

# Matthew Brun

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## Education

**Massachusetts Institute of Technology**, Cambridge, MA 2022 - present  
PhD Student in the Operations Research Center, advised by Dr. Andy Sun  
Research Focus: Global Optimization, Large Scale Optimization, Energy Systems Optimization

**Rice University**, Houston, TX 2018 - 2022  
GPA: 3.96 / 4.0, Honors: Summa Cum Laude, Phi Beta Kappa, Distinction in Research and Creative Work  
BA in Operations Research  
Michael Ross Franko Award (Exemplary Student, Computational and Applied Math Department)

## Relevant Coursework/Skills

Operations Research, Optimization, Simulation, Data Science/Machine Learning, Julia, Python, MATLAB, R, SQL

## Work Experience

**ORTEC**, Houston, TX  
Optimization Consultant Intern, Data Science & Consulting May 2022 - August 2022

- Engaged external clients to design and implement end-to-end manufacturing optimization applications in AIMMS
- Engineered model formulation to provide provably optimal solutions within minutes
- Designed, recommended, and presented best practices for implementing AIMMS unit tests

**Chevron**, Houston, TX  
Data Science Intern, Commodity Supply Chain Management May 2021 - August 2021

- Designed and implemented a linear programming optimization model for lubricant additive supply chains and manufacturing, solving operational problems in seconds
- Recommended a software framework for implementing future optimization projects

Data Science Intern, Chevron Pipeline & Power May 2020 - August 2020

- Trained a deep learning model to extract building footprints from satellite imagery near pipeline routes
- Predicted hot dog sales in gas stations, placed 2nd of 9 intern teams in model accuracy

## Research Experience

**Optimal Investment Strategy for EV Battery Recycling Facilities** September 2022 - present

- Implemented a two-stage nonconvex optimization model to identify optimal long term investment strategies in EV battery recycling facilities
- Designed new solution algorithms that improve solution time by 10-50x over standard algorithms, solving to global optimality in hours
- Work to be presented at INFORMS Annual Conference, manuscript in preparation for submission to Operations Research (INFORMS)

**ARPA-E Grid Optimization Competition** September 2022 - September 2023

- Implemented software to solve multiperiod security constrained AC power flow within 99% of optimality in hours
- Designed new heuristic methods to enable spatial and temporal decomposition of large scale (millions of variables) optimization problems
- Placed 2nd of 14 teams, receiving \$520k in prize money

**Lagrangian Duality of Multiobjective Integer Programs** January 2021 - January 2023

- Theoretical work which proved new results on dual strength in discrete multiobjective settings
- Extended concepts from single objective discrete optimization and identified new counterexamples
- Recipient of the INFORMS Undergraduate Operations Research Prize, publication under review at Mathematical Programming (Springer)

**Deep Learning for Ovarian Cancer Tissue Subtype Classification** May 2019 - December 2019

- Improved accuracy of deep learning image segmentation algorithm by 30% on new high-resolution dataset by adapting model structure
- Awarded best in program for poster presentation at the IBB Summer Undergraduate Research Symposium, published in Anaylst (RSC)