

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

Work and Education

10/2020– now	Postdoc in Machine Learning Research on the connection between optimizers and dynamical systems	INRIA and ENS, Paris
07/2015– 09/2020	PhD in Machine Learning <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	Master in Mathematics specialization in stochastic calculus and probabilistic modelling, GPA: 1.44 ('very good'; best grade)	LMU Munich
04/2014– 06/2015	Master's Thesis and Academic Exchange 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	Bachelor in Mathematics 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	Exchange Semester courses in mathematics and physics	ETH Zurich
06/2009	Abitur (A-Levels) GPA: 1.2 (best grade: 1.0)	Lessing-Gymnasium, Frankfurt am Main
08/2006– 06/2007	High School Year abroad supported by full scholarship from ASSIST	St. Mark's School of Texas, Dallas, TX

Additional Professional Experiences

07/2019– 09/2019	Amazon Research Cambridge <i>Internship</i> research on periodic ODEs	Cambridge, UK
10/2018– 07/2019	University of Tübingen <i>Teaching Assistant</i> for lectures 'Probabilistic Reasoning and Inference' and 'Numerics of Machine Learning'	Tübingen, Germany
10/2017– 02/2018	Bosch Center for Artificial Intelligence (BCAI) <i>Internship</i> research on inverse problems for engine control (see patent below)	Renningen, Germany
10/2011– 07/2014	LMU Munich <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	Allianz Inhouse Consulting <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)

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

Additional Activities (selected)

2021	Organizer of reading group on “Stochastic Processes and Optimization”	INRIA, Paris, France
2017–now	Reviewer for scientific conferences and journals	NeuRIPS, ICML, AISTATS, STCO, etc.
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
02/2014	Course in Academic English specialist language course, funded by <i>Studienstiftung des deutschen Volkes</i>	Hilderstone College, Broadstairs, UK
10/2012– 04/2013	Student Representation Mathematics Faculty responsible for appointment committees for professorships	LMU Munich

Scholarships and Awards (selected)

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