

# Paul P. Hager

Curriculum Vitae

June 11, 2021

Technische Universität Berlin  
Institut für Mathematik - Sekr. MA 7-2  
Straße des 17. Juni 136  
10623 Berlin

## Education

- since April 2019 PhD studies, Technische Universität Berlin,  
Thesis working title: “*Rough Analysis with Application in Markets and Related Fields*”, supervision by Prof. P. K. Friz and Dr. C. Bayer.
- April 2016 **Master of Science**, Technische Universität Berlin,  
- March 2019 Mathematics with emphasis on stochastic analysis and mathematical finance,  
Thesis: “*The Multiplicative Chaos of Fractional Brownian Motions with Vanishing Hurst Parameters*”, supervision by Prof. P. K. Friz.
- September 2012 **Bachelor of Science**, Technische Universität Berlin,  
- March 2016 Mathematics with emphasis on probability theory,  
Thesis: “*Bayesian Change Point Detection with an Asymmetric Miss Criterion*”, supervision by Prof. P. Bank.
- September 2009 **Fachgebundene Hochschulreife**, Fachoberschule Bamberg (tech. branch),  
- August 2012 Seminar work: “*Logarithmus- und Exponentialrechnung im Komplexen*”.

## Professional Experience

- since April 2019 Scientific Assistant at the Technical University of Berlin in the MATH+  
project AA4-2 “*Optimal control in energy markets using rough analysis and deep networks*”.
- Oktober 2017 Student job at Digitec GmbH, Hamburg,  
- March 2019 researching and developing software for interest rate term structure modelling  
with multiple yield curves.
- April 2017 Student job at Onwrks (StarTUp Incubator), Berlin,  
- September 2017 developing statistical and machine learning methods for maintenance  
prediction of wind turbines.

## Teaching Experience

- Fall Semester Tutor in Linear Algebra I for Engineers.  
2015/2016
- Spring Semester Tutor in Stochastics for Computer scientist.  
2016
- Fall Semester Tutor in Linear Algebra I for Engineers.  
2016/2017

## Current Research Interest

- Signatures and their applications in stochastic control and machine learning.
- Fractional Brownian motion, log-correlated fields, Gaussian multiplicative chaos and their applications to volatility modelling.

## Research Publications

### Preprints

- (5) C. Bayer, P. Hager, S. Riedel, and J. Schoenmakers. Optimal stopping with signatures. *arXiv e-prints*, page arXiv:2105.00778, May 2021. <https://arxiv.org/abs/2105.00778>
- (4) P. K. Friz, P. Hager, and N. Tapia. Unified Signature Cumulants and Generalized Magnus Expansions. *arXiv e-prints*, page arXiv:2102.03345, Feb. 2021. <https://arxiv.org/abs/2102.03345>

- (3) C. Bayer, D. Belomestny, P. Hager, P. Pigato, J. Schoenmakers, and V. Spokoiny. Reinforced optimal control. *arXiv e-prints*, page arXiv:2011.12382, Nov. 2020. <http://arxiv.org/abs/2011.12382>
- (2) P. Hager and E. Neuman. The Multiplicative Chaos of  $H = 0$  Fractional Brownian Fields. *arXiv e-prints*, page arXiv:2008.01385, Aug. 2020. <https://arxiv.org/abs/2008.01385>
- (1) C. Bayer, D. Belomestny, P. Hager, P. Pigato, and J. Schoenmakers. Randomized optimal stopping algorithms and their convergence analysis. *arXiv e-prints*, page arXiv:2002.00816, Feb. 2020. <https://arxiv.org/abs/2002.00816>

## Talks

- “*The Multiplicative Chaos of  $H=0$  fractional Brownian Fields*”:
  - June 4, 2021, SIAM Conference on Financial Mathematics and Engineering (online conference), SIAM Philadelphia.
- “*Optimal Stopping with Signatures*”:
  - June 10, 2021, Big Data and Machine Learning in Finance Conference (online conference), Politecnico di Milano,
  - May 11, 2021, Seminar “Modern Methods in Applied Stochastics and Nonparametric Statistics”, WIAS Berlin,
  - March 3, 2021, BMS Student Conference (online conference), Berlin Mathematical School,
  - January 29, 2021, XXII Workshop On Quantitative Finance (online conference), University of Verona.
- “*Unified Signature Cumulants and Generalized Magnus Expansions*”:
  - February 24, 2021, Cumulants in Stochastic Analysis (online conference), TU Berlin,
  - February 11, 2021, 14th Oxford-Berlin Young Researchers Meeting on Applied Stochastic Analysis (online conference), University of Oxford,
  - August 25, 2020, Bernoulli-IMS One World Symposium (pre-recorded talk),
  - June 9, 2020, 13th Berlin-Oxford Young Researchers Meeting on Applied Stochastic Analysis (online conference), WIAS Berlin.
- “*Reinforced Optimal Control*”:
  - July 7, 2020, Seminar “Modern Methods in Applied Stochastics and Nonparametric Statistics”, WIAS Berlin.
- “*What is Gaussian multiplicative chaos?*”:
  - Jan 1, 2020, “What is ...? Seminar”, Berlin Mathematical School.
- “*The Multiplicative Chaos of Fractional Brownian Motions with Vanishing Hurst Parameters*”:
  - December 5, 2019, 12th Oxford-Berlin Young Researchers Meeting on Applied Stochastic Analysis, University of Oxford.
  - June 26, 2019, Seminar “Finance and Stochastics”, Imperial College London,
  - May 29, 2019, Seminar “Modern Methods in Applied Stochastics and Nonparametric Statistics”, WIAS Berlin.

## Miscellaneous

Languages	German (mother tongue), English (fluent), Italian (beginner).
Programming Languages	Python, Cython, Scala.
Referee Activity	For the <i>Annals of Applied Probability</i> and the <i>Journal of Mathematical Finance</i> .