Andrey Sarantsev

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Research Interests

Probability Theory, Mathematical Statistics, Quantitative Finance

Random particle systems interacting through ranks; long-term stability of stochastic processes; concentration of measure for stochastic equations; systemic financial risk; financial econometrics; retirement planning; risk theory and ruin probability; stochastic portfolio theory; forest dynamics

Employment

University of Nevada, Reno (UNR)
Department of Mathematics and Statistics
Associate Professor (with tenure), Jul 2024 – now
Assistant Professor (tenure-track), Jul 2018 – Jun 2024

University of California, Santa Barbara (UCSB)
Department of Statistics and Applied Probability
Visiting Assistant Professor, Sep 2015 – Jun 2018
Mentor: Jean-Pierre Fouque. Partially supported by his NSF grant DMS 1409434

Education

University of Washington, Seattle (UW)
Ph.D. in Mathematics, Sep 2010 – Jun 2015
Adviser: Soumik Pal. **Thesis:** Competing Brownian Particles

Lomonosov Moscow State University, Moscow, Russia
Specialist (Master's equivalent) with Honors in Mathematics, Sep 2005 – Jun 2010
Undergraduate Mentor: Vladimir Piterbarg

57th mathematics high school
Top math high school in Moscow, Russia, 2001–2005

Research Advising

Ph.D. students: Abraham Atsiwo (Statistics, Aug 2024), Jihyun Park (Statistics, Aug 2024), Hayden Brown (Applied Math, May 2024)
M.S. students: William Kramer (Statistics, expected Dec 2024), Kwame Boamah-Addo (Statistics, May 2022), Hayden Brown (Applied Math, May 2021)
Undergraduate students: 12 former students

Teaching Experience

UNR Undergraduate Classes	Ordinary Differential Equations, Partial Differential Equations, Statistics & Probability for Engineers (large class with TA sections), Probability Theory, Stochastic Processes
UNR Graduate Classes	Probability Theory (Qualifying Exam Class), Stochastic Simulation & Models, Time Series
UCSB Undergraduate Classes	Probability Theory, Stochastic Processes
UW Undergraduate Classes	Multivariable and Vector Calculus (Calculus III and IV), Differential Equations, Matrix Algebra, Linear Analysis (PDE, systems of ODE), Probability Theory
UW Teaching Assistant	Multivariable Calculus (III), REU Inverse Problems
UW Homework Grader	Real Analysis (Ph.D. level)

Submitted Manuscripts

1. Capital Asset Pricing Model with Size Factor and Normalizing by Volatility Index (2024).
   With Abraham Atsiwo. Available at arXiv:2410.22498.
2. Zero-Coupon Treasury Yield Curve with VIX as Stochastic Volatility (2024).
   With Jihyun Park. Available at arXiv:2411.03699.
3. The VIX as Stochastic Volatility for Corporate Bonds (2024).
   With Jihyun Park. Available at arXiv:2410.22498.
4. Log Heston Model for Monthly Average VIX (2024).
   With Jihyun Park. Available at arXiv:2410.22471.
5. Tutorial on Running Median Subtraction Filter with Application to Searches for Exotic Field Transients in Multi-Messenger Astronomy (2024). With Geoffrey Blewitt, Andrei Derevianko, Arko Sen. Available at arXiv:2410.03773.
6. A New Stock Market Valuation Measure with Applications to Retirement Planning (2024).
   Available at arXiv:1905.04603

Published Articles

1. The Variance-Gamma Distribution: A Review (2023).
   With Adrian Fischer and Robert E. Gaunt. To appear in *Statistical Science.*
   arXiv:2303.05615.
2. Boundary Approximation for Sticky Jump-Reflected Processes on the Half-Line (2024).
   With Andrey Pilipenko. arXiv:2303.02771. *Electronic Journal of Probability* **29**, 1–21.
3. Modified Method of Moments for Generalized Laplace Distributions (2024).
   With Adrian Fischer and Robert E. Gaunt. *Communications in Statistics: Simulation and Computation* 1–18. arXiv:2203.10775.
4. IID Time Series Testing (2023).
   Theory of Stochastic Processes **27** (1) 41–52. arXiv:2203.10405.
5. Birth and Death Processes in Interactive Random Environments (2022).
   With Guodong Pang and Yuri Suhov. *Queueing Systems* **102** (1–2), 269–307. arXiv:2203.10411.
6. Transient Behaviors of Single-Server Queues with Diffusive Rates (2022).
   With Guodong Pang and Yuri Suhov. *Queueing Systems* **100** (3–4), 333–335.
7. Penalty Method for Obliquely Reflected Diffusions (2021).
   Lithuanian Mathematics Journal **61** (4), 518–549. arXiv:1509.01777.
8. Optimal Portfolio with Power Utility for Absolute and Relative Wealth (2021).
   Stat. & Probab. Let. **179** 109225. arXiv:2105.0813.
9. A Stock Market Model Based on CAPM and Market Size (2021).
   With Brandon Flores and Blessing Ofori-Atta. *Annals of Finance* **17** (3), 405–424. arXiv:1907.08911.
10. Sub-exponential Rate of Convergence to Equilibrium for Processes on the Half-line (2021).
    Statistics and Probability Letters **175** 109115. arXiv:2003.10614.
11. Time Series Analysis of Forest Dynamics at the Ecoregion Level (2020).
    With Olga Rumyantseva and Nikolay Strigul. *Forecasting* **2** (3), 364–386.
12. Convergence Rate to Equilibrium in Wasserstein Distance for Reflected Jump–Diffusions (2020).
    Statistics and Probability Letters **165** 108860. arXiv:2003.10590.
13. Stationary Distributions and Convergence for M/M/1 Queues in Interactive Random Environment (2020). With Yana Belopolskaya, Guodong Pang, and Yurii Suhov. *Queueing Systems* **94** (3–4), 357–392. arXiv:1902:03941.
14. A Note on Jump Atlas Models (2020).
    With Clayton Barnes. *Brazilian Journal of Probability and Statistics* **34** (4), 844–857. arXiv:1610.04323.

15. Autoregression Modeling of Forest Dynamics (2019).
With Olga Rumyantseva and Nikolay Strigul. *MDPI Forests* **10** (12), 1074. arXiv:1911.09182.
16. Exponential Convergence Rate of Ruin Probabilities for Level-Dependent Lévy-Driven Risk Processes (2019). With Pierre-Olivier Goffard. *Journal of Applied Probability* **56** (4), 1244–1268. arXiv:1710.01845.
17. Talagrand Concentration Inequalities for Stochastic Partial Differential Equations (2019).
With Davar Khoshnevisan. *Stochastic Partial Differential Equations: Analysis and Computations* **7** (4), 679–698. arXiv:1709.07098.
18. Stationary Distributions and Convergence of Walsh Diffusions (2018).
With Tomoyuki Ichiba. *Bernoulli* **25** (4A), 2439–2478. arXiv:1706.07127.
19. Dynamic Contagion in a Banking System with Births and Defaults (2019).
With Tomoyuki Ichiba and Michael Ludkovski. *Annals of Finance* **15** (4), 489–538. arXiv:1807.08987.
20. Comparison Techniques for Competing Brownian Particles (2019).
Journal of Theoretical Probability **32** (2), 545–585. Available at arXiv:1305.1653.
21. Brownian Particles with Rank-Dependent Drifts: Out-of-Equilibrium Behavior (2019).
With Manuel Cabezas, Amir Dembo, Vladas Sidoravicius. *Communications in Pure and Applied Mathematics* **72** (7), 1424–1458. arXiv:1708.01918.
22. Large Rank-Based Models with Common Noise (2019).
With Praveen Kolli. *Stat. Probab. Let.* **151**, 29–35. arXiv:1802.06202
23. A Note on Transportation Cost Inequalities for Diffusions with Reflections (2019).
With Soumik Pal. *Electronic Communications in Probability* **24** (21), 1–11. arXiv:1808.02164.
24. Modeling Systemic Risk with Interbank Flows, Borrowing, and Investing (2018).
With Aditya Maheshwari. *Risks* **6** (4), 1–26. arXiv:1707.03542.
25. Weak Convergence of Obliquely Reflected Diffusions (2018).
Annals of Institute Henri Poincare Probability and Statistics **54** (3), 1408-1431. arXiv:1509.01778.
26. Multiple Collisions in Systems of Competing Brownian Particles (2018).
With Cameron Bruggeman. *Bernoulli* **24** (1), 156-201. arXiv:1309.2621.
27. Infinite Systems of Competing Brownian Particles (2017).
Annals of Institute Henri Poincare Probability and Statistics **53** (4), 2279-2315. arXiv:1403.4229.
28. Yet Another Condition for Absence of Collisions for Competing Brownian Particles (2017).
With Tomoyuki Ichiba. *Electronic Communications in Probability* **22** (8), 1-7. arXiv:1608.07220.
29. Stationary Gap Distributions for Infinite Systems of Competing Brownian Particles (2017).
With Li-Cheng Tsai. *Electronic Journal of Probability* **22** (56), 1-20. arXiv:1608.00628.
30. Reflected Brownian Motion in a Convex Polyhedral Cone: Tail Estimates for the Stationary Distribution (2017). *Journal of Theoretical Probability* **30** (3), 1200-1223. arXiv:1509.01781.
31. Two-Sided Infinite Systems of Competing Brownian Particles (2017).
ESAIM Probability and Statistics **21**, 317-349. arXiv:1509.01859.
32. Explicit Rates of Exponential Convergence for Reflected Jump-Diffusions on the Half-Line (2016).
ALEA Latin American Journal of Probability and Mathematical Statistics **13** (2), 1069-1093. arXiv:1509.01783.
33. Penalty Method for Reflected Diffusions on the Half-Line (2016).
With Cameron Bruggeman. *Stochastics* **89** (2), 485-509. arXiv:1509.01776.
34. Diverse Market Models of Competing Brownian Particles with Splits and Mergers (2016).
With Ioannis Karatzas. *Annals of Applied Probability* **26** (3), 1329-1361. arXiv:1404.0748.
35. Triple and Simultaneous Collisions of Competing Brownian Particles (2015).
Electronic Journal of Probability **20** (29), 1-28. arXiv:1401.6255.
36. On a Class of Diverse Market Models (2014).
Annals of Finance **10** (2), 291-314. arXiv:1301.5941.

Research Talks

2024	Columbia University
2023	Society for Industrial & Applied Mathematics Conference in Financial Mathematics, Philadelphia
2022	University of Texas, Dallas; University of Utah
2021	Frontier Probability Days (University of Nevada Las Vegas)
2020	University of Montana; Joint Mathematics Meeting; University of Mississippi; Washington State University; Penn State University; European Seminar in Computing; Computational & Methodological Statistics
2019	American Statistical Association Nevada Sectional Meeting; INFORMS Annual Meeting
2018	Florida State University; Cornell University; Carnegie Mellon University; California State University, Los Angeles; University of Nevada, Reno; Frontier Probability Days; University of Minnesota; UCSB; University of Washington; AMS Western and Eastern Fall Sectional Meetings
2017	AMS Western, Southweatern, and Central Fall Sectional Meetings; INFORMS Annual Meeting in Houston; Center for Financial Mathematics & Actuarial Research (UCSB) 10th anniversary conference; University of Utah; UCSB; Boston University; 9th Western Conference in Mathematical Finance; Seminar on Stochastic Processes; University of Maryland, College Park; University of Delaware; AMS Central Spring Sectional Meeting; University of Washington
2016	SIAM Conference in Financial Mathematics; Michigan State University; Carnegie Mellon University; Oregon State University; University of Washington; University of Illinois, Chicago; Princeton University; Columbia University; City University of New York
2015	Southern California Probability Symposium; University of Southern California; UCSB
2014	Columbia University; Seminar on Stochastic Processes; UCSB

Miscellaneous

- Nevada Chapter President of the American Statistical Association (2023)
- Accessibility of mathematical content for visually impaired students
- Organized Department of Mathematics & Statistics Research Library
- Statistics & Data Science graduate committee
- Graduate committee member for graduate students
- Recommendation letters for graduate applications
- Python workshops for students
- Refereeing research manuscripts
- Portfolio Simulator `asarantsev.pythonanywhere.com` in Python, HTML/JS and Flask

Languages and Software

Languages: English (fluent), Russian (native)
Coding: C, Python, R, SQL
Editors: LaTeX, HTML

Personal Information

Born October 9, 1989, in Moscow, Russia
Citizenship: Russian
USA Permanent Resident (Green Card)

Updated January 14, 2025