Johann Brehmer

Machine learner, physicist, material discovery enthusiast

johannbrehmer.de
Google Scholar
github.com/johannbrehmer
mail@johannbrehmer.de

Experience

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

Started and lead CuspAI's generative model team: we train flow / diffusion / autoregressive models of molecules and materials and integrate them in material discovery campaigns.

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

Researched machine learning for the physical world: generative models, geometric deep learning, causality. Managed 6 reports and 2 team member.

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

Developed machine learning–based inference methods for simulation-driven physical systems.

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

Researched statistical methods for high-energy physics and applied them to the Higgs boson.

CERN, Switzerland
Summer student, with Johannes Albrecht 06/2012 – 09/2012

Built early deep learning models for high-energy physics.

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 (Google Scholar as of March 8, 2026)
7002 citations
h-index **30**
18 first-author papers accepted in top venues (PRL, PNAS, NeurIPS, ICML, …)

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
Equiv. diffusion for planning w/ embodied agents	**Brehmer**, Bose, de Haan, Cohen	NeurIPS 23
Flows for manifold learning & density estimation	**Brehmer**, Cranmer	NeurIPS 20
Neural message passing for jet physics	Henrion, **Brehmer**, Bruna, Cho, …	Workshop 17

Simulation-based inference

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 geom.	**Brehmer**, Cranmer, Kling, Plehn	PRD 17

Causality

Deconfounded imitation learning	Vuorio, de Haan, **Brehmer**, …, Cohen	TMLR 24
Weakly supervised causal representation learning	**Brehmer**, de Haan, Lippe, Cohen	NeurIPS 22

Other

Instance-adaptive video compression	van Rozendaal, **Brehmer**, …, Cohen	TMLR 23
Hierarchical clustering in particle physics through RL	**Brehmer**, Macaluso, …, Cranmer	Workshop 20
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:	35 invited talks (52 total) at international conferences / seminars, including keynotes
Awards:	Best paper award at NeurIPS NeurReps workshop 2024 PRL Editor's Suggestion 2018 Otto Haxel prize for best MSc thesis (out of 150) 2014

Skills

Leadership:	Project and line management, conference organization, grassroots diversity initiative
Technical:	Python, PyTorch, jax, git, Graphite, Docker, Pants, Flyte, Kubernetes
Languages:	German (native), English (fluent), Dutch (fluent)