Robert W. Neel — *Curriculum Vitae*

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Employment

· **Lehigh University**
Associate Professor, 2016–present.
Assistant Professor, 2009–2016.

· **Columbia University**
NSF Postdoctoral Research Fellow, 2006–2009.
Ritt Assistant Professor, 2005–2006.

Education

· **Harvard University**, Ph.D. Mathematics, June 2005.
Thesis: *The behavior of the heat kernel at the cut locus.*
Adviser: Daniel Stroock.

· **Stanford University**, B.S. Mathematics with departmental honors and university distinction (minor in Philosophy), June 1999.
Undergraduate Thesis Adviser: Robert Finn.

Papers

· *Non-Markovian maximal couplings and a vertical reflection principle on a class of sub-Riemannian manifolds* (with L. Luo), arXiv:2402.13976, preprint.

· *Localized bounds on log-derivatives of the heat kernel on incomplete Riemannian manifolds* (with L. Sacchelli), arXiv:2212.09559, preprint.

· *Variations of the sub-Riemannian distance on Sasakian manifolds with applications to coupling* (with F. Baudoin, E. Grong, and A. Thalmaier), arXiv:2212.07715, preprint.

· *Uniform, localized asymptotics for sub-Riemannian heat kernels and diffusions* (with L. Sacchelli), arXiv:2012.12888, preprint.

· *A pseudo-probabilistic approach to the dilation equation for wavelets* (with S. Dumnich), arXiv:1710.01364, unpublished preprint.

· *Brownian motion and the parabolicity of minimal graphs*, arXiv:0810.0669, unpublished preprint.

· *Geometric and Martin boundaries of a Cartan-Hadamard surface*, ALEA Lat. Am. J. Probab. Math. Stat. **18** (2021), no. 2, 1669–1687.

· *Radial processes for sub-Riemannian Brownian motions and applications* (with F. Baudoin, E. Grong, K. Kuwada, and A. Thalmaier), Electron. J. Probab. **25** (2020), Paper No. 97, 17 pp.

· *Extensions of Brownian motion to a family of Grushin-type singularities* (with U. Boscain), Electron. Commun. Probab. **25** (2020), Paper No. 29, 12 pp.

· *Heat kernel asymptotics on sub-Riemannian manifolds with symmetries and applications to the bi-Heisenberg group* (with D. Barilari and U. Boscain), Ann. Fac. Sci. Toulouse Math. (6) **28** (2019), no. 4, 707–732.

· *Intrinsic random walks in Riemannian and sub-Riemannian geometry via volume sampling* (with A. Agrachev, U. Boscain, and L. Rizzi), ESAIM

Control Optim. Calc. Var. **24** (2018), no. 3, 1075–1105.

· *Intrinsic random walks and sub-Laplacians in sub-Riemannian geometry* (with U. Boscain and L. Rizzi), Adv. Math. **314** (2017), 124–184.

· *On the heat diffusion for generic Riemannian and sub-Riemannian structures* (with D. Barilari, U. Boscain, and G. Charlot), Int. Math. Res. Not. IMRN (2017), no. 15, 4639–4672.

· *A stochastic target approach to Ricci flow on surfaces* (with I. Popescu), Ann. Probab. **44** (2016), no. 2, 1341–1425.

· *Martingales arising from minimal submanifolds and other geometric contexts*, Illinois J. Math. **58** (2014), no. 2, 323–357.

· *Brownian motion and the Dirichlet problem at infinity on two-dimensional Cartan-Hadamard manifolds*, Potential Anal. **41** (2014), no. 2, 443–462.

· *On parabolicity and area growth of minimal surfaces*, J. Geom. Anal. **23** (2013), no. 3, 1173–1188.

· *Small-time heat kernel asymptotics at the sub-Riemannian cut locus* (with D. Barilari and U. Boscain), J. Differential Geom. **92** (2012), no. 3, 373–416.

· *Stochastic methods for minimal surfaces*, Geometric analysis: partial differential equations and surfaces, Contemp. Math., vol. 570, Amer. Math. Soc., Providence, RI (2012), 111–136.

· *A martingale approach to minimal surfaces*, J. Funct. Anal. **256** (2009), no. 8, 2440–2472.

· *The small-time asymptotics of the heat kernel at the cut locus*, Comm. Anal. Geom. **15** (2007), no. 4, 845–890.

· *Analysis of the cut locus via the heat kernel* (with D. Stroock), Surveys in Differential Geometry, Vol. 9, International Press, Boston (2004), 337–349.

· *Equilibrium configurations for a floating drop* (with A. Elcrat and D. Siegel), J. Math. Fluid Mech. **6** (2004), no. 4, 405–429.

· *C-singular solutions of the capillary problem* (with R. Finn), J. Reine Angew. Math. **512** (1999), 1–25.

Awards/Grants

· NSF Conference Grant, "Seminar on Stochastic Processes 2022" (PI, Co-PIs Daniel Conus and Si Tang), 2022–present.

· Simons Foundation Collaboration Grant, "Diffusions on Geometric Structures Beyond the Riemannian," 2017–2023.

· NSA Mathematical Sciences Program research grant, "Martingale methods for geometric structures including minimal submanifolds, curvature flows, and sub-Riemannian manifolds," 2015–2017.

· Frank Hook Assistant Professorship, Lehigh University, 2014–2016.

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- NSF Postdoctoral Research Fellowship, 2006–2009.
- Clay Mathematics Institute Liftoff Fellowship, 2005.
- Certificate of Distinction in Teaching, Harvard University, Fall 2002, Fall 2003, and Spring 2005.
- NSF Graduate Research Fellowship, 2000–2003.
- Fulbright Grant to study at the University of Leipzig, 1999–2000.

Talks

2023 Summer School on Stochastic Analysis: Mini-symposium in stochastic differential geometry, Bernoulli Center at École Polytechnique Fédérale de Lausanne (Switzerland) • Minisymposium: Geometric Control Theory with Quantum and Classical Applications, 2023 SIAM Conference on Control and Its Applications, Philadelphia

2022 Séminaire McTAO (INRIA) Sophia Antipolis (France) • Workshop in Analysis and Probability: Concentration Week on Geometry and Analysis on Nonsmooth Spaces, Texas A&M • Union College Math Conference: Session on Stochastic Analysis and Applications • AMS Central Sectional: Special Session on Analysis and Probability in Sub-Riemannian Geometry (held online in lieu of the originally scheduled meeting at Purdue)

2021 Conference "Stochastic differential geometry and mathematical physics," Centre Henri Lebesgue, Rennes (France) (held online) • AMS Central Sectional: Special Session on Probabilistic and Diffusion Methods in Analysis and Geometry (held online in lieu of the originally scheduled meeting at University of Cincinnati)

2020 Decision and Control Lab Fall Lecture Series (held online), University of Illinois • Zoom mini-conference on Analysis and Probability in sub-Riemannian spaces (held online in lieu of the special session at the cancelled spring AMS Central Sectional at Purdue)

2019 Mini-workshop on "Self-adjoint extensions in new settings," Oberwolfach (Germany) • Analysis and Probability Seminar, University of Connecticut • Mini-symposium "Degenerate diffusion processes and their control" at Equadiff, Leiden (The Netherlands) • Probability Seminar, MIT • AMS Eastern Sectional: Special Session on Stochastic Processes, Random Walks, and Heat Kernels, University of Connecticut-Hartfield

2018 Tokyo one-day workshop on stochastic analysis and geometry, The University of Tokyo • Conference "Stochastic Analysis and Related Topics," Okayama University (Japan) • Workshop on Stochastic Systems: their Analysis, Geometry, and Perturbation, Chinese Academy of Sciences (Beijing) • Probability Seminar, University of Illinois

2017 Conference "The last 60 years of Mathematical Fluid Mechanics," Vilnius University (Lithuania) • Conference ProbaGeo, University of Luxembourg •

Geometry Seminar, University of Rochester • Differential Geometry Seminar, UC Irvine.

2016 Workshop on "Heat Kernels, Stochastic Processes and Functional Inequalities," Oberwolfach (Germany) • Mathematical Sciences Colloquium, Worcester Polytechnic Institute • Mathematics Lecture Series, Wichita State University

2015 Probability and Mathematical Physics Seminar, NYU/Courant • Probability Seminar, University of Luxembourg • Analysis and Probability Seminar, University of Connecticut • Probability Seminar, Purdue University

2014 Probability Seminar, University of Virginia • Workshop on geometric analysis on sub-Riemannian manifolds, Institut Henri Poincaré (France) • Conference ProbaGéo, University of Bordeaux (France) • Stochastics Seminar, Georgia Tech • Mathematical Finance and Probability Seminar, Rutgers University

2013 Probability Seminar, University of Luxembourg • SIAM Conference on Control and Its Applications, San Diego • Geometric Analysis Seminar, Cornell University

2012 Math Department Colloquium, Lehigh University • Probability Seminar, Cornell University • Probability Seminar, NYU/Courant • Stochastics Seminar, Georgia Tech

2011 Probability/Geometry Seminar, UT–Austin • Geometric Analysis Seminar, MIT • Math Department Seminar, University of Padua (Italy) • Geometric Analysis Seminar, SISSA (Trieste, Italy) • CMAP Seminar, École Polytechnique (Paris, France)

2010 Probability Seminar, UT–Austin • Probability Seminar, Cornell University • Math Department Colloquium, Purdue University • Santaló Summer School on Geometric Analysis, University of Granada (Spain)

2009 Minimal Surfaces Arbeitsgemeinschaft, Oberwolfach (Germany) • Geometric Analysis Seminar, MIT • Math Department Colloquium, Lehigh University

2008 Analysis and PDE Seminar, Johns Hopkins University • Geometry and Topology Seminar, University of Massachusetts at Amherst • Stochastics Seminar, Georgia Tech

2006 Probability Seminar, NYU/Courant • Analysis and Geometry Seminar, Columbia University • Summer School: Probabilistic and Analytic Perspectives on Contemporary PDEs, Carnegie Mellon University • CUNY Differential Geometry Seminar • Columbia-Princeton Probability Day

2005 Probability Seminar, Columbia University • Probability Seminar, Northwestern University

2004 Stochastic Analysis Seminar, University of Illinois • Analysis Seminar, MIT

Courses Taught

Lehigh University

· Math 463: Advanced Probability
· Math 450: Special Topics in Advanced Probability
· Math 402: Real Analysis II
· Math 401: Real Analysis I
· Math 374: Statistical Project
· Math 309: Theory of Probability
· Math 301: Principles of Analysis I
· Math 263: Introduction to the Theory of Probability
· Math 231: Probability and Statistics
· Math 205: Linear Methods
· Math 96/98: Calculus II, Part B and Differential Equations
· Math 23: Calculus III

Columbia University
· Math W4155: Probability Theory
· Math V2010: Linear Algebra
· Math V1202: Calculus IV
· Math V1201: Calculus III
· Math V1101: Calculus I

Advising

Doctoral students
· Zhaoping Yang, current.
· Sarah Dumnich, graduated Spring 2016.

Service

Lehigh University
· Chair of the math department's graduate committee/director of graduate studies, 2017–2022.
· Member (elected by the department) of the chair's advisory committee for the math department, 2012–2013, 2014–2015, 2016–17, and 2018–2022.
· Member of the university's Graduate and Research Committee (GRC), 2019–2021.
· Organizer of the Prob/Stat Seminar, 2018–2020.
· Undergraduate Mentor Advisor, 2017–2019.
· Member of the College of Arts and Sciences nominations committee, 2015–2019.
· Member of the university's planning committee for the renovation of Christmas-Saucon Hall, 2015–2017.
· Member of the university's honorary degrees committee, 2014–2017.
· Member of the math department's calculus committee, 2012–2017.

· (Co-) organizer of math department's colloquium, 2010–2012 and 2014–2015.

Professional

· Member of the local organizing committee for Seminar on Stochastic Processes 2022, held at Lehigh in March 2022.

· Doctoral Mentor for Math Alliance (The National Alliance for Doctoral Studies in the Mathematical Sciences), 2019–present.

· Have reviewed grant proposals for the NSF, the (French) National Research Agency (ANR), and the (Canadian) Natural Sciences and Engineering Research Council (NSERC).

· Reviewer for MathSciNet (Mathematical Reviews) and zbMATH (formerly Zentralblatt); reviewed a book for the Mathematical Association of America (MAA).

· Have refereed for Stochastic Processes and their Applications, Annals of Global Analysis and Geometry, Journal of the London Mathematical Society, ALEA, Journal of Theoretical Probability, Transactions of the AMS, International Mathematics Research Notices, Annales de l'Institut Fourier, Annales de l'Institut Henri Poincaré, Communications in Analysis and Geometry, Journal de Mathématiques Pures et Appliquées, Proc. A Royal Soc. Edinburgh, Probability Theory and Related Fields, Journal of Differential Geometry, Potential Analysis, the Electronic Journal of Probability, Mathematische Annalen, Journal für die reine und angewandte Mathematik (Crelle's journal), Mathematische Zeitschrift, Monatshefte für Mathematik, the SIAM Journal on Financial Mathematics, the Journal of Geometric Analysis, Geometria Dedicata, the Journal of Differential Equations, and the Journal of Functional Analysis.

· GEM Fellowship judge for The National GEM Consortium, 2020.

· Mentor for Fulbright applicants through Stanford University's office of overseas studies, 2013–present.

· Member of the American Mathematical Society (AMS), 2011–present.

· Member of the organizing committee for the 31st Midwest Probability Colloquium (held at Northwestern University), 2008–2009.