Alexander Steinicke

Curriculum Vitae

Personal Details

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ORCID:	0000-0001-6330-0295
Date of Birth:	December 3, 1984
Nationality:	Austrian

Education

October 2014	PhD in mathematics, University of Innsbruck, AT. Thesis: BSDEs in the Lévy Model and Malliavin Calculus. Advisor: Christel Geiss. Coadvisor: Stefan Geiss.
July 2010	Dipl.-Ing. in technical mathematics, University of Innsbruck, AT. Thesis: A new approach to the Kalman-Bucy filter via distributional stochastic processes. Supervisor: Ulrich Oberst.

Current and Former Positions

8/23-9/23	Research Associate by grant of the JYU Visiting Fellow program, University of Jyväskylä, FI.
10/21 - 02/22	Substitute W3 Professorship for Applied Stochastics with Focus on Mathematical Economics, University of Rostock, DE.
since 08/18	Senior Lecturer, Department of Mathematics and Information Technology, on leave 10/21 - 02/22, Montanuniversitaet Leoben, AT.
07/16 - 08/18	Postdoc within the Austrian Science Fund (FWF) special research program (SFB) *Quasi-Monte Carlo Methods: Theory and Applications*, University of Linz (until 2017, 50%) and University of Graz, AT.
09/16 - 12/16	Lecturer, Management Center Innsbruck, AT.
09/15 - 01/17	Senior Lecturer (50%), Department of Mathematics, University of Innsbruck, AT.
2013	Research assistant (5 months), Department of Mathematics and Statistics, University of Jyväskylä, FI.
09/10 - 01/15	PhD position, Department of Mathematics, University of Innsbruck, AT.
09/08 - 09/10	Teaching assistant, Department of Mathematics, University of Innsbruck, AT.
10/03 - 10/04	Civil service, Verein TafiE (Tiroler Arbeitskreis für integrative Erziehung; support for people with disabilities).

Research interests

Probability and related topics:

- Stochastic differential equations (SDEs)
- Backward stochastic differential equations (BSDEs)
- Applications of (B)SDEs in stochastic control theory and finance
- Algorithms and computational schemes for (B)SDEs
- Computational simulations of random processes using Monte Carlo and Quasi-Monte Carlo methods
- Stochastic calculus of variations, Malliavin calculus
- Lévy processes, Brownian motion

Other:

- Real Analysis, differential geometry and topology (in context with stochastic differential equations)
- Algebraic systems theory (in context with random processes)

Academic service

ongoing	Continuous reviewing activity for journals (Stochastic Processes and Applications; Electronic Journal of Probability; Journal of Theoretical Probability; Mathematical Methods for Operations Research; Journal of Mathematical Analysis and Applications; etc.).
2023-ongoing	Member of the steering commitee of the *Austrian Stochastics Days* conference series.
2021	Organizer of the *9th Austrian Stochastics Days*, Leoben.
since 2020	IT coordinator, Chair of Applied Mathematics, Montanuniversitaet Leoben.
2020	Organizer of the *8th Austrian Stochastics Days*, Graz.
since 2018	Library coordinator, Chair of Applied Mathematics, Montanuniversitaet Leoben.
2011	Co-organisation of the *Workshop on Stochastic Analysis, Lévy processes and (B)SDEs*, Innsbruck, October 2011.
2008-2015	Participation in scientific outreach activities such as: - *Bildungsmesse BeSt* - science & education fair, - *Lange Nacht der Forschung* - night of research (fair and show for a broad audience), - *Mathe – Cool!* - workshops for high school students.

Funding

2023	Visiting Fellow Grant of the University of Jyväskylä, Finland, (€ 6.750) to conduct research for 1.5 months at the Mathematics and Statistics Department in Jyväskylä.
2022	Proposal for the FWF project 'Irregular Generators of BSDEs', C3-rejection (possibility to revise and resubmit).
2019	Proposal for a Young Independent Research Group (YIRG) of the FWF, in cooperation with M. Szölgyenyi, R. Rissner, M. Feischl, R. Stauffer; C3-rejection (not resubmitted due to age limit).
2017	Contribution to the successful project proposal *Adapting QMC algorithms to the simulation problem* (€ 160.000) funded within the special research program (SFB) *Quasi-Monte Carlo methods: theory and applications* of the Austrian science fund (FWF).

Industrial cooperation

2016	Felder KG, *Erstellung einer Logik für prozessintegrierte Wiegezellen.* Design of an algorithm to decide the completeness of the capacity of a certain carrying system.

Teaching

Lectures are marked LE and Exercise Session EX, both abbreviations are followed by the number of hours per week, e.g. (LE/3h) for a 3h lecture.

Montanuniversitaet Leoben:

WT23/24	Programming in Python (LE/2h+EX/4h) Numerical methods 1 (LE/2h+EX/2h)
ST23	Programming in Python (LE/3h) Numerical methods 1 (EX/2h) Recursive Programming (LE/2h)
WT22/23	Programming in Python (LE/2h+EX/4h) Numerical methods 1 (LE/2h+EX/2h)
ST22	Programming in Python (LE/3h) Numerical methods 1 (EX/2h)

University of Rostock:

WT21/22	Stochastics 2 (LE/3h), online Stochastics 2(EX/1h), online Introduction to Mathematical Finance and Insurance (LE/4h), online

Montanuniversitaet Leoben:

ST21	Recursive programming (LE/2h), online Numerical methods 1 (EX/2h), online
WT20/21	Organisation of the mass university course (9 groups): Lab in Computer Application and Programming (EX/2h), online
ST20	Recursive programming (LE/2h), online Numerical methods 1 (EX/2h), online, 2 groups
WT19/20	Lab in Computer Application and Programming (EX/2h), 4 groups Multibody Simulation (LE/1h)
ST19	Recursive programming (LE/2h) Numerical methods 1 (EX/2h), 3 groups
WT18/19	Lab in Computer Application and Programming (EX/2h), 5 groups Multibody Simulation (LE/1h)

University of Graz:

ST18	Advanced probability for school teachers (LE/1h)
WT17/18	Basic probability for school teachers (EX/1h)
ST17	Stochastics 1 (EX/2h)

Management Center Innsbruck:

WT16/17	Mathematics for mechatronics engineers (EX/2h), 2 groups

University of Innsbruck:

WT16/17	Stochastics 2 (LE/3h) Stochastics 2 (EX/2h)

ST16	Analysis 1 (LE/1h) Analysis 2 (EX/2h) 2 groups Stochastics 1 (EX/2h)
WT15/16	Stochastics 2 (LE/3h) Stochastics 2 (EX/2h), 2 groups Statistics (EX/2h), 2 groups
WT14/15	Stochastics 2 (LE/3h)
ST13	Stochastics 1 (EX/2h)
WT12/13	Introduction to higher stochastics: Brownian motion (EX/2h)
ST12	Stochastics 2 (LE/3h)
WT11/12	Stochastics 1 (EX/2h)
ST11	Stochastic modeling (EX/2h)
WT10/11	Introduction to mathematics 2 (EX/2h)
WT09/10	Introduction to mathematics 1 (EX/2h)
WT08/09	Introduction to mathematics 1 (EX/2h)

Participation in Didactics Training

2021	*Seminar Didactics II*, Montanuniversitaet Leoben
2010	*Introduction for Teaching in Higher Education*, University of Innsbruck

Students

- S. Kremser, *Relaxed conditions for BSDEs in L^p spaces and Applications in PDEs and Optimal Control*, PhD-thesis, advised together with G. Leobacher, University of Graz, 2021.

- M. Hörmann, *Creation of a graphical user interface for the demonstration of the shortest path algorithms: A*-Search, Dijkstra and Bellman Ford*
- L. Seekircher, *Ruin Probabilities in the Cramér-Lundberg Model*, BSc-thesis, University of Innsbruck, 2016.
- B. Huber, *Die Lévy-Khintchine-Formel für Lévy Prozesse*, BSc-thesis, University of Innsbruck, 2016.
- D. Sirianni, *Das Gesetz des iterierten Logarithmus*, BSc-thesis, University of Innsbruck, 2016.
- E. Medjic, *Die Skorohod-Darstellung für polnische Räume*, BSc-thesis, University of Innsbruck, 2016.

Languages

German (native)
English (C2)
French (C1)
Japanese (B1)
Spanish (B1)

Publications

Journal publications (including preprints)

Journal Publications related to the PhD thesis are listed with an '!'.

19. *Worst-Case Optimal Investment in Incomplete Markets* (with S. Desmettre, S. Merkel and A. Mickel), Preprint, 2023, `https://arxiv.org/abs/2311.10021`
18. *On the tradeoff between almost sure error tolerance versus mean deviation frequency in martingale convergence* (with L.F. Estrada and M.A. Högele), Preprint, 2023, `https://arxiv.org/abs/2310.09055`
17. *Product formulas for multiple stochastic integrals associated with Lévy processes* (with P. Di Tella and Ch. Geiss), Preprint, 2023, `https://arxiv.org/abs/2309.11150`
16. *Deviation frequencies of Brownian path property approximations* (with M.A. Högele), Preprint, 2023, `https://arxiv.org/abs/2302.04115`
15. *A Skorohod measurable universal functional representation of solutions to semimartingale SDEs* (with P. Przybyłowicz, V. Schwarz, M. Szölgyenyi), Preprint, 2022, `https://arxiv.org/abs/2201.06278`
14. *Complements and Improvements Regarding Distributivity of the Product for σ-Algebras with Respect to the Intersection* (with K.P.S. Bhaskara Rao), accepted to Mathematica Slovaca, 2023, `https://arxiv.org/abs/2208.01428`
13. *Continuous functions with impermeable graphs* (with G. Leobacher and Z. Buczolich), Math. Nachr. 296(10), 4778-4805, 2023, `https://arxiv.org/abs/2201.02159`
12. *On the Configurations of Closed Kinematic Chains in three-dimensional Space* (with G. Zangerl), IEJG, 15(1), 96-115, 2022, `https://doi.org/10.36890/iejg.972576`
11. *Exception sets of intrinsic and piecewise Lipschitz functions* (with G. Leobacher), Journal of Geometric Analysis, 32, 118, 2022, `https://doi.org/10.1007/s12220-021-00860-5`
10. *Two Approaches for a Dividend Maximization Problem under an Ornstein-Uhlenbeck Interest Rate* (with J. Eisenberg and S. Kremsner), Mathematics, 9(18), 2257, 2021, `https://doi.org/10.3390/math9182257`
9. *Existence, uniqueness and regularity of the projection onto differentiable manifolds* (with G. Leobacher), Annals of Global Analysis and Geometry, 60(3), 559-587, 2021, `https://doi.org/10.1007/s10455-021-09788-z`.
8. *(Non-)Distributivity of the Product for σ-Algebras with Respect to the Intersection*, Archiv der Mathematik, 116(6), 667-675, 2020, `https://doi.org/10.1007/s00013-020-01571-z`
7. *A deep neural network algorithm for semilinear elliptic PDEs with applications in insurance mathematics* (with S. Kremsner and M. Szölgyenyi), Risks, 8(4), 136, 2020, `https://doi.org/10.3390/risks8040136`
6. *L^p-Solutions and Comparison Results for Lévy Driven BSDEs in a Monotonic, General Growth Setting* (with S. Kremsner), Journal of Theoretical Probability, in press, 2020, `https://doi.org/10.1007/s10959-020-01056-3`
5. *Existence, uniqueness and Malliavin differentiability of Lévy-driven BSDEs with locally Lipschitz driver* (with Ch. Geiss), Stochastics, 92(3):418-453, 2019, `https://doi.org/10.1080/17442508.2019.1626859`.
4. *Existence, uniqueness and comparison results for BSDEs with Lévy jumps in an extended monotonic generator setting* (with Ch. Geiss), Probability, Uncertainty and Quantitative Risk, 3 no. 9, 2018, `https://arxiv.org/abs/1711.01449`.

3! *Malliavin derivative of random functions and application to Lévy driven BSDEs* (with Ch. Geiss), Electronic Journal of Probability, 21(10):1–28, 2016, `https://arxiv.org/abs/1404.4477`.

2! *Functionals of a Lévy process on canonical and generic probability spaces*, Journal of Theoretical Probability, 29(2):443–458, 2016, `https://arxiv.org/abs/1304.6324`.

1! *L^2-variation of Lévy-driven BSDEs with non-smooth terminal conditions* (with Ch. Geiss), Bernoulli, 22(2):995–1025, 2016, `https://arxiv.org/abs/1212.3420`.

Theses

2. *BSDEs in the Lévy Model and Malliavin Calculus,* PhD-Thesis, University of Innsbruck, Austria, 2014.

1. *A new approach to the Kalman-Bucy filter via distributional stochastic processes,* MSc-Thesis, University of Innsbruck, Austria, 2010.

Conferences, workshops and talks

Invited talks are listed with a ⋆, organizational activities with a ⋄.

- *Numerical analysis and applications of SDEs*, September 25-October 1, 2022, Będlewo, PL.
  Talk: From Numerical Schemes for SDEs to the Analysis of Lipschitz Maps.
- ⋆ *10th Austrian Stochastics Days*, University of Vienna, September 8-9, 2022, AT. Keynote talk: Predictable and Chaotic Representation Properties – Survey and New Developments
- ⋆ *15th International Conference on Monte Carlo and Quasi-Monte Carlo Methods in Scientific Computing (MCQMC)*, July 17-22, 2022, Linz, AT.
  Talk: From Stochastic Differential Equations to Piecewise Lipschitz Functions.
- *9th International Colloquium on BSDEs and Mean Field Systems*, June 27-July 1, 2022, Annecy, FR.
  Talk: BSDEs with Jumps in the L^p-setting: Existence, Uniqueness and Comparison.
- *International Conference on Computational Finance (ICCF) 2022*, June 6-10, 2022, Wuppertal, DE.
  Talk: A deep neural network algorithm for semilinear elliptic PDEs with applications in insurance mathematics.
- ⋆ *Seminar Probability and Statistics* May 20, 2022, Klagenfurt, AT.
  Talk: Permeable Sets
- ⋄ *9th Austrian Stochastics Days*, September 9-10, 2021, Leoben, AT.
  Main organizer of the event.
- ⋄ *8th Austrian Stochastics Days*, September 10-11, 2020, Graz, AT.
  Main organizer of the event.
- ⋆ *SAA-Workshop on Stochastic Analysis and its Applications*, December 5-9, 2019, Pretoria, ZA.
  Lecture: An Introduction to BSDE Theory.
- *Workshop Algorithms and Complexity in High Dimensions*, September 30-October 4, 2019, Graz, AT.
  Talk: An Overview of Numerical Methods for BSDEs.
- ⋆ *Seminar Probability and Statistics*, September 26, 2019, Klagenfurt, AT.
  Talk: Backward Stochastic Differential Equations beyond Lipschitz Data.
- *ÖMG Conference*, September 16-20, 2019, Dornbirn, AT.
  Talk: BSDEs with Jumps in the L^p-setting: Existence, Uniqueness and Comparison.
- *SCICADE 2019*, July 22-26, 2019, Innsbruck, AT.
  Talk: QMC rates for backward SDEs with smooth Hermite terminal conditions.
- *SPARS 2019*, July 1-4, 2019, Toulouse, FR.
  Poster: Recovery results for dictionary learning with approximately known sparsity level.
- *39th Finnish Summer School on Probability and Statistics*, May 27-31, 2019, Lammi, FI.
  Talk: A comparison theorem for BSDEs with Lévy jumps and general growth in y
- *7th Austrian Stochastics Days*, September 13-14, 2018, Vienna, AT.
  Talk: Approximation of Lévy driven BSDEs by BSDEs with underlying finite activity Lévy processes and application to comparison theorems.
- *40th Conference on Stochastic Processes and Applications - SPA 2018*, June 11-15, 2018, Gothenburg, SE.
  Talk: Malliavin Differentiation of Lévy Driven BSDES for Local Lipschitz Drivers and Beyond.
- *13th German Probability and Statistics Days*, February 27 - March 2, 2018, Freiburg, DE.
  Talk: L^p-solutions for BSDEs - Existence and Comparison.

- *International Workshop on BSDEs, SPDEs and their Applications*, July 3-7, 2017, Edinburgh, UK.
  Talk: Approximation of Lévy driven BSDEs by BSDEs with underlying finite activity Lévy processes and application to comparison theorems.
- *12th German Probability and Statistics Days*, March 1-4, 2016, Bochum, DE.
  Talk: On an extended chain rule for the Malliavin derivative.
- *Workshop on Stochastic Analysis and Related Topics*, December 21-22, 2015, Jyväskylä, FI.
  Talk: An extended version of Malliavin's chain rule and its application to BSDEs.
- *Workshop on new advances in Malliavin calculus, SPDEs, BSDEs and application to finance*, March 5-6, 2015, Toulouse, FR.
  Talk: Malliavin derivative – the difference operator revisited.
- ⋆ *Workshop on Stochastic Analysis and Related Topics*, September 22-23, 2014, Dresden, DE.
  Talk: Aspects of Malliavin differentiation of random functions in the Lévy setting.
- *Second Young Researchers Meeting on BSDEs, Numerics and Finance*, July 7-9, 2014, Bordeaux, FR.
  Talk: Malliavin differentiation of random functions with applications to Lévy driven BSDEs.
- *11th German Probability and Statistics Days*, March 4-7, 2014, Ulm, DE.
  Talk: L^2-functionals on Lévy probability spaces.
- *Noon-to-Noon Sauna Seminar of the Finnish Doctoral Programme in Stochastics and Statistics*, December 12-13, 2013 Helsinki, FI.
  Talk: Malliavin differentiation of a Lévy driven BDSE with a path dependent generator functional.
- *2nd Austrian Stochastics Day*, September 27, 2013, Innsbruck, AT.
  Talk: Crucial steps in Malliavin differentiation of Lévy-driven BSDEs.
- *First German-Polish Joint Conference on Probability and Mathematical Statistics*, June 6-9, 2013, Toruń, PL.
  Talk: Malliavin differentiation of Lévy driven BSDEs.
- *Stochastic Sauna Seminar*, December 19, 2012, Helsinki, FI.
  Talk: Methods of analyzing Lévy spaces.
- *Young Stochasticians Afternoon*, December 17, 2012, Jyväskylä, FI.
  Talk: Methods of analyzing Lévy spaces.
- *First Austrian Stochastics Days*, September 24-25, 2012, Linz, AT
  Talk: Random variables on Lévy probability spaces and a Malliavin differentiation formula.
- *Barcelona Summer School on Stochastic Analysis: Functional Itô Calculus and Malliavin Calculus for Lévy processes*, July 23-27, 2012, Barcelona, ES.
  Talk: Functionals of a Lévy process on canonical and generic Probability Spaces.
- *10th German probability and statistics days*, March 6-9, 2012, Mainz, DE.
  Talk: L^2-variation of BSDEs driven by a Lévy process for non- smooth terminal conditions.
- ⋄ *Workshop Stochastic Analysis, Lévy processes and (B)SDEs*, October 3-7, 2011, Innsbruck, AT.
  Talk: L^2-variation of BSDEs driven by a Lévy process for non-smooth terminal conditions.
  Co-organizer of the event.