

Darrick Lee

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Academic Employment

- 09/2024 - present **(Tenure-Track) Chancellor's Fellow**, University of Edinburgh
- 09/2022 - 08/2024 **Postdoctoral Researcher**, University of Oxford
Advisor: Prof. Harald Oberhauser
- 08/2021 - 08/2022 **Postdoctoral Researcher**, École Polytechnique Fédérale de Lausanne (EPFL)
Advisor: Prof. Kathryn Hess

Education

- 2021 **Ph.D.** Applied Mathematics and Computational Sciences, University of Pennsylvania
Advisor: Prof. Robert Ghrist
- 2018 **M.A.** Applied Mathematics and Computational Sciences, University of Pennsylvania
- 2016 **B.A.Sc.** Engineering Physics (Electrical Option), University of British Columbia
Minor: Honours Mathematics

Research Interests

signature methods; applications of geometry, topology and probability to ML; mechanistic interpretability

Journal Publications and Refereed Conference Proceedings

* denotes equal contribution.

13. C. Hughes, Y. Liu, Y. Lahrach, J. Engdahl, H. Warren, **D. Lee**, F. Ramos, T. Miles, I. Abraham, *Asymptotically Optimal Ergodic Coverage on Generalized Motion Fields*, Robotics: Science and Systems, 2026
12. T. J. Nguyễn, **D. Lee**, B. J. Stolz, *Communities in the Kuramoto model: dynamics and detection via path signatures*, Journal of Physics: Complexity, Focus Issue on Higher Order Brain Networks, 2025.
11. C. Hughes, H. Warren, **D. Lee**, F. Ramos, I. Abraham, *Ergodic trajectory optimization on generalized domains using maximum mean discrepancy*, IEEE International Conference on Robotics and Automation (ICRA), 2025.
10. H.-T. Wong*, **D. Lee***, H. Yan, *Towards scalable topological regularizers*, ICLR, 2025.
9. Y. Cheng, **D. Lee**, H. Oberhauser, H. Li, *Generalized time-series data classification via component decomposition and alignment*, IEEE Transactions on Big Data, 2025.
8. C. Giusti, **D. Lee**, V. Nanda, H. Oberhauser, *A topological approach to mapping space signatures*, Advances in Applied Mathematics, 2025.
7. **D. Lee**, C. Lerch, F. Ramos, I. Abraham, *Stein variational ergodic search*, Robotics: Science and Systems, 2024.
6. C. Giusti, **D. Lee**, *Signatures, Lipschitz-free spaces, and paths of persistence diagrams*, SIAM Journal on Applied Algebra and Geometry, 2023.
5. X. Xu, **D. Lee**, N. Drougard, R. N. Roy, *Signature methods for brain-computer interfaces*, Scientific Reports, 2023.
4. C. Améndola, **D. Lee**, C. Meroni, *Convex hulls of curves: volumes and signatures*, Proceedings of Geometric Science of Information (GSI'23), 2023.
3. C. Toth*, **D. Lee***, C. Hacker, H. Oberhauser, *Capturing graphs with hypo-elliptic diffusions*, NeurIPS, 2022.
2. **D. Lee** and A. Schnyder, *Structure of vortex-bound states in spin-singlet chiral superconductors*, Physical Review B, 2016.
1. R. Froese, **D. Lee**, C. Sadel, W. Spitzer and G. Stolz, *Localization for transversally periodic random potentials on binary trees*, Journal of Spectral Theory, 2016.

Book Chapters

2. D. Lee, H. Oberhauser, *The signature kernel*, Signature Methods in Finance, Springer, 2025.
1. C. Giusti, D. Lee, *Iterated integrals and population time series analysis*, Proceedings of the Abel Symposium, 2020. (link)

Preprints and Submitted Articles

7. I. Chevyrev, E. Ferruci, D. Lee, T. Lyons, H. Oberhauser, N. Tapia, *Orthogonal polynomials on path-space*, preprint, 2026.
6. F. Bischoff, D. Lee, *Thin homotopy and the signature of piecewise linear surfaces*, preprint, 2025.
5. P. Semnani, V. Guan, E. Robeva, D. Lee, *Path-dependent SDEs: solutions and parameter estimation*, preprint, 2025.
4. D. Lee, *The surface signature and rough surfaces*, preprint, 2024.
3. D. Lee and H. Oberhauser, *Random surfaces and higher algebra*, preprint, 2023.
2. D. Lee, R. Ghrist, *Path signatures on Lie groups*, preprint, 2020.
1. D. Bhaskar, D. Lee, H. Knútsdóttir, C. Tan, M. Zhang, P. Dean, C. Roskelley, L. Edelstein-Keshet, *A methodology for morphological feature extraction and unsupervised cell classification*, preprint, 2016.

Awards and Honors

- 2018 - 2021 NSERC Postgraduate Scholarship - Doctoral (PGS-D3)
- 2018 Good Teaching Award, Department of Mathematics, University of Pennsylvania
- 2016 - 2021 Benjamin Franklin Fellowship, University of Pennsylvania
- 2016 - 2017 Fulbright Canada Student Award
- 2014, 2015 NSERC Undergraduate Student Research Award (USRA)

Research Visits

- 11/2024 Research Visitor, *University of Hertfordshire* (with Severin Bunk)
- 03-04/2024 Research Visitor, *MPI for Mathematics in the Sciences* (with Sayan Mukherjee)
- 06/2023 Research Visitor, *MPI for Mathematics, Bonn* (with Camilo Arias Abad)
- 06/2022 Research Visitor, *University of Oxford* (with Harald Oberhauser)
- 03/2022 Research Visitor, *MPI for Mathematics in the Sciences* (with Bernd Sturmfels)
- 05 - 07/2020 Research Visitor, *University of Oxford* (with Vidit Nanda)
(Cancelled due to COVID-19)

Recent and Upcoming Invited Seminar and Conference Talks

[†] denotes online talk. MS denotes minisymposium.

- 02/2026 *Algebraic systems biology seminar*, MPI-CBG, Dresden, Germany
- 02/2026 *Algebraic and geometric aspects of signatures and rough analysis*, WIAS, Berlin, Germany
- 11/2025 *Probability Seminar*, University of Warwick, Coventry, UK
- 10/2025 *Geometry and Topology Seminar*, University of Regina, Regina, Canada
- 10/2025 *Institute of Applied Mathematics Seminar*, University of British Columbia, Vancouver, Canada
- 09/2025 [†]IMPRS Combo IV: *Path Signature - From rough path theory to algebra and geometry*, MPI-MiS, Leipzig, Germany
- 09/2025 *Recent Advances in Rough Path and Signature Theory*, ShanghaiTech, China
- 07/2025 *SIAM Applied Algebra & Geometry MS (Beyond the Barcode)*, University of Wisconsin-Madison, USA
- 06/2025 *Signatures in 1 and 2 Dimensions*, BI Norwegian Business School, Oslo, Norway
- 05/2025 *Geometry and Analysis Seminar*, University of Leeds, Leeds, UK
- 12/2024 *Multi-Parameter Signatures*, NTNU, Trondheim, Norway

- 11/2024 *Centre for Data Innovation Research Seminar*, University of Hertfordshire, Hatfield, UK
- 11/2024 *Category Theory Seminar*, University of Edinburgh, Edinburgh, UK
- 11/2024 *Oberwolfach Workshop: Directions in Rough Analysis*, Oberwolfach, Germany
- 10/2024 *North British Probability Seminar*, University of Edinburgh, Edinburgh, UK
- 10/2024 *Applied Geometry, Algebra and Topology in Edinburgh (AGATE)*, University of Edinburgh, Edinburgh, UK
- 08/2024 *Rough Paths in Data Science Session*, Bernoulli-IMS World Congress, Bochum, Germany
- 07/2024 *New Impacts of Rough Analysis Workshop*, University of Warwick, Coventry, UK
- 06/2024 *Signatures of Paths and Images*, Centre for Advanced Studies, Oslo, Norway
- 05/2024 *Applied Topology Seminar*, EPFL, Switzerland
- 04/2024 [†]*Texas Tech Topology and Geometry Seminar*, Texas Tech, US
- 04/2024 *Mathematics of Data Streams: Signatures, Neural Differential Equations, and Diffusion Models*, Griefswald, Germany
- 03/2024 [†]*Geometric Structures Laboratory Seminar*, Fields Institute, Toronto, Canada
- 08/2023 *Structural aspects of signatures and rough paths*, Oslo, Norway
- 08/2023 [†]*ICIAM 2023 MS (Integrating rough paths into domain applications)*, Tokyo, Japan
- 07/2023 *SIAM Applied Algebra & Geometry MS (Applied Topology)*, Eindhoven, Netherlands
- 06/2023 *Graph Signal Processing Workshop 2023*, Oxford, UK
- 06/2023 *Higher Geometry Seminar*, MPI for Mathematics, Bonn, Germany
- 03/2023 [†]*GEOTOP-A: Web-Seminar Series on Application of Geometry and Topology*
- 12/2022 *Oxford-Berlin Young Researchers' Meeting on Applied Stochastic Analysis*, Oxford, UK
- 11/2022 *Stochastic Analysis and Mathematical Finance Seminar*, Oxford, UK
- 11/2022 [†]*Algebraic and Combinatorial Perspectives in the Mathematical Sciences*, online
- 10/2022 *Rough Paths, Algebraic Structures, and Machine Learning*, Kristiansand, Norway
- 09/2022 *4th IMA Conference on the Mathematical Challenges of Big Data*, Oxford, UK
- 09/2022 *New Interfaces of Stochastic Analysis and Rough Paths*, BIRS Workshop, Banff, Canada
- 07/2022 [†]*Rough Analysis and Data Science Workshop*, Imperial College London, UK
- 07/2022 [†]*SIAM Annual Meeting (Signatures, Kernels and Applications)*, Pittsburgh, USA
- 06/2022 [†]*SPDEs Seminar*, TU Berlin, Germany
- 06/2022 [†]*Persistence, Sheaves and Homotopy Online Seminar*
- 05/2022 [†]*Probability, Stochastic Analysis and Statistics in Pisa*, University of Pisa, Italy
- 03/2022 [†]*CIMDA-Oxford Seminar*, University of Oxford, UK
- 02/2022 *Applied Topology Seminar*, EPFL, Switzerland
- 12/2021 [†]*Applied Topology Seminar*, University of Oxford, UK
- 12/2021 [†]*Topology Seminar*, Bilkent University, Turkey
- 11/2021 [†]*Applied Topology in Albany*, University at Albany SUNY, USA
- 08/2021 *Berkeley Seminar*, Topos Institute, USA
- 05/2021 [†]*Geometry/Topology Seminar*, Oregon State University, USA
- 02/2021 [†]*Rough Paths Interest Group*, University of Oxford, UK
- 09/2020 [†]*Geometry and Topology Seminar*, North Carolina State University, USA

Teaching Experience

COURSE ORGANIZER - UNIVERSITY OF EDINBURGH

Winter 2026 MATH 10003: Financial Mathematics

TEACHING ASSISTANT - EPFL

Fall 2021 MATH 220: Metric and Topological Spaces

CO-INSTRUCTOR - UNIVERSITY OF PENNSYLVANIA

08/2020 Pre-Freshman Program

An intensive 4-week program for incoming freshman at Penn, many from low-income and/or first generation backgrounds. Alternated between teaching two classes: single variable calculus and multivariable calculus. This course was taught online.

TEACHING ASSISTANT - UNIVERSITY OF PENNSYLVANIA

Spring 2018 MATH 241: Calculus IV (Partial Differential Equations)

Fall 2017 MATH 360: Advanced Calculus (Analysis)

LAB TEACHING ASSISTANT - UNIVERSITY OF BRITISH COLUMBIA

Spring 2016 APSC 101: Introduction to Engineering II

Fall 2015 APSC 100: Introduction to Engineering I

Student Supervision

PHD SUPERVISION

Fall 2024 - **Student:** Siddharth Setlur (Edinburgh) - primary advisor
present **Coadvisor:** Sjoerd Beentjes (Edinburgh)Fall 2023 - **Student:** Luca Bonengel (Oxford) - secondary advisor
present **Coadvisor:** Harald Oberhauser (Oxford)

MEANO AFRICA PROGRAM (OXFORD)

07 - 09/2023 **Student:** Shabani Makwaru (University of Dar es Salaam)
Project: Convex hulls and path signatures

MASTER'S THESIS SUPERVISION (OXFORD)

05 - 09/2023 **Student:** Vaibhav Mahajan (Oxford)
Coadvisors: Prof. Terry Lyons (Oxford), Dr. Sumanth Swaminathan (Vironix Health)
Project: Ordinal classification in machine learning and chronic kidney disease

MASTER'S THESIS SUPERVISION (EPFL)

05 - 09/2022 **Student:** Hugo Henneuse (Institut Polytechnique de Paris/ENSAE)
Project: Orthogonal Invariants of the Mapping Space Signature02 - 07/2022 **Student:** Karl Arthursson (KTH Royal Institute of Technology in Stockholm)
Project: Gaussian Process Methods for Static and Dynamic Persistent Homology

UNDERGRADUATE MENTORSHIP

Fall 2021 Semester Project: Topics in Applied Algebraic Topology (Student: Xiaohan Wang)

Spring 2021 Directed Reading Program: Mathematics of Data Science (Student: Sam Rosenberg)

Fall 2020 Directed Reading Program: Causal Inference (Student: Sam Rosenberg)

Summer
2020 Independent Study: Stochastic Calculus (Student: Sam Rosenberg)

Spring 2020 Directed Reading Program: Time Series Analysis (Student: Sam Rosenberg)

SEMINAR ORGANIZATION

2025-present Co-organizer: North British Probability Seminar (NBPS) (UoE)

2024-present Co-organizer: Applied Geometry, Algebra and Topology in Edinburgh (AGATE) (UoE)

2020-2021 Organizer: Graduate Student Applied Topology Seminar (UPenn)

Spring 2019 Co-organizer: Simplicial Homotopy Theory Seminar (UPenn)

2017 - 2018 Organizer: Graduate Student Applied Topology Seminar (UPenn)

OUTREACH AND SERVICE

- 2018-2021 Master TA, University of Pennsylvania
Helped train, observe and select teaching assistants for the department of mathematics
- 2018, 2019 Volunteer, University of Pennsylvania Math Festival
Coordinated, built and presented topology demonstrations (linkages, picture frame problem, 3D printed examples)
- Summer 2017 Summer Discovery Camp Volunteer, Franklin Institute Science Museum
Planned and presented 7 science activities for summer campers entering grades 7-9

Undergraduate Employment

- 05 - 08/2016 USRA Student, UBC Math Department (Vancouver, BC)
Advisor: Prof. Leah Edelstein-Keshet
Project: A computational pipeline for morphological cell classification
- 05 - 08/2015 USRA Student, Université du Québec à Montréal Math Department (Montreal, QC)
Advisor: Prof. Steven Boyer and Prof. Dale Rolfsen
Project: Left orderability of knot groups, branched covers, and representations
- 05 - 12/2014 Research Intern, Max Planck Institute for Solid State Physics (Stuttgart, Germany)
Advisor: Prof. Andreas Schnyder
Project: Vortex-bound states in topological superconductors
- 01 - 04/2013 Modeling and Simulations Intern, Robert Bosch GmbH (Stuttgart, Germany)
Project: Simulations for micro-electromechanical system (MEMS) design
- 05 - 08/2012 Research Student, UBC Math Department (Vancouver, BC)
Advisor: Prof. Richard Froese
Project: Anderson localization in 1 dimension

Last updated: June 5, 2026