

# JINGBO LIU

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## RESEARCH INTERESTS

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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

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### 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.S. 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

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### Assistant Professor

University of Illinois at Urbana-Champaign  
Department of Statistics

Department of Electrical and Computer Engineering (Affiliate)

Aug. 2020 - present

### Postdoctoral Research Fellow

Massachusetts Institute of Technology, MA, USA  
Sponsor: Institute for Data, Systems, and Society

Sept. 2018 - Aug. 2020

### Postdoctoral Research Associate

Princeton University, NJ, USA  
Sponsors: Ramon van Handel, Sergio Verdú

Jan. 2018 - Aug. 2018

### Research Assistant

Princeton University, NJ, USA  
Department of Electrical Engineering  
Advisors: Paul Cuff, Sergio Verdú

Sept. 2012 - Dec. 2017

### Research Student

National Laboratory for Information Science and Technology  
Tsinghua University, Beijing, China  
Supervisor: Yuantao Gu

Sept. 2010 - June 2011

### Research Intern

Viterbi School of Engineering  
University of Southern California, Los Angeles, CA, USA  
Supervisor: Urbashi Mitra

July 2011 - Aug. 2011

## HONORS

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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

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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

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IEEE Information Theory Workshop (ITW), 2021 Technical Program Committee  
IEEE International Symposium on information theory, 2021 Technical Program Committee  
International Conference on Artificial Intelligence and Statistics (AISTATS) reviewer 2021  
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  
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

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1. **J. Liu**, “Dispersion Bound for the Wyner-Ahlsvede-Korner Network via Reverse Hypercontractivity on Types,” to appear on *IEEE Transactions on Information Theory* (arXiv: 1805.03367)
2. **J. Liu**, A. Ozgur, “Capacity Upper Bounds for the Relay Channel via Reverse Hypercontractivity,” to appear on *IEEE Transactions on Information Theory*. (arXiv: 1811.11303)
3. T. A. Courtade, **J. Liu**, “Euclidean Forward-Reverse Brascamp-Lieb Inequalities: Finiteness, Structure and Extremals,” to appear on *Journal of Geometric Analysis*. (arXiv: 1907.12723)
4. **J. Liu**, R. van Handel, S. Verdú, “Second-order Converses via Reverse Hypercontractivity,” to appear on *Mathematical Statistics and Learning*. (arXiv: 1812.10129)
5. **J. Liu**, M. Yassaee, S. Verdú, “Sharp Bounds for Mutual Covering,” to appear on *IEEE Transactions on Information Theory*.
6. **J. Liu**, T. A. Courtade, P. Cuff, S. Verdú, “Smoothing Brascamp-Lieb Inequalities and Strong Converses of Coding Theorems,” to appear on *IEEE Transactions on Information Theory*.
7. **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*).
8. **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.
9. **J. Liu**, P. Cuff, S. Verdú, “ $E_\gamma$ -Resolvability,” *IEEE Transactions on Information Theory*, vol. 63, no. 5, pp. 2629–2658, May 2017.

10. **J. Liu**, P. Cuff, S. Verdú, “Key Capacity for Product Sources with Application to Stationary Gaussian Processes,” *IEEE Transactions on Information Theory*, vol. 62, no. 2, pp. 984–1005, Feb. 2016.
11. **J. Liu**, J. Jin, Y. Gu, “Robustness of Sparse Recovery via  $F$ -minimization: A Topological Viewpoint,” *IEEE Transactions on Information Theory*, vol. 61, no. 7, pp. 3996–4014, July 2015.
12. 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.

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## MANUSCRIPTS UNDER REVIEW

1. **J. Liu**, “Minorization via Mixed Volumes and Cover’s Problem for General Channels,” arXiv:2012.14521

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## CONFERENCE PAPERS

1. P. Turner, **J. Liu**, and P. Rigollet, “A Statistical Perspective on Coreset Density Estimation,” to appear on *AISTATS* 2021.
2. P. Turner, **J. Liu**, and P. Rigollet, “Efficient Interpolation of Density Estimators,” to appear on *AISTATS* 2021.
3. **J. Liu**, P. Rigollet, “Power Analysis of Knockoff Filters for Correlated Designs,” *Proc. Conference on Neural Information Processing Systems (Neurips)*, 2019
4. V. Jain, F. Koehler, **J. Liu**, E. Mossel, (alphabetical) “Accuracy-Memory Tradeoffs and Phase Transitions in Belief Propagation,” *Proc. Computational Learning Theory (COLT)*, 2019.
5. 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.
6. 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.
7. **J. Liu**, A. Ozgur, “New Converse for the Relay Channel via Reverse Hypercontractivity,” *Proc. 2019 IEEE Int. Symposium on Information Theory*, Paris, France, July 7-12, 2019.
8. **J. Liu**, “Dispersion Bound for the Wyner-Ahlsvede-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%).
9. **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.
10. **J. Liu**, P. Cuff and S. Verdú, “On  $\alpha$ -Decodability and  $\alpha$ -Likelihood Decoder,” *Fifty-fifth Annual Allerton conference on Communication, Control, and Computing*, University of Illinois, Monticello, Illinois, Oct 4–6, 2017.
11. **J. Liu**, R. van Handel and S. Verdú, “Beyond the Blowing-Up Lemma: Sharp Converse via Reverse Hypercontractivity,” *Proc. 2017 IEEE Int. Symposium on Information Theory*, Aachen, Germany, June 25–30, 2017.
12. 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.
13. **J. Liu**, T. A. Courtade, P. Cuff and S. Verdú, “Smoothing Brascamp-Lieb Inequalities and Strong Converse for CR Generation,” *Proc. 2016 IEEE Int. Symposium on Information Theory*, Barcelona, Spain, July 10–15, 2016.
14. **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.
15. **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.
16. **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.

17. **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.
18. **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.
19. **J. Liu**, P. Cuff, S. Verdú, “Resolvability in  $E_\gamma$  with Applications to Lossy Compression and Wiretap Channels,” *Proc. 2015 IEEE Int. Symposium on Information Theory*, Hong-Kong, China, June 15–19, 2015.
20. **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.
21. **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.
22. **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.
23. **J. Liu**, J. Jin, Y. Gu, “Efficient Recovery of Block Sparse Signals via Zero-Point Attracting Projection,” *ICASSP 2012*, Kyoto, Japan.

## SELECTED TALKS

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1. “Gaussian Limited in Two Inference Problems,” *Princeton EE Seminar*, Nov. 2019; *Berkeley BLISS Seminar* Dec. 2019 (scheduled).
2. “Recursive Inference on a Tree with Limited Memory: A Wasserstein CLT Approach,” *International Workshop on “Inference and Graphical Models”*, *Columbia Statistics* Oct. 2019.
3. “Accuracy-Memory Tradeoffs and Phase Transitions in Belief Propagation,” *Computational Learning Theory (COLT)* 2019.
4. “Communication complexity of Estimating Correlations,” *ACM Symp. on Theory of Comp. (STOC)* 2019.
5. “New Converses for the Relay Channel via Reverse Hypercontractivity,” *Information Theory and Applications (ITA)* (invited) 2019.
6. “Reverse Hypercontractivity Beats Blowing-up Lemma for Information Theoretic Converses,” *Stanford IT Forum* 2018; *Berkeley BLISS Seminar* 2018; *MIT Stochastics and Statistics Seminar* 2018.
7. “Dispersion Bound for the Wyner-Ahlsvede-Körner Network via Reverse Hypercontractivity on Types,” *IEEE Int. Symposium on Information Theory* (TPC choice) 2018.
8. “Functional Methods for Information Theoretic Converses,” *CISS* (invited) 2018.
9. “A Duality between Covering and Sampling,” *Information Theory and Applications (ITA)* (invited) 2018.
10. “One-Shot Mutual Covering Lemma and Marton’s Inner Bound with a Common Message,” *IEEE Int. Symposium on Information Theory* (Semi-Plenary) 2015.
11. “Polynomial Complexity of Polar Codes for Non-binary Alphabets, Key Agreement and Slepian-Wolf Coding,” *CISS* (invited) 2014.