Dahye Han

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Summary

I am broadly interested in nonlinear nonconvex optimization, mixed-integer programming, and large-scale optimization in power systems. My current research focuses on finding convex hulls of nonconvex sets and developing heuristics to improve the branch and bound algorithm.

Education

Georgia Institute of Technology Aug 2020 – Present

- Ph.D. student in Operations Research, GPA: 3.84/4.00
- Advisor: Santanu S. Dey

Washington University in St. Louis Aug 2011 – Dec 2015

- A.B. *summa cum laude* in Mathematics, GPA: 3.96/4.00
- Visiting student at the University of Edinburgh (2013 –2014)

Publications

(marks alphabetical order of author names)*

Santanu S. Dey*, **Dahye Han***, Yang Wang*. "Aggregation of Bilinear Bipartite Equality Constraints and its Application to Structural Model Updating Problem." (*Submitted*).

Dahye Han, Nan Jiang, Weijun Xie, Santanu S. Dey. "Regularized MIP Model for Optimal Power Flow with Energy Storage Systems and its Applications." *(Under review*).

Seonho Park, Wenbo Chen, **Dahye Han**, Mathieu Tanneau, Pascal Van Hentenryck. (2023). Confidence-Aware Graph Neural Networks for Large-Scale Reliability Assessment Commitments in Power Systems. *IEEE Transactions on Power Systems* 39(2): 3839–3850.

Neil Barry*, Minas Chatzos*, Wenbo Chen*, **Dahye Han***, Chaofan Huang*, Roshan Joseph*, Michael Klamkin*, Seonho Park*, Mathieu Tanneau*, Pascal Van Hentenryck*, Shangkun Wang*, Hanyu Zhang*, Haoruo Zhao*. (2022). Risk-aware control and optimization for high-renewable power grids. *arXiv*:2204.00950.

Talks and Posters

Aggregation of Bilinear Bipartite Equality Constraints and its Application to Structural Model Updating Problem

- Poster at the Mixed Integer Programming (MIP) Workshop. Lexington, KY. June 2024.
  - Best Poster Award, Student Poster Competition
- Invited talk at INFORMS Annual Meeting. Seattle, WA. Oct 2024.

Regularized MIP Model for Optimal Power Flow with Energy Storage Systems and its Applications

- Poster at the Mixed Integer Programming (MIP) Workshop. Los Angeles, CA. May 2023.
- Invited talk at INFORMS Annual Meeting. Phoenix, AZ. Oct 2023.
- Invited talk at International Symposium on Mathematical Programming. Montreal, QC. Jul 2024.

Awards and Honors

Best Poster Award, Student Poster Competition, MIP 2024	Jun 2024
Center for the Integration of Research, Teaching & Learning (CIRTL) Associate Teaching Certificate	Apr 2024
Kerry Clayton Fellowship	Aug 2020 – Jul 2022
H. Milton Stewart Fellowship	Aug 2020 – Jul 2022
Thomas Eliot Scholarship	Aug 2011 – Dec 2015
High Distinction in Mathematics	Dec 2015
Honors Program in Statistics	Dec 2015

Research Experience

Georgia Institute of Technology, *Graduate Research Assistant* Aug 2020 – Present

- *Selected Projects:*

  Improving Branch and Bound for Bilinear Bipartite Problems (Mar 2023 – Sep 2024)
  - Developed custom branch-and-bound code and separation cut code for bilinear bipartite problems.
  - Proposed a new class of cuts that utilize the problem structure.
  - Apply aggregation technique for two bilinear bipartite constraints and showed sufficient conditions for achieving the exact convex hull via finite or infinite aggregations.

  Optimal Power Flow with Energy Storage Systems (Oct 2022 – Dec 2023)
  - Studied the structure of mixed-integer problem of optimal power flow with battery problem.
  - Proposed a new model whose linear relaxation has a zero-integrality gap and nice structural properties.
  - Applied the model for large planning problems including trilevel interdiction problem.

  Stochastic Look-Ahead Commitment Problem (Jul 2021 – Aug 2022)
  - Developed a stochastic Look-Ahead Commitment simulator as part of the Risk-aware Market Clearing for Power Systems (RAMC) project.
  - Assessed the benefit of stochastic model in substituting market elements.
  - Collaborated with MISO, an independent operator for the second largest electric system in the United States.

  Electric Vehicle Battery Recycling (Dec 2020 – Jul 2021)
  - With Dr. Andy Sun, developed the first multi-period deterministic Electric Vehicle lithium-ion battery recycling model that expands from existing life-cycle analysis and closed-loop battery recycling models.

Work Experience

NERA Economic Consulting Senior Analyst Feb 2016 – Jul 2020

- As part of the Energy and Auctions practice group, provided rigorous economic analysis and consulting service to electric utilities regarding the purchase of power and renewable energy certificates.
- Promoted from Research Associate, Associate Analyst, and Analyst.
- *Selected Projects:*

  Oman Power 2022 Procurement (May 2017 – Jul 2020)
  - Built a quadratically constrained optimization tool to provide the optimal economic purchase option for Oman.
  - Assessed and enhanced the standardization feature of the bid evaluation model to allow comparisons of bids from different types of powerplants.
  - Conduct sensitivity analysis of the benchmark price to provide a robust benchmark for evaluating powerplant bids.

  Illinois Energy and Renewable Procurement (Mar 2017 – Apr 2020)
  - Evaluated energy bid blocks using linear optimization that resulted in the least cost combination of energy purchase to clients for over 45,000 MW of energy.
  - Developed a scalable and efficient linear optimization tool for bid allocation across multiple companies, handling the high dimensionality of the input variables.
  - Designed an automatic marginal bid selection tool using machine learning libraries in Python.

  PSE&G Solar Loan Program (Feb 2016 – Dec 2017)
  - Performed linear regression on project characteristic of bids to determine independent variables.
  - Simplified the benchmark analysis model by identifying and blocking nuisance variables.
  - Created a sensitivity matrix to estimate changes in the benchmark price based on significant factors.

Twinword, Inc. Associate Developer Jul 2014 – Dec 2015

- Participated in all parts of start-up management from idea sketch and marketing to front-end/back-end programming.
- *Selected Project:*

  Psychological Test (project funded by the Korean government) (Jul 2014 – Aug 2015)
  - Developed a semantic algorithm that produces results close to the MBTI based on semantic similarities in responses.
  - Parsed the text corpora and performed word clustering and sentiment analysis to reinforce the database.

Teaching Experience

Simulation Analysis and Design, Teaching Assistant	Sumer 2023, Summer 2024
Deterministic Optimization, Teaching Assistant	Spring 2023
Financial Optimization, Teaching Assistant	Fall 2021
Statistical Methods, Teaching Assistant	Summer 2021

Academic Service

Reviewer for IEEE Power & Energy Society (PES) Letters

Reviewer for SIAM Journal on Optimization

Reviewer for Power System Computation Conference (PSCC) 2022

Technical Skills

Programming Languages: Julia, Python, MATLAB, SAS Programming

Optimization Solvers: Gurobi, BARON, HiGHs, Mosek, SCIP

Patents

Mathieu Tanneau, Wenbo Chen, Minas Chatzos, **Dahye Han**, Hanyu Zhang, Haoruo Zhao. “Risk-assessment Simulator for Power Systems.” (Filed).