

JOHANN BREHMER

Machine learner and physicist

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[Google Scholar](https://scholar.google.com/citations?user=JohannBrehmer)

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RESEARCH INTERESTS

- Geometric deep learning: Equivariant architectures, scalable inductive biases, generative models
- Causality & interactive learning: Non-iid situations, offline reinforcement learning, skill learning
- Simulators + ML: Simulation-based inference, neural surrogates, inverse problems

EXPERIENCE

Qualcomm AI Research Amsterdam, Netherlands

Research scientist (Senior Staff Engineer)

11/2023 – now

Research scientist (Staff Engineer)

01/2021 – 11/2023

- Topics: Geometric deep learning, diffusion models, causality, offline RL, skill learning
- Roles: Researcher, supervisor, team lead, manager (5 reports)
- Key collaborators: Taco Cohen, Pim de Haan

New York University, USA

Moore-Sloan postdoctoral researcher

09/2017 – 12/2020

- Topics: Simulation-based inference, normalizing flows, machine learning for physics
- Roles: Researcher, supervisor
- Key collaborators: Kyle Cranmer, Gilles Louppe

Heidelberg University, Germany

PhD candidate

07/2014 – 08/2017

- Topics: Statistics for particle physics, effective field theories, Higgs boson measurements
- Roles: Researcher, co-supervisor, (head) teaching assistant
- PhD advisor: Tilman Plehn

CERN, Geneva

Summer student

06/2012 – 09/2012

- Topic: Machine learning for particle physics
- Supervisor: Johannes Albrecht

EDUCATION

PhD in Physics	Heidelberg University	summa cum laude*	07/2014 – 08/2017
MSc in Physics	Heidelberg University	1.0*	02/2012 – 06/2014
BSc in Physics	Heidelberg University	1.0*	09/2008 – 02/2012
Visiting student	Imperial College, London, UK	1.0*	09/2010 – 07/2011
Abitur	Heidelberg University	1.0*	06/2007

*German grading scale: from 1.0 (best) to 6.0 (worst); PhD grades: from summa cum laude (best) to rite (worst)

PUBLICATION OVERVIEW

- 44 publications with 4320 citations, h-index of 21 ([Google Scholar](https://scholar.google.com/citations?user=JohannBrehmer) as of February 18, 2024)
- 17 first-author papers accepted in top venues including PRL, PNAS, NeurIPS

SELECTED PUBLICATIONS

GEOMETRIC DEEP LEARNING

[Euclidean, projective, conformal: ...](#)

[Geometric algebra transformer](#)

[Equivariant diffusion for planning w/ embodied agents](#)

[Flows for simult. manifold learning & density estimation](#)

[Neural message passing for jet physics](#)

de Haan, Cohen, **Brehmer**

Brehmer, de Haan, Behrends, Cohen

Brehmer, Bose, de Haan, Cohen

Brehmer, Cranmer

Henrion, **Brehmer**, Bruna, Cho, ...

AISTATS 24

NeurIPS 23

NeurIPS 23

NeurIPS 20

Workshop 17

CAUSALITY & INTERACTIVE LEARNING

[Weakly supervised causal representation learning](#)

[Deconfounded imitation learning](#)

[Hierarchical clustering in particle physics through RL](#)

Brehmer, de Haan, Lippe, Cohen

Vuorio, de Haan, **Brehmer**, ..., Cohen

Brehmer, Macaluso, ..., Cranmer

NeurIPS 22

Workshop 22

Workshop 20

SIMULATORS + ML

[Simulation-based inference for particle physics](#)

[Stronger symbolic summary statistics for the LHC](#)

[The frontier of simulation-based inference](#)

[MadMiner: ML-based inference for particle physics](#)

[Mining implicit models for likelihood-free inference](#)

[Inferring subhalo population properties with ML](#)

[Constraining effective field theories with ML](#)

[Guide to constraining EFTs with ML](#)

[Better Higgs-CP tests w/ information geometry](#)

[Better Higgs measurements w/ information geometry](#)

Brehmer, Cranmer

Soybelman, Butter, Plehn, **Brehmer**

Cranmer, **Brehmer**, Louppe

Brehmer, Kling, Espejo, Cranmer

Brehmer, Louppe, Pavez, Cranmer

Brehmer, Mishra-Sharma, ..., Cranmer

Brehmer, Cranmer, Louppe, Pavez

Brehmer, Cranmer, Louppe, Pavez

Brehmer, Kling, Plehn, Tait

Brehmer, Cranmer, Kling, Plehn

Book chapter 22

Workshop 22

PNAS 20

CSBS 20

PNAS 20

AstrJ 19

PRL 18

PRD 18

PRD 18

PRD 17

OTHER

[Instance-adaptive video compression](#)

[Pushing Higgs Effective Theory to its limits](#)

van Rozendaal, **Brehmer**, ..., Cohen

Brehmer, Freitas, Lopez-Val, Plehn

TMLR 23

PRD 16

ACCOMPLISHMENTS

Speaker: **27** invited talks (**43** total) at international conferences / seminars
Keynote speaker at ACAT 2019

Open source: Lead developer of the [MadMiner library](#)

Organizer: Seminars, workshops, conferences with up to 150 participants, including CLeaR 2023

Member: ELLIS

Awards: PRL Editor's Suggestion
1 oral + 1 spotlight at workshops
Top Reviewer at NeurIPS 2023
Otto Haxel prize for best MSc thesis (out of 150)
Prestigious German Studienstiftung scholarship (top 0.5% of all German students)

Press coverage: [TWIML podcast](#), [Physics](#), [phys.org](#), [Frankfurter Allgemeine Zeitung](#)

SKILLS

Technical: Python, PyTorch, git, Docker, SLURM

Leadership: Team leadership, people management, project management, conference organization, hiring pipeline design, hiring, grassroots diversity initiative

Communication: Technical writing, LaTeX, data visualization, presentations to experts and non-experts, teaching

Languages: German (native), English (fluent), Dutch (advanced)