Dennis Frauen

RESEARCHER · (CAUSAL) MACHINE LEARNING

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I am researching the next generation of AI/ ML systems that are capable of *reliable data-driven decision-making*. Specifically, I focus on designing methods that not only predict outcomes but also understand the (causal) *impact of actions*—a critical step toward truly efficient, robust, and trustworthy AI.

Professional Experience

Netflix *San Francisco Bay Area, US*
MACHINE LEARNING RESEARCH INTERN *06.2024 - 08.2024*
- PhD internship at Netflix Research
- Topic: Adapting neural networks for message recommendations using Causal ML and Reinforcement Learning

ETH Zurich *Zurich, Switzerland*
ETH STUDENT SUMMER RESEARCH FELLOW *07.2020 - 09.2020*
- Selected as one of 20 participants out of 2880 applicants
- Work on high-dimensional statistical methodology, hosted by Prof. Dr. Fanny Yang

Körber Technologies *Hamburg, Germany*
DATA SCIENCE INTERN *02.2019 - 03.2019*
- Statistical data analysis, in particular high-resolution time-series from machine production.

Education

LMU Munich *Munich, Germany*
(ELLIS) PHD STUDENT, CAUSAL MACHINE LEARNING *09.2021 - present*
- Advisors: Prof. Dr. Stefan Feuerriegel (LMU Munich) and Prof. Dr. Mihaela van der Schaar (University of Cambridge)
- Research on Causal Machine Learning for optimal decision making
- Published first author papers in all major machine learning conferences (NeurIPS, ICML, ICLR, AAAI)
- Co-director of the Causal ML lab at LMU Munich
- Expected graduation: Fall 2025

University of Cambridge *Cambridge, UK*
VISITING PHD STUDENT *06.2023 - 02.2025*
- A total of 6 months of research stays at the lab of Prof. Dr. Mihaela van der Schaar (part of the Ellis PhD program)
- Work on deep generative models for causal sensitivity analysis
- Results published at ICLR and ICML 2024

University of Göttingen *Göttingen, Germany*
MASTER OF SCIENCE, MATHEMATICS *10.2019 - 08.2021*
- GPA: 1.1 ("Very good", German grading scale from 1.0 to 5.0)
- Focus on Mathematical Statistics, Machine Learning, and Econometrics

Lund University *Lund, Sweden*
SEMESTER ABROAD, MATHEMATICS *08.2018 - 01.2019*
- Passed with distinction

Universtiy of Hamburg *Hamburg, Germany*
BACHELOR OF SCIENCE, MATHEMATICS *09.2016 - 09.2019*
- GPA: 1.36 ("Very good", German grading scale from 1.0 to 5.0)
- Minor subject: Physics

Skills

- **Coding:** Python, Pytorch, Lightning, Tensorflow, Keras, Scikit-learn, Pandas, SQL, Git, R
- **ML**: Deep Learning, Causal Inference, Reinforcement Learning, Bandits, Generative Models, Transformers, LLMs
- **Statistics:** linear models, time-series analysis, high-dimensional statistics, time-to-event analysis, multiple testing, optimization

Selected Publications (full list here)

Frauen, D, Melnychuk, M, Feuerriegel, S. 2023. *Sharp Bounds for Generalized Causal Sensitivity Analysis*. In: **NeurIPS**.

Frauen, D, Feuerriegel, S. 2023. *Estimating Individual Treatment Effects under Unobserved Confounding using Binary Instruments*. In: **ICLR**.

Frauen, D, Melnychuk, M, Feuerriegel, S. 2023. *Estimating Average Causal Effects from Patient Trajectories*. In: **AAAI**.

Frauen, D, Imrie, F, Curth, A, Melnychuk, M, Feuerriegel, S, van der Schaar, M. 2024. *A Neural Framework for Generalized Causal Sensitivity Analysis*. In: **ICLR**.

Frauen, D, Melnychuk, M, Feuerriegel, S. 2024. *Fair Off-Policy Learning from Observational Data*. In: **ICML**.

Schweisthal*, J, **Frauen*, D**, van der Schaar, M, Feuerriegel, S. 2024. *Meta-learners for Partially Identified Treatment Effects from Multiple Environments.*. In: **ICML**. (* indicates equal contributions)

Frauen, D, Hess, K, Feuerriegel, S. 2024. *Model-agnostic meta-learners for estimating heterogeneous treatment effects over time*. Under review at **ICLR**.

Feuerriegel, S,**Frauen, D**, Melnychuk, M, Schweisthal, J, Hess, Konstantin, Curth, Alicia, Bauer, Stefan, Kilbertus, Niki, Kohane, Isaac S., van der Schaar, Mihaela. 2023. *Causal Machine Learning to Predict Treatment Outcomes*. **Nature Medicine**.

Schweisthal, J, **Frauen, D**, Melnychuk, M, Feuerriegel, S. 2023. *Reliable Off-Policy Learning for Dosage Combinations.*. In: **NeurIPS**.

Schröder, M, **Frauen, D**, Feuerriegel, S. 2024. *Causal Fairness under Unobserved Confounding: A Neural Sensitivity Framework*. In: **ICLR**.

Melnychuk, M, **Frauen, D**, Feuerriegel, S. 2024. *Bounds on Representation-Induced Confounding Bias for Treatment Effect Estimation*. In: **ICLR**.

Hess, K, Melnychuk, M, **Frauen, D**, Feuerriegel, S. 2024. *Bayesian Neural Controlled Differential Equations for Treatment Effect Estimation*. In: **ICLR**.

Melnychuk, M, **Frauen, D**, Feuerriegel, S. 2022. *Causal Transformer for Estimating Counterfactual Outcomes*. In: **ICML**.

Kuzmanovic, M, **Frauen, D**, Hatt, T, Feuerriegel, S. 2023. *Machine Learning Informs Cost-Effective Allocation of Development Aid*. In: **KDD 2024**.

Ma, Y, **Frauen, D**, Melnychuk, M, Feuerriegel, S. 2024. *Counterfactual Fairness for Predictions using Generative Adversarial Networks*. Arxiv Preprint arXiv:2310.17687. Under review at **ICLR**.

Awards and Recognitions

2024	**G-Research Early Career Grant**, G-Research
2023	**Acceptance into the ELLIS PhD program**, ELLIS Society
2023	**NeurIPS Top Reviewer**, Conference on Neural Information Processing Systems
2021	**Member of the MCML**, Munich Center for Machine Learning (MCML)
2019-2021	**German Excellence Scholarship (Deutschlandstipendium)**, German Federal Ministry of Education and Research

Selected Talks

Frauen, D. *Causal Machine Learning: Beyond Traditional Assumptions*. 2024. University of Cologne, Germany.

Frauen, D, Schweisthal, J. *Bounding causal effects using multiple observational datasets*. 2024. LMU Munich, Germany

Frauen, D. *Causal Sensitivity Analysis*. 2023. Microsoft Research, Cambridge, UK.

Frauen, D. 2022. *Fair Off-Policy Learning from Observational Data*. Causal Data Science Meeting (online).