

# Mufan (Bill) Li

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## RESEARCH POSITIONS

Postdoctoral Research Associate, Princeton University  
Department of Operations Research and Financial Engineering  
Supervised by Boris Hanin  
2023–Present

## DEGREES

Ph.D. Statistics, University of Toronto  
Thesis: *Analysis of Learning Algorithms via Diffusion Limits*  
Supervised by Daniel M. Roy and Murat A. Erdogdu  
2017–2023  
M.Sc. Statistics, University of Toronto  
2015–2016  
B.A.Sc. Engineering Science, University of Toronto  
2010–2015

## PUBLISHED ARTICLES

See also my [Google Scholar](#) or [Semantic Scholar](#) pages.

1. **M. Li** and Mihai Nica, *Differential Equation Scaling Limits of Shaped and Unshaped Neural Networks*. [TMLR](#) 2024. [arXiv:2310.12079](#).
2. Blake Bordelon, Lorenzo Noci, **M. Li**, Boris Hanin, and Cengiz Pehlevan, *Depthwise Hyperparameter Transfer in Residual Networks: Dynamics and Scaling Limit*. [ICLR 2024](#). M3L Workshop Oral Presentation. [arXiv:2309.16620](#).
3. Lorenzo Noci\*, Chuning Li\*, **M. Li\***, Bobby He, Thomas Hofmann, Chris Maddison, and Daniel M. Roy, *The Shaped Transformer: Attention Models in the Infinite Depth-and-Width Limit*. [NeurIPS 2023](#). [arXiv:2306.17759](#).
4. Matthew Zhang, Sinho Chewi, **M. Li**, Krishnakumar Balasubramanian, and Murat A. Erdogdu, *Improved Discretization Analysis for Underdamped Langevin Monte Carlo*. [COLT 2023](#). [arXiv:2302.08049](#).
5. **M. Li** and Murat A. Erdogdu, *Riemannian Langevin Algorithm for Solving Semidefinite Programs*. [Bernoulli](#) 2023. [arXiv:2010.11176](#).
6. **M. Li**, Mihai Nica, and Daniel M. Roy, *The Neural Covariance SDE: Shaped Infinite Depth-and-Width Networks at Initialization*. [NeurIPS 2022](#) (Selected for Oral, Nominated for Outstanding Paper Award). [arXiv:2206.02768](#).
7. Raphaël Berthier and **M. Li**, *Acceleration of Gossip Algorithms through the Euler–Poisson–Darboux Equation*. [IMA Journal of Applied Mathematics](#) 2022. [arXiv:2202.10742](#).
8. Sinho Chewi, Murat A. Erdogdu, **M. Li**, Ruoqi Shen, and Matthew Zhang, *Analysis of Langevin Monte Carlo from Poincaré to Log-Sobolev*. [COLT 2022 Extended Abstract](#). [arXiv:2112.12662](#).
9. **M. Li**, Mihai Nica, and Daniel M. Roy, *The Future is Log-Gaussian: ResNets and Their Infinite-Depth-and-Width Limit at Initialization*. [NeurIPS 2021](#). [arXiv:2106.04013](#).

## PREPRINTS

1. Yunbum Kook, Matthew S. Zhang, Sinho Chewi, Murat A. Erdogdu, and **M. Li**, *Sampling from the Mean-Field Stationary Distribution*. Preprint 2024. [arXiv:2402.07355](#).
2. **M. Li**, and Maxime Gazeau, *Higher Order Generalization Error for First Order Discretization of Langevin Diffusion*. Preprint 2021. [arXiv:2102.06229](#).

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\*Equal Contribution.

<b>AWARDS</b>	Princeton DataX Postdoctoral Fellowship	2024–2025
	NSERC Postdoctoral Fellowship (Declined)	2024
	Doctoral Award, University of Toronto	2023
	Ontario Graduate Scholarship	2019–2023
	Student Research Presentation Award, Stat. Soc. of Canada	2021
	MITACS Accelerate Fellowship, with Borealis AI	2018–2019
	Undergraduate Summer Research Fellowship, University of Toronto	2012
<b>INVITED TALKS</b>	Transformers Seminar, Flatiron Institute <i>Neural Covariance SDE and the Shaped Transformer</i>	April 2024
	Alg-ML Seminar, Princeton University <i>Neural Covariance SDE and Its Limiting Spectrum</i>	April 2024
	One World Mathematics of ML Seminar ( <a href="#">Video</a> ) <i>Infinite-Depth Neural Networks as Depthwise Stochastic Processes</i>	April 2024
	LCDS Seminar, Brown University <i>Geometric Dyson Brownian Motion and the Free Log-Normal for Minor of Products of Random Matrices</i>	November 2023
	Google DeepMind <i>The Shaped Transformer: Attention Models in the Infinite Depth-and-Width Limit</i>	August 2023
	DeepProb, University of Oxford <i>Neural Covariance SDE: Shaped Infinite Depth-and-Width Networks at Initialization</i>	Feb 2023
	OPTML++, MIT ( <a href="#">Video</a> ) <i>Neural Covariance SDE: Shaped Infinite Depth-and-Width Networks at Initialization</i>	Feb 2023
	Layer 6 AI <i>Neural Covariance SDE: Shaped Infinite Depth-and-Width Networks at Initialization</i>	November 2022
	Deep Learning Foundations, University of Maryland ( <a href="#">Video</a> ) <i>Neural Covariance SDE: Shaped Infinite Depth-and-Width Networks at Initialization</i>	Sept 2022
<b>WORK EXPERIENCE</b>	Research Intern, Borealis AI	Aug 2018–Apr 2019
	Investment Analyst, Ontario Teachers’ Pension Plan	Jul 2016–Jul 2017
	Electronic Trading Intern, RBC Capital Markets	May 2013–Aug 2014
<b>PEER REVIEW</b>	Foundations of Computational Mathematics (FoCM)	
	Journal of Machine Learning Research (JMLR)	
	Transactions on Machine Learning Research (TMLR) <a href="#">Expert Reviewer</a>	
	SIAM Journal on Mathematics of Data Science (SIMODS)	
	Journal of Computational and Graphical Statistics (JCGS)	
	Neural Information Processing Systems (NeurIPS)	
	International Conference on Learning Representations (ICLR)	
	International Conference on Machine Learning (ICML)	