Stephan Mandt

Machine Learning Researcher

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Work Experience

2018— **Senior Research Scientist, Disney Research Los Angeles**
Head of Machine Learning Group
Leading the machine learning research group of Disney Research Los Angeles, and co-developing machine learning initiatives across the company. Publishing fundamental and applied research, securing patents, and promoting technology transfer to diverse business units, such as Disney Studios, theme parks, and ABC Television.

2016—2017 **Research Scientist, Disney Research Pittsburgh**
Lead Disney Research Pittsburgh's machine learning research group by supervising two postdocs and a total of eight interns. Authored 6 papers including NIPS, UAI, ICML, and CVPR publications, secured 2 patents, and transferred technology to ABC Television.

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

2012 **Intern, Deutsche Bank**
Developed tools and analytics for an interest rates trading desk

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

2014 New York City Ascent Fellowship

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

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**
NIPS, 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. Zadorozhnyi, 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

Since 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 Referee
Journal of Machine Learning Research,
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 Reviewer
Neural Information Processing Systems,
Artificial Intelligence and Statistics,
International Conference of Machine Learning,
International Conference on Learning Representations.

Mentoring and Group Leadership

Postdocs

01/2017–12/2017 Cheng Zhang,
`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.