

# Miruna Oprescu

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## Summary

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I design machine learning algorithms for causal inference, reinforcement learning, and data-driven decision-making under uncertainty. My work tackles fundamental challenges including imperfect compliance in experiments, robustness to unobserved or limited data, off-policy evaluation, and learning from structured datasets such as spatiotemporal and networked data. My overarching goal is to develop trustworthy and effective models for high-stakes applications in healthcare, scientific research, and AI-assisted decision-making.

## Education

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### Cornell University (Cornell Tech)

Fall 2021 – Present

Ph.D. Candidate in Computer Science. Advisor: Nathan Kallus  
M.S. in Computer Science (2024, awarded en route to Ph.D.)  
Department of Energy Computational Science Graduate Fellow

### Harvard University

2011 – 2015

Joint A.B. degree in Physics and Mathematics. Minor in Computer Science  
*Cum laude in field* with High Honors in Physics and Mathematics

## Experience

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### Machine Learning Research Intern

Summer 2025

*Netflix, New York City, NY*

- Developed and estimated a structural causal model of subscription choice under quasi-experimental plan migration, leveraging instrumental variation and purchasing power differences to identify plan value, price sensitivity, and switching costs. Mentors: David Hubbard, Yonatan Gur.

### Research Intern

Summer 2024

*Brookhaven National Laboratory, Brookhaven, NY*

- Developed GST-UNet [2], a neural framework for spatiotemporal causal inference under time-varying confounding, integrating UNet architectures with iterative G-computation to estimate intervention effects in environmental and health applications. Mentor: Shinjae Yoo.

### Machine Learning Research Intern

Summer 2022

*Netflix, Los Gatos, CA*

- Built a causal machine learning model to estimate the effect of watching novel content on user engagement, developing methods that combine weak instrumental variables with observational data to identify effects under low compliance [3]. Mentors: Sudeep Das, Aish Fenton.

### Senior Data and Applied Scientist

2017 – 2021

*Microsoft Research, Cambridge, MA*

- Conducted research in causal machine learning, developing methods for heterogeneous treatment effect estimation and policy evaluation, with results published at top venues [8, 9, 10, 11].
- Founded and maintained the open-source EconML library, implementing production-scale causal inference algorithms now widely used in industry and academia.
- Collaborated on projects in subseasonal weather forecasting and cancer modeling, applying ML techniques to real-world scientific data.

### Software Development Engineer

2015 – 2017

*Microsoft, Cambridge, MA*

- Developed scalable, distributed machine learning algorithms as a core contributor to MMLSpark, Microsoft's open-source ML library for Apache Spark.

## Selected Publications

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† equal contribution, ‡ alphabetical authors. Full publication list available on [Google Scholar](#).

- [1] **Miruna Oprescu**, Brian M Cho, and Nathan Kallus. Efficient adaptive experimentation with non-compliance. *Advances in Neural Information Processing Systems*, 2025. To appear.
- [2] **Miruna Oprescu**, David K Park, Xihaier Luo, Shinjae Yoo, and Nathan Kallus. Gst-unet: A neural framework for spatiotemporal causal inference with time-varying confounding. *Advances in Neural Information Processing Systems*, 2025. To appear.
- [3] **Miruna Oprescu** and Nathan Kallus. Estimating heterogeneous treatment effects by combining weak instruments and observational data. *Advances in Neural Information Processing Systems*, 37:118777–118806, 2025.
- [4] Andrew Bennett, Nathan Kallus, **Miruna Oprescu**<sup>†</sup>, Wen Sun, and Kaiwen Wang<sup>†</sup>. Efficient and sharp off-policy evaluation in robust markov decision processes. *Advances in Neural Information Processing Systems*, 37:112962–113000, 2025.
- [5] Andrew Bennett<sup>†</sup>, Nathan Kallus<sup>†</sup>, and **Miruna Oprescu**<sup>†</sup>. Low-rank mdps with continuous action spaces. In *International Conference on Artificial Intelligence and Statistics*, pages 4069–4077. PMLR, 2024.
- [6] **Miruna Oprescu**, Jacob Dorn, Marah Ghoummaid, Andrew Jesson, Nathan Kallus, and Uri Shalit. B-learner: Quasi-oracle bounds on heterogeneous causal effects under hidden confounding. In *Proceedings of the 40th International Conference on Machine Learning*, pages 26599–26618. PMLR, 2023.
- [7] Nathan Kallus<sup>†</sup> and **Miruna Oprescu**<sup>†</sup>. Robust and agnostic learning of conditional distributional treatment effects. In *International Conference on Artificial Intelligence and Statistics*, pages 6037–6060. PMLR, 2023.
- [8] Keith Battocchi<sup>‡</sup>, Eleanor Dillon<sup>‡</sup>, Maggie Hei<sup>‡</sup>, Greg Lewis<sup>‡</sup>, **Miruna Oprescu**<sup>‡</sup>, and Vasilis Syrgkanis<sup>‡</sup>. Estimating the long-term effects of novel treatments. *Advances in Neural Information Processing Systems*, 34:2925–2935, 2021.
- [9] **Miruna Oprescu**<sup>†</sup>, Vasilis Syrgkanis<sup>†</sup>, and Zhiwei Steven Wu<sup>†</sup>. Orthogonal random forest for causal inference. In *International Conference on Machine Learning*, pages 4932–4941. PMLR, 2019.
- [10] Vasilis Syrgkanis, Victor Lei, **Miruna Oprescu**, Maggie Hei, Keith Battocchi, and Greg Lewis. Machine learning estimation of heterogeneous treatment effects with instruments. *Advances in Neural Information Processing Systems*, 32:15193–15202, 2019. **Spotlight presentation.**
- [11] **Miruna Oprescu**<sup>†</sup>, Vasilis Syrgkanis<sup>†</sup>, Keith Battocchi<sup>†</sup>, Maggie Hei<sup>†</sup>, and Greg Lewis<sup>†</sup>. EconML: A Machine Learning Library for Estimating Heterogeneous Treatment Effects. In *CausalML Workshop, NeurIPS*, 2019. **Spotlight presentation.**

## Talks

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- *Causal Inference for Spatiotemporal Interventions*, SIAM CSE, 2025.
- *Reliable Treatment Effect Estimation Using Weak Instruments and Observational Data*, Workshop in Operations Research and Data Science (WORDS), Duke University, 2024.
- *Uncertainty Quantification in Causal Inference: Sharp and Efficient Bounds on Heterogeneous Causal Effects Under Hidden Confounding*, Computational Science Seminar, Brookhaven National Lab, 2023.
- *Causal Inference and Machine Learning in Practice with EconML and CausalML*, SIGKDD, 2021.
- *EconML: A Machine Learning Library for Estimating Heterogeneous Treatment Effects*, ODSC East, 2019.
- *MMLSpark: Lessons from Building a SparkML Compatible Machine Learning Library*, Spark Summit, 2017.

## Honors & Awards

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- Department of Energy Computational Science Graduate Fellowship 2022–2026
- DOE Communicate Your Science & Engineering (CYSE) Award 2025
- Meta PhD Research Fellowship Finalist 2022
- *Cum laude*, Harvard University 2015
- High Honors, Harvard Physics Department 2015
- Derek C. Bok Award for Distinction in Teaching (Data Science), Harvard 2014

## Professional Service

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- Director, Summer Science Program (SSP) 2023–Present
- Reviewer, NeurIPS 2021–2025
- Reviewer, ICML 2024–2025
- Reviewer, AISTATS 2024

## Teaching

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- Teaching Assistant, Cornell University
  - Learning, Inference, and Decision Making from Data Spring 2022
  - Applied Machine Learning Fall 2021
- Teaching Fellow, Harvard University
  - Mechanics and Special Relativity Fall 2014
  - Data Science Fall 2014
  - Linear Algebra and Real Analysis Spring 2013
  - Algebra I Fall 2013