. 202, pp. 95–134.

6. 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.
7. 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.
8. 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)
9. Sparse and Smooth Signal Estimation: Convexification of  $\ell_0$ -Formulations.  
Alper Atamtürk, Andrés Gómez, and **Shaoning Han**. [alphabetical order]  
**Journal of Machine Learning Research** (2021), Vol. 22 (52), pp. 1–43.

## PREPRINTS

1. Real-Time Solution of Quadratic Optimization Problems with Banded Matrices and Indicator Variables.  
Andrés Gómez, **Shaoning Han**, and Leonardo Lozano.  
Submitted (2024).
2. Robust Support Vector Machines via Conic Optimization.  
Valentina Cepeda, Andrés Gómez, and **Shaoning Han**.  
Submitted (2024).
3. Analysis of a Class of Minimization Problems Lacking Lower Semicontinuity.  
**Shaoning Han**, Ying Cui, and Jong-Shi Pang.  
Submitted (2023).
4. On Polynomial-Time Solvability of Combinatorial Markov Random Fields.  
**Shaoning Han**, Andrés Gómez, and Jong-Shi Pang.  
Submitted (2022).
5. Single-Neuron Convexifications for Binarized Neural Networks.  
**Shaoning Han**, and Andrés Gómez.  
Technical Report (2021).

## TEACHING EXPERIENCE

- National University of Singapore**
- *MA 5243: Advanced Mathematical Programming* (Graduate Level), Fall 2024
- University of Southern California**
- *ISE 530: Optimization Methods for Analytics* (Graduate Level), Fall 2023

## INVITED TALKS

- *Real-Time Solution of Mixed-Integer Quadratic Programs Using Decision Diagrams*. INFORMS Annual Meeting, Seattle, WA, October 2024
- *On Polynomial-Time Solvability of Combinatorial Markov Random Fields*. 25th International Symposium on Mathematical Programming (ISMP), Montréal, Québec, Canada, July 2024

- *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, China, March 2023
- *On polynomial-time solvability of combinatorial Markov random fields*. INFORMS Annual Meeting, Indianapolis, IN, October 2022
- *Convecification 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
- Operations Research Letters
- Computational Optimization and Applications
- Optimization Letters
- Advances in Operations Research
- 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)