Leonid Koralov

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PERSONAL INFORMATION

Educational Background

- 1998 - PhD - SUNY at Stony Brook
- 1991 - BSc - Moscow State University

Academic Appointments at UMD

- 2012 – present - professor
- 2008 – 2012 - associate professor
- 2005 – 2008 - assistant professor

Other Employment

- 2000 – 2006 - assistant professor, Princeton University
- 1998 – 2000 - member, Institute for Advanced Study
- 1997 – 1998 - visiting graduate student, Los Alamos National Laboratory

RESEARCH

Books

- L. Koralov, Y. Sinai. Theory of Probability and Random Processes, Springer-Verlag, Universitext (2007), 353 pp + xi. ISBN 978-3-540-25484-3

Articles in Refereed Journals

- M. Freidlin, L. Koralov, Perturbations of Parabolic Equations and Diffusion Processes with Degeneration: Boundary Problems, Metastability, and Homogenization, submitted to Journal of American Mathematical Society.
- M. Freidlin, L. Koralov, Asymptotics in the Dirichlet Problem for Second Order Elliptic Equations with Degeneration on the Boundary, submitted to Journal of Differential Equations.
- L. Koralov, B. Vainberg, Global Limit Theorem for Parabolic Equations with a Potential, to appear in SIAM Journal on Mathematical Analysis.

- L. Koralov, S. Molchanov, B. Vainberg, On the Near-Critical Behavior of Continuous Polymers, to appear in Pure and Applied Functional Analysis.
- L. Koralov, S. Molchanov, B. Vainberg, The Radius of a Polymer at a Near-Critical Temperature, to appear in Applicable Analysis.
- M. Freidlin, L. Koralov, Averaging in the case of multiple invariant measures for the fast system, Electronic Journal of Probability 26 (2021), Paper No 138, 17 pp.
- P. Hebbar, L. Koralov, J. Nolen, Asymptotic behavior of branching diffusion processes in periodic media. Electronic Journal of Probability, 25 (2020), Paper No 126, 40 pp.
- M. Freidlin, L. Koralov, Diffusion in the presence of cells with semi-permeable membranes, Journal of Statistical Physics, 178 (2020), no 6, pp 1417-1441.
- M. Freidlin, L. Koralov, A. Wentzell. On diffusion in media with pockets of large diffusivity, Probability Theory and Related Fields, 175(1) (2019), pp 559-578.
- M. Freidlin, L. Koralov, Front propagation for reaction-diffusion equations in composite structures, Journal of Statistical Physics, 172 (2018), no 6, pp 1663—1681.
- D. Dolgopyat, P. Hebbar, L. Koralov, M. Perlman, Multi-type branching processes with time-dependent branching rates, Journal of Applied Probability 55 (2018), no 3, pp 701-727.
- M. Hairer, G. Iyer, L. Koralov, A. Novikov, Z. Pajor-Gyulai. A fractional kinetic process describing the intermediate time behavior of cellular flows, Ann. of Probability, 46 (2018), no. 2, pp 897-955.
- M. Freidlin, L. Koralov. Metastable distributions of Markov chains with rare transitions, Journal of Statistical Physics., 167 (2017), no 6, pp 1355-1375.
- M. Freidlin, L. Koralov, On stochastic perturbations of slowly changing dynamical systems, Nonlinearity 30 (2017), no 1, pp 445-453.
- M. Freidlin, L. Koralov, A. Wentzell. On the behavior of diffusion processes with traps, Annals of Probability. 45 (2017), no 5, pp. 3203-3222.
- L. Koralov, L. Tcheuko. Quasi-linear equations with a small diffusion term and the evolution of the hierarchies of cycles, Journal of Theoretical Probability (2016), Vol 29, pp. 867--895.
- M. Hairer, L. Koralov, Z. Pajor-Gyulai. From averaging to homogenization in cellular flows – an exact description of the transition, Annales de l'Institut Henri Poincare - Probabilites et Statistiques, (2016), Vol 52, No 4, pp 1592—1612.
- L. Koralov, Z. Pajor-Gyulai. On the critical behavior of a polymer model, Stochastics and Dynamics (2014), Vol 14, No 1, 12 pp.
- L. Koralov, S. Molchanov, B. Vainberg. On mathematical foundation of the Brownian motor theory. Journal of Functional Analysis 267 (2014), no. 6, 1725-1750.
- L. Koralov. Branching diffusion in inhomogeneous media, Asymptotic Analysis, (2013), Vol 81, no 3–4, pp 357–377.
- D. Dolgopyat, L. Koralov. Averaging of incompressible flows on two-dimensional surfaces, Journal of American Mathematical Society (2013), Vol 26, no 2, pp 427–449.
- L. Koralov, S. Molchanov. Structure of population inside propagating front, Journal of Mathematical Sciences (Problems in Mathematical Analysis) (2013), Vol 189, no 4, pp 637–658.
- D. Dolgopyat, M. Freidlin, L. Koralov. Deterministic and Stochastic Perturbations of Hamiltonian Systems on a 2-dimensional torus, Ergodic Theory and Dynamical Systems, (2012) Vol 32, issue 3, 899–918

- M. Freidlin, L. Koralov. Averaging Principle for quasi-linear parabolic PDE's and related diffusion processes, Stochastics and Dynamics, (2012) Vol 12, no 1, 12 pp
- M. Freidlin, L. Koralov. Nonlinear Stochastic Perturbations of Dynamical Systems, Probability Theory and Related Fields (2010), 147, pp 273–301
- M. Cranston, L. Koralov, S. Molchanov, B. Vainberg. A solvable model for homopolymers and self-similarity near the critical point, Random Operators and Stochastic Equations 18 (2010), no. 1, 7395.
- M. Freidlin, L. Koralov. Metastability for Nonlinear Random Perturbations of Dynamical Systems, Stochastic Processes and Applications 120 (2010), no. 7, 1194-1214
- Dolgopyat, L. Koralov. Motion in a Random Force Field, Nonlinearity, 22 (2009), pp 187–211.
- M. Cranston, L. Koralov, S. Molchanov, B. Vainberg. Continuous Model for Homopolymers, Jounal of Functional Analysis 256 (2009), no 8, pp 2656–2696.
- D. Dolgopyat, L. Koralov. Averaging of Hamiltonian Flows with an Ergodic Component, Annals of Probability, Vol. 36, No. 6, 1999–2049 (2008)
- (conference proceedings) L. Koralov. An Inverse Problem for Gibbs Fields, Probability and Mathematical Physics, CRM Proceedings and Lecture Notes, 42, pp 299–307 (2007)
- L. Koralov. An Inverse Problem for Gibbs Fields with Hard CorePotential, Journal of Mathematical Physics , 48 No 5 (2007)
- (conference proceedings) D. Dolgopyat, V. Kaloshin, L. Koralov. Long time behavior of periodicsto chastic flows, International Congress on Mathematical Physics, 290–295, World Sci Publ. (2005).
- L. Koralov. The Existence of Pair Potential Corresponding to Specified Density and Pair Correlation, Letters in Mathematical Physics (2005), 71, pp 135–148.
- D. Dolgopyat, V. Kaloshin, L. Koralov. A Limit Shape Theorem for Peridic Stochastic Dispersion, Communications in Pure and Applied Mathematics, 57 (2004), no 9, pp 1127–1158.
- D. Dolgopyat, V. Kaloshin, L. Koralov. Sample Path Properties of the Stochastic Flows, Annals of Probability, 32 (2004) no 1A, pp 1–27.
- L. Koralov. Random Perturbations of 2-Dimensional Hamiltonian Flows, Probability Theory and Related Fields 129, pp 37–62 (2004).
- D. Dolgopyat, V. Kaloshin, L. Koralov. Hausdorff Dimension in Stochastic Dispersion, Journal of Statistical Physics, Vol 108, Nos 5/6, pp 943–972 (2002).
- R. Carmona, L. Koralov, S. Molchanov. Asymptotics for the Almost Sure Lyapunov Exponent for the Solution of the Parabolic Anderson Problem, Random Operators and Stochastic Equations , Vol 9, No. 1, pp 77–86 (2001).
- L. Koralov. Transport by Vector Fields with Kolmogorov Spectrum, Journal of Statistical Physics, Vol 98, Issue 1/2, pp 405–418 (2000).
- L. Koralov. Transport by Time Dependent Stationary Random Flow, Communications in Mathematical Physics, 199, pp 649–681 (1999).
- L. Koralov. Effective Diffusivity of Stationary Vector Fields with Short Time Correlations, Random Operators and Stochastic Equations, no 4, Vol 5, pp 303–324 (1997).
- L. Koralov, S. Nechaev, Y. Sinai. Limit Behavior of a two-dimensional Random Walk with Topological Constraints, Theory Probab. Appl 38 (1993), no 2, 296–306.
- L. Koralov, S. Nechaev, Y. Sinai. Limiting Probability Distribution for a Random Walk with Topological Constraints, Chaos 1 (1991), no 2, 131–133.

Conference and Seminar Talks

- 2022 – NYU/Columbia probability seminar.
- 2021 - International Workshop of the Laboratory of Stochastic Analysis (Moscow); International Conference Chebyshev-200, Moscow.
- 2020 – AMS meeting (Chattanooga); International Workshop of the Laboratory of Stochastic Analysis (Moscow).
- 2019 – Conference on perturbations techniques in stochastic analysis, CIRM, France; Probability seminar, Carnegie-Mellon University; AMS meeting, Madison.
- 2018 - UNC Charlotte colloquium; AIMS 2018 conference (Taipei); Statistical Mechanics Conference, Rutgers University; Stochastic Analysis International Workshop (plenary speaker), Moscow.
- 2017 - UMD dynamics seminar; Statistics meets stochastics conference (Moscow); Conference in honor of A. Wentzell (Tulane University); Columbia/Courant probability seminar; Colloquium talk at Drexel University.
- 2016 - Workshop on probabilistic methods in dynamical systems and applications, CRM Montreal (Fall 2016); Seminar talk at CSCAMM, UMD (Fall 2016).
- SUNY Stony Brook (Spring 15); Averaging and Homogenization in Deterministic and Stochastic Systems workshop, Luminy (Spring 15); Disordered Models of Mathematical Physics conference, Valparaiso, Chile (Summer 15); Carnegie Mellon University Probability Seminar (Fall 15); Columbia University Probability Seminar (Fall 15).
- 2014 - Carnegie Mellon University (Spring 14), Warwick University (Spring 14), University of Bath (Spring 14), Loughborough University (Spring 14), London Probability Seminar (Spring 14), AMS meeting Baltimore (Spring 14), UNC Chapel Hill (Fall 14), Stochastic and PDE Methods in Mathematical Physics Conference, Paris (Fall 14), MIT Probability Seminar (Fall 14), Mittag Lefler Institute, Sweden (Fall 14)
- Other recent talks, prior to 2014: Conference on Asymptotic Problems (UMD), Random Dynamical Systems Workshop (Bielefeld); Qualitative Behavior of Stochastic Systems Workshop (Bielefeld); Interacting Processes in Random Environment (Fields Institute); Random Media: Homogenization and Beyond (IPAM); Workshop in Dynamical Systems and Related Topics (PSU); 106th Statistical Mechanics Conference (Rutgers); Multi-scale Systems: Theory and Applications Workshop (Warwick); Stochastic Dynamics opening workshop (SAMSI); AMS meeting (Penn State); Stochastic Processes and Applications (Berlin); Turbulent Mixing and Beyond (Trieste); AMS meeting (Raleigh); Workshop on Random Walks, Particle Systems and Random Media (Santiago, Chile); Stochastic Dynamical Systems and Control (MSRI); Stochastic Processes and Applications (Urbana-Champaign). Seminar talks in: ZIF (Bielefeld), City University of New York, New York University, University of Toronto, UMBC, CIMAT, University of Illinois at Urbana-Champaign, University of Chicago, UNC Charlotte, UMD, Penn State University, Georgia Tech.

Sponsored Research

- 2020—2021: Simons Fellowship in Mathematics, Simons Foundation, PI
- 2021 – 2023: Russian Science Foundation grant – Co-PI
- 2017—2020: ARO grant, PI (amount: 321,000)
- 2019: Graduate School Research and Scholarship Award (amount: 9,000)

- 2016: Seminar on Stochastic Processes - Conference grant - Co-PI, NSF (amount: 48,000)
- 2013 – 2017: Asymptotic Methods in Probability and their Applications to Problems in Natural Sciences, NSF Research Grant, PI (amount: 151,000)
- 2013 – 2014: Simons Fellowship in Mathematics, Simons Foundation, PI (amount: 123,000)
- 2013: Graduate School Research and Scholarship Award (amount: 9,000)
- 2009 – 2013: Stochastics and Dynamics: Asymptotic Problems, NSF Focused Research Group Grant (amount: 523,000)
- 2007 – 2010: NSF Research Grant, PI
- 2004 – 2007: NSF Research Grant, PI
- 1999 - 2002: NSF Postdoctoral Fellowship
- 1998 – 1999: Institute for Advanced Study Fellowship

TEACHING AND ADVISING

Courses Taught

- STAT 601, Probability (graduate, level 2) – Spring 2022, Spring 2019, Spring 2018, Spring 2015, Spring 2013
- STAT 600, Probability (graduate, level 1) – Fall 2018, Fall 2015, Fall 2014 , Fall 2012, Fall 2010
- STAT 410, Probability – Spring 2018, Spring 2017, Fall 2016, Spring 2016, Spring 2012, Spring 2011
- MATH 410, Advanced Calculus – Spring 2022, Spring 2016, Spring 2015, Spring 2013, Spring 2012, Fall 2010
- MATH 411, Advanced Calculus II – Fall 2018, Spring 2017
- STAT 400, Probability - Fall 2011
- Sabbatical - Fall 2013 - Spring 2014

Advising

- Ryan Zavislak – defended MA in the Spring of 2013, employment – NSA
- Lucas Tcheuko – defended PhD in the Spring of 2015, employment – FDA
- Zsolt Pajor-Gyulai - defended PhD in the Spring of 2015, employment – Courant Instructor/Assistant Professor, NYU (Courant Institute)
- Pratima Hebbar -defended PhD in the Summer of 2019, employment – Phillip Griffiths Research Assistant Professor, Duke University
- Shuo Yan – current PhD student
- Ishfaaq Imtiyas – current PhD student

SERVICE AND OUTREACH

Workshops organized

- Conference "Asymptotic Problems in Stochastic Processes and PDEs", Co-organizer, UMD - 2022
- SSP conference, UMD, co-organizer – 2016
- AMS meeting, Co-organizer of the special session, Georgetown University - 2015
- Conference "Asymptotic Problems in Stochastic Processes and PDEs", Co-organizer, UMD - 2013
- Workshop "Stochastics and Dynamics, Asymptotic Problems", Co-organizer, UMD - 2010
- Stochastic Processes and Applications meeting, Berlin, Organizer of invited session - 2009
- Stochastic Processes and Applications meeting, Urbana-Champaign, Organizer of invited session - 2007

Reviewing Activities

- Reviewer: Acta Applicandae Matematicae, Electronic Journal of Probability, Annals of Probability, Journal of Statistical Physics, De Gruyter, Applications and Applied Mathematics, Stochastic Processes and Applications, Nonlinearity, Journal of Mathematical Analysis and Applications, American Mathematical Monthly, SIAM Journal on Applied Dynamical Systems, Princeton University Press, Journal of Theoretical Probability, Indiana University Mathematical Journal, The American Statistician, Journal of Functional Analysis, Science China Mathematics, Illinois Journal of Mathematics, Chaos, Journal of Pure and Applied Functional Analysis, Annals of Applied Probability, Probability Theory and Related Fields
- Repeatedly served on NSF probability panel
- Reviewer, NSF PIRE panel – 2010
- Reviewer- Simons Foundation – 2016
- Reviewer – French National Research Agency - 2016

Committees, Professional & Campus Service

Campus Service - University

- Banneker/Key Committee (2019-2022)
- Flagship Fellowship Committee (2019-2022)

Campus Service - Department

- Probability Seminar, Co-organizer, (currently)
- UMD Mathematics Colloquium, Co-organizer (2019-2021)
- Graduate admissions committee (currently)
- PCC committee (currently)

- Hiring Committee – 2016, 2018-19
- Merit Committee – 2013, 2015, 2018
- Summer REU on branching processes - 2015
- RIT on Stochastic Dynamics, Co-organizer – 2011, 2019
- Maryland Mathematics Institute, Lectured – 2010

Professional Service outside the University

- Regeneron Science Talent Search Committee – 2015--2022
- Math in Moscow Committee of the AMS – 2008-2010