Paul Peter Hager

Curriculum Vitae

Humboldt University Berlin
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December 23, 2023

Education

April 2019 - September 2021	**Dr. rer. nat.**, Technische Universität Berlin / Berlin Mathematical School, graduated 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 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.

Prices

July 2022	MATH+ Dissertation Award

Research Publications

Preprints

[6] G. Fu, P. P. Hager, and U. Horst. "Mean-Field Liquidation Games with Market Drop-out". In: *arXiv e-prints*, arXiv:2303.05783 (2023) (accepted at *Mathematical Finance*)

Publications in Peer Reviewed Journals

[5] C. Bayer, P. P. Hager, S. Riedel, and J. Schoenmakers. "Optimal stopping with signatures". In: *Annals of Applied Probability* 33.1 (2023), pp. 238–273

[4] C. Bayer, D. Belomestny, P. Hager, P. Pigato, J. Schoenmakers, and V. Spokoiny. "Reinforced optimal control". In: *Communications in Mathematical Sciences* 20.7 (2022), pp. 1951–1978

[3] P. K. Friz, P. P. Hager, and N. Tapia. "Unified signature cumulants and generalized Magnus expansions". In: *Forum of Mathematics, Sigma* 10 (2022), e42

[2] P. Hager and E. Neuman. "The multiplicative chaos of $H = 0$ fractional Brownian fields". In: *Annals of Applied Probability* 32.3 (2022), pp. 2139–2179

[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

Teaching Experience

Fall 2023/24	Lecture on Stochastic Differential Equations
Spring 2023	Lecture on Continuous Time Finance
Fall 2022/23	Lecture on Discrete Time Finance
Spring 2022	Lecture on Continuous Time Finance
Fall 2021/22	Exercise Class on Analysis III for Physicists
Fall 2016/2017	Tutorial on Linear Algebra I for Engineers.
Spring 2016	Tutorial on Stochatics for Computer scientist.
Fall 2015/2016	Tutorial on Linear Algebra I for Engineers.

Talks

- *"A Mean Field Game of Optimal Portfolio Liquidation with Market Drop-out"*:
  - July 30, 2023, 11th General AMaMeF Conference, Bielefeld,
  - May 25, 2023, Stochastische Analysis und Stochastik der Finanzmärkte Seminar, TU Berlin,
  - August 29, 2022, Workshop on Many Player Games and Applications, Humboldt University of Berlin.
- *"Time Scales in Rough Volatility"*:
  - February 2, 2023, Thematic Einstein Forum – Lecture Series on Models of Time and Probability, Free University of Berlin.
- *"Unified Signature Cumulants and Generalized Magnus Expansions"*:
  - June 15, 2023, Vienna Seminar in Mathematical Finance and Probability, TU Vienna,
  - May 12th, 2022, 15th Oxford-Berlin Young Researchers Meeting on Applied Stochastic Analysis, WIAS Berlin,
  - February 24, 2021, Cumulants in Stochastic Analysis (online), TU Berlin,
  - February 11, 2021, 14th Oxford-Berlin Young Researchers Meeting on Applied Stochastic Analysis (online), 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), WIAS Berlin.
- *"Optimal Stopping with Signatures"*:
  - June 7, 2023, SIAM Conference on Financial Mathematics and Engineering, Philadelphia,

- September 15, 2022, DMV Annual Meeting, Free University of Berlin,
- September 7, 2022, New interfaces of Stochastic Analysis and Rough Paths, (remote), Banff,
- November 10, 2021, Math+ Spotlight Talk (online), 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), Politecnico di Milano,
- May 11, 2021, Seminar "Modern Methods in Applied Stochastics and Nonparametric Statistics", WIAS Berlin,
- March 3, 2021, BMS Student Conference (online), Berlin Mathematical School,
- January 29, 2021, XXII Workshop On Quantitative Finance (online), University of Verona.

- *"Mini-Course on Machine Learning Methods in Finance - Lecture on Deep Signature Stopping"*:
  - May 23, 2022, Stochastic Numerics Meeting, KAUST.
- *"Optimal Stopping with Signatures – Reinforced Optimal Control"*:
  - December 1, 2021, DataSıg Research Seminar, (online), University of Oxford / Imperial College London.
- *"The Multiplicative Chaos of H=0 fractional Brownian Fields"*:
  - June 4, 2021, SIAM Conference on Financial Mathematics and Engineering (online), SIAM Philadelphia.
- *"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 (intermediate).
Programming Languages	Python, Cython, Scala.
Memberships	MATH+ postdoctoral member.
Referee Activity	For the *Annals of Applied Probability* and the Journal of *Mathematical Finance*.