Johann Brehmer

Machine learner, physicist, material discovery enthusiast

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Experience

CuspAI, Netherlands
Member of Technical Staff 08/2024 – now

- Mission: Material discovery with molecular simulation & machine learning, esp. for sustainability
- Tools: Generative models (diffusion, flow, autoregressive, LLMs), material discovery pipelines
- Roles: Researcher, engineer, project lead, employee number 5
- Manager: Max Welling

Qualcomm AI Research Amsterdam, Netherlands
Senior Staff Engineer / Manager 02/2024 – 08/2024
Senior Staff Engineer 11/2023 – 02/2024
Staff Engineer 01/2021 – 11/2023

- Mission: Fundamental research on machine learning for the physical world
- Tools: Geometric deep learning, diffusion models, causality, offline RL, robotics
- Roles: Researcher, team lead (team of 3), manager (6 reports), intern supervisor (3 interns)
- Team lead: Taco Cohen

New York University, USA
Moore-Sloan postdoctoral researcher 09/2017 – 12/2020

- Mission: Developing foundational methods to analyze physics data with machine learning
- Tools: Simulation-based inference, normalizing flows, architectures for particle physics
- Roles: Researcher, supervisor
- Advisor: Kyle Cranmer

Heidelberg University, Germany
PhD candidate 07/2014 – 08/2017

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

CERN, Switzerland
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

- **50** publications with **6686** citations, h-index of **27** (Google Scholar as of November 1, 2025)
- **18** first-author papers accepted in top venues including PRL, PNAS, NeurIPS

Selected publications

Material discovery

The Open DAC 2025 dataset	Sriram, …, **Brehmer**, , …	arXiv 25

Geometric deep learning

Does equivariance matter at scale?	**Brehmer**, Behrends, de Haan, Cohen	TMLR 25
Lorentz-equivariant geom. algebra transformer	Spinner, Bresó, …, **Brehmer**	NeurIPS 24
Euclidean, projective, conformal: …	de Haan, Cohen, **Brehmer**	AISTATS 24
Geometric algebra transformer	**Brehmer**, de Haan, Behrends, Cohen	NeurIPS 23
Equivariant diffusion for planning w/ embodied agents	**Brehmer**, Bose, de Haan, Cohen	NeurIPS 23
Flows for simult. manifold learning & density estimation	**Brehmer**, Cranmer	NeurIPS 20
Neural message passing for jet physics	Henrion, **Brehmer**, Bruna, Cho, …	Workshop 17

Simulators + ML

Back to the formula–LHC edition	Butter, Plehn, Soybelman, **Brehmer**	SciPost 24
Simulation-based inference for particle physics	**Brehmer**, Cranmer	Book chapter 22
The frontier of simulation-based inference	Cranmer, **Brehmer**, Louppe	PNAS 20
MadMiner: ML–based inference for particle physics	**Brehmer**, Kling, Espejo, Cranmer	CSBS 20
Mining implicit models for likelihood-free inference	**Brehmer**, Louppe, Pavez, Cranmer	PNAS 20
Inferring subhalo population properties with ML	**Brehmer**, Mishra-Sharma, …, Cranmer	AstrJ 19
Constraining effective field theories with ML	**Brehmer**, Cranmer, Louppe, Pavez	PRL 18
Guide to constraining EFTs with ML	**Brehmer**, Cranmer, Louppe, Pavez	PRD 18
Better Higgs-CP tests w/ information geometry	**Brehmer**, Kling, Plehn, Tait	PRD 18
Better Higgs measurements w/ information geometry	**Brehmer**, Cranmer, Kling, Plehn	PRD 17

Causality & Interactive Learning

Deconfounded imitation learning	Vuorio, de Haan, **Brehmer**, …, Cohen	TMLR 24
Weakly supervised causal representation learning	**Brehmer**, de Haan, Lippe, Cohen	NeurIPS 22
Hierarchical clustering in particle physics through RL	**Brehmer**, Macaluso, …, Cranmer	Workshop 20

Other

Instance-adaptive video compression	van Rozendaal, **Brehmer**, …, Cohen	TMLR 23
Pushing Higgs Effective Theory to its limits	**Brehmer**, Freitas, Lopez-Val, Plehn	PRD 16

Accomplishments

Organizer:	Conferences, workshops, seminars with up to 150 participants, including CLeaR 2023
Speaker:	29 invited talks (45 total) at international conferences / seminars Keynote speaker at ACAT 2019
Member:	ELLIS
Awards:	Best paper award at NeurIPS NeurReps workshop 2024 PRL Editor's Suggestion 2018 2 orals + 1 spotlight at workshops (2020 – 2024) Top Reviewer at NeurIPS 2023 Otto Haxel prize for best MSc thesis (out of 150) 2014 Prestigious German Studienstiftung scholarship (top 0.5% of all German students)
Press coverage:	TWIML podcast, Physics, phys.org, Frankfurter Allgemeine Zeitung

Skills

Leadership:	Team leadership, project leadership, people management, conference organization, hiring pipelines design, technical interviews, grassroots diversity initiative
Technical:	Python, PyTorch, jax, git, Graphite, Docker, Pants, Flyte, Kubernetes
Languages:	German (native), English (fluent), Dutch (advanced)