

# Tobias Hurth

Hermann-Föge-Weg 4  
37073 Göttingen

Email: [tobias.hurth@fu-berlin.de](mailto:tobias.hurth@fu-berlin.de)  
Homepage: [tobias-hurth.squarespace.com](http://tobias-hurth.squarespace.com)  
Phone: 0172 3630315  
Linkedin: [www.linkedin.com/in/tobias-hurth-math](http://www.linkedin.com/in/tobias-hurth-math)

## Employment

- September 2022- Einstein International Postdoctoral Fellow at Freie Universität Berlin  
Supervisor: Dr. Maximilian Engel
- April-July 2022 Substitute Teacher at an elementary school in Lower Saxony  
September 2020 Affiliation with the University of Neuchâtel, Switzerland, while working  
-August 2021 on a textbook on Markov chains with Michel Benaïm  
(September 2020 - April 2021: Substitute Teacher at a Neuchâtel high school)
- 2018-2020 Postdoctoral Researcher at the University of Neuchâtel  
Supervisor: Prof. Dr. Michel Benaïm
- 2017-2018 Postdoctoral Researcher and Instructor at EPF Lausanne, CH  
Supervisor: Prof. Dr. Thomas Mountford
- 2014-2017 Postdoctoral Researcher and Instructor at the University of Toronto, Canada  
Supervisor: Prof. Dr. Konstantin Khanin

## Education

- 2011-2014 **Ph.D. in Mathematics**, Georgia Institute of Technology, USA  
Advisor: Prof. Dr. Yuri Bakhtin  
Thesis: "Invariant Densities for Dynamical Systems with Random Switching"
- 2009-2010 **M. Sc. in Mathematics**, Georgia Institute of Technology
- 2006-2009 **B. Sc. in Mathematics**, Technical University of Munich

## Research

I am mainly interested in problems arising in probability, random dynamical systems, and mathematical physics. In particular, I have been working on random switching between deterministic vector fields (piecewise deterministic Markov processes) as well as directed polymers in a random environment. My current research projects include work on the ergodic theory of conditioned random dynamical systems (jointly with Maximilian Engel), on switching processes with nonexponential jump times (jointly with Edouard Strickler), and on global stationary in time solutions to the stochastic heat equation (jointly with Konstantin Khanin and Beatriz Navarro Lameda).

*Preprints*

- 1) Hurth, T., Khanin, K., Navarro Lamedea, B., and Nazarov, F. (2021). On a factorization formula for the partition function of directed polymers  
[arxiv.org/abs/2107.12738](https://arxiv.org/abs/2107.12738)

*Publications*

- 2022 Kuehn, C., Berglund, N., Bick, C., Engel, M., Hurth, T., Iuorio, A., and Soresina, C. (2022). A general view on double limits in differential equations. *Physica D: Nonlinear Phenomena*, 431:133105 [arxiv.org/abs/2106.01160](https://arxiv.org/abs/2106.01160)
- 2021 Bakhtin, Y., Hurth, T., Lawley, S. D., and Mattingly, J. C. (2021). Singularities of invariant densities for random switching between two linear ODEs in 2D. *SIADS*, 20(4):1917–1958 [arxiv.org/abs/2009.01299](https://arxiv.org/abs/2009.01299)
- 2020 Hurth, T. and Kuehn, C. (2020). Random switching near bifurcations. *Stoch. Dyn.*, 20(2):2050008, 28 [arxiv.org/abs/1901.00124](https://arxiv.org/abs/1901.00124)
- 2018 Benaïm, M., Hurth, T., and Strickler, E. (2018). A user-friendly condition for exponential ergodicity in randomly switched environments. *Electron. Commun. Probab.*, 23:Paper No. 44, 12 [arxiv.org/abs/1803.03456](https://arxiv.org/abs/1803.03456)
- 2018 Bakhtin, Y., Hurth, T., Lawley, S. D., and Mattingly, J. C. (2018). Smooth invariant densities for random switching on the torus. *Nonlinearity*, 31(4):1331–1350 [arxiv.org/abs/1708.01390](https://arxiv.org/abs/1708.01390)
- 2015 Bakhtin, Y., Hurth, T., and Mattingly, J. C. (2015). Regularity of invariant densities for 1D systems with random switching. *Nonlinearity*, 28(11):3755–3787 [arxiv.org/abs/1406.5425](https://arxiv.org/abs/1406.5425)
- 2012 Bakhtin, Y. and Hurth, T. (2012). Invariant densities for dynamical systems with random switching. *Nonlinearity*, 25(10):2937–2952 [arxiv.org/abs/1203.5744](https://arxiv.org/abs/1203.5744)

## College-level Teaching

### *Courses*

#### **University of Neuchâtel (Master's level)**

2019, Fall Random Dynamical Systems (teaching assistant, expert at the oral exam)

#### **EPF Lausanne (Bachelor's level)**

2018, Spring Stochastic Processes and their Applications  
(instructor, jointly with Prof. Dr. Sophie Hautphenne)

#### **University of Toronto Mississauga (Bachelor's level)**

2017, Winter Partial Differential Equations (instructor)

2016, Fall Ordinary Differential Equations (instructor)

2015/16 Single-Variable Calculus (instructor, course coordinator)

2015, Winter Vector Calculus (instructor)

2014, Fall Multi-Variable Calculus (instructor)

#### **Georgia Institute of Technology (Bachelor's level)**

2014, Spring Ordinary Differential Equations (instructor)

2013, Fall Single-Variable Calculus (instructor)

In addition, I was a teaching assistant for several Bachelor's level courses at the Georgia Institute of Technology (2010-2013) and at the Technical University of Munich (2008/09).

### *Textbook*

Since September 2019, Michel Benaïm and I have been writing a graduate-level textbook on discrete-time Markov chains evolving on a metric space. A link to a preliminary version of the first chapter is available on my website: [tobias-hurth.squarespace.com/teaching](http://tobias-hurth.squarespace.com/teaching).

### *Didactic workshops*

2019, February Flipped-Classroom Teaching (EPF Lausanne)

2018, March Course Design (EPF Lausanne)

2016, April Large-Class Teaching (University of Toronto)

2016, March Scholarship of Teaching and Learning (University of Toronto)

## Recent talks

- 2021, July      Symposium on Stochastic Hybrid Systems and Applications,  
jointly with Michel Benaïm (remote talk)
- 2020, June      Berlin–Oxford Young Researchers Meeting  
on Applied Stochastic Analysis (remote talk)
- 2020, April      University of Lorraine at Nancy, IECL Seminar (remote talk)
- 2019, October    ETH Zürich, Seminar on Stochastic Processes
- 2019, April      EPF Lausanne, Probability Seminar
- 2018, October    TU Munich, Seminar on Dynamical Systems
- 2018, May        Centre Paul Langevin, First Meeting of MALIN  
(French-Swiss research project on random walks)
- 2018, April      New York University, Dynamics Seminar
- 2018, January    Ludwig-Maximilians-Universität, TU Munich, Probability Seminar
- 2017, December   EPF Lausanne, Probability Seminar
- 2017, April      University of Maryland, Workshop on Dynamical Systems
- 2016, December    Niagara Falls, Winter Meeting of the Canadian Mathematical Society
- 2016, July        Fields Institute, World Congress in Probability and Statistics
- 2016, June        Dalhousie University, Conference on Iterated Function Systems, Fractals,  
Invariant Measures and their Applications

## Additional conferences and academic stays

- 2022, April      University of Bristol, Probability, Analysis and Dynamics (remote participation)
- 2021, December    Bielefeld University, Winter School on Stochastic Dynamics
- 2021, October      University of Lorraine at Nancy, one-week stay, invited by Edouard Strickler
- 2019, September    Centre International de Rencontres en Mathématiques (CIRM),  
Research in Pairs Program  
with Konstantin Khanin and Beatriz Navarro Lameda
- 2019, June        University of Tours, one-week stay, invited by Florent Malrieu
- 2019, June        Les Diablerets, Second Meeting of MALIN
- 2019, June        Paris, conference in honor of Jean-François Le Gall's 60th birthday
- 2019, March        ETH Zurich, goMATH Symposium
- 2019, February    Les Diablerets, Workshop on Statistical Mechanics
- 2018, September/  
October          Mathematisches Forschungsinstitut Oberwolfach,  
Research in Pairs Program  
with Konstantin Khanin and Beatriz Navarro Lameda
- 2017, April/May    Centre International de Rencontres en Mathématiques,  
Conference on qualitative methods around KPZ
- 2014, July        MSRI, Summer School on Stochastic Partial Differential Equations
- 2013, June        University of Rennes, Summer School on the KPZ Equation  
and Rough Paths
- 2013, May        University of Rennes, Workshop on Piecewise Deterministic  
Markov Processes

## Professional development and service

- 2019, October Workshop on writing a grant proposal
- 2019, July Doctoral thesis reviewer and member of the examining committee for Jacques Saliba (EPF Lausanne)
- 2019, June Co-organizer of an international conference (Second Meeting of MALIN in Les Diablerets)
- 2018, 2014 Mentor of two bachelor's students at the Georgia Institute of Technology (study and career advice)
- 2015, October Volunteer in the Ontario Universities' Fair
- 2013/14 Co-organizer for the High School Math Competition at Georgia Tech (in charge of registration)
- 2012/13 Co-organizer of a research seminar at the Georgia Institute of Technology

## Refereeing

I have refereed articles for the journals *Nonlinearity*, *SIAM Journal on Mathematical Analysis*, *Journal of Nonlinear Analysis*, and *Journal of Physics: A*.

## Awards and scholarships

- 2016 Award for excellence in teaching by a junior member of the research community "Mathematics, Computer Science, and Statistics" at the University of Toronto Mississauga
- 2014 Outstanding Graduate Teaching Assistant Award in the School of Mathematics at the Georgia Institute of Technology

## Memberships

- since 2018 Friends of Oberwolfach
- since 2013 Institute of Mathematical Statistics (IMS)
- since 2013 Society for Industrial and Applied Mathematics (SIAM)

## Skills

### *Languages*

- German mother tongue, teaching experience from my Bachelor's studies
- English very good command, used at work and while teaching during my Ph.D. studies and at the University of Toronto
- French very good command, used at work and while teaching in Neuchâtel
- Spanish advanced level (my wife is from Argentina)

### *Software*

L<sup>A</sup>T<sub>E</sub>X, MATLAB, R, Git, Microsoft Office, HTML