Yuanming Shi

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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.
- Optimization and Machine Learning, ShanghaiTech University, Spring 2017.

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 mathematics, computation, and communication for network science, data science and deep learning, including:

- Intelligent IoT and smart city
- Computational big data analytics
- Dense 5G communication Networks
- Convex and nonconvex optimization
- Deep machine learning and mobile edge AI

Publications

Book Chapters

1. **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. **Y. Shi**, J. Zhang, W. Chen, and K. B. Letaief, "Generalized sparse and low-rank optimization for ultra-dense networks," submitted to *IEEE Commun. Mag.*, May 2017.
2. J. Dong, K. Yang, **Y. Shi**, and W. Chen, "Ranking from crowdsourced pairwise comparisons via smoothed Riemannian optimization," submitted to *IEEE Trans. Signal Process.*, May 2017.
3. X. Peng, **Y. Shi**, J. Zhang, and K. B. Letaief, "Layered group sparse beamforming for cache-enabled wireless networks," submitted to *IEEE Trans. Commun.*, under revision.
4. X. Liu, **Y. Shi**, J. Zhang, and K. B. Letaief, "Massive CSI acquisition for dense Cloud-RANs with spatial-temporal dynamics," submitted to *IEEE Trans. Wireless Commun.*, Mar. 2017.
5. **Y. Shi**, J. Zhang, W. Chen, and K. B. Letaief, "Enhanced group sparse beamforming for dense green Cloud-RAN: A random matrix approach," submitted to *IEEE Trans. Wireless Commun.*, under revision.
6. **Y. Shi**, B. Mishra, and W. Chen, "Topological interference management with user admission control via Riemannian optimization," submitted to *IEEE Trans. Wireless Commun.*, under revision.

7. **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.

8. **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.

9. **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**)

10. **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.

11. **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.

12. **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.

13. **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**)

Conference Papers

1. J. Dong, K. Yang, **Y. Shi**, and W. Chen, "Ranking from crowdsourced pairwise comparisons in social computing via Riemannian optimization," submitted to *IEEE Globecom, Singapore*, Dec. 2017.

2. **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 *Pro. IEEE Veh. Technol. Conf. (VTC)*, Sydney, Australia, Jun. 2017. (Invited Paper)

3. X. Liu, **Y. Shi**, J. Zhang, and K. B. Letaief, "Massive CSI acquisition in dense Cloud-RAN with spatial and temporal prior information," in *Pro. IEEE Int. Conf. Commun. (ICC)*, Paris, France, May 2017.

4. **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.

5. 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.

6. 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.

7. 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.

8. **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.

9. 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.

10. **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.

11. 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.

12. **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.

13. **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.

14. **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.

15. **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

Invited Seminars

1. "The power of sparse and low-rank optimization paradigms for network densification", Shanghai Jiao Tong University, Aug. 2016.

2. "The power of sparse optimization paradigms for dense Cloud-RAN", SIST Group Seminar of Communication and Information System, ShanghaiTech University, Jul. 2016.

3. "Scalable sparse optimization in dense wireless cooperative networks", School of Information Science and Technology, ShanghaiTech University, Jul. 2015.

Conference and Workshop Presentations

1. "Low-rank matrix completion for topological interference management via Riemannian pursuit", IEEE International Symposium on Information Theory (ISIT), Hong Kong, Jun. 2015.

2. "CSI overhead reduction with stochastic beamforming for cloud radio access networks", IEEE International Conference on Communications (ICC), Sydney, Australia, Jun. 2014.

3. "Coordinated relay beamforming for amplify-and-forward two-hop interference networks", IEEE Global Communications Conference (Globecom), Anaheim, California, USA, Dec. 2012.

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

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, 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)
- Ning Cai (Professor, SIST, ShanghaiTech University, email: ningcai@shanghaitech.edu.cn)

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