

# Hans Kersting, PhD

Researcher 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, Matlab, C++,  
LaTeX, R

## Areas of Expertise

Machine Learning,  
Bayesian Inference,  
Gaussian Processes,  
Probabilistic Numerics,  
Dynamical Systems,  
Optimization

## Specialist Knowledge

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

## Academic Education

10/2020– now	<b>Postdoc in Machine Learning</b> Research on the connection between optimizers and dynamical systems	INRIA and ENS, 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)	LMU Munich
04/2014– 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); 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
08/2006– 06/2007	<b>High School Year abroad</b> supported by full scholarship from ASSIST	St. Mark's School of Texas, Dallas, TX

## Professional Experience

07/2019– 09/2019	<b>Amazon Research Cambridge</b> <i>Internship</i> research on periodic ODEs	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 (see patent below)	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

# Publications

## **Anticorrelated Noise Injection for Improved Generalization**

Antonio Orvieto\*, Hans Kersting\*, Frank Proske, Francis Bach, Aurelien Lucchi  
arXiv preprint arXiv:2202.02831, 2022

## **Uncertainty-Aware Numerical Solutions of ODEs by Bayesian Filtering**

Hans Kersting  
PhD Thesis, University of Tübingen, 2021

## **Convergence Rates of Gaussian ODE Filters**

Hans Kersting, Tim J. Sullivan, Philipp Hennig  
Statistics and Computing (STCO), 2020

## **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

## **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

## **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 MI 0104-5588-BC-JK (filed 09/2018)

## Invited Talks (selected)

26/10/2022	<b>Dagstuhl Seminar</b> 'ODE Filters – Forward and Backward'	Leibniz-Zentrum für Informatik, Schloss Dagstuhl, Germany
06/07/2021	<b>MaxEnt 2021</b> 'Uncertainty-Aware Numerical Solutions of ODEs by Bayesian Filtering'	TU Graz, Austria
26/05/2021	<b>Data-Centric Engineering Reading Group</b> 'Uncertainty-Aware Numerical Solutions of ODEs by Bayesian Filtering'	Alan Turing Institute, London, UK
16/02/2021	<b>ML@CL Seminar Series</b> 'Uncertainty-Aware Numerical Solutions of ODEs by Bayesian Filtering'	University of Cambridge, UK
14/07/2020	<b>International Conference for Machine Learning (ICML)</b> 'Differentiable Likelihoods for Fast Inversion of 'Likelihood-Free' Dynamical Systems'	Virtual
20/11/2019	<b>INRIA Seminar</b> 'Bayesian ODE Filters for Uncertainty-Aware Numerical Integration'	École normale supérieure (ENS), Paris, France
11/10/2019	<b>Workshop on Uncertainty Propagation</b> 'Convergence Rates of Gaussian ODE Filters'	Siemens AI Lab, Munich, Germany
21/05/2019	<b>Approximation Theory 16 (AT16)</b> 'Gaussian Likelihoods for Bayesian Inversion of ODEs'	Vanderbilt University, Nashville, TN, USA
16/04/2018	<b>SIAM Conference on Uncertainty Quantification</b> 'Convergence Rates of Gaussian ODE Filters'	Garden Grove, CA, USA
12/04/2018	<b>Workshop on Probabilistic Numerical Methods</b> 'ODE Filtering—A Gaussian Decision Agent for Forward Problems'	Alan Turing Institute, London, UK
09/06/2017	<b>ICERM Workshop on Probabilistic Numerics</b> 'Probabilistic Approaches to ODEs'	Brown University, Providence, RI, USA
01/03/2017	<b>SIAM Conference on Computational Science and Engineering</b> 'Prior Information in Bayesian ODE Solvers'	Atlanta, GA, USA
13/02/2017	<b>Bosch Center for Artificial Intelligence (BCAI)</b> 'Prior Information in Bayesian ODE Solvers'	Bosch Research, Renningen, Germany
29/07/2016	<b>Kolloquium 'KI—Künstliche Verantwortung?'</b> 'Uncertainty Quantification in Artificial Intelligence'	ZIF, Bielefeld, Germany
26/06/2016	<b>Uncertainty in Artificial Intelligence (UAI) Conference</b> 'Active Uncertainty Calibration in Bayesian ODE Solvers'	New York City, NY, USA
14/06/2016	<b>Research Seminar on Uncertainty Quantification</b> 'Uncertainty Quantification in Probabilistic ODE Solvers'	Zuse Institute, Berlin, Germany
24/05/2016	<b>Open Graduate Day at MPI</b> 'Probabilistic Numerics for Machine Learning'	Max Planck Institute Tübingen
25/04/2016	<b>Workshop on Probabilistic Numerics</b> 'Uncertainty Calibration in ODE Solvers'	Max Planck Institute, Tübingen, Germany
21/04/2016	<b>Workshop on Probabilistic Radiation</b> 'Uncertainty Calibration in ODE Solvers'	Max Planck Institute, Tübingen, Germany

## Additional Activities (selected)

2017–now	<b>Reviewer</b> for International Conference on Machine Learning	NeuRIPS, ICML, AISTATS
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
02/2014	<b>Course in Academic English</b> specialist language course, funded by <i>Studienstiftung des deutschen Volkes</i>	Hilderstone College, Broadstairs, UK
10/2012– 04/2013	<b>Student Representation Mathematics Faculty</b> responsible for appointment committees for professorships	LMU Munich

## Scholarships and Awards (selected)

07/2013	<b>Stipendium 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)
11/2012	<b>SwissLife Studienförderprogramm</b> scholarship for excellent performance during internship	Swiss Life Group
06/2009	<b>Physics Price</b> best physics abitur (A-levels) in entire class of high school	Deutsche Physikalische Gesellschaft (DPG)
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