JINGBO LIU

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RESEARCH INTERESTS

Statistical inference (high-dimensional statistics, inference under systems constraints, graphical models); information theory (information-theoretic inequalities, converse techniques, multiuser, security); signal processing; applications of high-dimensional probability and functional analysis to information sciences.

EDUCATION

Dept. of Electrical Engineering, Princeton University

- Ph.D. in Electrical Engineering — Sept. 2014 - Dec. 2017
  Thesis: Information theory from a functional viewpoint
- M.A. in Electrical Engineering — Sept. 2012 - May 2014
  GPA: 4.00/4.00

Dept. of Electronic Engineering, Tsinghua University (THU)

- B.E. in Electronic Engineering — Sept. 2008 - July 2012
  GPA: 93.1/100 (major), 93.2/100 (overall)
  Ranking in the department: 3/209 (major), 2/209 (overall)

WORK/RESEARCH EXPERIENCE

Assistant Professor — Aug. 2020 - present
University of Illinois at Urbana-Champaign
Department of Statistics
Department of Electrical and Computer Engineering (Affiliate)

Norbert Wiener Postdoctoral Research Fellow — Sept. 2018 - Aug. 2020
Massachusetts Institute of Technology, MA, USA
Sponsor: Institute for Data, Systems, and Society

Postdoctoral Research Associate — Jan. 2018 - Aug. 2018
Princeton University, NJ, USA
Sponsors: Ramon van Handel, Sergio Verdú

Research Assistant — Sept. 2012 - Dec. 2017
Princeton University, NJ, USA
Department of Electrical Engineering
Advisors: Paul Cuff, Sergio Verdú

Research Student — Sept. 2010 - June 2011
National Laboratory for Information Science and Technology
Tsinghua University, Beijing, China
Supervisor: Yuantao Gu

Research Intern — July 2011 - Aug. 2011
Viterbi School of Engineering
University of Southern California, Los Angeles, CA, USA
Supervisor: Urbashi Mitra

HONORS

Thomas Cover dissertation award, IEEE Information Theory Society (1 thesis per year)	2018
Bede Liu best dissertation award, Princeton EE (top 2 in EE)	2018
TPC choice session at ISIT 2018 (top 4%)	June 2018
Norbert Wiener postdoctoral fellowship in statistics, MIT IDSS	2018
Wallace Memorial honorific fellowship, Princeton University (top 2 in EE)	2016 - 2017
Semi-plenary session at ISIT 2015 (top 4%)	July 2015
Anthony Ephremides Fellowship, Princeton University	May 2013
Best Undergraduate Thesis of Tsinghua University	July 2012
Academic Excellence Scholarship for THU Students	2009 - 2011

TEACHING EXPERIENCE

Instructor (UIUC): STAT 410/MATH 464: Statistics and Probability II
Instructor (UIUC): STAT 527 Advanced Regression Analysis
Instructor (UIUC): STAT 578 Topics in High Dimensional Statistics
Instructor (UIUC): STAT 430 Nonparametric Statistics
Assistant Instructor (Princeton): ELE 201 Information Signals; ELE 528 Information Theory.

PROFESSIONAL SERVICES

IEEE Information Theory Workshop (ITW), 2021 Technical Program Committee
IEEE International Symposium on information theory, 2021 Technical Program Committee
Reviewer for Mathematical Reviews/MathSciNet
International Conference on Artificial Intelligence and Statistics (AISTATS) reviewer 2021
Innovations in Theoretical Computer Science (ITCS) 2021 reviewer
ACM-SIAM Symposium on Discrete Algorithms (SODA), 2019, reviewer
Computational Learning Theory (COLT) 2019 reviewer
IEEE Symposium on Foundations of Computer Science (FOCS) 2019 reviewer
IEEE International Symposium on information theory, 2018 session chair
Conference on Information Sciences and Systems, 2018 TPC member
Annals of Statistics, reviewer
IEEE Transactions on Information Theory, reviewer
IEEE Transactions on Communications, reviewer
IEEE Transactions on Signal Processing, reviewer
Entropy Journal, reviewer
IEEE International Symposium on information theory, 2015 - 2019 reviewer
IEEE Information Theory Workshop, 2015, 2018, 2019 reviewer
IEEE Communication Magazine, reviewer

JOURNAL PAPERS

1. **J. Liu**, "Minorization via Mixed Volumes and Cover's Problem for General Channels," *Probability Theory and Related Fields*, Jan. 2022, arXiv:2012.1452.
2. **J. Liu**, "Dispersion Bound for the Wyner-Ahlswede-Korner Network via Reverse Hypercontractivity on Types," *IEEE Transactions on Information Theory*, Vol. 67, Issue: 2, pp. 869–885, Feb. 2021.
3. **J. Liu**, A. Ozgur, "Capacity Upper Bounds for the Relay Channel via Reverse Hypercontractivity," *IEEE Transactions on Information Theory*, Vol. 66, Issue: 9, pp. 5448–5455, Sept. 2020.
4. T. A. Courtade, **J. Liu**, "Euclidean Forward-Reverse Brascamp-Lieb Inequalities: Finiteness, Structure and Extremals," *Journal of Geometric Analysis*, Vol. 31, pp. 3300–3350, 2021.
5. **J. Liu**, R. van Handel, S. Verdú, "Second-order Converses via Reverse Hypercontractivity," *Mathematical Statistics and Learning*, Vol. 2, Issue 2, pp. 103–163, 2020-07-16.
6. **J. Liu**, M. Yassaee, S. Verdú, "Sharp Bounds for Mutual Covering," *IEEE Transactions on Information Theory*, Vol. 65, Issue 12, pp. 8067–8083, Dec. 2019.
7. **J. Liu**, T. A. Courtade, P. Cuff, S. Verdú, "Smoothing Brascamp-Lieb Inequalities and Strong Converses of Coding Theorems," *IEEE Transactions on Information Theory*, Vol. 66, Issue 2, pp. 704–721, Feb. 2020.

8. **J. Liu**, T. A. Courtade, P. Cuff, S. Verdú, "A Forward-Reverse Brascamp-Lieb Inequality: Entropic Duality and Gaussian Optimality," *Entropy*, Special Issue "Entropy and Information Inequalities", vol. 20, issue 6, May 2018 (earlier longer version available at *arXiv:1702.06260*).
9. **J. Liu**, P. Cuff, S. Verdú, "Common Randomness and Key Generation with Limited Interaction," *IEEE Transactions on Information Theory*, vol. 63, no. 11, pp. 7358–7381, Nov. 2017.
10. **J. Liu**, P. Cuff, S. Verdú, "E_γ-Resolvability," *IEEE Transactions on Information Theory*, Vol. 63, Issue 5, pp. 2629–2658, May 2017.
11. **J. Liu**, P. Cuff, S. Verdú, "Key Capacity for Product Sources with Application to Stationary Gaussian Processes," *IEEE Transactions on Information Theory*, Vol. 62, Issue 2, pp. 984–1005, Feb. 2016.
12. **J. Liu**, J. Jin, Y. Gu, "Robustness of Sparse Recovery via F-minimization: A Topological Viewpoint," *IEEE Transactions on Information Theory*, Vol. 61, Issue 7, pp. 3996–4014, July 2015.
13. F. Liu, **J. Liu**, "Anisotropic Diffusion for Image Denoising Based on Diffusion Tensors," *Journal of Visual Communication and Image Representation*, Volume 23, Issue 3, April 2012.

MANUSCRIPTS UNDER REVIEW

1. **J. Liu**, "A few interactions improve distributed nonparametric estimation, optimally," arXiv:2107.00211
2. **J. Liu**, "Stability of the Gaussian Stationary Point in the Han-Kobayashi Region for Z-Interference Channels," arXiv:2209.00163

CONFERENCE PAPERS

1. **J. Liu**, "Interaction Improves Two-Party Nonparametric Pointwise Density Estimation," in *Proceedings of the IEEE International Symposium on Information Theory (ISIT)*, 2022.
2. **J. Liu**, "Communication Complexity of Two-party Nonparametric Global Density Estimation," in *Proceedings of the 56th Annual Conference on Information Sciences and Systems (CISS)* 2022 (invited).
3. N Rajaraman, Y Han, L Yang, **J Liu**, J Jiao, K Ramchandran "On the Value of Interaction and Function Approximation in Imitation Learning," *Advances in Neural Information Processing Systems (NeurIPS)* 2021.
4. **J. Liu**, "Soft Minoration: Solution to Cover's Problem In the Original Discrete Memoryless Setting," *Proc. 2021 IEEE International Symposium on Information Theory (ISIT)*, 1648-1652.
5. P. Turner, **J. Liu**, and P. Rigollet, "A Statistical Perspective on Coreset Density Estimation," *AISTATS* 2021.
6. P. Turner, **J. Liu**, and P. Rigollet, "Efficient Interpolation of Density Estimators," to appear on *AISTATS* 2021.
7. **J. Liu**, P. Rigollet, "Power Analysis of Knockoff Filters for Correlated Designs," *Proc. Conference on Neural Information Processing Systems (Neurips)*, 2019
8. V. Jain, F. Koehler, **J. Liu**, E. Mossel, (alphabetical) "Accuracy-Memory Tradeoffs and Phase Transitions in Belief Propagation," *Proc. Computational Learning Theory (COLT)*, 2019.
9. U. Hadar, **J. Liu**, Y. Polyanskiy and O. Shayevitz, (alphabetical) "Communication complexity of estimating correlations," *Proc. 51st ACM Symp. on Theory of Comp. (STOC)*, 2019.
10. U. Hadar, **J. Liu**, Y. Polyanskiy, O. Shayevitz, "Error Exponents in Distributed Hypothesis Testing of Correlations," *Proc. 2019 IEEE Int. Symposium on Information Theory*, Paris, France, July 7-12, 2019.
11. **J. Liu**, A. Ozgur, "New Converses for the Relay Channel via Reverse Hypercontractivity," *Proc. 2019 IEEE Int. Symposium on Information Theory*, Paris, France, July 7-12, 2019.
12. **J. Liu**, "Dispersion Bound for the Wyner-Ahlswede-Körner Network via Reverse Hypercontractivity on Types," *Proc. 2018 IEEE Int. Symposium on Information Theory*, Vail, Colorado, USA, June 17–22, 2018 (**TPC choice session**, top 4%).
13. **J. Liu** and S. Verdú, "Rejection Sampling and Noncausal Sampling Under Moment Constraints," *Proc. 2018 IEEE Int. Symposium on Information Theory*, Vail, Colorado, USA, June 17–22, 2018.

14. **J. Liu**, P. Cuff and S. Verdú, " On α-Decodability and α-Likelihood Decoder," *Fifty-fifth Annual Allerton conference on Communication, Control, and Computing*, University of Illinois, Monticello, Illinois, Oct 4–6, 2017.
15. **J. Liu**, R. van Handel and S. Verdú, "Beyond the Blowing-Up Lemma: Sharp Converses via Reverse Hypercontractivity," *Proc. 2017 IEEE Int. Symposium on Information Theory*, Aachen, Germany, June 25–30, 2017.
16. M. Yassaee, **J. Liu** and S. Verdú, "One-shot Multivariate Covering Lemmas via Weighted Sum and Concentration Inequalities," *Proc. 2017 IEEE Int. Symposium on Information Theory*, Aachen, Germany, June 25–30, 2017.
17. **J. Liu**, T. A. Courtade, P. Cuff and S. Verdú, "Smoothing Brascamp-Lieb Inequalities and Strong Converses for CR Generation," *Proc. 2016 IEEE Int. Symposium on Information Theory*, Barcelona, Spain, July 10–15, 2016.
18. **J. Liu**, T. A. Courtade, P. Cuff and S. Verdú, "Brascamp-Lieb Inequality and Its Reverse: An Information Theoretic View," *Proc. 2016 IEEE Int. Symposium on Information Theory*, Barcelona, Spain, July 10–15, 2016.
19. **J. Liu**, P. Cuff and S. Verdú, "Key Generation with Limited Interaction," *Proc. 2016 IEEE Int. Symposium on Information Theory*, Barcelona, Spain, July 10–15, 2016.
20. **J. Liu**, P. Cuff and S. Verdú, "Secret Key Generation with One Communicator and a One-Shot Converse via Hypercontractivity," *Proc. 2015 IEEE Int. Symposium on Information Theory*, Hong-Kong, China, June 15–19, 2015.
21. **J. Liu**, P. Cuff, S. Verdú, "Secret Key Generation with One Communicator and a One-Shot Converse via Hypercontractivity," *Proc. 2015 IEEE Int. Symposium on Information Theory*, Hong-Kong, China, June 15–19, 2015.
22. **J. Liu**, P. Cuff, S. Verdú, "One-Shot Mutual Covering Lemma and Marton's Inner Bound with a Common Message," *Proc. 2015 IEEE Int. Symposium on Information Theory* (**Semi-Plenary Session**, top 4%), Hong-Kong, China, June 15–19, 2015.
23. **J. Liu**, P. Cuff, S. Verdú, "Resolvability in E_γ with Applications to Lossy Compression and Wiretap Channels," *Proc. 2015 IEEE Int. Symposium on Information Theory*, Hong-Kong, China, June 15–19, 2015.
24. **J. Liu**, P. Cuff, S. Verdú, "Key Capacity with Limited One-way Communication for Product Sources," *Proc. 2014 IEEE Int. Symposium on Information Theory*, Honolulu, Hawaii, June 30 -July 4, 2014.
25. **J. Liu**, E. Abbe, "Polynomial Complexity of Polar Codes for Non-binary Alphabets, Key Agreement and Slepian-Wolf Coding," *CISS* 2014 (**invited**), Princeton, NJ, USA.
26. **J. Liu**, J. Jin, Y. Gu, "Relation between Exact and Robust Recovery for F-minimization: A Topological Viewpoint," *Proc. 2013 IEEE Int. Symposium on Information Theory*, Istanbul, Turkey, July 7 -July 12, 2013.
27. **J. Liu**, J. Jin, Y. Gu, "Efficient Recovery of Block Sparse Signals via Zero-Point Attracting Projection," *ICASSP* 2012, Kyoto, Japan.

SELECTED TALKS

1. "Minoration via Mixed Volumes and Cover's Problem for General Channels," *Oberwolfach Workshop on New Mathematical Techniques in Information Theory*, Mathematisches Forschungsinstitut Oberwolfach, Germany, March 15, 2022.
2. "A Few Interactions Improve Distributed Nonparametric Estimation," *UIUC Statistics Seminar* Sept. 2021; *Berkeley BLISS Seminar* Sept. 2021; *Machine Learning Seminar*, University of Minnesota, Twin Cities, Feb. 2022.
3. "Gaussian Limited in Two Inference Problems," *Princeton EE Seminar*, Nov. 2019; *Berkeley BLISS Seminar* Dec. 2019.
4. "Recursive Inference on a Tree with Limited Memory: A Wasserstein CLT Approach," *International Workshop on "Inference and Graphical Models", Columbia Statistics* Oct. 2019.

5. "Accuracy-Memory Tradeoffs and Phase Transitions in Belief Propagation," *Computational Learning Theory (COLT)* 2019.
6. "Communication complexity of Estimating Correlations," *ACM Symp. on Theory of Comp. (STOC)* 2019.
7. "New Converses for the Relay Channel via Reverse Hypercontractivity," *Information Theory and Applications (ITA)* (invited) 2019.
8. "Reverse Hypercontractivity Beats Blowing-up Lemma for Information Theoretic Converses," *Stanford IT Forum* 2018; *Berkeley BLISS Seminar* 2018; *MIT Stochastics and Statistics Seminar* 2018.
9. "Dispersion Bound for the Wyner-Ahlswede-Körner Network via Reverse Hypercontractivity on Types," *IEEE Int. Symposium on Information Theory* (TPC choice) 2018.
10. "Functional Methods for Information Theoretic Converses," *CISS* (invited) 2018.
11. "A Duality between Covering and Sampling," *Information Theory and Applications (ITA)* (invited) 2018.
12. "One-Shot Mutual Covering Lemma and Marton's Inner Bound with a Common Message," *IEEE Int. Symposium on Information Theory* (Semi-Plenary) 2015.
13. "Polynomial Complexity of Polar Codes for Non-binary Alphabets, Key Agreement and Slepian-Wolf Coding," *CISS* (invited) 2014.