LIZHEN LIN

The University of Notre Dame
Department of Applied
and Computational Mathematics and Statistics
Notre Dame, Indiana, 46556.

Phone: (574) 631-0301
Email: lizhen.lin@nd.edu
Homepage: www.nd.edu/~llin4/
Lab page: www.optimizationlab.nd.edu/

EMPLOYMENT

Associate Professor (July 2019-): Department of Applied and Computational Mathematics and Statistics, The University of Notre Dame.

Huisking Foundation, Inc. Assistant Professor (August 2017-June 2019): Department of Applied and Computational Mathematics and Statistics, The University of Notre Dame.

Assistant Professor (July 2016- August 2017): Department of Applied and Computational Mathematics and Statistics, The University of Notre Dame.

Assistant Professor (August 2014-July 2016): Department of Statistics and Data Sciences, The University of Texas-Austin.

Postdoctoral Associate (June 2012-August 2014): Department of Statistical Science, Duke University.
Mentor: Prof. David Dunson, Arts and Sciences Distinguished Professor.

Member of Laboratory of Psychiatric Neuroengineering (2012-2014), Duke University Medical Center. Mentor: Prof. Kafui Dzirasa, MD Ph.D.

EDUCATION

Doctor of Philosophy (Ph.D.) in Mathematics.
Department of Mathematics, The University of Arizona (May 2012).
Thesis advisor: Prof. Rabi Bhattacharya.

HONORS/AWARDS

1. 2017 NSF Career award.
2. 2017 DARPA YFA (Young Faculty Award).

RESEARCH INTERESTS

Bayesian nonparametrics; Statistics on manifolds; Big data analysis; Geometry & Statistics; Network analysis; Shape constrained inference; Robust statistical inference; Bioassay and environmental risk assessment; Machine learning in neuroscience; Cancer research.

PUBLICATIONS

Books

1. Bhattacharya, R., **Lin, L.**, and Patrangenaru, V (2016). `A Course in Mathematical Statistics and Large Sample Theory`. Springer Series in Statistics.

Research Articles

*−graduate student; $^{+}$− postdoc;

2. Kolaczyk, E., **Lin, L.**, Rosenberg, S., Xu., J and Jackson, W. (2020). Averages of unlabeled networks: geometric characterization and asymptotic behavior. *Annals of Statistics,*, Vol. 48, No. 1, 514–538.

3. Lee, K.$^{+}$, and **Lin, L.** (2020). Bayesian bandwidth test and selection for high-dimensional banded precision matrices. *Bayesian Analysis*, accepted.

4. Lee, K^{+}., Lee, J. and **Lin, L.** (2019). Minimax posterior convergence rates and model selection consistency in high-dimensional DAG models based on sparse Cholesky factors. *Annals of Statistics 2019,* Vol. 47, No. 6, 3413–3437.

5. Niu, M.,Cheung, P., **Lin, L.**$^{\#}$, Dai, Z., Lawrence, N. and Dunson, D. B. (2019). Intrinsic Gaussian processes on complex constrained domains. *Journal of the Royal Statistical Society, Ser. B.,* **81**: 603-627.$^{\#}$-corresponding.

6. Bhattacharya, R. and **Lin, L.** (2019). Differential geometry for model independent analysis of images and other non-Euclidean data: recent developments. In: *Sidoravicius V. (eds) Sojourns in Probability Theory and Statistical Physics - II.* Springer Proceedings in Mathematics & Statistics, vol 299. Springer.

7. Chae, M.$^{+}$, **Lin, L** and Dunson, D.B. (2019) Bayesian sparse linear models with unknown symmetric errors. *Information and Inference.* vol 8 (3), 621–653.

8. **Lin, L.**, Niu, M., Pokman, C. and Dunson. D.B. (2019). Extrinsic Gaussian process models for regression and classification on manifolds. *Bayesian Analysis.* vol.14, 907–926. `Arxiv:1706.08757`

9. Li, C., **Lin, L.** and Dunson, D. B. (2019). On posterior consistency of tail index for Bayesian kernel mixture models. *Bernoulli*, Vol. 25, No. 3, 1999–2028.

10. Sarpavayeva, B.$^{+}$, Zhang, M.* and **Lin, L.** (2018). Communication efficient parallel algorithms for optimization on manifolds. *Neural Information Processing Systems 2018.*

11. Zhang, M.*, Lam, H. and **Lin, L.** (2018). Robust and scalable Bayesian model selection. *Computational Statistics & Data Analysis*, Vol. **127**, 229–247.

12. **Lin, L.**, Thomas, B.*, Zhu, H. and Dunson, D.B (2017). Extrinsic local regression on manifold-valued data. *Journal of the American Statistical Association-Theory and Methods.* **112**(519), 1261-1273.

13. Bhattacharya, R. and **Lin, L.** (2017). Omnibus CLTs for Fréchet means and nonparametric inference on non-Euclidean spaces. *Proceedings of American Mathematical Society.* Vol. **145**, 413-428.

14. Minsker, S., Srivastava, S., **Lin, L.** and Dunson, D.B. (2017). Robust and scalable Bayes via a median of subset posterior measure. *Journal of Machine Learning Research*, **18**(124):1–40.

15. Mukherjee, S. S., Sarkar, P., and **Lin, L.** (2017). On clustering network-valued data. *Neural Information Processing Systems 2017.*

16. **Lin, L.**, Rao, V., and Dunson, D.B (2017). Bayesian nonparametric inference on Stiefel manifold. *Statistics Sinica* **27**, 535–553.

17. Lazar, D. and **Lin, L.** (2017). Scale and curvature effects in principal geodesic analysis. *Journal of the Multivariate Analysis* **153**, 64–82.

18. Borg, J.S., **Lin, L.** et al. (2017) Rat intersubjective decisions are encoded by frequency-specific oscillatory contexts. *Brain and Behavior* **7**: e00710. DOI: 10.1002/brb3.710.

19. Hultman, R., Mague, S.D., Li, Q., Katz, B.M., Michel, N., **Lin, L.,** et.al (2016). Dysregulation of cortical-mediated slow evolving limbic dynamics drives stress-induced emotional pathology. *Neuron* **91**(2),439–452.

20. Rao, V., **Lin, L.**, and Dunson, D.B (2016). Data augmentation for models based on rejection sampling. *Biometrika* **103** (2): 319–335.

21. Li, D., Wang X., **Lin, L** and Dey, D.(2016). Flexible link functions in nonparametric binary regression with Gaussian process priors. *Biometrics* **72**, 707–719.

22. **Lin, L**, Piegorsch, W., and Bhattacharya, R. (2015). Nonparametric benchmark dose estimation with continuous dose-response data. *Scandinavian Journal of Statistics* **42**, 713–731.

23. **Lin, L.** and Dunson, D. B. (2014). Bayesian monotone regression using Gaussian process projection. *Biometrika*, **101** (2): 303–317.

24. Piegorsch, W., Xiong, H, Bhattacharya, R., and **Lin, L.** (2014). Benchmark dose analysis via nonparametric regression modeling. *Risk Analysis* **34**(1), 135–151.

25. Minsker, S., Srivastava, S., **Lin, L.**, and Dunson, D.B. (2014) Scalable and robust Bayesian inference via the median posterior. Journal of Machine Learning Research, W&CP.

26. Bhattacharya, R. and **Lin, L.** (2013). Recent progress in the nonparametric estimation of monotone curves -with applications to bioassay and environmental risk assessment. *Computational Statistics & Data Analysis*, **63**, 63–80.

27. Bhattacharya, R., Majumdar, M., and **Lin, L.** (2013). Problem of ruin and survival in economics: application of limit theorems in probability. *Sankhyā, Ser.B* **75**(2), 145–180

28. Piegorsch, W., Xiong, H., Bhattacharya, R., and **Lin, L.** (2012). Nonparametric estimation of benchmark doses in environmental risk assessment. *Environmetrics* **23** (8), 717–728.

29. Bhattacharya, R. and **Lin, L.** (2011). Nonparametric benchmark analysis in risk assessment: a comparative study by simulation and data analysis. *Sankhyā, Ser.B* **73**(1), 144-163.

30. Bhattacharya, R. and **Lin, L.** (2010). An adaptive nonparametric method in benchmark analysis for bioassay and environmental Studies. *Stat & Probab. Lett* **80**, 1947-1953.

Research Articles under review

31. **Lin, L.**, Lazar, D., Saparbayeva, B., and Dunson, D. B. (2020). Robust optimization and inference on manifolds. Submitted.

32. Hong, M, **Lin, L.** and Chen, Y. (2020). Asymptotically corrected person fit statistics for multidimensional constructs with simple structure and mixed item types. `PsyArXiv, 30 Apr.2020.` Submitted.

33. Josephs, N., **Lin, L.**, Rosenberg, S. and Kolaczyk, E. (2020). Bayesian classification, anomaly detection, and survival analysis using network inputs with application to the microbiome. `Arxiv:2004.04765`. Submitted.

34. Chen, L.*, Zhou, J. and **Lin, L.** (2020). Hypothesis testing for population of networks. `arXiv:1911.03783` Submitted.

35. Lee, K.$^+$, **Lin, L.**, and Dunson, D. (2020). Maximum pairwise Bayes factors for covariance structure testing. Submitted.

36. Jin, I., Jeon, M., Schweinberger, M. and **Lin, L.** (2020). Hierarchical network item response modeling for discovering differences between innovation and regular school systems in Korea. Submitted. `Arxiv:1810.07876`.

37. Paez., M., Amini, A. and **Lin, L.** (2020). Hierarchical stochastic block model for community detection in multiplex networks. Submitted.

38. Lee, K.$^+$, Chae, M.$^+$, and **Lin, L.** (2020). Bayesian high-dimensional semi-parametric inference beyond sub-Gaussian errors. Revision Submitted.

39. Thomas, B., **Lin, L.**, Lim, L., and Mukherjee, S (2020). Learning subspaces of different dimensions. Submitted. `Arxiv:1404.6841`.

40. **Lin, L.**, Thomas, B*, Piegorsch, W., Scott, J., and Cavarlho, C.(2020) A projection approach for multiple monotone regression. Submitted.

41. **Lin, L.**, Sarpabayeva, B., Zhang, M. and Dunson, D. (2019). Accelerated algorithms for convex and non-convex optimizations on manifolds. Submitted.

42. Zhao, Z., **Lin, L.**, and Li, C. (2019). Change point detection in dynamic networks via graphon estimation. Submitted.

43. Bao, D.$^{+}$, You, K.* and **Lin, L.** (2018). Network distance based Laplacian flow on graphs. Submitted. `Arxiv:1810.02906`.

44. Amini, A., Paez, M., and **Lin, L.** and Razaee, Z (2018). Exact slice sampler for HDPs. Submitted.

45. Zhang, J.* and **Lin, L.** (2018). Bounded regression with Gaussian process projection. Submitted. `Arxiv:1810.07876`

GRANTS

1. **Current**: PI for DMS: Geometric and Statistical Foundations for modeling cell shapes (Co-PI: Xu). $ 288,000. 07/2019 -06/2022.

2. **Current**: PI for DMS Career: Utilizing Geometry for Statistical Learning and Inference. $400,000. 07/01/2017-06/30/2022.

3. **Completed**: PI for Darpa: Topological, Geometric and Statistical Foundations for Dynamic Networks (Co-PI: Nguyen). $458,744. 07/2017-12/2019.

4. **Completed**: PI for NSF BigData 154633: BIGDATA:Collaborative Research:F:Big Data, it's not so big: exploiting low-dimensional geometry for learning and inference (PIs: Lim and Mukherjee). $1,000,000. 12/01/ 2015-11/30/ 2018.

5. **Completed**: Co-PI for ARO 201403161 (PI for Notre Dame subcontract): Mathematical Foundations for Analyzing Large Collections of Combinatorial-Data; $330,000. 07/01/2015-07/30/ 2018;

6. **Completed**: PI and organizer for NSF CBMS mathematical regional conference: Topological Data Analysis: Topology, Geometry and Statistics. $ 37,500. Summer 2016 at UT-Austin.

7. **Completed**: Big Data Information Initiative at Duke (iiD) Research Incubator Award Grant, $ 50,000, Duke University, 2013.

TEACHING EXPERIENCE

Courses Taught at Notre Dame

1. **Instructor:** ACMS 80870, *Topics in Statistics: Geometry & Statistics*, **Fall 2020**.

2. **Instructor:** ACMS 80870, *Topics in Statistics: High-dimensional Statistics*, **Fall 2019**.

3. **Instructor:** ACMS 60801-01, *Statistical Inference*, **Spring 2018, Spring 2019, Spring 2020**.
4. **Instructor:** ACMS 80870, *Topics in Statistics: Network Analysis*, **Fall 2018**.
5. **Instructor:** ACMS 30540-01, *Mathematical Statistics*, **Spring 2018, Spring 2019**.
6. **Instructor:** ACMS 30540-1, *Mathematical Statistics*, **Spring 2017**.
7. **Instructor:** ACMS 80870, *Topics in Statistics: Network Analysis*, **Fall 2016**.

Courses Taught at UT-Austin

8. **Instructor:** SDS 383D, *Statistical Modeling II (Bayesian Nonparametrics)*, **Spring 2016.**
9. **Instructor:** SDS 302, *Data Analysis for the Health Sciences,* **Fall 2015**
10. **Instructor:** SSI 2015, *Introduction to Mixed Models with Applications*, **May 26–29, 2015; May 23-26, 2016**
11. **Instructor:** SDS 302, *Data Analysis for the Health Sciences,* **Fall 2014**

Courses Taught at UA

12. **Instructor:** Math 263, *Intro: Stat+Biostatistics,* **Spring 2010**
13. **Instructor:** Math 120R, *Calculus Preparation,* **Fall 2009**
14. **Instructor:** Math 160, *Basic Statistics,* **Spring 2009**
15. **Instructor:** Math 110, *College Algebra,* **Fall 2007, Spring 2008, Summer 2008.**

STUDENTS AND POSTDOC SUPERVISED

1. **Postdocs**:
   Ilsang Onh (03/2020-).
   Bayan Saparbayeva (08/2017-07/2019, Co-supervise with with Dong Quan Nguyen). Now at University of Rochester.
   Kyoungjae Lee (01/2017-01/2019). Now at Inha University
   Dianbin Bao (08/2017-,07/2018, Co-supervise with with Dong Quan Nguyen)
   Minwoo Chae (08/2015-2017, Co-supervise with Stephen Walker). Now at Case Western Reserve University.
   Prithwish Bhaumik (2014-2016). Now at Quantifind.
2. **Ph.D students**:
   Yutzu Kuo (5th year);
   Luyi Shen (4th year);
   Kisung You (4th year, Co-supervise with Ick Hoon Jin);

Kevin Manley (3rd year).
Yihao Fang (2nd year, Co-supervise with Zhiliang Xu);

3. **Master students**:
   Notre Dame:
   Mohammad Rasool Izadi (May 2020)
   Max Hong (May 2019).
   Philip Pickering (June 2019).
   Zhou Kastner (graduated in August, 2017, now Data Scientist at Epic System).

   UT-Austin:
   Na Li (graduated in August, 2016. Senior Data Scientist at HomeAway-Expedia Group)
   Wanyi Wang (graduated in August, 2016. Statistician Texas Woman's University)
   Lingjia Zhang (graduated in May, 2016. Data Scientist at NRG Energy)
   Jiajun Chen (graduated in May, 2015. Software Engineer at Bloomberg LP)
   Shuling Malloy (graduated in May, 2015. Now at Texas education agency.)

4. **Undergraduate students**:
   Caroline Hill (Fall 2018);
   Ezster Anna Kish (now graduate student at UCSF).

RECENT TALKS/PRESENTATIONS

1. Seminar talk. School of Mathematical and Statistical Sciences, Arizona State University October 22, 2019.

2. Seminar talk. School of Mathematics and Computer Science, Wuhan University, China. July 26, 2019.

3. Colloquium talk. Department of Mathematics and Computer Science, University of Science, Ho Chi Minh City, Vietnam. July 8, 2019.

4. Invited talk. 2nd Midwest Statistical Machine Learning Colloquium. May 13, 2019.

5. Colloquium talk. Department of Statistics and Actuarial Science, The University of Iowa. May. 9, 2019.

6. Invited talk. Biostatistics seminar. Indiana University. Jan 11, 2019.

7. Invited talk. Applied and Computational Mathematics Seminar. Department of Mathematics, Georgia Institute of Technology. November 5, 2018.

8. Invited talk. Biostatistics seminar. Northwestern University. October 29, 2018.

9. Invited talk. Machine Learning Seminar series. Michigan State University. October 1, 2018.

10. Invited talk. Eastern Asia Chapter of ISBA, July 12-13, 2018.

11. Lecturer for Summer school on 'Bayesian methods for Machine Learning'. Department of Mathematics and Computer Science, University of Science, Ho Chi Minh City, Vietnam. July 5-6, 2018.
12. Invited talk. IMS Asia Pacific Rim Meeting (IMS-APRM), June 26-29, 2018.
13. Invited talk. TGDA@OSU (Topology, Geometry, and Data Analysis @ OSU) TRIPODS workshop on Theory and Foundations of TGDA. May 21-25, 2018.
14. Invited talk. AMS Special Session on Geometric Methods in Shape Analysis at The Ohio State University. Mar. 17-18, 2018.
15. Invited talk. Special invited session. EcoSta 2017, Hong Kong, June 15-17, 2017.
16. Colloquium talk. Department of Mathematics and Computer Science, University of Science, Ho Chi Minh City, Vietnam. May 31, 2017.
17. Invited talk. 'Geometry, Statistics and Data Analysis'. RTG Statistical Sciences Symposium 2017. May 19-20, 2017.
18. Invited talk. Quantitive psychology seminar, The University of Notre Dame. November 17, 2016.
19. Invited talk. The 2016 IISA International Conference on Statistics. August 18-21, 2016.
20. Invited talk. IMS-APRM conference, Section on Geometry and Statistics, Hong Kong, June 27-30, 2016.
21. Colloquium talk. Department of Mathematics, Zhejiang University. Mar. 18. 2016.
22. Colloquium talk. Department of Statistics and Biostatistics, Rutgers University. Feb 24. 2016.
23. Stochastic seminar. Department of Mathematics, The University of Utah. Feb. 9, 2016.
24. Colloquium talk. Department of Mathematics, The University of Utah. Feb. 8, 2016.
25. Colloquium talk. Department of Statistics, Yale University. Feb. 5, 2016.
26. Colloquium talk. Department of Statistics, Columbia University. Jan. 21, 2016.
27. Colloquium talk. Department of Statistics, The University of California at Los Angeles. Jan. 5, 2016.
28. Colloquium talk. Department of Mathematical Sciences, NJIT. Dec. 2, 2015.
29. Colloquium talk. Department of Applied and Computational Mathematics and Statistics. The University of Notre Dame. November 19, 2015.
30. Invited talk. 15th Annual Red Raider Mini-Symposium on Spatial Inference on Manifolds. Nov. 6-7, 2015.

31. Colloquium talk. Department of Statistics, Purdue University, Oct. 16. 2015.
32. Colloquium talk. College of Mathematics, Sichuan University, June 2nd. 2015.
33. Colloquium talk. Department of Statistics and Actuarial Science, The University of Iowa. Apr. 30, 2015.
34. Invited lectures on Parametric Bayesian models (with Mingyuan Zhou). Machine Learning Summer School. The University of Texas at Austin, Jan. 07-08, 2015.
35. Colloquium talk. Department of Mathematics and Statistics, Boston University. Nov. 14, 2014.
36. Short presentation. ICML, Beijing, Jun. 22-26, 2014.
37. Invited talk. "Computational Methods for Massive/Complex Data" workshop, Imperial College London, UK, Jun. 19-20, 2014
38. Colloquium talk. Department of Statistics, University of Toronto. Feb. 25, 2014.
39. Colloquium talk. The Fariborz Maseeh Department of Mathematics and Statistics, Portland State University. Feb. 21, 2014.
40. Colloquium talk. Department of Statistics, Rice University. Feb. 17, 2014.
41. Colloquium talk. Department of Statistics, University of Pittsburgh. Feb. 7, 2014.
42. Colloquium talk. Department of Mathematical and Statistical Sciences, University of Colorado-Denver. Feb. 3, 2014.
43. Colloquium talk. Department of Statistics, Indiana University. Jan. 31, 2014.
44. Colloquium talk. Department of Mathematics and Statistics, Boston University. Jan.27, 2014.
45. Colloquium talk. Department of Statistics and Data Sciences, University of Texas-Austin. Jan. 24, 2014.
46. Colloquium talk. Department of Statistics, University of South Carolina. Jan. 21, 2014.
47. Colloquium talk. Department of Mathematics, New Mexico State University. Dec. 3, 2013.
48. Colloquium talk. Statistics Graduate Interdisciplinary Program. University of Arizona. Mar. 7th, 2013.
49. Colloquium talk. Trinity University, Texas, Feb. 15th, 2011.

OUTREACH/CONFERENCES ORGANIZED

1. **PI and organizer for NSF CBMS regional conference:** Organized the 2016 NSF-CBMS regional conference on Topological Data Analysis: Topology, Geometry and Statistics, which attracted almost 100 participants including graduate students, junior researchers and others.

2. **Co-organizer for Sonia Kovalevsky High School Mathematics Day:** Organized Sonia Kovalevsky High School Mathematics Day with two other female graduate students which is aimed at promoting women in science and mathematics, March 2010, University of Arizona.

3. **U of A Integration Workshop:** Participated in the U of A Integration Workshop, 2008 and 2009 as a senior graduate student. Helped to integrate incoming graduate students into the graduate math program.

REFEREE & REVIEWERS EXPERIENCE

Annals of Statistics; Annals of Applied Statistics; Biometrika; Biostatistics; Computational Statistics & Data Analysis; Electronic Journal of Statistics; Mathematical Reviews; Mathematical Biosciences; JMLR; JSCS; JASA; Statistics & Computing; Technometrics; PeerJ;

PROFESSIONAL MEMBERSHIPS

AMS: American Mathematical Society

AWA: Association for Women in Mathematics

IMS: Institute of Mathematical Statistics