

# Hans Kersting, PhD

Research Scientist in Machine Learning

## Date of Birth

1990-06-16

## Contact

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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	<b>Research Scientist</b> Research on scalable machine learning in AdTech for the Yahoo DSP; main topics: R&D of click prediction model and Ad Optimization Controller	Yahoo! Research, NYC, USA (remote from Germany)
10/2020– 12/2022	<b>Postdoc in Machine Learning</b> Research on optimizers for deep learning	INRIA and Ecole Normale Supérieure, Paris
07/2015– 09/2020	<b>PhD in Machine Learning</b> <i>'Uncertainty-Aware Numerical Solutions of ODEs by Bayesian Filtering'</i> , grade: 'very good' ( <i>magna cum laude</i> )	Max Planck Institute for Intelligent Systems and Univ. Tübingen
10/2013– 06/2015	<b>Master in Mathematics</b> specialization in stochastic calculus and probabilistic modelling, GPA: 1.44 ('very good'; best grade: 1.0)	LMU Munich
08/2014– 06/2015	<b>Master's Thesis and Academic Exchange</b> topic: application of Malliavin calculus to nonlinear SDEs; research stay abroad supported by <i>Studienstiftung des deutschen Volkes</i>	University of Oslo
10/2009– 06/2013	<b>Bachelor in Mathematics</b> specialization in probability theory and analysis, GPA: 1.14 ('very good'; best grade: 1.0); additional courses in physics and economics	LMU Munich
09/2010– 01/2011	<b>Exchange Semester</b> courses in mathematics and physics	ETH Zurich
06/2009	<b>Abitur (A-Levels)</b> GPA: 1.2 (best grade: 1.0)	Lessing-Gymnasium, Frankfurt am Main

## Additional Professional Experiences

07/2019– 09/2019	<b>Amazon Research Cambridge</b> <i>Internship</i> research on supply-chain optimization	Cambridge, UK
10/2018– 07/2019	<b>University of Tübingen</b> <i>Teaching Assistant</i> for lectures 'Probabilistic Reasoning and Inference' and 'Numerics of Machine Learning'	Tübingen, Germany
10/2017– 02/2018	<b>Bosch Center for Artificial Intelligence (BCAI)</b> <i>Internship</i> research on inverse problems for engine control	Renningen, Germany
10/2011– 07/2014	<b>LMU Munich</b> <i>Teaching Assistant</i> for probability theory, linear algebra, stochastic processes, analysis; independent organizations of tutorials, corrections of exercise sheets and exams	Munich, Germany
04/2013– 07/2013	<b>Allianz Inhouse Consulting</b> <i>Intern</i> consulting project; VBA, Excel and PowerPoint	Munich, Germany

## 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	<b>Applied Maths Seminar</b> <i>'Exploration and implicit bias due to an optimizer's stochasticity'</i>	Weierstrass Institute, Berlin, Germany
18/01/2024	<b>Statistical Science Seminar</b> <i>'Exploration and implicit bias due to SGD's stochasticity'</i>	University College London, London, UK
14/04/2023	<b>Deep Fridays</b> <i>'The beneficial role of stochastic noise in SGD'</i>	University of Bologna, Bologna, Italy
07/12/2022	<b>Machine Learning Seminar</b> <i>'The beneficial role of stochastic noise in SGD'</i>	Linköping University, Linköping, Sweden
25/10/2022	<b>Probability and Statistics Seminar</b> <i>'The beneficial role of stochastic noise in SGD'</i>	Université Côte d'Azur, Nice, France
20/09/2022	<b>Dagstuhl Seminar "ML for Science"</b> <i>'Bayesian ODE Filters for Uncertainty-Aware Numerical Integration'</i>	Schloss Dagstuhl, Germany
26/10/2021	<b>Dagstuhl Seminar "Probabilistic Numerical Methods"</b> <i>'ODE Filters – Forward and Backward'</i>	Schloss Dagstuhl, Germany
06/07/2021	<b>MaxEnt 2021</b> <i>'Uncertainty-Aware Numerical Solutions of ODEs by Bayesian Filtering'</i>	TU Graz, Austria
26/05/2021	<b>Data-Centric Engineering Reading Group</b> <i>'Uncertainty-Aware Numerical Solutions of ODEs by Bayesian Filtering'</i>	Alan Turing Institute, London, UK
16/02/2021	<b>ML@CL Seminar Series</b> <i>'Uncertainty-Aware Numerical Solutions of ODEs by Bayesian Filtering'</i>	University of Cambridge, UK
14/07/2020	<b>International Conference for Machine Learning (ICML)</b> <i>'Differentiable Likelihoods for Fast Inversion of 'Likelihood-Free' Dynamical Systems'</i>	Virtual
20/11/2019	<b>INRIA Seminar</b> <i>'Bayesian ODE Filters for Uncertainty-Aware Numerical Integration'</i>	École normale supérieure (ENS), Paris, France
11/10/2019	<b>Workshop on Uncertainty Propagation</b> <i>'Convergence Rates of Gaussian ODE Filters'</i>	Siemens AI Lab, Munich, Germany
21/05/2019	<b>Approximation Theory 16 (AT16)</b> <i>'Gaussian Likelihoods for Bayesian Inversion of ODEs'</i>	Vanderbilt University, Nashville, TN, USA
16/04/2018	<b>SIAM Conference on Uncertainty Quantification</b> <i>'Convergence Rates of Gaussian ODE Filters'</i>	Garden Grove, CA, USA
12/04/2018	<b>Workshop on Probabilistic Numerical Methods</b> <i>'ODE Filtering—A Gaussian Decision Agent for Forward Problems'</i>	Alan Turing Institute, London, UK
09/06/2017	<b>ICERM Workshop on Probabilistic Numerics</b> <i>'Probabilistic Approaches to ODEs'</i>	Brown University, Providence, RI, USA
01/03/2017	<b>SIAM Conference on Computational Science and Engineering</b> <i>'Prior Information in Bayesian ODE Solvers'</i>	Atlanta, GA, USA
13/02/2017	<b>Bosch Center for Artificial Intelligence (BCAI)</b> <i>'Prior Information in Bayesian ODE Solvers'</i>	Bosch Research, Renningen, Germany
29/07/2016	<b>Kolloquium 'KI—Künstliche Verantwortung?'</b> <i>'Uncertainty Quantification in Artificial Intelligence'</i>	ZIF, Bielefeld, Germany
26/06/2016	<b>Uncertainty in Artificial Intelligence (UAI) Conference</b> <i>'Active Uncertainty Calibration in Bayesian ODE Solvers'</i>	New York City, NY, USA
14/06/2016	<b>Research Seminar on Uncertainty Quantification</b> <i>'Uncertainty Quantification in Probabilistic ODE Solvers'</i>	Zuse Institute, Berlin, Germany

## Additional Activities (selected)

2017–now	<b>Reviewer</b> for scientific conferences and journals	NeuRIPS, ICML, AISTATS, STCO, etc.
07/2023– 09/2023	<b>Supervision of Intern</b> Enea Monzio Compagnoni, research on control algorithms for AdTech	Yahoo! Research
06/2023	<b>Co-organizer</b> of ELLIS theory workshop SCSP023	Tübingen, Germany
06/2022	<b>Co-organizer</b> of meeting of the ELLIS theory unit	Genoa, Italy
2021	<b>Co-organizer</b> of reading group on “Stochastic Processes and Optimization”	INRIA, Paris, France
03/2019	<b>Artistic Research Workshop</b> with Johanna Barnbeck	Tübingen, Germany
08/2017	<b>Summer School on Sequential Monte Carlo Methods</b> attendance	Uppsala University
06/2016	<b>Summer School on Probabilistic Numerics</b> attendance	Dobbiaco, Italy
11/2016– 06/2017	<b>Supervision of Intern</b> Emilia Magnani, development of probabilistic ODE solver for stiff equations	Max Planck Institute for Intelligent Systems
04/2016– 03/2017	<b>External PhD Representative</b> representing the PhD students of MPI Tübingen within the Max Planck Society	Max Planck Society
09/2016	<b>Gaussian Process Summer School (GPSS)</b> attendance	University of Sheffield
07/2016	<b>Machine Learning Summer School (MLSS)</b> attendance	Max Planck Institute for Intelligent Systems
10/2012– 07/2014	<b>Unicef University Group</b> board member for events	LMU Munich
10/2012– 04/2013	<b>Student Representation Mathematics Faculty</b> responsible for appointment committees for professorships	LMU Munich

## Scholarships and Awards (selected)

07/2022	<b>ICML Outstanding Reviewer Award</b> awarded to best 10 % of reviewers at ICML	ICML 2022
06/2016	<b>UAI Student Scholarship</b> Free tutorial, conference and workshop registration; awarded for promising junior scientists	UAI 2016
07/2013	<b>Studienstiftung</b> scholarship for excellent academic achievement; awarded to <0.5% of university students in Germany	Studienstiftung des deutschen Volkes
04/2013	<b>Deutschlandstipendium</b> scholarship for excellent academic achievement	Bundesministerium für Bildung und Forschung (BMBF)
08/2006– 07/2007	<b>ASSIST Exchange Scholarship</b> 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 2024/02/14.