HANBAEK LYU

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480 Lincoln Drive, 303 Van Vleck Hall ⋄ Madison, WI 53706

EMPLOYMENT

University of Wisconsin - Madison	Associate Professor in Mathematics	*Sep. 2026 -*
	Assistant Professor in Mathematics	*Sep. 2021 - Present*
	Courtesy affiliation in Computer Science	
	Courtesy affiliation in the Institute for Foundations of Data Science	
University of California, Los Angeles	Hedrick Assistant Professor (Supervisor: Marek Biskup)	*Jul. 2018 - Jun. 2021*

EDUCATION

The Ohio State University	Ph.D. in Mathematics (Supervisor: David Sivakoff)	*Aug. 2013 - Apr. 2018*
	Thesis: *Combinatorial and probabilistic aspects of coupled oscillators*	
Seoul National University	B.S. in Mathematics	*Mar. 2008 - Feb. 2013*

RESEARCH INTEREST

· **Fields of research**: Discrete probability, optimization, and machine learning. Current interest lies at the intersection of random matrices, Schrödinger bridges, optimal transport, and generative modeling.

· **General interest**: Understanding emergent structures in large discrete systems such as interacting particle systems, networks, and structured random matrices.

GRANTS

NSF DMS-2541878: *CAREER: Random Matrices, Schrödinger Bridges, Optimal Transport, and Generative Modeling. 2026-2031*

Award amount: $450,000 (Role: Principal Investigator)

KRAFTON AI *Collaborative research on LLM and online attention. 2026-2027*

Award amount: $73,000 (Role: Principal Investigator)

Fall Research Competition *2026-2027*

Award amount: $25,110 (Role: Principal Investigator)

NSF DMS-2206296 : *Online Dictionary Learning for Dependent and Multimodal Data Samples: Convergence, Complexity, and Applications. 2022-2026*

Award amount: $300,000 (Role: Principal Investigator)

NSF DMS-2010035: *Combinatorial and probabilistic approaches to oscillator and clock synchronization. 2020-2024*

Award amount: $146,953 (Role: Principal Investigator)

RESEARCH SUPERVISION

Current Postdoc	Ander Aguirre	2025-Present	UC Davis, Ph.D. '22
Past Postdoc	David Clancy	2022-2025	UW Seattle, Ph.D. '22
Current Ph.D. students	William Powell	2022-2025	UW-Madison, expected in May 2027
	Danny Duan	2022-2025	UW-Madison, expected in May 2027
	Rahul Choudhary	2024-2025	UW-Madison, expected in May 2027
	Shuqi Bi	2024-2025	UW-Madison, expected in May 2029
Former Ph.D. students	Yuchen Li	2021-2025	UW-Madison Now a ML Research Scientist at Meta
Former MS students	Jiahong Yuan	2021-2023	UW-Madison, now in our Ph.D. program

Summer REU

2025 "*Generative modeling using Schrödinger bridges*" (link)
Paper submitted to the International Convergence on Learning Representations 2025
Ishaan Kharbanda (CS)
Xuan Ouyang (CS)
Judy Li (Math)

2024 "*Learning subgraph patterns from networks*" (link)
Pheobe Kuang (Now in Ph.D. program at Northwestern)
Yi Wei (Now in Ph.D. program at UW Seattle)
David Jiang (Now at Goldman Sachs)

2022 "*Interpretible Machine Learning approaches to coupled oscillators*" Preprint (2023)
Paper Under Review in Chaos: An Interdisciplinary Journal of Nonlinear Science
Agam Goyal (Now in Ph.D. program at UIUC)
Zhaoxing Wu (Now in Ph.D. at UW Seattle)
Binhao Chen (Now in Ph.D. at Brown)
Zihong Xu (Now in Ph.D. at UW-Madison)

2020 "*Machine Learning approaches to oscillators and clock synchronization*" (Journal, GitHub)
Paper published in Scientific Reports
Hardeep Bassi (Now in Ph.D. at UC Berkeley)
Richard Yim (Now in Ph.D. at UNC)
Rohith Kodukula (Now at Amazon)
Joshua Vendrow (Now in Ph.D. program at MIT)
Cherlin Zhu (Now in Ph.D. program at Columbia)

2019 "*Sequence learning for topic-aware chatbot using RNN and NMF*" (Preprint, link)
Henry Sojico (Now at Cruise AI)
Nicholas Hanoian (Now at Milliman)
Nicholas Liskij (Now in Ph.D. program at UC Berkeley)
Zhexiao Lin (Now in Ph.D. program at UC Berkeley)
Jiajao Quo (Now in Ph.D. program at EPFL)
Yuliang Wang (Now in Ph.D. program at Shanghai Jiao Tong U.)
Xiong Zhe (Now in Ph.D. program at Shanghai Jiao Tong U.)
Zhenhong Zou (Now in Ph.D. program at Tsinghua U.)
Yuchen Guo

PROFESSIONAL SERVICES

Panel	Review Panel for the NSF CISE Directorate review in 2025(6)
Editorial	Scientific Reports, Editor for "Networks and Complex Systems" (2023-2025)

REFEREEING

Journals	Journal of American Mathematical Society, Communications in Mathematical Physics, Electronic Journal of Probability, Journal of Statistical Physics, Combinatorics, Probability, and Computing, Mathematical Physics, Analysis, and Geometry, ALEA: Latin American Journal of Probability and Mathematical Statistics, Nature Communications, PNAS Nexus, SIAM Journal on Numerical Analysis, SIAM Journal on Mathematical Analysis, SIAM Journal on Matrix Analysis, Linear Algebra and its Applications, Journal of Nonlinear Science, Nonlinear Dynamics, Automatica, Journal of Cellular Automata, IEEE Transactions in Cybernetics
Conferences	International Conference on Machine Learning 2023 – 2025 International Conference on Learning Representations 2024 – 2025 Neural Information Processing Systems 2023 - 2025 Optimization for Machine Learning: OPT 2021, OPT 2024, OPT 2025 Artificial Intelligence and Statistics 2023 Complex Networks and their Applications 2023

PUBLICATIONS

(author*=undergraduate student)

Journal Publications

[1] D. Clancy Jr., H. Lyu, S. Roch, and A. Sly, "*Likelihood-Based Root State Reconstruction on a Tree: Sensitivity to Parameters and Applications* ." To appear in Electronic Journal of Probability Preprint (2025)

[2] Y. Li, L. Balzano, D. Needell, H. Lyu, "*Convergence and complexity of block majorization-minimization for constrained block-Riemannian optimization*." Journal of Machine Learning Research. 27(42):1–77, 2026. Journal (2026)

[3] H. Lyu, "*Time complexity of synchronization of discrete pulse-coupled oscillators on trees.*" To appear in Journal of Cellular Automata. Preprint (2023)

[4] H. Lyu and Y. Li ,"*Block majorization-minimization with diminishing radius for constrained nonconvex optimization* ." SIAM Journal on Optimization, Vol. 35, Iss. 2 (2025) (Journal, GitHub) (2025)

[5] S. Ahn, M. Junge, H. Lyu, J. Richey, L. Reeves, and D. Sivakoff, "*Diffusion-limited annihilating-coalescing systems.*" Electron. J. Probab. 30: 1-20 (2025). DOI: 10.1214/25-EJP1286 Journal (2025)

[6] H. Lyu, "*Stochastic regularized block majorization-minimization with weakly convex and multi-convex surrogates.*" Journal of Machine Learning Research, 25(306):1–83, 2024 (Journal, GitHub) (2024)

[7] Y. Alexandr, M. Bakenhus, M. Curiel, S. K. Deshpande, E. Gross, Y. Gu, M. Hill, J. Johnson, B. Kagy, V. Karwa, J. Li, H. Lyu, S. Petrović, J. Israel Rodriguez, "*New directions in algebraic statistics: Three challenges from 2023.*" Algebraic Statistics, Vol. 15 (2024), No. 2, 357–382 (Journal, Preprint)

[8] K. Affeld, C. Dean, M. Junge, H. Lyu, C. Panish, and L. Reeves "*Four-parameter coalescing ballistic annihilation.*" Journal of Statistical Physics, **191**, 89 (2024) Journal

[9] L. Kassab, A. Kryshchenk, H. Lyu, D. Molitor, D. Needell, E. Rebrova, and J. Yuan, "*Sparseness-constrained Nonnegative Tensor Factorization for Detecting Topics at Different Time Scales.*" Front. Appl. Math. Stat., 21 July 2024, Volume 10 (2024). Journal

[10] K. Kim, H. Lyu, J. Kim, and J. Jung, "*Supervised low-rank semi-nonnegative matrix factorization with frequency regularization for forecasting spatio-temporal data.*" Journal of Scientific Computing **100**, 29 (2024) (Journal, Preprint)

[11] J. Peng, C. Pan, H. Lyu, M. Kim, A. Cheng, and O. Milenkovic, "*Interpretable online network dictionary learning for inferring long-range chromatin interactions.*" PLoS computational biology 20.5 (2024) (Journal)

[12] J. Lewis, H. Lyu, P. Pylyavskyy, and A. Sen, "*Scaling limit of soliton lengths in a multicolor box-ball system.*" Forum of Mathematics, Sigma, Vol. 12, 2024 e120 (Journal)

[13] H. Lyu, Y. Kureh, J. Vendrow, and M. A. Porter, "*Learning low-rank latent mesoscale structures of networks.*" Nature Communications 15, Article number: 224 (2024) (Journal, Preprint, GitHub, Python package "*ndlearn*")

[14] T. Johnson, M. Junge, H. Lyu, and D. Sivakoff, "*Particle density in diffusion-limited annihilating systems*" Annals of Probability, Vol. 51, No. 6, 2301-2344. (Journal, Preprint) (2023)

[15] L. Benitez, M. Junge, H. Lyu, M. Redman, L. Reeves, "*Three-velocity coalescing ballistic annihilation*". Electronic Journal of Probability, 28, 1-18, 2023 (Journal, Preprint)

[16] H. Lyu, F. Memoli, and D. Sivakoff, "*Sampling random graph homomorphisms and applications to network data analysis.*" Journal of Machine Learning Research, 24(9):1-79, 2023. (Journal Preprint, GitHub)

[17] (From REU 2020) H. Bassi*, R. Yim*, R. Kodukula*, J. Vendrow*, C. Zhu*, H. Lyu, "*Learning to predict synchronization of coupled oscillators on randomly generated graphs.*" Scientific Reports 12, Article number: 15056 (Journal, GitHub) (2022)

[18] H. Lyu, C. Strohmeier, and D. Needell, "*Online nonnegative tensor factorization and CP-dictionary Learning for Markovian data.*" Journal of Machine Learning Research, 23(148):1-50, 2022 (Journal, Preprint, GitHub)

[19] M. Junge and H. Lyu, "*The phase structure in asymmetric ballistic annihilation*" The Annals of Applied Probability 32.5 (2022): 3797-3816 (Journal, Preprint)

[20] H. Lyu and I. Pak, "*On the number of contingency tables and the independence heuristic.*" Bulletin of the London Mathematical Society 54 (1), 242-255, 2022 (Journal, Preprint)

[21] M. Damron, H. Lyu, and D. Sivakoff, "*Stretched exponential decay for subcritical parking times on* $\mathbb{Z}^d$." Random Structures and Algorithms 59 (2), 143-154, 2021 (Journal, Preprint)

[22] H. Lyu, D. Needell, and L. Balzano, "*Online matrix factorization for Markovian data and applications to Network Dictionary Learning.*" Journal of Machine Learning Research. 21(251):1-49, 2020 (Journal, Preprint, GitHub)

[23] L. Levine, H. Lyu, and J. Pike, "*Double jump phase transition in a soliton cellular automaton.*" International Mathematics Research Notices, Volume 2022, Issue 1, January 2022, Pages 665-727, (Journal, Preprint)

[24] H. Lyu, "*Chromatic number, cycles, and non-separating cycles.*" Graphs and Combinatorics. 36, 1297–1310 (2020) (Journal, Preprint)

[25] S. Dittmer, H. Lyu, and I. Pak, "*Phase transition in random contingency tables with non-uniform margins.*" Trans. Amer. Math. Soc. 373 (2020), pp. 8313-8338. (Journal, Preprint)

[26] A. Kuniba and H. Lyu, "*Large deviations and one-sided scaling limit of random multicolor box-ball system*" Journal of Statistical Physics, 178(1), 38-74 (2019) (Journal, Preprint)

[27] A. Kuniba, H. Lyu, and M. Okado, " *Randomized box-ball systems, limit shape of rigged configurations, and thermodynamic Bethe ansatz*" Nuclear Physics B (2018), Vol. 937, 240-271. (Journal, Preprint)

[28] M. Damron, J. Gravner, M. Junge, H. Lyu, and D. Sivakoff, "*Parking on transitive unimodular graphs.*" Annals of Applied Probability, Volume 29, Number 4 (2019), 2089-2113 (Journal, Preprint)

[29] H. Lyu and D. Sivakoff "*Persistence of sums of correlated increments and clustering in cellular automata*" Stochastic Processes and Applications (2018), Vol. 129, Issue 4. (Journal, Preprint)

[30] E. Foxall and H. Lyu, "*Clustering in three and four color cyclic particle systems in one dimension*" Journal of Statistical Physics (2018), Vol. 171, Issue 3, 470–483. (Journal, Preprint)

[31] H. Lyu, "*Global synchronization of pulse-coupled oscillators on trees.*" SIAM Journal on Applied Dynamical Systems (2018), Vol. 17, No. 2. (Journal, Preprint)

[32] J. Gravner, H. Lyu, and D. Sivakoff, "*Limiting behavior of 3-color excitable media on arbitrary graphs.*" Annals of Applied Probability, Vol. 28, Number 6 (2018), 3324-3357. (Journal, Preprint)

[33] H. Lyu, "*Synchronization of finite-state pulse-coupled oscillators.*", Physica D: Nonlinear Phenomena 303 (2015): 28-38. (Journal, Preprint)

Conference Proceedings

[34] W. Powell, J. Kwon, Q. Xie, and H. Lyu, "*Optimal Regret for Policy Optimization in Average Reward MDPs Without Mixing*", to appear in Reinforcement Learning Conference 2026

[35] W. Powell, J. Kwon, Q. Xie, and H. Lyu, "*Offline Actor-Critic for Average Reward MDPs*", to appear in Advances in Neural Information Processing Systmes 2025

[36] R. Choudhary and H. Lyu ,"*Linear convergence of Sinkhorn's algorithm for generalized static Schrödinger bridge.*" Proceedings of the 42nd International Conference on Machine Learning 2025. OpenReview

[37] D. Clancy Jr., H. Lyu, and S. Roch,"*Sample complexity of branch-length estimation by maximum likelihood .*" Proceedings of the 42nd International Conference on Machine Learning 2025. Preprint

[38] D. Duan and H. Lyu, "*A fast and efficient randomized quasi-Newton method*", NeurIPS 2024 Workshop on Optimization for Machine Learning. Paper

[39] J. Lee, H. Lyu, and W. Yao, "*Supervised Constrained Matrix Factorization: Local Landscape Analysis and Applications.*" Proceedings of the 41st International Conference on Machine Learning, PMLR 235:26752-26788, 2024. Paper

[40] J. Kwon, D. Kwon, H. Lyu, "*On the Complexity of First-Order Methods in Stochastic Bilevel Optimization.*" Proceedings of the 41st International Conference on Machine Learning, PMLR 235:25784-25811, 2024 (Paper)

[41] W. Powell and H. Lyu, "*Stochastic optimization with arbitrary recurrent data sampling.*" Proceedings of the 41st International Conference on Machine Learning, PMLR 235:41000-41038, 2024. (Paper)

[42] Y. Li, L. Balzano, D. Needell, H. Lyu, "*Convergence and Complexity Guarantee for Inexact First-order Riemannian Optimization Algorithms.*" Proceedings of the 41st International Conference on Machine Learning, PMLR 235:27376-27398, 2024. (Paper)

[43] J. Lee, H. Lyu, and W. Yao. "*Exponentially convergent algorithm for supervised low-rank matrix factorization and applications in identification of oncogene clusters.*" Advances in Neural Information Processing Systems, Vol. 36, 76947–76959 (2023) (Paper)

[44] J. Lee, H. Lyu, and W. Yao. "*Interpretable Feature Extraction by Supervised Dictionary Learning for Identification of Cancer-Associated Gene Clusters.*" ICML Workshop on Computational Biology 2023. (Paper)

[45] D. Kwon and H. Lyu, "*Complexity of block coordinate descent with proximal regularization and applications to Wasserstein CP-dictionary learning.*" Proceedings of the 40th International Conference on Machine Learning, 2023 (Paper)

[46] A. Alacaoglu and H. Lyu, "*Convergence of first-order methods for nonconvex constrained optimization with dependent data.*" Proceedings of the 40th International Conference on Machine Learning, 2023 (Paper)

[47] C. Strohmeier, H. Lyu, and D. Needell, "*Online nonnegative CP tensor factorization for Markovian data*" NeurIPS workshop on Optimization for Machine Learning 2020. (Publication, Poster)

[48] H. Lyu, C. Strohmeier, G. Menz, and D. Needell, "*Applications of Online Nonnegative Matrix Factorization to Image and Time-Series Data*" 2020 Information Theory and Applications Workshop (ITA) (Publication, Preprint)

Under Review

[49] H. Hong, Q. Li, M. J Colbrook, and H. Lyu, "*Finding Koopman Invariant Subspaces via Personalized PageRank*", Preprint (2026)

[50] D. Duan, H. Lyu, and W. Powell, "*Scaling limit of Sinkhorn-rescaled Random Matrices via Stability of Static Schrödinger Bridges*", Under review in the Annals of Probability, Preprint (2026)

[51] H. Lyu and S. Mukherjee, "*Large random matrices with given margins.*" Under review in Probability Theory and Related Fields Preprint (2024)

[52] A. Aguirre, H. Lyu, and D. Sivakoff "*Phase transition in one-dimensional excitable media with variable interaction range.*" Under reveiw in the Annals of Applied Probability. Preprint (2024)

[53] D. Clancy Jr., D., H. Lyu, and S. Roch, "*Likelihood landscape of binary latent model on a tree* ." Under review in Probability Theory and Related Fields. Preprint (2025)

[54] D. Keating, M. Kim, E. Loeser, and H. Lyu, "*Diffusive scaling limit of stochastic box-ball systems and PushTASEP* ." Under review in the Annals of Applied Probability. Preprint (2025)

[55] (From REU 2022) A. Goyal, Z. Wu, R. P. Yim, B. Chen, Z. Xu, and H. Lyu, "*A latent linear model for nonlinear coupled oscillators on graphs.*" Under review in Chaos: An Interdisciplinary Journal of Nonlinear Science. Preprint (2023)

[56] D. Duan and H. Lyu, "*Regularized Overestimated Newton.*" Under Review in SIAM Journal of Matrix Analysis. Preprint (2025)

[57] J. Oh, H. Lyu, and H. Son, "*Sobolev acceleration for neural networks.*" Under Review in SIAM Mathematics of Data Science, Preprint (2025)

In Preparation

[58] D. Duan, H. Lyu, William Powell, "*Poison random matrices rescaled or conditioned to to satisfy a given margin.*"

Unpublished works

[59] H. Lyu, C. Strohmeier, G. Menz, and D. Needell, "*COVID-19 Time-series prediction by joint dictionary learning and online NMF*" Submitted (Preprint, GitHub) (2020)

[60] (From REU 2019) Y. Guo*, N. Hanoian*, Z. Lin*, N. Liskij*, H. Lyu, D. Needell, J. Qu*, H. Sojico*, Y. Wang*, Z. Xiong*, and Z. Zou*, "*Topic-aware Chatbot Using Recurrent Neural Networks and Nonnegative Matrix Factorization.*" (Preprint, GitHub) (2019)

[61] H. Lyu, "*A Note on Graph Characteristics and Hadwiger's Conjecture.*" Preprint (2012)

[62] H. Lyu and P. Jablonski, "*Four-Dimensional Discrete-time Lotka-Volterra Models with an Application to Ecology.*" Prepint (2012)

INVITED TALKS

"*Large random matrices with given margins*", Workshop on New Directions in Algebraic Statistics. IMSI , 2025

"*Large random matrices with given margins*", UNC IDEAS Seminar, Apr. 3, 2025 [slides]

"*Cyclic Block Optimization: How they work, why they work, and where they work*", University of Michigan Applied and Interdisciplinary Math Seminar, Feb. 21, 2025

"*Large random matrices with given margins*", UW-Madison Probability Seminar, Feb. 13, 2025

"*Large random matrices with given margins*", Yonsei University Discrete Analysis Seminar, Jan. 15, 2025

"*Large random matrices with given margins, Schrödinger bridge, and Sinkhorn algorithm*", KIAS AI seminar, Dec. 23, 2024

"*Large random matrices with given margins, Schrödinger bridge, and Sinkhorn algorithm*", Rutgers Discrete Math Seminar, Nov. 11, 2024

"*Exponentially convergent algorithms for supervised matrix factorization*", SIAM MDS24, Oct. 23, 2024 [slides]

"*Large random matrices with given margins, Schrödinger bridge, and Sinkhorn algorithm.*" Colloquium, KAIST, Sep. 24, 2024

"*Concentration and limit of large random matrices with given margins.*" Workshop on Theory and Applications for Optimal Control and Generative mode, Purdue University, Aug 7-9, 2024

"*Concentration and limit of large random matrices with given margins.*" Coin Flippers Conference 2024, University of Delaware, Aug 1-2, 2024

"*Concentration and limit of large random matrices with given margins.*" Summer school on Optimal Transport, Stochastic Analysis and Applications to Machine Learning, KAIST, June 3, 2024 [slides]

"*How to improve first-order optimization methods by using trust-region, block structure, geometry, and randomization.*" Deep Learning Seninar, KRAFTON AI, May 29, 2024 [slides]

"*Particle density in diffusion-limited annihilating systems*", Stochastic Analysis on Large Scale Interacting Systems, RIMS, Kyoto, Oct. 23, 2023 [slides]

"*Learning low-rank mesoscale structures in networks*", Ghent Methusalem Junior Seminar, Oct. 18, 2023

"*Stochastic Regularized Majorization-Minimization*", IFDS IDEAS Forum, Oct. 16, 2023

"*On the number of contingency tables and independence heuristic*" University of Hawaii at Manoa, Jul. 24, 2023

"*Scaling limit of soliton statistics of a multicolor box-ball system*", U Chicago Probability Seminar, Apr. 28, 2023 [slides]

"*Scaling limit of soliton statistics of a multicolor box-ball system*", Cornell Probability Seminar, Apr. 10, 2023

"Mesoscale reconstruction of images and networks using tensor decomposition", IPAM, Workshop IV: Multi-Modal Imaging with Deep Learning and Modeling, Nov. 28, 2022 [slides, YouTube]

"*Scaling limit of soliton statistics of a multicolor box-ball system*", CUNY Probability Seminar, Nov. 22, 2022

"Learning low-rank mesoscale structure of networks", Columbia Applied Probability Seminar, Nov. 16, 2022

"Scaling limit of soliton statistics of a multicolor box-ball system", CRM Workshop on box-ball systems from integrable systems and probabilistic perspectives, Montreal, Sep 19-23, 2022 [YouTube]

"Convergence and Complexity of Stochastic Regularized Majorization-Minimization", KIAS, Jun. 13, 2022 [slides]

"Matrix and Tensor Factorization Models: Applications, Algorithms, and Theory", KRAFTON, Jun. 10, 2022 [slides]

"Matrix and Tensor Factorization Models: Applications, Algorithms, and Theory", Optimization Seminar, SNU, Jun. 8, 2022

"Introduction to matrix and tensor factorization models and related stochastic nonconvex and constrained optimization algorithms", BIMAGS Seminar, KAIST, Jun. 2, 2022 [slides]

"Introduction to matrix and tensor factorization models and related stochastic nonconvex and constrained optimization algorithms", BIMAGS Seminar, KAIST, Jun. 2, 2022 [slides]

"Introduction to matrix and tensor factorization models and related stochastic nonconvex and constrained optimization algorithms", MINDS Seminar, POSTECH, May 31, 2022 [slides]

"Convergence and Complexity of Stochastic Block Majorization-Minimization", Statistics Seminar, UW-Madison, UCLA, Feb. 23, 2022 [slides]

"Convergence and Complexity of Block Coordinate Descent with Diminishing Radius and Proximal Regularization", Applied Math and Optimization Seminars, UCLA, Jan. 11, 2022

"Convergence and Complexity of Block Coordinate Descent with Diminishing Radius and Proximal Regularization", IFDS Ideas forum, UW-Madison, Oct. 29, 2021

"Online Dictionary Learning from Dependent Data Samples and Networks", SILO seminar, UW-Madison, Oct. 13, 2021

" Scaling limit of soliton statistics of a multicolor box-ball system ", Probability Seminar, UW-Madison, Sep. 16, 2021

"Online Nonnegative Tensor Factorization and CP Decomposition", SIAM Minisymposium on Low Rank Methods in Data Science and Machine Learning, May 21, 2021

"On the number of contingency tables and independent heuristic", AMS Special Session on Probability and Combinatorics, Mar. 21, 2021

"Online matrix factorization for Markovian data", NeurIPS worship on Optimization for Machine Learning, Dec. 11, 2020

"Online robust matrix factorization for dependent data streams", Applied math and data science seminar, HKUST, Mar. 25, 2020

"Stochastic optimization for dependent data streams and Network Dictionary Learning", UCLA applied mathematics colloquium, Nov. 10, 2020

"Learning parts of networks by motif sampling and online matrix factorization", Information Theory and Applications, SD, Feb 6, 2020

"Large deviations and one-sided scaling limit of randomized box-ball system", AMS Special Session on Random Matrices and Integrable Systems, I., JMM 2020, Jan 18, 2020

"Online matrix factorization for Markovian data", AMS Special Session on Iterative Methods for Large-Scale Data Analysis, JMM 2020, Jan 16, 2020

"Learning parts of networks by motif sampling and online matrix factorization", UCLA Applied Math Colloquium, Jan 8, 2020

"Online matrix factorization for Markovian data and applications to Network Dictionary Learning", Probability seminar, Seoul National University, Nov. 27, 2019

"Sampling random graph homomorphisms and applications to network data analysis", Austin - TAMU Probability and Related Fields, TAMU, Oct. 25, 2019

"Stability inequalities of some probabilistic network observables", TDA seminar, UCLA, Oct. 17, 2019

"Online nonnegative matrix factorization for Markovian data", Random matrix seminar", Random matrix seminar, UCLA, Oct. 9, 2019

"Phase transition in random contingency tables with non-uniform margins", Combinatorics Seminar, University of Michigan, Sep. 27, 2019

"Stable network observables via dynamic embedding of motifs", Probability seminar, CUNY, May. 7, 2019

"Phase transition in random contingency table with non-uniform margins", Probability seminar, OSU, Apr. 11, 2019

"Stable network observables and dynamic embedding of motifs into networks", TGDA Seminar, OSU, Apr. 9, 2019

"*Phase transition in random contingency table with asymmetric margins*" Probability Seminar, USC, Apr. 5, 2019

"*Synchronization of firefly cellular automata on various graphs*", Applied math seminar, University of Alberta, Mar 25, 2019

"Phase transition in random contingency table with asymmetric margins", Interacting Particle Systems Conference, IPAM, Mar. 9, 2019

"Stable network observables and dynamic embedding of motifs into networks", Probability Seminar, UCSD, Feb. 28, 2019

"Dynamic embedding of motifs into networks", Probability Seminar, UCI, Dec 11, 2018

"Phase transition in box-ball system and its spatial generalization", Integrable systems seminar, Tokyo University, June 19, 2018

"Double jump phase transition in soliton cellular automata", Southeastern Probability Conference, Duke University, May 14-15, 2018

"Double jump phase transition in soliton cellular automata", Probability Seminar, University of California, Los Angeles, April 19, 2018

"Double jump phase transition in soliton cellular automata", Probability Seminar, University of Pennsylvania, Mar 27, 2018

"Double jump phase transition in random soliton cellular automaton", Combinatorics seminar, University of Minnesota, March 2, 2018

"Double jump phase transition in random soliton cellular automaton", Combinatorics seminar, University of Michigan, Jan 26, 2018

"Global synchronization of pulse-coupled oscillators on trees", AMS Contributing papers on Applied Mathematics III, Joint Mathematics Meetings 2018, San Diego

"Limiting behavior of 3-color excitable media on arbitrary graphs", AMS Special Session on Emergent Phenomena in discrete models, Joint Mathematics Meetings 2018, San Diego

"Persistence of sums of correlated increments and clustering in cellular automata", AMS Special Session on Markov chains, Markov processes and applications, Joint Mathematics Meetings 2018, San Diego

"Phase transition in a random soliton cellular automaton" Combinatorics and Probability Seminar, OSU, April 12, 2017

"Discrete excitable media on graphs" Probability Seminar, Indiana University, Sep 12, 2016

"Synchronization of finite-state pulse-coupled oscillators and applications to distributed algorithms" 2016 Combinatorics Conference, KAIST, Jul 23, 2016

"Synchronization of finite-state pulse-coupled oscillators on various network topologies" Hayes Graduate Research Forum, OSU, Feb 26, 2016

"Synchronization of finite-state pulse-coupled oscillators on various graphs" Probability Seminar, Cornell University , Feb 22, 2016

"Synchronization of finite-state pulse-coupled oscillators on various graphs" Korea Institute of Advanced Studies, Jan 14, 2016

"Synchronization of finite-state pulse-coupled oscillators" HYKE seminar, Seoul National University, May 14, 2015

"Synchronization of finite-state pulse-coupled oscillators on various network topologies" Combinatorics and Probability seminar, OSU, Oct 1, 2015

Synchronization of finite-state pulse-coupled oscillators" Graduate Student Seminar, OSU, Sep 22, 2015

TEACHING

Course Proposal *Math 444: Graphs and Networks in Data Science* with Sebastien Roch (Fall 2023)

Course Description: Mathematical foundations of networks with an emphasis on their applications in modern data science, using tools from algorithmic graph theory and linear algebra. Topics include: basics of graph theory, network statistics, graph traversal algorithms and implementation, matrix methods, community detection, PageRank, simulation of random graph models.

Math 718: Randomized Linear Algebra and applications with Qin Li (Fall 2023)

Course Description: This course will provide the students a systematic study of these modern methods of randomized linear algebra solvers, presenting mathematical backgrounds, algorithms, and concrete applications. Core theoretical topics include randomized Kaczmarz and its generalization to stochastic gradient descent, randomized singular value decomposition, random sketching, matrix completion, and compressive sensing, and corresponding applications.

Lecture Notes Randomized Linear Algebra, Graduate Probability, Undergraduate Probability
Stochastic Processes, Mathematical Finance, Introduction to Statistics II
Graphs and Networks in Data Science

UW-Madison

Spring 2025: Math 444 (Graphs and Networks in Data Science)

Fall 2024: Math 718 (Randomized Linear Algebra)

Spring 2024: Math 734 (Probability Theory II)

Fall 2023: Math 444 (Graphs and Networks in Data Science)

Spring 2023: Math 535 (Mathematical Methods in Data Science)

Fall 2022: Math 733 (Probability Theory I)

Spring 2022: Math 431 (Introduction to Probability Theory)

Fall 2021: Math 631 (Stochastic Processes)

UCLA

Spring 2021: Math 156 (Machine Learning)

Winter 2021: Math 170S (Intro. to Probability and Statistics II)

Fall 2020: Math 170S (Intro. to Probability and Statistics II) — Course coordinator

Summer 2020 C: Math 170S (Intro. to Probability and Statistics II), Math 174E (Mathematical Finance)

Spring 2020: Math 170S (Intro. to Probability and Statistics II)

Winter 2020: Math 171 (Stochastic processes), Math 170S (Intro. to Probability and Statistics II)

Summer 2019: Math 170A (Probability theory), Math 170B (Probability theory), Math 174E (Mathematical Finance)

Spring 2019: Math 170B (Probability theory)

Winter 2019: Math 170A (Probability theory), Math 171 (Stochastic Processes)

Fall 2018: Math 170B (Probability theory)

OSU

Fall 2015: Math 2153 (Calculus 3) (Notes)

Spring 2014: Math 1131 (Calculus for business)

Fall 2014: Fall 2014: Math 1131 (Calculus for business)

Summer 2013: Summer 2013: Math 1152 (Calculus 2)

Spring 2013: Spring 2013: Math 1151 (Calculus 1)

Fall 2013: Math 1151 (Calculus 1)

GRADUATE AND UNDERGRADUATE AWARDS AND FELLOWSHIPS

The Ohio State University Presidential Fellowship (University research fellowship), Spring 2017 - Fall 2017

Special Graduate Associate (Departmental research fellowship), Fall 2016

Special Graduate Associate (Departmental research fellowship), Spring 2016

National Science & Technology Scholarship, 2008-2012