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Education

The Hong Kong University of Science and Technology, Hong Kong
Ph.D. in Electronic and Computer Engineering, 08/2011-08/2015

- Dissertation Title: Scalable Sparse Optimization in Dense Cloud-RAN
- Advisor: Prof. Khaled B. Letaief

Tsinghua University, Beijing, China
B.E. in Electronic Engineering

- Dept. of Electronic Engineering, 07/2009-07/2011
- Dept. of Mathematical Sciences, 08/2007-07/2009
- Thesis Title: Numerical Algorithms for the Meijer's G-function with Applications in Wireless Networks
- Advisor: Prof. Wei Chen

Academic Positions

- **Assistant Professor**, School of Information Science and Technology, ShanghaiTech University, Shanghai, China, Sept. 2015-Present.
- **Visiting Research Scholar**, Department of Electrical Engineering and Computer Sciences, University of California, Berkeley, Host: Prof. Martin J. Wainwright, Oct. 2016-Feb. 2017.

Academic Honors and Awards

- The 2016 Marconi Prize Paper Award in Wireless Communications (best paper in prior 3 years in the IEEE Transactions on Wireless Communications).
- The 2016 IEEE Signal Processing Society Young Author Best Paper Award.
- The 2016 Excellence in Research Award, ShanghaiTech University.
- Exemplary Reviewer of IEEE Wireless Communications Letters, 2016.

Teaching Experience

- Convex Optimization, ShanghaiTech University, Spring 2016, Spring 2017, Spring 2018.
- Optimization and Machine Learning, ShanghaiTech University, Spring 2017, Spring 2018.

Research Grants

- **Start-up Research Fund (No. F-0203-15-009)**, PI/Project Manager, ShanghaiTech University, RMB \$ 2,000,000, 2015-2018.
- **Shanghai Sailing Program (No. 16YF1407700)**, PI/Project Manager, RMB\$ 200,000, “Large-Scale Optimization for Dense Fog Computing Enabled Radio Access Networks”, 2016-2019.
- **NSFC (No. 61601290)**, PI/Project Manager, RMB\$ 220,000, “Mobile Edge Computing in Tactile Internet”, 2017-2019.

Research Interests

My research focuses on optimization, statistics, learning for data science, network science, and information science, including:

- High-dimensional data analysis
- Intelligent IoT and mobile AI
- Deep and machine learning
- Mathematical optimization
- High-dimensional statistics

Publications

Book Chapters

1. **Y. Shi, K. Yang**, and Y. Yang, “Generalized Low-Rank Optimization for Ultra-Dense Fog-RANs,” submitted to *Cloud Ultra Dense Networks: Principles and Technologies*, Cambridge University Press, 2019.
2. **Y. Shi**, J. Zhang, K. B. Letaief, B. Bai, and W. Chen, “Large-Scale Convex Optimization For C-RANs,” in *Cloud Radio Access Networks: Principles, Technologies, and Applications*, Cambridge University Press, 2017.

Journal Articles

1. **H. Choi**, H. Lee, Y. Shen, and **Y. Shi**, “Comparing large-scale graphs based on quantum probability theory,” submitted to *Applied Mathematics and Computation*.
2. **T. Jiang, Y. Shi**, J. Zhang, and K. B. Letaief, “Joint activity detection and channel estimation for IoT networks: phase transition and computation-estimation tradeoff,” submitted to *IEEE Internet of Things J.*
3. **K. Yang, Y. Shi**, and Z. Ding, “Data shuffling in wireless distributed computing via low-rank optimization,” submitted to *IEEE Trans. Wireless Commun.*
4. **H. Choi**, S. Kim, and **Y. Shi**, “Geometric mean of partial positive definite matrices with missing entries,” submitted to *Linear and Multilinear Algebra*.
5. **J. Dong**, K. Yang, and **Y. Shi**, “Ranking from crowdsourced pairwise comparisons via smoothed Riemannian optimization,” submitted to *Signal Process.*

6. **K. Yang**, **Y. Shi**, and Z. Ding, “Generalized low-rank optimization for topological cooperation in ultra-dense networks,” submitted to *IEEE Trans. Wireless Commun.* under second round revision.
7. **J. Dong**, K. Yang, and **Y. Shi**, “Blind demixing for low-latency communication,” submitted to *IEEE Trans. Wireless Commun.*, under second round version.
8. **J. Dong** and **Y. Shi**, “Nonconvex demixing from bilinear measurements,” *IEEE Trans. Signal Process.*, under second round revision.
9. **Y. Shi**, J. Zhang, W. Chen, and K. B. Letaief, “Generalized sparse and low-rank optimization for ultra-dense networks,” *IEEE Commun. Mag.*, vol. 56, no. 6, Jun. 2018.
10. X. Liu, **Y. Shi**, J. Zhang, and K. B. Letaief, “Massive CSI acquisition for dense Cloud-RANs with spatial-temporal dynamics,” *IEEE Trans. Wireless Commun.*, vol. 17, no. 4, pp. 2557-2570, Apr. 2018.
11. **Y. Shi**, J. Zhang, W. Chen, and K. B. Letaief, “Enhanced group sparse beamforming for dense green Cloud-RAN: A random matrix approach,” *IEEE Trans. Wireless Commun.*, vol. 17, no. 4, pp. 2511-2524, Apr. 2018.
12. X. Peng, **Y. Shi**, J. Zhang, and K. B. Letaief, “Layered group sparse beamforming for cache-enabled wireless networks,” *IEEE Trans. Commun.*, vol. 65, no. 12, pp. 5589-5603, Nov. 2017.
13. **Y. Shi**, B. Mishra, and W. Chen, “Topological interference management with user admission control via Riemannian optimization,” *IEEE Trans. Wireless Commun.*, vol. 16, no. 11, Nov. 2017.
14. **Y. Shi**, J. Zhang, and K. B. Letaief, “Low-rank matrix completion for topological interference management by Riemannian pursuit,” *IEEE Trans. Wireless Commun.*, vol. 15, no. 7, Jul. 2016.
15. **Y. Shi**, J. Cheng, J. Zhang, B. Bai, W. Chen and K. B. Letaief, “Smoothed L_p -minimization for green Cloud-RAN with user admission control,” *IEEE J. Select. Areas Commun.*, vol. 34, no. 4, Apr. 2016.
16. **Y. Shi**, J. Zhang, B. O’Donoghue, and K. B. Letaief, “Large-scale convex optimization for dense wireless cooperative networks,” *IEEE Trans. Signal Process.*, vol. 63, no. 18, pp. 4729-4743, Sept. 2015. (**The 2016 IEEE Signal Processing Society Young Author Best Paper Award**)
17. **Y. Shi**, J. Zhang, and K. B. Letaief, “Robust group sparse beamforming for multicast green Cloud-RAN with imperfect CSI,” *IEEE Trans. Signal Process.*, vol. 63, no. 17, pp. 4647-4659, Sept. 2015.
18. **Y. Shi**, J. Zhang, K. B. Letaief, B. Bai and W. Chen, “Large-scale convex optimization for ultra-dense Cloud-RAN,” *IEEE Wireless Commun. Mag.*, vol. 22, no. 3, pp. 84-91, Jun. 2015.
19. **Y. Shi**, J. Zhang, and K. B. Letaief, “Optimal stochastic coordinated beamforming for wireless cooperative networks with CSI uncertainty,” *IEEE Trans. Signal Process.*, vol. 63., no. 4, pp. 960-973, Feb. 2015.
20. **Y. Shi**, J. Zhang, and K. B. Letaief, “Group sparse beamforming for green Cloud-RAN,” *IEEE Trans. Wireless Commun.*, vol. 13, no. 5, pp. 2809-2823, May 2014. (**The 2016 Marconi Prize Paper Award**) (**ESI Highly Cited Paper**)

Conference Papers

1. **Y. Shen**, **Y. Shi**, J. Zhang, and K. B. Letaief, “Scalable network adaption for green Cloud-RANs: An imitation learning approach,” submitted to *Proc. IEEE Global Conf. Signal and Inf. Process. (GlobalSIP)*, Anaheim, CA, Nov. 2018.

2. **H. Choi**, X. Song, and **Y. Shi**, “Randomized method for estimating the von Neumann entropy of large-scale density matrices,” submitted to *Proc. IEEE Global Conf. Signal and Inf. Process. (GlobalSIP)*, Anaheim, CA, Nov. 2018.
3. **T. Jiang** and **Y. Shi**, “Sparse and low-rank optimization for pliable index coding,” submitted to *Proc. IEEE Global Conf. Signal and Inf. Process. (GlobalSIP)*, Anaheim, CA, Nov. 2018.
4. **T. Jiang** and **Y. Shi**, “Phase transitions of massive device connectivity via convex geometry,” in *Proc. IEEE Veh. Technol. Conf. (VTC)*, Chicago, USA, Aug. 2018.
5. **Q. Wu**, F. Zhang, H. Wang, and **Y. Shi**, “Generalized low-rank matrix completion via nonconvex Schatten p -norm minimization,” in *Proc. IEEE Veh. Technol. Conf. (VTC)*, Chicago, USA, Aug. 2018.
6. **F. Zhang**, Q. Wu, H. Wang, and **Y. Shi**, “ L_2 -Box optimization for green Cloud-RAN via network adaptation,” in *Proc. IEEE Veh. Technol. Conf. (VTC)*, Chicago, USA, Aug. 2018.
7. **F. Zhang**, Q. Wu, H. Wang, and **Y. Shi**, “Topological interference alignment via generalized low-rank optimization with sequential convex approximations,” in *Proc. IEEE Int. Workshop Signal Process. Adv. Wireless Commun. (SPAWC)*, Kalamata, Greece, Jun. 2018.
8. **J. Dong**, and **Y. Shi**, “Nonconvex demixing from bilinear measurements,” in *Proc. IEEE Int. Sump. Inform. Theory (ISIT)*, Colorado, USA, Jun. 2018.
9. **X. Song**, H. Choi, and **Y. Shi**, “Permuted linear model for header-free communication via symmetric polynomials,” in *Proc. IEEE Int. Symp. Inform. Theory (ISIT)*, Colorado, USA, Jun. 2018.
10. **H. Choi**, Y. Shen, and **Y. Shi**, “Comparing massive networks via moment matrices,” in *Proc. IEEE Int. Symp. Inform. Theory (ISIT)*, Colorado, USA, Jun. 2018.
11. **K. Yang**, **Y. Shi**, and Z. Ding, “Low-rank optimization for data shuffling in wireless distributed computing,” in *Proc. IEEE Int. Conf. Acoust. Speech Signal Process. (ICASSP)*, Alberta, Canada, Apr. 2018.
12. **J. Dong**, K. Yang, and **Y. Shi**, “Blind demixing for low-latency communication,” in *Proc. IEEE Wireless Commun. Networking Conf. (WCNC)*, Barcelona, Spain, Apr. 2018.
13. **J. Dong**, K. Yang, and **Y. Shi**, “Ranking from crowdsourced pairwise comparisons via smoothed matrix manifold optimization,” in *ICDM Workshops on Data-driven Discovery of Models (D3M)*, New Orleans, Louisiana, USA, Nov. 2017.
14. **K. Yang**, **Y. Shi**, and Z. Ding, “Generalized matrix completion for low complexity transceiver processing in cache-aided Fog-RAN via the Burer-Monteiro approach,” in *Proc. IEEE Global Conf. Signal and Inf. Process. (GlobalSIP)*, Montreal, Canada, Nov. 2017.
15. **Y. Shi**, B. Mishra, X. Liu, and W. Chen, “A sparse and low-rank optimization framework for network topology control in dense Fog-RAN,” in *Proc. IEEE Veh. Technol. Conf. (VTC)*, Sydney, Australia, Jun. 2017. (Invited Paper)
16. X. Liu, **Y. Shi**, J. Zhang, and K. B. Letaief, “Massive CSI acquisition in dense Cloud-RAN with spatial and temporal prior information,” in *Proc. IEEE Int. Conf. Commun. (ICC)*, Paris, France, May 2017.
17. **Y. Shi** and B. Mishra, “Sparse and low-rank decomposition for big data systems via smoothed Riemannian optimization,” in *9th NIPS workshop on optimization for machine learning (OPT2016)*, Barcelona, Spain, Dec. 2016.

18. Y. Su, **Y. Shi**, B. Bai, W. Chen, J. Zhang, K. B. Letaief, and S. Zhou, "Optimal stochastic power control with compressive CSI acquisition for Cloud-RAN," in *Proc. IEEE Global Conf. Signal and Inf. Process. (GlobalSIP)*, Washington, DC, Dec. 2016.
19. **K. Yang**, **Y. Shi**, J. Zhang, Z. Ding and K. B. Letaief, "A low-rank approach for interference management in dense wireless networks," in *Proc. IEEE Global Conf. Signal and Inf. Process. (GlobalSIP)*, Washington, DC, Dec. 2016.
20. **K. Yang**, **Y. Shi**, and Z. Ding, "Low-rank matrix completion for mobile edge caching in Fog-RAN via Riemannian optimization," in *Proc. IEEE Global Commun. Conf. (Globecom)*, Washington, DC, Dec. 2016.
21. **Y. Shi**, J. Zhang, and K. B. Letaief, "Statistical group sparse beamforming for green Cloud-RAN via large system analysis," in *Proc. IEEE Int. Symp. Inform. Theory (ISIT)*, Barcelona, Spain, Jul. 2016.
22. J. Cheng, **Y. Shi**, B. Bai, and W. Chen, "Computation offloading in Cloud-RAN based mobile cloud computing system," in *Proc. IEEE Int. Conf. Commun. (ICC)*, Kuala Lumpur, Malaysia, May 2016.
23. **Y. Shi**, J. Zhang, and K. B. Letaief, "Low-rank matrix completion via Riemannian pursuit for topological interference management," in *Proc. IEEE Int. Symp. Inform. Theory (ISIT)*, Hong Kong, Jun. 2015.
24. J. Cheng, **Y. Shi**, B. Bai, W. Chen, J. Zhang, and K. B. Letaief, "Group sparse beamforming for multicast green Cloud-RAN via parallel semidefinite programming," in *Proc. IEEE Int. Conf. Commun. (ICC)*, London, UK, Jun. 2015.
25. **Y. Shi**, J. Zhang, and K. B. Letaief, "Scalable coordinated beamforming for dense wireless cooperative networks," in *Proc. IEEE Global Commun. Conf. (Globecom)*, Austin, TX, Dec. 2014.
26. **Y. Shi**, J. Zhang, and K. B. Letaief, "CSI overhead reduction with stochastic beamforming for cloud radio access networks," in *Proc. IEEE Int. Conf. Commun. (ICC)*, Sydney, Australia, Jun. 2014.
27. **Y. Shi**, J. Zhang, and K. B. Letaief, "Group sparse beamforming for green cloud radio access networks," in *Proc. IEEE Global Commun. Conf. (Globecom)*, Atlanta, GA, Dec. 2013.
28. **Y. Shi**, J. Zhang, and K. B. Letaief, "Coordinated relay beamforming for amplify-and-forward two-hop interference networks," in *Proc. IEEE Global Commun. Conf. (Globecom)*, Anaheim, CA, Dec. 2012.

Talks and Presentations

Tutorials

1. "Sparse and low-rank optimization for dense wireless networks: models, algorithms and theory", IEEE Global Communications Conference (GLOBECOM), Singapore, Dec. 2017.
2. "Generalized sparse and low-rank optimization for ultra-dense networks: models, algorithms and theory", IEEE/CIC International Conference on Communications in China, Beijing, Aug. 2018.

Invited Talks

1. "Nonconvex demixing from bilinear measurements", a) University of Electronic Science and Technology of China, b) Southern University of Science and Technology, c) Shanghai University, Jul. 2018.
2. "Geometry and statistics in high-dimensional structured optimization", International Workshop on Big Data and Optimization, Sungkyunkwan University, Suwon, Korea, Dec. 2017.

3. “The power of sparse and low-rank optimization paradigms for network densification”, Shanghai Jiao Tong University, Aug. 2016.
4. “Scalable sparse optimization in dense wireless cooperative networks”, School of Information Science and Technology, ShanghaiTech University, Jul. 2015.

Technical Backgrounds

Mathematics

Mathematical Analysis	Advanced Algebra and Geometry	Stochastic Processes
Complex Analysis	Advanced Probability Theory	Matrix Analysis
Functional Analysis	Advanced Mathematical Statistics	Random Matrix Theory

Optimization

Convex Optimization	Large-Scale Optimization	Riemannian Optimization
Convex Analysis	Integral Geometry	Differential Geometry

Applied Mathematics and Engineering

Information Theory	Machine Learning
Communication Theory	Estimation Theory

Research Supervision and Advising

Ph.D. Students

- Kai Yang, Topic: Sparse and low-rank optimization for dense wireless networks.

Master Students

- Yukan Fang, Topic: Deep reinforcement learning for mobile edge computing.
- Gao Yin, Topic: Randomized algorithms for computational dense wireless networks.
- Jialin Dong, Topic: Algorithmic crowdsourcing systems.
- Tao Jiang, Topic: High-dimensional structured estimation for massive IoT systems.

Postdoctoral Fellows

- Hayoung Choi, Dec. 2016-Present, Ph.D. in Mathematics at University of Wyoming, USA.

Professional Activities

Technical Program Committee

- IEEE Global Communications Conference (GLOBECOM), 2018.
- IEEE Vehicular Technology Conference (VTC), 2016-Spring.
- IEEE/CIC International Conference on Communications in China (ICCC), 2016, 2018.

Reviewing

- Journal Reviewing: *IEEE Journal on Selected Areas in Communications*, *IEEE Journal of Selected Topics in Signal Processing*, *IEEE Transaction on Wireless Communications*, *IEEE Transaction on Communications*, *IEEE Transactions on Mobile Computing*, *IEEE Transactions on Vehicular Technology*, *IEEE Communication Magazine*, *IEEE Wireless Communication Magazine*, *IEEE Communications Letters*, *IEEE Wireless Communications Letters*.
- Conference Reviewing: NIPS, ICML, ISIT, Globecom, ICC, VTC.

Membership

- Member of Institute of Electrical and Electronics Engineers (IEEE).

Computer Skills

Matlab, C, C++, Python, Mathematica.

Outside Interests

Cooking, hiking, running, cycling, and basketball.

Academic References

- Khaled B. Letaief (Chair Professor, ECE, HKUST, email: eekhaled@ust.hk)
- Martin J. Wainwright (Professor, Statistics and EECS, UC Berkeley, email: wainwrig@berkeley.edu)
- Zhi Ding (Professor, ECE, UC Davis, email: zding@ucdavis.edu)
- Wei Chen (Professor, EE, Tsinghua University, email: wchen@tsinghua.edu.cn)

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