JOHANN **BREHMER**, PHD

Researcher at the intersection of machine learning and physics

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EXPERIENCE

Center for Data Science, New York University 09/2017 – present
Moore-Sloan postdoctoral researcher New York, USA

- Developed machine learning algorithms for statistical inference in models described by computer simulations and turned them into a widely used open-source Python library
- Applied this research to particle physics problems, enabling up to 90% more efficient measurements of the fundamental properties of nature
- Introduced first-ever scalable method to analyze satellite images for the almost imperceivable effects of Dark Matter clumps based on deep convolutional networks and Bayesian statistics
- Designed a new type of flow-based generative neural network, improving state-of-the-art performance in density estimation, manifold learning, and inference tasks
- Led interdisciplinary and international research teams, managed projects from idea to publication / release

Heidelberg University 07/2014 – 08/2017
Graduate research and teaching assistant Heidelberg, Germany

- Pioneered statistical metrics that guide the design of particle physics experiments
- Analyzed theoretical models of the newly discovered Higgs boson
- Taught undergraduate and graduate physics students

CERN 06/2012 – 09/2012
Summer student Geneva, Switzerland

- Designed and deployed a neural network-based signal-noise classifier for the LHCb experiment, which made hundreds of studies more efficient

EDUCATION

*German grading scale: summa cum laude / 1.0 = best, 6.0 = worst

PhD in Physics	Heidelberg University, Germany	summa cum laude*	07/2014 – 08/2017
Master of Science in Physics	Heidelberg University, Germany	1.0*	02/2012 – 06/2014
Bachelor of Science in Physics	Heidelberg University, Germany	1.0*	09/2008 – 02/2012
Visiting student	Imperial College, London, UK		09/2010 – 07/2011
Abitur	Ökumenisches Gymnasium, Bremen, Germany	1.0*	06/2007

SKILLS

Programming:	Python, git, bash, Docker, SLURM, LaTeX; C++ basics
Libraries:	PyTorch, scikit-learn, NumPy, SciPy, pandas, Matplotlib
Machine learning:	Deep learning (CNNs, GNNs), probabilistic and generative models (normalizing flows, VAEs), reinforcement learning, unsupervised learning, density estimation, anomaly detection
Statistics:	Likelihood-based methods, hypothesis tests, Bayesian techniques, MCMC, variational inference
Languages:	German (native), English (fluent)

ACCOMPLISHMENTS

Publications:	27 publications overall, cited 1729 times (14 first-author papers in peer-reviewed journals like PRL, PNAS; 4 at NeurIPS / ICML workshops)	see bit.ly/jb-pub
Talks:	16 invited talks (26 total) at international conferences / seminars	see bit.ly/jb-talk
Software:	Lead developer of the open-source Python library MadMiner	see bit.ly/jb-madm
Leadership:	Organizer of workshops and seminars with up to 150 participants	
Awards:	Spotlight, ICML workshop on Invertible NNs, Normalizing Flows & Explicit Likelihood Models Otto Haxel prize for best MSc thesis (out of 150) Prestigious German Studienstiftung scholarship (top 0.5% of all German students)	
Press coverage:	Frankfurter Allgemeine Zeitung, Forbes, Physics, phys.org	