Hans Kersting, PhD

Researcher 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, Matlab, C++, R, LaTeX, Git

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 — INRIA and Ecole Normale Supérieure, Paris
Research on the connection between optimizers and dynamical systems

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)

04/2014–06/2015 Master's Thesis and Academic Exchange — University of Oslo
topic: application 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); 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)

08/2006–06/2007 High School Year abroad — St. Mark's School of Texas, Dallas, TX
supported by full scholarship from ASSIST

Additional Professional Experiences

07/2019–09/2019 **Amazon Research Cambridge** — Cambridge, UK
Internship
research on periodic ODEs

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 (see patent below)

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, to appear

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)

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)

Invited Talks (selected)

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'

24/05/2016 **Open Graduate Day at MPI** Max Planck Institute Tübingen
'Probabilistic Numerics for Machine Learning'

25/04/2016 **Workshop on Probabilistic Numerics** Max Planck Institute, Tübingen, Germany
'Uncertainty Calibration in ODE Solvers'

21/04/2016 **Workshop on Probabilistic Radiation** Max Planck Institute, Tübingen, Germany
'Uncertainty Calibration in ODE Solvers'

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 *Studienstiftung des deutschen Volkes*	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

This CV was last updated on 2022/03/30.