

Hao Hu

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EDUCATION

- | | |
|---|---------------------------------------|
| Tilburg University
Ph.D. in Mathematical Programming
Dissertation: <i>The quadratic shortest path problem: Theory and computations</i>
Advisor: Prof. Renata Sotirov | Tilburg, The Netherlands
2016-2019 |
| Tilburg University
M.Phil. in Operations Research
Dissertation: <i>The quadratic shortest path problem</i>
Advisor: Prof. Renata Sotirov | Tilburg, The Netherlands
2015-2016 |
| Utrecht University
M.S. in Mathematics
Dissertation: <i>On the extension complexity of stable set polytopes for perfect graphs</i>
Advisor: Prof. Monique Laurent, Prof. Ronald de Wolf | Utrecht, The Netherlands
2013-2015 |
| Tilburg University
B.S. Econometrics & Operations Research
Dissertation: <i>Latin Hypercube Designs</i>
Advisor: Prof. Edwin van Dam | Tilburg, The Netherlands
2010-2013 |

PROFESSIONAL APPOINTMENTS

- | | |
|--|--------------------------------------|
| Clemson University
<i>Assistant Professor, Mathematical and Statistical Sciences</i> | Clemson, SC, USA
09.2021– Present |
| University of Waterloo
<i>Postdoctoral Researcher, Combinatorics and Optimization</i>
Postdoctoral Advisor: Prof. Henry Wolkowicz | Waterloo, ON, Canada
2019-2021 |

PUBLICATIONS

Submitted

- **Hao Hu**. “Sharp Singularity-Degree Bounds for SDP–RLT Relaxations of Binary Programs”. arXiv:2608.29945, 2026.
- **Hao Hu**, Blake Smith, and Mingming Xu. “Face Identification via Polyhedral Relaxations for Binary Programs: A Comparison with Factor-Width Partial Facial Reduction”. arXiv:2608.15676, 2026.
- **Hao Hu** and Mingming Xu. “Face Structure in Partial Facial Reduction of Semidefinite Relaxations of Binary Programs”. arXiv:2607.25689, 2026.
- **Hao Hu**. “On the Singularity Degree of Shor Relaxations for 0–1 Programs”. arXiv:2607.12476, 2026.

- Mingming Xu, **Hao Hu**. “SDP Approach to Quadratic Vertex-Disjoint Paths Problem”. arXiv: 2604.03452, 2026.
- **Hao Hu**, Stefan Sremac, Hugo J. Woerdeman and Henry Wolkowicz. “Finding a Maximal Determinant Principal Submatrix via Hadamard’s Inequality”. arXiv:2508.15608, 2025.
- **Hao Hu** and Boshi Yang. “Affine FR: an Effective Facial Reduction Algorithm for Semidefinite Relaxations of Combinatorial Problems”. arXiv:2402.11796, 2024.
- **Hao Hu**. “The Maximum Singularity Degree for Linear and Semidefinite Programming”. arXiv:2402.11795, 2024.

Published and Accepted

- **Hao Hu** and Mingming Xu. “A Primal Approach to Facial Reduction for SDP Relaxations of Combinatorial Optimization Problems”. Accepted for publication in *INFORMS Journal on Computing*. arXiv:2607.26514, 2026.
- **Hao Hu**, Xinxin Li, Haesol Im, and Henry Wolkowicz. “A semismooth Newton-type method for the nearest doubly stochastic matrix problem”. *Mathematics of Operations Research*, 49(2):729–751, 2024.
- **Hao Hu** and Xinxin Li. “Facial Reduction for the Shor SDP relaxation of QCQPs”. *Applied Set-Valued Analysis & Optimization*, 5(2), 2023.
- **Hao Hu**, Renata Sotirov, and Henry Wolkowicz. “Facial reduction for symmetry reduced semidefinite and doubly non-negative programs”. *Mathematical Programming*, 200(1):475–529, 2023.
- **Hao Hu**, Xinxin Li, and Jiageng Wu. “A note on the SDP relaxation of the minimum cut problem”. *Journal of Global Optimization*, 87(2):857–876, 2023.
- **Hao Hu**, Jiyoung Im, Jie Lin, Norbert Lütkenhaus, and Henry Wolkowicz. “Robust interior point method for quantum key distribution rate computation”. *Quantum*, 6:792, 2022.
- Naomi Graham, **Hao Hu**, Jiyoung Im, Xinxin Li, and Henry Wolkowicz. “A restricted dual Peaceman-Rachford splitting method for a strengthened DNN relaxation for QAP”. *INFORMS Journal on Computing*, 34(4):2125–2143, 2022.
- **Hao Hu** and Renata Sotirov. “The linearization problem of a binary quadratic problem and its applications”. *Annals of Operations Research*, 307:229–249, 2021.
- **Hao Hu** and Renata Sotirov. “On solving the quadratic shortest path problem”. *INFORMS Journal on Computing*, 32(2):219–233, 2020.
- **Hao Hu** and Monique Laurent. “On the linear extension complexity of stable set polytopes for perfect graphs”. *European Journal of Combinatorics*, 80:247–260, 2019.
- **Hao Hu** and Renata Sotirov. “Special cases of the quadratic shortest path problem”. *Journal of Combinatorial Optimization*, 35:754–777, 2018.

GRANTS & FELLOWSHIPS

Defense Established Program to Stimulate Competitive Research 2023-2026

Amount: \$598,842

Title: Facial Reduction Algorithm for Semidefinite Relaxations of Combinatorial Problems

Funder: Air Force Office of Scientific Research

Co-PI: Boshi Yang

Faculty Excellence Interdisciplinary Enhancement Program

2023

Amount: \$19,075

Funder: Clemson University

TEACHING EXPERIENCE

Clemson University		Clemson, SC
Term	Course Name	Code
Fall 26	Discrete Optimization	MATH8120
Fall 26	Introductory Business Statistics	STAT3090
Spring 26	Advanced Linear Programming	MATH8130
Fall 25	Discrete Optimization	MATH8120
Fall 25	Network Flow Programming	MATH8140
Spring 25	Advanced Linear Programming	MATH8130
Fall 24	Discrete Optimization	MATH8120
Fall 24	Introductory Business Statistics	STAT3090
Spring 24	Advanced Linear Programming	MATH8130
Fall 23	Introductory Business Statistics	STAT3090
Fall 23	Mathematical Programming	MATH8100
Spring 23	Mathematical Programming	MATH8100
Fall 22	Discrete Optimization	MATH8120
Spring 22	Discrete Optimization	MATH8120
Spring 22	Mathematical Programming	MATH8100
University of Waterloo		Waterloo, Canada
Term	Course Name	Code
Spring 21	Algebra for Honours Mathematics	MATH135
Winter 21	Introduction to Optimization	CO227
Fall 20	Introduction to Optimization	CO227

Graduate Students Supervised and/or Co-Supervised

Start	End	Name	Degree	University	Notes
Aug 25	-	Damith Wijethunga	PhD	Clemson University	
Aug 24	-	Mingming Xu	PhD	Clemson University	
May 25	-	Katherine Charbonneau	PhD	Clemson University	
Aug 22	-	Blake Smith	PhD	Clemson University	Expected 12/2026
Aug 24	May 25	Katherine Charbonneau	Master	Clemson University	
Aug 24	May 25	Brigid Murphy	Master	Clemson University	
May 23	May 24	Sarah Kelly	PhD	Clemson University	Co-supervised with Dr. Boshi Yang
Sep 19	Aug 21	Jiyoung Haesol Im	PhD	Waterloo University	Co-supervised with Prof. Henry Wolkowicz

PRESENTATIONS

Invited Conference Presentations

- “Facial Reduction for Semidefinite Relaxations of Combinatorial Optimization Problems”, *SIAM Conference on Optimization*, The University of Edinburgh, Edinburgh, United Kingdom, June 2–5, 2026.
- “Facial Reduction for Semidefinite Relaxations of Combinatorial Optimization Problems”, *INFORMS Optimization Society Conference*, Georgia Institute of Technology, Atlanta, Georgia, USA, March 13-15, 2026.
- “Facial Reduction for Semidefinite Relaxations of Combinatorial Optimization Problems”, *INFORMS Annual Meeting*, Atlanta, Georgia, USA, October 26-29, 2025.
- “Facial Reduction for Semidefinite Relaxations of Combinatorial Optimization Problems”, *International Conference on Continuous Optimization (ICCOPT)*, The University of Southern California, Los Angeles, California, USA, July 19-24, 2025.
- “The Maximum Singularity Degree for Linear and Semidefinite Programming”, *INFORMS Annual Meeting*, Seattle, Washington, USA, October 20-23, 2024.
- “The Maximum Singularity Degree for Linear and Semidefinite Programming”, *International Symposium on Mathematical Programming*, Montreal, Canada, July 21-26, 2024.
- “Affine FR: an Effective Facial Reduction Algorithm for Semidefinite Relaxations of Combinatorial Problems”, *INFORMS Optimization Society*, Houston, Texas, USA, March 22-24, 2024.
- “Affine FR: an Effective Facial Reduction Algorithm for Semidefinite Relaxations of Combinatorial Problems”, *INFORMS Annual Meeting*, Phoenix, Arizona, USA, October 15-18, 2023.
- “Affine FR: an Effective Facial Reduction Algorithm for Semidefinite Relaxations of Combinatorial Problems”, *SIAM Conference on Optimization*, Seattle, Washington, USA, May 31 - June 3, 2023.
- “Robust Interior Point Methods for the Key Rate Computation in Quantum Key Distribution”, *INFORMS Annual Meeting*, Indiana Convention Center, Indianapolis, USA, October 16-19, 2022.
- “Robust Interior Point Methods for the Key Rate Computation in Quantum Key Distribution”, *International Conference on Continuous Optimization (ICCOPT)*, Lehigh University, Bethlehem, Pennsylvania, USA, July 25-28, 2022.
- *The Canadian Mathematical Society (CMS) Winter Meeting*, Online, December 2-7, 2021.
- “The linearization problem of a binary quadratic problem and its applications”, *INFORMS Annual Meeting*, Online, October 24-27, 2021.
- “A semismooth Newton-type method for the nearest doubly stochastic matrix problem”, *SIAM Conference on Optimization*, Online, July 20-23, 2021.
- “Robust Interior Point Methods for the Key Rate Computation in Quantum Key Distribution”, *Tutte Colloquium (University of Waterloo)*, Online, April 23, 2021.
- *The Canadian Mathematical Society (CMS) Winter Meeting*, Online, December 4-7, 2020.
- “Facial reduction for symmetry reduced semidefinite and doubly non-negative programs”, *Virtual seminar on algebraic matroids, and geometric constraint systems*, Online, October 22, 2020.
- “A semismooth Newton-type method for the nearest doubly stochastic matrix problem”, *Midwest Optimization Meeting*, Online, October 16-17, 2020.

- “Facial reduction for symmetry reduced semidefinite and doubly non-negative programs”, *The Canadian Mathematical Society (CMS) Winter Meeting*, Toronto, Canada, December 6-9, 2019.
- “Facial reduction for symmetry reduced semidefinite and doubly non-negative programs”, *Groups and Graphs, Designs and Dynamics (G2D2)*, Yichang, China, August 12-25, 2019.
- “Facial reduction for symmetry reduced semidefinite and doubly non-negative programs”, *International Conference on Continuous Optimization*, Berlin, Germany, August 3-9, 2019.
- “On solving the quadratic shortest path problem”, *International Symposium on Mathematical Programming*, Bordeaux, France, July 2-6, 2018.
- “Special cases of the quadratic shortest path problem”, *DIAMANT symposium*, Koningshof, Eindhoven, The Netherlands, April 5, 2018.
- “Special cases of the quadratic shortest path problem”, *SIAM Conference on Optimization*, Vancouver, BC, Canada, May 21-25, 2017.

Conference Session Organization

- INFORMS Optimization Society Conference, Greenville, SC, USA, March 13-15, 2022.

HONORS & AWARDS

Center Koopmans Scholarship	2015-2016
Utrecht Excellence Scholarship	2013-2015
Excellence Scholarship, Tilburg University	2013

ACADEMIC SERVICE

Service

Graduate Affairs, Clemson University	2025-now
Research Committee, Clemson University	2022-2025
Subfaculty Coordinator, Clemson University	2021-2025

Reviewer for Journals

Mathematics of Operations Research
 Mathematical Programming Computation
 European Journal of Operational Research
 EURO Journal on Computational Optimization
 Journal of Global Optimization
 Computational Optimization and Applications
 Discrete Optimization
 Symmetry
 Computers and Operations Research