Paul Peter Hager

Curriculum Vitae

Humboldt University Berlin
Department of Mathematics
Unter den Linden 6
10099 Berlin

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Education

April 2019 - September 2021	**Dr. rer. nat.**, Technische Universität Berlin, with “summa cum laude”, Thesis: “*Rough Analysis with Application in Markets and Related Fields*”, supervision by Prof. P. K. Friz and Dr. habil. C. Bayer.
April 2016 - March 2019	**Master of Science**, Technische Universität Berlin, 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 - March 2016	**Bachelor of Science**, Technische Universität Berlin, Mathematics with emphasis on probability theory, Thesis: “*Bayesian Change Point Detection with an Asymmetric Miss Criterion*”, supervision by Prof. P. Bank.
September 2009 - August 2012	**Fachgebundene Hochschulreife**, Fachoberschule Bamberg (tech. branch), Seminar work: “*Logarithmus- und Exponentialrechnung im Komplexen*”.

Professional Experience

since October 2021	Postdoctoral Researcher at the Humboldt University of Berlin with Prof. Ulrich Horst in the research group “*Applied Financial Mathematics & Applied Stochastic Analysis*”.
April 2019 - September 2021	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*”.
October 2017 - March 2019	Student job at Digitec GmbH, Hamburg, researching and developing software for interest rate term structure modelling with multiple yield curves.
April 2017 - September 2017	Student job at Onwrks (StarTUp Incubator), Berlin, developing statistical and machine learning methods for maintenance prediction of wind turbines.

Teaching Experience

Fall 2021/22	Exercise Class in Analysis III for Physicists
Fall 2015/2016	Tutorial in Linear Algebra I for Engineers.
Spring 2016	Tutorial in Stochatics for Computer scientist.
Fall 2016/2017	Tutorial in Linear Algebra I for Engineers.

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

(1) C. Bayer, D. Belomestny, P. Hager, P. Pigato, and J. Schoenmakers. "Randomized Optimal Stopping Algorithms and Their Convergence Analysis". In: *SIAM Journal on Financial Mathematics* 12.3 (2021), pp. 1201–1225

Preprints

(4) C. Bayer, P. Hager, S. Riedel, and J. Schoenmakers. "Optimal stopping with signatures". In: *arXiv e-prints*, arXiv:2105.00778 (May 2021). `https://arxiv.org/abs/2105.00778`

(3) P. K. Friz, P. Hager, and N. Tapia. "Unified Signature Cumulants and Generalized Magnus Expansions". In: *arXiv e-prints*, arXiv:2102.03345 (Feb. 2021). `https://arxiv.org/abs/2102.03345`

(2) C. Bayer, D. Belomestny, P. Hager, P. Pigato, J. Schoenmakers, and V. Spokoiny. "Reinforced optimal control". In: *arXiv e-prints*, arXiv:2011.12382 (Nov. 2020). `http://arxiv.org/abs/2011.12382`

(1) P. Hager and E. Neuman. "The Multiplicative Chaos of $H = 0$ Fractional Brownian Fields". In: *arXiv e-prints*, arXiv:2008.01385 (Aug. 2020). `https://arxiv.org/abs/2008.01385` (accepted at the *Annals of Applied Probability*)

Talks

- *"Optimal Stopping with Signatures – Reinforced Optimal Control"*:
  - December 1, 2021, DataSıg Research Seminar, (online talk), University of Oxford / Imperial College London.
- *"Optimal Stopping with Signatures"*:
  - November 10, 2021, Math+ Spotlight Talk, (online talk), Berlin
  - August 25, 2021, Berlin Workshop for Young Researchers on Mathematical Finance (online conference), Humboldt University of Berlin,
  - 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.
- *"The Multiplicative Chaos of H=0 fractional Brownian Fields"*:
  - June 4, 2021, SIAM Conference on Financial Mathematics and Engineering (online conference), SIAM Philadelphia.
- *"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 *Annals of Applied Probability* and the Journal of *Mathematical Finance*.