Gizem Toplu Tutay

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EDUCATION

The University of Texas at Austin **Austin, TX**
PhD in Operations Research and Industrial Engineering *Spring 2021 – Summer 2025 (expected)*
Thesis: Equity-Driven Resilience Planning: Data Analytics and Optimization Models under Uncertainty
(*Advisors: Prof. John J. Hasenbein and Prof. Erhan Kutanoglu*)

The University of Texas at Austin **Austin, TX**
MS in Operations Research and Industrial Engineering *2024*

Stanford University and DeepLearning.AI **Online**
Machine Learning Specialization *Certification, 2023*

Bogazici University **Istanbul, Turkey**
BS in Civil Engineering (Highest Honors, ranked 3rd) *2008 – 2013*
Thesis: Optimizing Wind Energy and Storage: A Financial and Operational Investment Analysis

RESEARCH INTERESTS

Methodology: Integer programming, network optimization, multi-stage stochastic optimization, robust optimization, machine learning

Applications:
- Energy systems, societal systems, and power systems/electric grids
- Interdisciplinary research to address complex environmental, social, and policy challenges
- Infrastructure resilience to extreme events
- Equitable resource allocation and investment planning

PUBLICATIONS

Published Journal Papers:

- **Toplu-Tutay, G.**, Hasenbein, J. J., Kutanoglu. E., "Impact of Power Outages Depends on Who Loses It: Equity-Informed Grid Resilience Planning via Stochastic Optimization," *Socio-Economic Planning Sciences*, Vol. 95, 102036, pp. 1–16, October 2024
- Kim, K. Y., **Toplu-Tutay, G.**, Kutanoglu, E., Hasenbein, J. J., "A Stochastic Optimization Model for Patient Evacuation from Health Care Facilities during Hurricanes," *International Journal of Disaster Risk Reduction*, Vol. 108, 104518, pp. 1–18, June 2024

Peer Reviewed Conference Papers:

- Das, J., **Toplu-Tutay, G.**, Gulen, G., and Young, M., "Power Grid Dispatch Modeling for the Prospective Current Trends Scenario for the ERCOT Service Area of Texas," *IEEE Texas Power and Energy Conference (TPEC)*, pp. 1-6, 2025.
- **Toplu-Tutay, G.**, Hasenbein, J. J., Kutanoglu. E., "Scenario-based optimization model for long-term healthcare infrastructure resilience against flooding," *IISE Annual Conference.Proceedings*, pp. 1–6, 2022

Work in Preparation:

- Quantifying the Social Cost of Storms: How Social Vulnerabilities Drive Mortality Burden, Target Journal Submission: *Nature, in Fall 2025*

  (with John J. Hasenbein and Erhan Kutanoglu, University of Texas at Austin).

- Assessing Grid Resilience and the Social Cost of Disasters Under Varying Decarbonization Scenarios, Target Journal Submission: *Energy Economics, in Fall 2025*

  (with John J. Hasenbein, Erhan Kutanoglu, and Michael H. Young, University of Texas at Austin).

- Building Resilient Communities: A Network Analytics Approach to Infrastructure Planning, Target Journal Submission: *European Journal of Operational Research, in Spring 2026*

  (with John J. Hasenbein and Erhan Kutanoglu, University of Texas at Austin).

RESEARCH AND INDUSTRY EXPERIENCE

The University of Texas at Austin **Austin, TX**
Doctoral Research Assistant *Jan 2021 – present*

University Graduate Continuing Fellowship Research (2024-2025)

- Developed a framework to quantify long-term tropical cyclone-induced mortality, integrating historical storm data with county-level total death records. (Work in Preparation: Quantifying the Social Cost of Storms)
- Analyzing the social cost of storms, examining how socio-economic factors influence mortality burden under different hazard intensities. (Ongoing)
- Assessing grid resilience and the social cost of disasters under varying decarbonization scenarios, exploring trade-offs between renewable energy integration and disaster preparedness. (Ongoing)

Bureau of Economic Geology - Comparing Electricity Options (CEO) project (2023-2024)

- Developed a mixed-integer programming (MIP) model for capacity expansion planning to optimize the future energy mix, ensuring grid reliability under energy transition scenarios with the gradual integration of wind, solar, and battery storage technologies

IC^2 Institute-funded research (2022-2023)

- Developed a two-stage stochastic integer programming model for disaster mitigation investments in transmission grids, with a focus on substation hardening
- Created equity metrics to incorporate the uneven impacts of prolonged power outages on socially vulnerable communities
- Formulated equity-informed models and a justice model inspired by the U.S. government's Justice40 Initiative
- Conducted a case study on the Texas grid's resilience during hurricane-induced flooding

National Science Foundation (NSF)-funded research (2021-2022)

- Developed a two-stage stochastic integer programming model for staging area location(s) and resource allocation, considering the uncertainty in patient evacuation needs due to the uncertain landfall and precipitation of an emerging hurricane
- Integrated the decision-making model with physics-based hydrological models for inland flooding and storm surge
- Conducted a case study on Hurricane Harvey's impact on the Texas coastline

National Renewable Energy Laboratory (NREL) **Golden, CO**
Ph.D. Research Intern *May 2024 – August 2024*

- Contributed to a project optimizing electric vehicle managed charging (EVMC) to improve bulk power grid reliability, affordability, and decarbonization
- Assisted in integrating EVMC into ReEDS, NREL's flagship capacity planning model (MIP-based), and validated it using load profiles and charging flexibility data from the TEMPO model
- Developed scripts for translating TEMPO data to ReEDS format and generating interpretable outputs from optimal solutions and constraint marginals
- Collaborated with a large, distributed team while adhering to coding standards, leveraging version control tools like Git and GitHub for code development and management
- Utilized High-Performance Computing (HPC), working remotely with cloud-based infrastructure

GISEMAI **Ankara, Turkey**
Founder *Jan 2018 – Dec 2020*
- Led an e-commerce startup, managing global logistics, supply chain management, and operations
- Applied inventory management techniques, including *just-in-time* and the *newsvendor* model, to ensure effective stock control and demand forecasting
- Managed end-to-end processes, from manufacturing to warehousing, sales, and delivery.

CLK Energy Investment **Istanbul, Turkey**
Senior Strategic Planning Analyst *Jun 2015 – Nov 2017*
- Led a strategic planning team, collaborating with departments across the enterprise (trading, finance, onsite technical teams)
- Developed and applied time series forecasting models to predict electricity demand, enabling data-driven strategic decisions
- Led cross-functional initiatives to shape or inform the company's long-term plans and decisions

ENERJISA **Istanbul, Turkey**
Key Account Manager *Sep 2013 – Mar 2014*
- Acquired and managed key accounts (high-electricity demand companies and industrial facilities) for Turkey's largest electricity generation and distribution company
- Analyzed energy markets, negotiated high-value contracts, and collaborated with onsite technical teams to support key accounts in achieving optimal energy solutions

HONORS AND AWARDS

- $52K 1 year University Graduate Continuing Fellowship for outstanding academic accomplishments (2024-2025)
- IC^2 Institute Seed Grant, *Towards a Well-Being Economy: Advancing Equity in Social, Economic, and Health Systems* (2022-2023)
- NSF Award #1940308, *CoPe EAGER: Addressing Human-Centric Decision-Making Challenges from Coastal Hazards via Integrated Geosciences Modeling and Stochastic Optimization* (2021-2022) (Participated under advisors)
- Graduated *summa cum laude* (with highest honors), B.S. (2013)
- Academic excellence scholarship for outstanding performance (2008-2013)

TEACHING EXPERIENCE

Department of Mechanical Engineering - Cockrell School of Engineering
Teaching Assistant for Engineering Statistics *Fall 2022*
- Upper-division course on probability, distribution theory, data analysis, statistics, interval estimation, hypothesis testing, and statistical quality control.
- Designed and led recitation classes, held weekly office hours, graded assignments and exams.
- Responsible for 25 students

Department of IROM - McCombs School of Business

Teaching Assistant for Learning Structures & Time Series *Spring 2021*

- Graduate-level course on unsupervised machine learning (principal component analysis, cluster analysis, factor analysis) and time series forecasting (ARIMA, autoregression).
- Held weekly office hours and graded assignments and exams.
- Responsible for 105 students

Talks

- Presented *Equity-informed Power Grid Resilience Planning via Stochastic Optimization*:
  - INFORMS Annual Meeting, Seattle, October 2024
  - Society for Risk Analysis Annual Meeting, Austin, December 2024
- Presented *Disparate Impacts of Extreme Flooding And Power Grid Failures in Different Communities*, INFORMS Annual Meeting, Indianapolis, October 2022
- Presented *A Scenario-based Optimization Model for Long-term Healthcare Infrastructure Resilience against Flooding*, IISE Annual Conference, Seattle, May 2022
- Led annual seminars at CLK Energy Investment. Presented on electricity market developments to an audience managing 25% of Turkey's total electricity demand (2015, 2016, 2017).

PROFESSIONAL SERVICE

- Reviewer for *Applied Energy* and *IEEE Transactions on Energy Markets, Policy, and Regulation* (2023-present)
- Member of INFORMS and International Association for Energy Economics (IAEE)
- Chair of the Tenant Advisory Board for University Housing and Dining: Represent residents and organize community-building events in university apartments (2023-present)
- Organized the IAEE Eurasian Conferences in Nur-Sultan, Kazakhstan (2019); Baku, Azerbaijan (2016, 2018); Zagreb, Croatia (2017)
- Organized the IAEE Southeast Europe Symposium in Sofia, Bulgaria (2018) and Bucharest, Romania (2019)
- Assisted in organizing the East Med Energy Symposium for the Turkish Association for Energy Economics in Güzelyurt, Turkish Republic of Northern Cyprus (2019)
- Assisted in organizing the IAEE Middle East Symposium in Abu Dhabi, UAE (2019)
- Assisted in organizing the En.Economics & Industry Conference for the Slovenian Association for Energy Economics in Ljubljana, Slovenia (2016)
- Organized IAEE Summer Schools on Electricity Markets and Regulation in Istanbul, Turkey (2015, 2016)
- Assisted in organizing the 38th IAEE International Conference in Antalya, Turkey (2015)

SKILLS

Programming Languages: Python, R, MATLAB, SQL, GAMS

Optimization and Machine Learning Tools: Gurobi, CPLEX, IPOPT, TensorFlow, PyTorch, Keras, NumPy, Pandas, Matplotlib, Seaborn, Scikit-learn

PERSONAL DETAILS

Languages: Turkish (native), English (fluent)

Citizenship: Turkey (Turkish Citizen)

Personal Interests: Engaging in daily exercise to unwind and stay focused, including walking, weight lifting, dancing, and various sports such as rowing, tennis, and snowboarding, depending on the time of year and location, as well as experimenting in the kitchen.