

# Haoming Shen

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🌐 <https://hm-shen.github.io/>

## Research Interests

Methodologies **Stochastic Optimization and Integer Programming**  
Applications **Power and Transportation Systems**

## Education

- 2018–Present **Ph.D. in Industrial and Operations Engineering**,  
*University of Michigan*, Ann Arbor, MI, USA
- 2021–Present **M.S. in Applied Mathematics**,  
*University of Michigan*, Ann Arbor, MI, USA
- 2016–2018 **M.S. in Electrical and Computer Engineering**,  
*University of Michigan*, Ann Arbor, MI, USA  
Specialized in Signal Processing and Machine Learning
- 2012–2016 **B.E. in Electrical Engineering**,  
*Xi'an Jiaotong University*, Xi'an, Shannxi, China

## Preprints

- 2022 **Shen, H.** and Jiang, R., 2022. **Wasserstein Two-Sided Chance Constraints with An Application to Optimal Power Flow**. arXiv:2204.00191.
- 2021 **Shen, H.** and Jiang, R., 2021. **Convex Chance-Constrained Programs with Wasserstein Ambiguity**. arXiv:2111.02486. Major Revision at Operations Research, Honorable mention in the 2022 INFORMS Optimization Society's Student Paper Prize.

## Publications

- 2022 **Shen, H.** and Jiang, R., 2022. **Chance-Constrained Set Covering with Wasserstein Ambiguity**. *Mathematical Programming*, pp.1-54.
- 2020 Chen, X., Huang, X., Cai, Y., **Shen, H.** and Lu, J., 2020. **Intra-day Forecast of Ground Horizontal Irradiance Using Long Short-term Memory Network (LSTM)**. *Journal of the Meteorological Society of Japan*. Ser. II.
- 2018 Heimann, M., **Shen, H.**, Safavi, T. and Koutra, D., 2018, October. **REGAL: Representation learning-based graph alignment**. In *Proceedings of the 27th ACM international conference on information and knowledge management* (pp. 117-126).
- 2017 Jin, D., Leventidis, A., **Shen, H.**, Zhang, R., Wu, J. and Koutra, D., 2017, September. **PERSEUS-HUB: Interactive and collective exploration of large-scale graphs**. In *Informatics* (Vol. 4, No. 3, p. 22).

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## Research Projects

- 2020-2021 **A Data-Driven Approach towards Strategic Planning of Charging Stations**  
Developed a data-driven distributionally robust chance-constrained model for the strategic planning of charging stations for battery electric buses (BEBs), where the uncertainty in energy consumption and dwell time of BEBs are explicitly considered.
- Derived mixed-integer second-order conic reformulation for the problem.
  - Designed an efficient algorithm based on separation and low-rank approximation.
  - Extensive experiments on a real-world bus system demonstrated the effectiveness of the proposed models and algorithms.
- 2018-2019 **Projection Cuts for Two-Stage Stochastic Mixed-Integer Programs**  
Proposed a new type of valid inequality, called projection cuts, for Benders decomposition to significantly reduce the Benders feasibility cuts and accelerate computation.
- Motivated by Principal Component Analysis (PCA), projection cuts are constructed from the minor components of the positive cone generated by the recourse matrix.
  - Designed a two-phase variant of Benders decomposition with projection cuts to strengthen the initial relaxation.
  - Demonstrated its effectiveness on an extensive numerical study based on stochastic unit commitment, multi-commodity network design, and stochastic production routing problems.

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## Presentations and Posters

- 2022 **Shen, H.**, Jiang, R., Convex Chance-Constrained Programs with Wasserstein Ambiguity, International Conference on Continuous Optimization (ICCOPT).
- 2022 **Shen, H.**, Jiang, R., Convex Chance-Constrained Programs with Wasserstein Ambiguity, INFORMS Optimization Society (IOS) Conference.
- 2022 **Shen, H.**, Jiang, R., Chance-Constrained Set Covering with Wasserstein Ambiguity, INFORMS Computing Society (ICS) Conference.
- 2021 **Shen, H.**, Jiang, R., Chance-Constrained Set Covering with Wasserstein Ambiguity, INFORMS Annual Meeting.
- 2021 **Shen, H.**, Jiang, R., Chance-Constrained Set Covering with Wasserstein Ambiguity, Mixed Integer Programming Workshop.
- 2020 **Shen, H.**, Jiang, R., Distributionally Robust Chance-Constrained Set Covering, INFORMS Annual Meeting.
- 2019 **Shen, H.**, Jiang, R., Benders Decomposition with Projection Cuts, INFORMS Annual Meeting.

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## Awards

- 2022 Honorable mention in the 2022 INFORMS Optimization Society's Student Paper Prize
- 2022 Rackham Graduate Student Travel Grant, University of Michigan
- 2019-2021 Rackham Graduate Student Research Assistantship, University of Michigan
- 2019-2020 Rackham Graduate Student Instructor, University of Michigan
- 2019 Rackham Graduate Student Travel Grant, University of Michigan

2018 Engineering Graduate Fellowship, University of Michigan

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## Related Courses

Optimization	Linear Programming, Convex Optimization, Integer Programming, Dynamic Programming, Stochastic and Robust Optimization.
Mathematics	Real Analysis, Functional Analysis, Probability Theory, Stochastic Processes, Intro to Topology.
Computer Science	Machine Learning, Reinforcement Learning, Computational Complexity Theory, Foundations of AI, Foundations of Computer Vision, Computational Data Science, Database Management Systems.

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## Teaching Experience

Fall 2020	<b>Graduate Student Instructor</b> , IOE 310, Intro to Optimization Methods
Winter 2020	<b>Graduate Student Instructor</b> , IOE 310, Intro to Optimization Methods
Fall 2019	<b>Graduate Student Instructor</b> , IOE 611, Nonlinear Programming

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## Professional Skills

Languages	Python, Julia, $\text{\LaTeX}$ , Shell Script, MATLAB, Mathematica, C++, C, Java, R, SQL.
Packages	Gurobi, MOSEK, Pyomo, PySpark, Networkx, scikit-learn, Tensorflow.