

Stephan Mandt

Machine Learning Researcher

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Work Experience

10/2018— **Assistant Professor, University of California, Irvine**
Donald Bren School of Information and Computer Sciences

01/2018— **Senior Research Scientist, Disney Research Los Angeles**
10/2018 **Head of Machine Learning Group**

Lead the machine learning research group of Disney Research Los Angeles, and co-developed machine learning initiatives across the company. Published research, secured patents, and promoted technology transfer to diverse business units.

2016—2017 **Research Scientist, Disney Research Pittsburgh**
Lead Disney Research Pittsburgh's machine learning research group.

2014—2016 **Postdoctoral Researcher, Columbia University**
Conducted research on machine learning at the Data Science Institute
Focus on scalable probabilistic modeling and stochastic optimization
Advisor: David Blei

2012—2014 **Postdoctoral Fellow, Princeton University**
Princeton Center for Complex Materials
Conducted research on probabilistic modeling and non-equilibrium statistical physics
Awarded Princeton's 2-year PCCM Fellowship for independent research

Education

2008—2012 **University of Cologne, Ph.D., Magna Cum Laude**
Theoretical Physics, GPA 4.0/4.0
National Merit Foundation Fellowship (Studienstiftung)
Thesis: "Transport and Non-Equilibrium Dynamics in Optical Lattices"
Advisor: Achim Rosch

2010 **University of Colorado at Boulder, Visiting Scholar**
Conducted research on computational statistical physics

2002—2008 **University of Cologne, M.S. and B.S. with distinction, best of year**
German Diplom degree in Physics and Mathematics, GPA 4.0/4.0
Thesis on random matrix theory, advised by Martin Zirnbauer

Honors and Awards

2012 Princeton Center for Complex Materials Postdoctoral Fellowship, \$ 100,000

2010 German National Merit Scholarship (Studienstiftung des deutschen Volkes), supporting the top 0.5% of students based on academic performance, \$ 40,000

- 2016 NVIDIA Hardware Grant
- 2015 Schloss Dagstuhl NSF Support Grant for Junior Researchers, \$ 1000
- 2016 Best Poster Award, New York Academy of Sciences ML Symposium, \$ 500

Publications

Five Representative Papers

- 2016 **Stochastic Gradient Descent as Approximate Bayesian Inference**
S. Mandt, M. Hoffman, and D. Blei
Journal of Machine Learning Research 18 (2017), 1-35.
Description: The paper established stochastic differential equations as an analysis tool for stochastic gradient descent and first drew the connection to variational inference.
- 2017 **Dynamic Word Embeddings**
R. Bamler and S. Mandt
International Conference on Machine Learning (ICML 2017).
Description: The paper combines a probabilistic version of word2vec with a latent time series model to create a powerful new model for analyzing the evolution of language.
- 2018 **Disentangled Sequential Autoencoder**
Y. Li and S. Mandt
International Conference on Machine Learning (ICML 2018).
Description: A deep generative model for creating artificial videos or acoustic signals is presented, where content and dynamics can be controlled separately from each other.
- 2017 **Sparse Probit Linear Mixed Model**
S. Mandt, F. Wenzel, S. Nakajima, J. Cunningham, C. Lippert, and M. Kloft
Machine Learning, 106(9), 1621-1642 (2017).
Description: Linear mixed models for genome-wide association studies are generalized to models for binary labels, using approximate Bayesian inference.
- 2017 **Factorized Variational Autoencoders for Modeling Audience Reactions to Movies**
Z. Deng, R. Navarathna, P. Carr, S. Mandt, Y. Yue, I. Matthews, and G. Mori
Computer Vision and Pattern Recognition (CVPR 2017).
Description: The paper presents one of the first structured variational autoencoders in an applied setup, namely for summarizing audience face reactions to video screenings.

Papers Under Review

- 2018 **Deep Probabilistic Video Compression**
J. Han, S. Lombardo, C. Schroers, and S. Mandt
<https://arxiv.org/pdf/1810.02845.pdf>.
- 2017 **Advances in Variational Inference**
C. Zhang, J. Bütepage, H. Kjellström, and S. Mandt
TPAMI, under review.
<https://arxiv.org/pdf/1711.05597.pdf>.
- 2018 **Skip-Trigrams: Embedding Words Using Triplet Co-Occurrence Statistics**
A. Fecke, M. Kloft, and S. Mandt
AAAI, under review.

2017 **Active Mini-Batch Sampling using Repulsive Point Processes**
C. Zhang, C. Ötzireli, **S. Mandt**, and G. Salvi
arXiv preprint.
<https://arxiv.org/pdf/1711.05597.pdf>.

— NIPS and ICML Papers (the top conferences)

- 2018 **Quasi Monte Carlo Variational Inference**
A. Buchholz, F. Wenzel, and **S. Mandt**
International Conference on Machine Learning (ICML 2018).
Acceptance rate 25%.
- 2018 **Iterative Amortized Inference**
J. Marino, Y. Yue, and **S. Mandt**
International Conference on Machine Learning (ICML 2018).
Acceptance rate 25%.
- 2018 **Improving Optimization in Models with Continuous Symmetry Breaking**
R. Bamler and **S. Mandt**
International Conference on Machine Learning (ICML 2018).
Long talk, acceptance rate 8%.
- 2018 **Disentangled Sequential Autoencoder**
Y. Li and **S. Mandt**
International Conference on Machine Learning (ICML 2018).
Acceptance rate 25%.
- 2017 **Perturbative Black Box Variational Inference**
C. Zhang, R. Bamler, M. Opper, and **S. Mandt**
Neural Information Processing Systems (NIPS 2017).
Acceptance rate 20%.
- 2017 **Dynamic Word Embeddings**
R. Bamler and **S. Mandt**
International Conference on Machine Learning (ICML 2017).
Acceptance rate 25%.
- 2016 **Exponential Family Embeddings**
M. Rudolph, F. Ruiz, **S. Mandt**, and D. Blei
Neural Information Processing Systems (NIPS 2016).
Acceptance rate 22%.
- 2016 **A Variational Analysis of Stochastic Gradient Algorithms**
S. Mandt, M. Hoffman, and D. Blei
Proceedings of the International Conference on Machine Learning (ICML 2016).
Acceptance rate 25%.
- 2014 **Smoothed Gradients for Stochastic Variational Inference**
S. Mandt and D. Blei
Advances in Neural Information Processing Systems, 2438-2446 (NIPS 2014).
Acceptance rate 25%.

Other International Conference Proceedings

- 2018 **Continuous Word Embedding Fusion via Spectral Decomposition**
T. Fu, C. Zhang, and **S. Mandt**
Conference on Computational Natural Language Learning (CoNLL 2018).
- 2018 **Anomaly Detection with Generative Adversarial Networks**
L. Deecke, R. Vandermeulen, L. Ruff, **S. Mandt**, and M. Kloft
European Conference on Machine Learning (ECML 2018).
- 2018 **Generalized Dynamic Topic Models**
P. Jähnichen, F. Wenzel, M. Kloft, and **S. Mandt**
Artificial Intelligence and Statistics (AISTATS 2018).
Acceptance rate 33%.
- 2017 **Determinantal Point Processes for Mini-Batch Diversification**
C. Zhang, H. Kjellström, and **S. Mandt**
Uncertainty in Artificial Intelligence (UAI 2017).
Acceptance rate 10% for plenary talk.
- 2017 **Factorized Variational Autoencoders
for Modeling Audience Reactions to Movies**
Z. Deng, R. Navarathna, P. Carr, **S. Mandt**, Y. Yue, I. Matthews, and G. Mori
Computer Vision and Pattern Recognition (CVPR 2017).
Acceptance rate 25%.
- 2016 **Variational Tempering**
S. Mandt, J. McInerney, F. Abrol, R. Ranganath, and D. Blei
Proceedings of the 19th International Conference on Artificial Intelligence and Statistics, Journal of Machine Learning Research Conference Proceedings (AISTATS 2016).
Acceptance rate 30%.
- 2016 **Huber-Norm Regularization for Linear Prediction Models**
O. Zadrozny, G. Benecke, **S. Mandt**, T. Scheffer, M. Kloft
European Conference on Machine Learning (ECML 2016).

Journal Papers

- 2017 **Stochastic Gradient Descent as Approximate Bayesian Inference**
S. Mandt, H. Hoffman, and D. Blei
Journal of Machine Learning Research 18 (2017), 1-35.
- 2017 **Sparse Probit Linear Mixed Model**
S. Mandt, F. Wenzel, S. Nakajima, J. Cunningham, C. Lippert, and M. Kloft
Machine Learning, 106(9), 1621-1642 (2017).
- 2015 **Stochastic Differential Equations for Quantum Dynamics
of Spin-Boson Networks**
S. Mandt, D. Sadri, A. Houck, and H. Tureci
New Journal of Physics 17 (5), 053018.
- 2014 **Damping of Bloch Oscillations: Variational Solutions
of the Boltzmann Equation Beyond Linear Response**
S. Mandt
Physical Review A 90, 053624 (2014).

- 2013 **Relaxation Towards Negative Temperatures in Bosonic Systems: Generalized Gibbs Ensembles and Beyond Integrability**
S. Mandt, A. Feiguin, S. Manmana
Phys. Rev. A **88**, 043643 (2013).
- 2012 **Fermionic Transport in a Homogeneous Hubbard Model: Out-of-Equilibrium Dynamics With Ultracold Atoms**
U. Schneider, L. Hackermüller, J. P. Ronzheimer, S. Will, S. Braun, T. Best, I. Bloch, E. Demler, S. Mandt, D. Rasch and A. Rosch
Nature Physics **8**, 213-218 (2012).
- 2011 **Interacting Fermionic Atoms in Optical Lattices Diffuse Symmetrically Upwards and Downwards in a Gravitational Potential**
S. Mandt, A. Rapp, A. Rosch
Phys. Rev. Lett. **106**, 250602 (2011) .
- 2010 **Equilibration Rates and Negative Absolute Temperatures for Ultracold Atoms in Optical Lattices**
A. Rapp, S. Mandt, A. Rosch
Phys. Rev. Lett. **105**, 220405 (2010).
- 2010 **Zooming in on Local Level Statistics by Supersymmetric Extension of Free Probability**
S. Mandt, M. R. Zirnbauer
J. Phys. A: Math. Theor. **42** (2010) 025201 (33pp).

Patents Pending

- 2018 **Efficient Encoding and Decoding Sequences Using Variational Autoencoders**
S. Mandt and Y. Li.
- 2018 **Dynamic Word Embeddings**
R. Bamler and S. Mandt, *US Patent App. 15/828,884*, 2018.
- 2017 **Factorized Variational Autoencoders**
Z. Deng, R. Navarathna, P. Carr, S. Mandt, and Y. Yue.

Peer-Reviewed Workshop Papers

- 2017 **Iterative Inference Models**
J. Marino, Y. Yue, and S. Mandt
NIPS 2017 Workshop on Bayesian Deep Learning.
- 2017 **Diversified Mini-Batch Sampling using Repulsive Point Processes**
C. Zhang, C. Öztireli, and S. Mandt
NIPS 2017 Workshop on Approximate Bayesian Inference.
- 2017 **Generalizing and Scaling-up Dynamic Topic Models**
P. Jahnichen, F. Wenzel, M. Kloft, S. Mandt
NIPS 2017 Workshop on Approximate Bayesian Inference.
- 2017 **Bayesian Paragraph Vectors**
G. Ji, R. Bamler, E. Sudderth, and S. Mandt
NIPS 2017 Workshop on Approximate Bayesian Inference.

- 2017 **Structured Black Box Variational Inference for Latent Time Series Models**
R. Bamler and **S. Mandt**
ICML 2017 Time Series Workshop (oral).
- 2016 **Balanced Population Stochastic Variational Inference**
C. Zhang, **S. Mandt**, and H. Kjellström
NIPS 2016 Workshop on Approximate Bayesian Inference.
- 2015 **Continuous-Time Limit of Stochastic Gradient Descent Revisited**
S. Mandt, M. Hoffman, and D. Blei
Proceedings of the 2015 NIPS workshop on optimization (OPT2015).
- 2015 **Finding Sparse Features in Strongly Confounded Medical Binary Data**
S. Mandt, F. Wenzel, S. Nakajima, J. Cunningham, C. Lippert, and M. Kloft
NIPS Workshop Machine Learning for Healthcare (MLHC2015). *Contributed Talk*.
- 2014 **Probit Regression with Correlated Label Noise: An EM-EP approach**
S. Mandt, F. Wenzel, J. Cunningham, and M. Kloft
NIPS Workshop on Variational Inference (NIPS 2014).

Technical Reports

- 2014 **Comment on "Consistent Thermostatistics Forbids Negative Absolute Temperatures"**
U. Schneider, **S. Mandt**, A. Rapp, S. Braun, H. Weimer, I. Bloch, A. Rosch
arXiv:1407.4127.
- 2010 **Breakdown of Diffusion: From Collisional Hydrodynamics to a Continuous Quantum Walk in a Homogeneous Hubbard Model**
U. Schneider, L. Hackermüller, J. P. Ronzheimer, S. Will, S. Braun, T. Best, I. Bloch, E. Demler, **S. Mandt**, D. Rasch and A. Rosch
arXiv preprint arxiv:1005.3545.
- 2007 **Symmetric Spaces Toolkit**
H. Sebert and S. Mandt
<http://www.stephanmandt.com/papers/SebertMandt2007.pdf>.

Other Publications

- 2012 **Transport and Non-Equilibrium Dynamics in Optical Lattices**
S. Mandt
Ph.D. Thesis, University of Cologne.
- 2013 **Ultrakalt und Doch Heißer als Unendlich Heiß**
S. Mandt
Monthly proceedings of the German Physical Society (in German), Physik Journal, 3/2013.

Service

- 2019 **Area Chair**, International Conference on Machine Learning
- 2018 **Advisor**, Symposium on Advances in Approximate Bayesian Inference
- 2017– **Member**, International Machine Learning Society

- 2017 **Co-Chair**, NIPS Workshop on Approximate Inference,
as part of Neural Information Processing Systems.
- 2016 **Co-Chair**, NIPS Workshop on Approximate Inference,
as part of Neural Information Processing Systems, 60 paper submissions.
- 2015 **Co-Chair**, NIPS Workshop on Approximate Inference,
as part of Neural Information Processing Systems, 32 paper submissions.
- 2017 **Sessions Chair**, International Conference on Machine Learning
- Journal Journal of Machine Learning Research,
- Referee Digital Signal Processing,
Physical Review A (atomic physics),
Physical Review E (statistical physics),
Data Mining and Knowledge Discovery,
Transactions on Pattern Analysis and Machine Intelligence.
- Conference Neural Information Processing Systems,
- Reviewer Artificial Intelligence and Statistics,
International Conference of Machine Learning,
International Conference on Learning Representations.

Mentoring and Group Leadership

Postdocs

- 01/2017– Cheng Zhang,
12/2017 <https://cheng-zhang.org/>
Placement: Research Scientist, Microsoft Research Cambridge
- 03/2017– Robert Bamler,
<https://robamler.github.io/>
- 06/2018– Salvatore Lombardo

Interns and Students

- 2018 Lei Chen, intern, Simon Frazier University
- 2018 Farnood Salehi, intern, EPFL
- 2018 Jun Han, intern, Dartmouth
- 2018 Joel Castellon, intern, EPFL
- 2017 Geng Ji, intern, Brown University
- 2017 Judith Butepage, intern, KTH
- 2017 Joseph Marino, intern, Caltech
- 2016 Zhiwei Deng, intern, Simon Fraser University
- 2014-2016 Florian Wenzel, PhD student and intern, Humboldt University Berlin.
- 2015 Gaurav Ragtah, master student independent study, Columbia University.
- 2015 Chenzhe Quian, master student independent study, Columbia University.

Keynotes

- 2018 LWDA Conference, Mannheim, Germany.

Invited Talks

- 2018 CS Colloquium, University of California, Santa Cruz, CA, USA
- 2018 CS Colloquium, University of California, Los Angeles, CA, USA
- 2018 CS Colloquium, University of California, Irvine, CA, USA
- 2017 CS Colloquium, UMass Amherst, MA, USA
- 2017 CS Colloquium, EPFL, Lausanne, Switzerland
- 2017 ML Lunch Seminar, Carnegie Mellon University, Pennsylvania, USA
- 2017 Disney Data Analytics Conference, Orlando, USA
- 2017 CS Colloquium, University of Southern California, California, USA
- 2017 CS Colloquium, ETH Zurich, Switzerland
- 2017 ML and Friends Seminar, UMass Amherst, Massachusetts, USA
- 2016 AI Seminar, Carnegie Mellon University, Pennsylvania, USA
- 2016 California Institute of Technology, Pasadena, USA
- 2016 Data Science Colloquium, Rutgers University, Newark, USA
- 2016 Google Research, Mountain View, USA
- 2016 Microsoft, Sunnyvale, USA
- 2016 Computer Science Colloquium, University of Rhode Island, USA
- 2016 Computer Science Colloquium, University of Colorado at Boulder, USA
- 2016 National Renewable Energy Laboratory (NREL), Golden, CO, USA
- 2015 Adobe Research, San Francisco, USA.
- 2015 Human Longevity Inc., Mountain View, USA.
- 2015 Schloss Dagstuhl Seminar, Leibniz Center for Informatics, Germany.
Machine Learning with Interdependent and Non-identically Distributed Data
- 2015 Machine Learning Seminar, Humboldt University Berlin, Germany.
- 2015 Machine Learning Seminar, Technical University Berlin, Germany.
- 2015 Machine Learning Seminar, University of British Columbia, Canada.
- 2015 D-Wave Systems, Burnaby, Canada.
- 2014 IBM Watson Research Center, Yorktown Heights, USA
- 2014 Emergent Phenomena in the Dynamics of Quantum Matter, New York, USA.
- 2013 Theoretical Physics Seminar, University of Otago, Dunedin, New Zealand.
- 2012 Theoretical Physics Seminar, Princeton University, Princeton, USA.
- 2011 Finite Temperature Non-Equilibrium Superfluid Systems, Heidelberg, Germany.
- 2010 Theoretical Physics Seminar, University of Colorado, Boulder, USA.
- 2010 Theoretical Physics Seminar, Ecole Polytechnique, Palaiseau, France.

Teaching Experience

- 08/2018 Tutorial, Title: “Discovering Hidden Structure in Data with Deep Probabilistic Models”, Disney Data Analytics Conference

- 07/2017 Tutorial, Title: "Deep Learning, Far Reaching: An Introduction", Disney Data Analytics Conference, 150 attendants, anonymous rating of 4.1 out of 5.0.
- 10/2015 Guest lecture, Title: "Stochastic Gradient Descent", Humboldt University Berlin.
- 2/2015 Guest lecture, Title: "Variational Inference", Humboldt University Berlin.
- Fall 2013 Instructor, Condensed Matter Field Theory, Princeton University
Extracurricular undergraduate course.
- Spring 2012 Teaching assistant, Computer Physics, University of Cologne.
- Fall 2011 Teaching assistant, Mathematical Methods, University of Cologne.
- Spring 2011 Teaching assistant, Quantum Field Theory II, University of Cologne.
- Fall 2010 Teaching assistant, Quantum Field Theory I, University of Cologne.
- Spring 2010 Teaching assistant, Statistical Physics, University of Cologne.
- Fall 2009 Teaching assistant, Quantum Physics, University of Cologne.
- Spring 2009 Teaching assistant, Electrodynamics, University of Cologne.
- Fall 2008 Teaching assistant, Classical Mechanics, University of Cologne.