

Ariel Neufeld



CONTACT INFORMATION

E-mail: ariel.neufeld@ntu.edu.sg
Office: SPMS-MAS 05-02
Webpage: <https://personal.ntu.edu.sg/ariel.neufeld/>

PERSONAL INFORMATION

Born: December 4th, 1987
Citizenship: Swiss
Languages: Swiss German, German, French, English, Hebrew

EMPLOYMENT

Since 01.2019: Nanyang Assistant Professor in Mathematics at NTU Singapore
06.2015-12.2018: Postdoc in Financial and Insurance Mathematics at ETH Zurich
(in the group of Prof. Cheridito, Prof. Jentzen, and Prof. Soner)
02.2012-05.2015: Teaching Assistant at the Department of Mathematics at ETH Zurich

RESEARCH INTERESTS

- Machine Learning Algorithms in Finance and Insurance
- Model Uncertainty in Financial Markets
- Financial & Insurance Mathematics
- Stochastic Analysis & Stochastic Optimal Control
- Cybersecurity for Insurance

EDUCATION

PhD in Mathematics from ETH Zurich
Fellowships at Columbia University, UC Berkeley, and Weizmann Institute
02.2012-05.2015: PhD in Mathematics, ETH Zurich
Supervisors: Professor Marcel Nutz (Columbia University),
Professor Martin Schweizer (ETH Zurich)
Thesis title: *Knightian Uncertainty in Mathematical Finance*

- Spent half of the PhD at Columbia University in New York

03.2011-10.2011: MSc in Mathematics with distinction, ETH Zurich
10.2006-03.2011: BSc in Mathematics, ETH Zurich

- Semester exchange to UC Berkeley (2010)
- Student Summer Research Fellowship at the Weizmann Institute (2010)

AWARDS & HONORS

2021: SIAM Activity Group on Financial Mathematics and Engineering Early Career Prize (SIAG/FME Early Career Prize)
SPMS Young Researcher Award 2020
(awarded by the School of Physical and Mathematical Sciences (SPMS), NTU Singapore)
2019: NAP Grant of 1'000'000 S\$ for the period from 2019–2022
Travel Grant of 6000 CHF for short-term visits in 2019 at the Risk Center, ETH Zurich
2018: First prize for the contribution at the 10th Conference in Actuarial Science & Finance in Samos, organized by the University of Aegean, Katholieke Universiteit Leuven, University of Copenhagen, and New York University
(paper: *Robust Utility Maximization with Lévy Processes*)
2015: IMU Itô Travel Award to the symposium "Stochastic Analysis" at Kyoto University
2014: Young Researcher Prize of the Financial Mathematics Program at Bar-Ilan University for Outstanding Papers in Financial Mathematics and Risk Management
(paper: *Superreplication under volatility uncertainty for measurable claims*)
2012-2015: Swiss National Science Foundation Grant PDFMP2-137147/1 (for PhD)
2012: Willi Studer Award for the best ETH Zurich master in mathematics of the year 2011/12 (grade: 6.0 out of 6.0)

26. A. Neufeld, J. Sester
A deep learning approach to data-driven model-free pricing and to martingale optimal transport
Preprint (submitted). arXiv:2103.11435, 2021
25. Q. Xiang, A. Neufeld, G. W. Peters, I. Nevat, A. Datta
A Bonus-Malus Framework for Cyber Risk Insurance and Optimal Cybersecurity Provisioning
Preprint (submitted). arXiv:2102.05568, 2021
24. A. Neufeld, J. Sester
On the stability of the martingale optimal transport problem: A set-valued map approach
Preprint (submitted). arXiv:2102.02718, 2021
23. A. Neufeld, J. Sester
Model-free price bounds under dynamic option trading
Preprint (submitted). arXiv:2101.01024, 2021
22. C. Beck, S. Becker, P. Cheridito, A. Jentzen and A. Neufeld
Deep learning based numerical approximation algorithms for stochastic partial differential equations and high-dimensional nonlinear filtering problems
Preprint (submitted). arXiv:2012.01194, 2020
21. A. Neufeld, A. Papapantoleon, Q. Xiang
Model-free bounds for multi-asset options using option-implied information and their exact computation
Preprint (submitted). arXiv:2006.14288, 2020
20. P. Ghosh, A. Neufeld, J. K. Sahoo
Forecasting directional movements of stock prices for intraday trading using LSTM and random forests
Preprint (submitted). arXiv:2004.10178, 2020
19. P. Harms, C. Liu and A. Neufeld
Supermartingale Deflators in the Absence of a Numéraire
Preprint (submitted). arXiv:2001.05906, 2020
18. M. Baes, C. Herrera, A. Neufeld and P. Ruysen
Low-Rank plus Sparse Decomposition of Covariance Matrices using Neural Network Parametrization
Preprint (submitted). arXiv:1908.00461, 2019
17. C. Beck, S. Becker, P. Cheridito, A. Jentzen and A. Neufeld
Deep splitting method for parabolic PDEs
Preprint (submitted). arXiv:1907.03452, 2019
16. D. Bartl, M. Kupper, A. Neufeld
Duality Theory for Robust Utility Maximization
Finance and Stochastics, forthcoming. arXiv:2007.08376, 2020
15. P. J. Graber, V. Ignazio and A. Neufeld
Nonlocal Bertrand and Cournot Mean Field Games with General Nonlinear Demand Schedule
Journal de Mathématiques Pures et Appliquées (JMPA), forthcoming.
arXiv:2002.11055, 2020
14. A. Jentzen, B. Kuckuck, A. Neufeld and P. von Wurstemberger
Strong error analysis for stochastic gradient descent optimization algorithms
IMA Journal of Numerical Analysis, Vol. 41, No. 1, pp. 455-492, 2021
13. D. Bartl, M. Kupper and A. Neufeld
Pathwise superhedging on prediction sets
Finance and Stochastics, Vol. 24, No. 1, pp. 215-248, 2020
12. A. Neufeld and M. Šikić
Nonconcave Robust Optimization with Discrete Strategies under Knightian Uncertainty
Mathematical Methods of Operations Research, Vol. 90, No. 2, pp. 229-253, 2019
11. D. Bartl, M. Kupper and A. Neufeld
Stochastic integration and differential equations for typical paths
Electronic Journal of Probability, Vol. 24, No. 97, pp. 1-21, 2019

10. T. Fadina, A. Neufeld and T. Schmidt
Affine processes under parameter uncertainty
Probability, Uncertainty and Quantitative Risk, Vol. 4, No. 1, pp. 1-35, 2019
9. C. Liu and A. Neufeld
Compactness Criterion for Semimartingale Laws and Semimartingale Optimal Transport
Transactions of the American Mathematical Society, Vol. 372, No. 1, pp. 187-231, 2019
8. A. Neufeld
Buy-and-Hold Property for Fully Incomplete Markets when Super-replicating Markovian Claims
International Journal of Theoretical and Applied Finance, Vol. 21, No. 7, pp. 1850051-1-12, 2018
7. A. Neufeld and M. Šikić
Robust Utility Maximization in Discrete-Time Markets with Friction
SIAM Journal on Control and Optimization (SICON), Vol. 56, No. 3, pp. 1912-1937, 2018
6. Y. Dolinsky and A. Neufeld
Super-replication in Fully Incomplete Markets
Mathematical Finance, Vol. 28, No. 2, pp. 483-515, 2018
5. A. Neufeld and M. Nutz
Robust Utility Maximization with Lévy Processes
Mathematical Finance, Vol. 28, No. 1, pp. 82-105, 2018
4. A. Neufeld and M. Nutz
Nonlinear Lévy Processes and their Characteristics
Transactions of the American Mathematical Society, Vol. 369, No. 1, pp. 69-95, 2017
3. A. Neufeld and M. Nutz
Measurability of Semimartingale Characteristics with Respect to the Probability Law
Stochastic Processes and their Applications, Vol. 124, No. 11, pp. 3819-3845, 2014
2. A. Neufeld and M. Nutz
Superreplication under volatility uncertainty for measurable claims
Electronic Journal of Probability, Vol. 18, No. 48, pp. 1-14, 2013
1. K. Du and A. Neufeld
A note on asymptotic exponential arbitrage with exponentially decaying failure probability
Journal of Applied Probability, Vol. 50, No. 3, pp. 801-809, 2013

MEMBERS OF THE
RESEARCH GROUP

- Géraldine Bouveret (Gopalakrishnan - Presidential Postdoctoral Fellow, since 10.2019)
- Julian Sester (Postdoctoral Fellow, since 04.2020)
- Shunan Sheng (Undergraduate Research Student, since 06.2020)
- Qikun Xiang (PhD Student, since 08.2019)
- Daiying Yin (Undergraduate Research Student, since 06.2020)
- Ying Zhang (Postdoctoral Fellow, since 11.2020)

FORMER MEMBERS
OF THE RESEARCH
GROUP

- Pushpendu Ghosh (Research Internship, 08.2019-12.2019)
- Yongming Li (Project Officer, 05.2020-12.2020)
- Philipp Schmock (Research Internship, 02.2020-08.2020)

TEACHING
EXPERIENCE

2021: Lecturer of the graduate course *Mathematical Statistics MAS 713*
2020: Lecturer of the undergraduate course *Stochastic Processes MH 3512*
Lecturer of the graduate seminar course *Statistics MAS 796*
Lecturer of the graduate course *Mathematical Statistics MAS 713*
2019: Lecturer of the undergraduate course *Stochastic Processes MH 3512*
Lecturer of the graduate seminar course *Statistics MAS 796*
Lecturer of the graduate course *Mathematical Statistics MAS 713*
2018: Lecturer (part-time) of the undergraduate course *Probability and Statistics*
2016: Lecturer of the seminar for master students *Robustness in Mathematical Finance*
2015: Teaching Assistant at ETH Zurich of the graduate course
Applied Stochastic Processes
2014: Teaching Assistant and Coordinator at ETH Zurich of the graduate course
Mathematical Finance
Teaching Assistant and Coordinator at ETH Zurich of the graduate course
Brownian Motion and Stochastic Calculus
2013: Teaching Assistant and Coordinator at ETH Zurich of the graduate course
Brownian Motion and Stochastic Calculus
2012: Teaching Assistant at ETH Zurich of the graduate course
Brownian Motion and Stochastic Calculus

TALKS AT
INTERNATIONAL
CONFERENCES
AND SEMINARS

Standard Chartered Conference on AI and Data Innovation, forthcoming
Centre for Data Science and Machine Learning (CDSML), seminar series, 2021
Bar-Ilan University, Tel Aviv; Webinar in Financial Mathematics, 2020
University of Technology Sydney; Quantitative Methods in Finance Conference, 2019
Shandong University; International Workshop on Probability, Uncertainty and Quantitative Risk, 2019
Vietnam Institute for Advanced Study in Mathematics; 7th Asian Quantitative Finance Conference, 2019
University of Toronto; SIAM Conference on Financial Mathematics, 2019
National University of Singapore; Seminar in Financial Mathematics, 2019
National Technical University Athens; Seminar in Financial Mathematics, 2018
Shanghai Jiao Tong University; Seminar in Financial Mathematics, 2018
National Technical University Athens; Stochastic Methods in Finance and Physics, 2018
Universitat de València & Universitat Politècnica de València;
29th European Conference on Operations Research, 2018
University of Aegean; 10th Conference in Actuarial Science & Finance on Samos, 2018
Freiburg Institute for Advanced Studies; Robust Finance Workshop, 2018
Cornell University; ORIE Colloquium, 2018
Nanyang Technological University; Seminar at the Division of Mathematical Sciences, 2018

University of Padova; Seminar in Financial Mathematics, 2017
Shanghai Jiao Tong University; Seminar in Financial Mathematics, 2017
University of Konstanz; Seminar in Financial Mathematics, 2017
University of Amsterdam; 8th Advanced Mathematical Methods in Finance Conference, 2017
Humboldt - Universität zu Berlin; Seminar in Applied Financial Mathematics, 2017
Imperial College London; Imperial - ETH Workshop, 2017
National University of Singapore; 5th NUS Workshop on Risk & Regulation, 2017

University of Technology Sydney; Quantitative Methods in Finance Conference, 2016
New York; 9th World Congress of the Bachelier Finance Society, 2016
Fields Institute, Toronto; World Congress in Probability and Statistics, 2016
Bar-Ilan University, Tel Aviv; 2nd Bar-Ilan Conference on Financial Mathematics, 2016
University of Vienna; Mathematical Finance Seminar, 2016

Albert-Ludwigs-Universität Freiburg; Mathematical Finance Seminar, 2015
Université Pierre et Marie Curie (Paris VI); Mathematical Finance Seminar, 2015
University of Zurich; Symposium about Applied Mathematics, 2015
Fudan University, Shanghai; International Workshop on SPDEs, 2015
University of Mannheim; Workshop on Lévy Processes and their Applications, 2015
Columbia University, New York; Mathematical Finance Seminar, 2015
Imperial College London; Imperial - ETH Workshop, 2015

Bar-Ilan University, Tel Aviv; 2nd Joint International Meeting of the Israel Mathematical Union and the American Mathematical Society, 2014

EXTENDED
VISITS

03.2020: ETH Zurich, Risk Center
03. & 07.2019: ETH Zurich, Risk Center
11.2017: Shanghai Jiao Tong University, Shanghai Advanced Institute of Finance (SAIF)
05.2017: Hebrew University, Department of Statistics
06.2015-07.2015: Hebrew University, Department of Statistics
04.2015: Columbia University, Department of Mathematics
09.2013-02.2014: Columbia University, Department of Mathematics
09.2012-02.2013: Columbia University, Department of Mathematics

SERVICES

Organizer: Workshop *Young Researchers in Robust Mathematical Finance*, ETH Zurich, 04.2017
Referee for Journals and Conferences: ASTIN Bulletin, Bernoulli, Electronic Journal of Probability, ESAIM: Control, Optimisation and Calculus of Variations, Finance and Stochastics, International Journal of Theoretical and Applied Finance, Journal of Applied Probability, Journal of Mathematical Analysis and Applications, Mathematical and Scientific Machine Learning Conference (MSML), Mathematical Finance, Mathematical Methods of Operations Research, Mathematics and Financial Economics, Mathematics of Operations Research, Probability Uncertainty and Quantitative Risk, SIAM Journal on Control and Optimization, SIAM Journal on Financial Mathematics, Stochastic Processes and their Applications, Quantitative Finance

PROGRAMMING
SKILLS

- MATLAB, Python
- Coursera Certificate in Machine Learning (authorized by Stanford University)