Miruna Oprescu

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Summary

I design machine learning methods for **cause-and-effect analysis** and **reliable evaluation**, drawing on causal inference, policy evaluation, and reinforcement learning. My research emphasizes robustness to confounding and distribution shift, reliability under limited data, and methods for structured scientific data (e.g., spatiotemporal and networked systems). Across these areas, I develop statistically principled algorithms with efficiency and robustness guarantees. My goal is to translate these foundations into dependable tools for high-stakes scientific and societal applications in healthcare, climate and Earth systems, neuroscience, and large-scale digital platforms.

Education

Cornell University (Cornell Tech)   *Fall 2021 – May 2026*
Ph.D. Candidate in Computer Science. Advisor: Nathan Kallus   *(expected)*
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

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 to 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

† equal contribution, ‡ alphabetical authors. Full publication list available on Google Scholar.

Preprints

[1] Ayush Khot†, **Miruna Oprescu**†, Maresa Schröder, Ai Kagawa, and Xihaier Luo. Spatial deconfounder: Interference-aware deconfounding for spatial causal inference. *arXiv preprint arXiv:2510.08762*, 2025.

Conference and Journal Publications

[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**†, Wen Sun, and Kaiwen Wang†. Efficient and sharp off-policy evaluation in robust markov decision processes. *Advances in Neural Information Processing Systems*, 37:112962–113000, 2025.

[5] Andrew Bennett†, Nathan Kallus†, and **Miruna Oprescu**†. 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† and **Miruna Oprescu**†. 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‡, Eleanor Dillon‡, Maggie Hei‡, Greg Lewis‡, **Miruna Oprescu**‡, and Vasilis Syrgkanis‡. Estimating the long-term effects of novel treatments. *Advances in Neural Information Processing Systems*, 34:2925–2935, 2021.

[9] **Miruna Oprescu**†, Vasilis Syrgkanis†, and Zhiwei Steven Wu†. 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**†, Vasilis Syrgkanis†, Keith Battocchi†, Maggie Hei†, and Greg Lewis†. EconML: A Machine Learning Library for Estimating Heterogeneous Treatment Effects. In *CausalML Workshop, NeurIPS*, 2019. **Spotlight presentation.**

[12] Soukayna Mouatadid, Paulo Orenstein, Genevieve Flaspohler, Judah Cohen, **Miruna Oprescu**, Ernest Fraenkel, and Lester Mackey. Adaptive bias correction for improved subseasonal forecasting. *Nature Communications*, 14(1):3482, 2023.

[13] Genevieve E Flaspohler, Francesco Orabona, Judah Cohen, Soukayna Mouatadid, **Miruna Oprescu**, Paulo Orenstein, and Lester Mackey. Online learning with optimism and delay. In *International Conference on Machine Learning*, pages 3363–3373. PMLR, 2021.

[14] K Arbour, **M Oprescu**, J Hakim, H Rizvi, M Leiserson, M Ginsburg, A Plodkowski, J Sauter, I Preeshagul, S Gillett, et al. Multifactorial Model to Predict Response to PD-(L) 1 Blockade in Patients with High PD-L1 Metastatic Non-Small Cell Lung Cancer. *Journal of Thoracic Oncology*, 14(10):S290, 2019.

Talks

- *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

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
Derek C. Bok Award for Distinction in Teaching (Mathematics), Harvard	2012

Professional Service

Director, Summer Science Program (SSP)	2023–Present
Reviewer, NeurIPS	2021–2025
★ Awarded the NeurIPS 2025 Top Reviewer Award (Top 10%)	
Reviewer, ICML	2024–2025
Reviewer, AISTATS	2024

Teaching

- Teaching Assistant, Cornell University

– CS 5726: Learning, Inference, and Decision Making from Data	Spring 2022
– CS 5785: Applied Machine Learning	Fall 2021

- Teaching Fellow, Harvard University

– Physics 16: Mechanics and Special Relativity	Fall 2014
– CS 109: Data Science	Fall 2014
★ Awarded the Derek C. Bok Award for Distinction in Teaching	
– Math 122: Algebra I	Fall 2013
– Math 23b: Honors Linear Algebra and Real Analysis II	Spring 2013
– Math 23a: Honors Linear Algebra and Real Analysis I	Fall 2012
★ Awarded the Derek C. Bok Award for Distinction in Teaching	