Hans Kersting, PhD

Research Scientist in Machine Learning

Date of Birth
1990-06-16

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Languages
fluent English and German
some French, Spanish and Latin

Programming
Python, Java, Matlab, Git, LaTeX, PySpark, Hadoop, Tensorflow, Pytorch

Areas of Expertise
Machine Learning, Bayesian Inference, Gaussian Processes, Probabilistic Numerics, Dynamical Systems, Optimization, Deep Learning

Specialist Knowledge
Differential Equations (ODEs, PDEs, SDEs), Numerical Analysis, Probability Theory, Stochastic Calculus, Bayesian Filtering, (Bayesian) Inverse Problems, Approximate Bayesian Computation, Optimization, Factorization Machines

Work and Education

01/2023–now **Research Scientist** Yahoo! Research, NYC, USA (remote from Germany)
Research on scalable machine learning in AdTech for the Yahoo DSP; main topics: R&D of click prediction model and Ad Optimization Controller

10/2020–12/2022 **Postdoc** in Machine Learning INRIA and Ecole Normale Supérieure, Paris
Research on optimizers for deep learning

07/2015–09/2020 **PhD** in Machine Learning Max Planck Institute for Intelligent Systems and Univ. Tübingen
'Uncertainty-Aware Numerical Solutions of ODEs by Bayesian Filtering', grade: 'very good' (*magna cum laude*)

10/2013–06/2015 **Master** in Mathematics LMU Munich
specialization in stochastic calculus and probabilistic modelling, GPA: 1.44 ('very good'; best grade: 1.0)

08/2014–06/2015 Master's Thesis and Academic Exchange University of Oslo
topic: *a*pplication of Malliavin calculus to nonlinear SDEs; research stay abroad supported by *Studienstiftung des deutschen Volkes*

10/2009–06/2013 **Bachelor** in Mathematics LMU Munich
specialization in probability theory and analysis, GPA: 1.14 ('very good'; best grade: 1.0); additional courses in physics and economics

09/2010–01/2011 Exchange Semester ETH Zurich
courses in mathematics and physics

06/2009 **Abitur** (A-Levels) Lessing-Gymnasium, Frankfurt am Main
GPA: 1.2 (best grade: 1.0)

Additional Professional Experiences

07/2019–09/2019 **Amazon Research Cambridge** Cambridge, UK
Internship
research on supply-chain optimization

10/2018–07/2019 **University of Tübingen** Tübingen, Germany
Teaching Assistant
for lectures 'Probabilistic Reasoning and Inference' and 'Numerics of Machine Learning'

10/2017–02/2018 **Bosch Center for Artificial Intelligence (BCAI)** Renningen, Germany
Internship
research on inverse problems for engine control

10/2011–07/2014 **LMU Munich** Munich, Germany
Teaching Assistant
for probability theory, linear algebra, stochastic processes, analysis; independent organizations of tutorials, corrections of exercise sheets and exams

04/2013–07/2013 **Allianz Inhouse Consulting** Munich, Germany
Intern
consulting project; VBA, Excel and PowerPoint

Books

Probabilistic Numerics – Computation as Machine Learning
Philipp Hennig, Michael A. Osborne, Hans Kersting
Cambridge University Press, 2022

Journal Papers

Mean first exit times of Ornstein-Uhlenbeck processes in high-dimensional spaces
Hans Kersting, Antonio Orvieto, Frank Proske, Aurelien Lucchi
Journal of Physics A: Mathematical and Theoretical, 2023

Convergence Rates of Gaussian ODE Filters
Hans Kersting, Tim J. Sullivan, Philipp Hennig
Statistics and Computing (STCO), 2020

Probabilistic Solutions to Ordinary Differential Equations as Non-Linear Bayesian Filtering: A New Perspective
Filip Tronarp, Hans Kersting, Simo Särkkä, Philipp Hennig
Statistics and Computing (STCO), 2019

Conference Papers

SDEs for Minimax Optimization
Enea Monzio Compagnoni, Antonio Orvieto, Hans Kersting, Frank Norbert Proske, Aurelien Lucchi
Conference on Artificial Intelligence and Statistics (AISTATS), 2024

An SDE for Modeling SAM: Theory and Insights
Enea Monzio Compagnoni, Antonio Orvieto, Luca Biggio, Frank Norbert Proske, Hans Kersting, Aurelien Lucchi
International Conference on Machine Learning (ICML), 2023

Explicit Regularization in Overparametrized Models via Noise Injection
Antonio Orvieto*, Anant Raj*, Hans Kersting*, Francis Bach
Conference on Artificial Intelligence and Statistics (AISTATS), 2023

Batch size selection by stochastic optimal control
Jim Zhao, Aurelien Lucchi, Frank Norbert Proske, Antonio Orvieto, Hans Kersting
Has it Trained Yet? NeurIPS Workshop, 2022

On the Theoretical Properties of Noise Correlation in Stochastic Optimization
Aurelien Lucchi*, Frank Proske*, Antonio Orvieto, Francis Bach, Hans Kersting
Conference on Neural Information Processing Systems (NeurIPS), 2022

Anticorrelated Noise Injection for Improved Generalization
Antonio Orvieto*, Hans Kersting*, Frank Proske, Francis Bach, Aurelien Lucchi
International Conference on Machine Learning (ICML), 2022

Differentiable Likelihoods for Fast Inversion of 'Likelihood-Free' Dynamical Systems
Hans Kersting*, Nicholas Krämer*, Martin Schiegg, Christian Daniel, Michael Tiemann, Philipp Hennig
International Conference on Machine Learning (ICML), 2020

A Fourier State Space Model for Bayesian ODE Filters
Hans Kersting, Maren Mahsereci
ICML Workshop on Invertible Neural Networks, Normalizing Flows, and Explicit Likelihood Models, 2020

Bayesian Filtering for ODEs with Bounded Derivatives
Emilia Magnani, Hans Kersting, Michael Schober, Philipp Hennig
arXiv preprint arXiv:1709.08471, 2017

Active Uncertainty Calibration in Bayesian ODE Solvers
Hans Kersting and Philipp Hennig
Conference on Uncertainty in Artificial Intelligence (UAI 2016)

Patents

Fast ABC for Differential Equation Parameters by Gaussian ODE Filtering
Hans Kersting, Philipp Hennig, Michael Schober, Martin Schiegg, Christian Daniel
German Patent Application Nr DE102019107390 (filed 09/2018)

Thesis

Uncertainty-Aware Numerical Solutions of ODEs by Bayesian Filtering
Hans Kersting
PhD Thesis, University of Tübingen, 2021

Invited Talks (selected)

13/02/2024 **Applied Maths Seminar** Weierstrass Institute for Applied Analysis and Stochastics, Berlin, Germany
'Exploration and implicit bias due to an optimizer's stochasticity'

18/01/2024 **Statistical Science Seminar** University College London, London, UK
'Exploration and implicit bias due to SGD's stochasticity'

14/04/2023 **Deep Fridays** University of Bologna, Bologna, Italy
'The beneficial role of stochastic noise in SGD'

07/12/2022 **Machine Learning Seminar** Linköping University, Linköping, Sweden
'The beneficial role of stochastic noise in SGD'

25/10/2022 **Probability and Statistics Seminar** Université Côte d'Azur, Nice, France
'The beneficial role of stochastic noise in SGD'

20/09/2022 **Dagstuhl Seminar "ML for Science"** Schloss Dagstuhl, Germany
'Bayesian ODE Filters for Uncertainty-Aware Numerical Integration'

26/10/2021 **Dagstuhl Seminar "Probabilistic Numerical Methods"** Schloss Dagstuhl, Germany
'ODE Filters — Forward and Backward'

06/07/2021 **MaxEnt 2021** TU Graz, Austria
'Uncertainty-Aware Numerical Solutions of ODEs by Bayesian Filtering'

26/05/2021 **Data-Centric Engineering Reading Group** Alan Turing Institute, London, UK
'Uncertainty-Aware Numerical Solutions of ODEs by Bayesian Filtering'

16/02/2021 **ML@CL Seminar Series** University of Cambridge, UK
'Uncertainty-Aware Numerical Solutions of ODEs by Bayesian Filtering'

14/07/2020 **International Conference for Machine Learning (ICML)** Virtual
'Differentiable Likelihoods for Fast Inversion of 'Likelihood-Free' Dynamical Systems'

20/11/2019 **INRIA Seminar** École normale supérieure (ENS), Paris, France
'Bayesian ODE Filters for Uncertainty-Aware Numerical Integration'

11/10/2019 **Workshop on Uncertainty Propagation** Siemens AI Lab, Munich, Germany
'Convergence Rates of Gaussian ODE Filters'

21/05/2019 **Approximation Theory 16 (AT16)** Vanderbilt University, Nashville, TN, USA
'Gaussian Likelihoods for Bayesian Inversion of ODEs'

16/04/2018 **SIAM Conference on Uncertainty Quantification** Garden Grove, CA, USA
'Convergence Rates of Gaussian ODE Filters'

12/04/2018 **Workshop on Probabilistic Numerical Methods** Alan Turing Institute, London, UK
'ODE Filtering—A Gaussian Decision Agent for Forward Problems'

09/06/2017 **ICERM Workshop on Probabilistic Numerics** Brown University, Providence, RI, USA
'Probabilistic Approaches to ODEs'

01/03/2017 **SIAM Conference on Computational Science and Engineering** Atlanta, GA, USA
'Prior Information in Bayesian ODE Solvers'

13/02/2017 **Bosch Center for Artificial Intelligence (BCAI)** Bosch Research, Renningen, Germany
'Prior Information in Bayesian ODE Solvers'

29/07/2016 **Kolloquium 'KI—Künstliche Verantwortung?'** ZIF, Bielefeld, Germany
'Uncertainty Quantification in Artificial Intelligence'

26/06/2016 **Uncertainty in Artificial Intelligence (UAI) Conference** New York City, NY, USA
'Active Uncertainty Calibration in Bayesian ODE Solvers'

14/06/2016 **Research Seminar on Uncertainty Quantification** Zuse Institute, Berlin, Germany
'Uncertainty Quantification in Probabilistic ODE Solvers'

Additional Activities (selected)

2017–now	**Reviewer** for scientific conferences and journals	NeuRIPS, ICML, AISTATS, STCO, etc.
07/2023– 09/2023	**Supervision of Intern** Enea Monzio Compagnoni, research on control algorithms for AdTech	Yahoo! Research
06/2023	**Co-organizer** of ELLIS theory workshop SCSPO23	Tübingen, Germany
06/2022	**Co-organizer** of meeting of the ELLIS theory unit	Genoa, Italy
2021	**Co-organizer** of reading group on "Stochastic Processes and Optimization"	INRIA, Paris, France
03/2019	**Artistic Research Workshop** with Johanna Barnbeck	Tübingen, Germany
08/2017	**Summer School on Sequential Monte Carlo Methods** attendance	Uppsala University
06/2016	**Summer School on Probabilistic Numerics** attendance	Dobbiaco, Italy
11/2016– 06/2017	**Supervision of Intern** Emilia Magnani, development of probabilistic ODE solver for stiff equations	Max Planck Institute for Intelligent Systems
04/2016– 03/2017	**External PhD Representative** representing the PhD students of MPI Tübingen within the Max Planck Society	Max Planck Society
09/2016	**Gaussian Process Summer School (GPSS)** attendance	University of Sheffield
07/2016	**Machine Learning Summer School (MLSS)** attendance	Max Planck Institute for Intelligent Systems
10/2012– 07/2014	**Unicef University Group** board member for events	LMU Munich
10/2012– 04/2013	**Student Representation Mathematics Faculty** responsible for appointment committees for professorships	LMU Munich

Scholarships and Awards (selected)

07/2022	**ICML** Outstanding Reviewer Award awarded to best 10 % of reviewers at ICML	ICML 2022
06/2016	**UAI** Student Scholarship Free tutorial, conference and workshop registration; awarded for promising junior scientists	UAI 2016
07/2013	**Studienstiftung** scholarship for excellent academic achievement; awarded to <0.5% of university students in Germany	Studienstiftung des deutschen Volkes
04/2013	**Deutschlandstipendium** scholarship for excellent academic achievement	Bundesministerium für Bildung und Forschung (BMBF)
08/2006– 07/2007	**ASSIST** Exchange Scholarship full scholarship to attend private high school, St. Mark's School of Texas (Dallas, TX) in 11th grade	ASSIST

This CV was last updated on 2024/02/03.