Shuang Li

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RESEARCH INTERESTS

- Machine Learning;
- Game Theory;
- Optimization;
- Signal Processing;

EDUCATION

2020 Ph.D., Colorado School of Mines (CSM)

- Major: Electrical Engineering
- Minor: Computational & Applied Math
- Advisor: Dr. Michael B. Wakin
- Co-advisor: Dr. Gongguo Tang
- Thesis: "Optimization for High-Dimensional Analysis and Estimation in Signal Processing and Machine Learning"

2013 B.S., Zhejiang University of Technology (ZJUT)

- Major: Communication Engineering
- Advisor: Dr. Gang Li

POSITIONS

2023-current	Iowa State University Dept. of Electrical and Computer Engineering	Assistant Professor
2020-2023	University of California, Los Angeles Dept. of Mathematics	Hedrick Assistant Adjunct Professor
2019-2020	Colorado School of Mines Dept. of Electrical Engineering	Teaching Assistant
2015-2020	Colorado School of Mines Dept. of Electrical Engineering	Research Assistant
2012-2015	Zhejiang University of Technology Zhejiang Key Lab. for Signal Processing	Research Assistant

HONORS AND AWARDS

- 2024, CPAL Rising Stars Award
- 2022-2024, AMS-Simons Travel Grant ($5,000 for early-career researchers)
- 2022, DARPA Riser in the DARPA Forward conference
- 2020, Graduate Student Research Award of CSM
- 2015, Poate Fellowship of EECS Department of CSM
- 2014, National Academic Scholarship of China
- 2014, First Class Academic Scholarship of ZJUT
- 2012, Second Class Academic Scholarship of ZJUT
- 2011, Second Class Academic Scholarship of ZJUT

RESEARCH SUPPORT

- 2024-2027
  "Collaborative Research: Scalable, Robust, and Distributed Nonconvex Approaches for Structured Tensor Recovery"
  ISU PI, $250K, NSF ECCS Div Of Electrical, Commun & Cyber Sys
  (Collaborative with Zhihui Zhu at Ohio State University)

PREPRINTS

1. G. Dong and S. Li, "AltProj-Min: A projection-based alternating minimization algorithm for low-rank matrix recovery," submitted.
2. X. Liang, Z. Qin, Z. Zhu, and S. Li, "Landscape analysis of simultaneous blind deconvolution and phase retrieval via structured low-rank tensor recovery," submitted.
3. G. Li, Q. Li, S. Li, and W. A. Li, "On a class of greedy sparse recovery algorithms - A high dimensional approach," submitted.
4. S. Li and M. Wakin, "Recovery guarantees for time-varying pairwise comparison matrices with non-transitivity," submitted.
5. S. Li, P. Nayeri, and M. Wakin, "Digital beamforming robust to time-varying carrier frequency offset," submitted.

JOURNAL PAPERS

1. R. Grotheer, S. Li, A. Ma, D. Needell, and J. Qin, "Iterative singular tube hard thresholding algorithms for tensor completion," *Inverse Problems and Imaging*, 2024.
2. S. Li, G. Tang, and M. B. Wakin, "Landscape correspondence of empirical and population risks in the eigendecomposition problem," *IEEE Transactions on Signal Processing*, vol. 70, pp. 2985–2999, 2022.
3. R. Grotheer, S. Li, A. Ma, D. Needell, and J. Qin, "Iterative hard thresholding for low CP-rank tensor models," *Linear and Multilinear Algebra*, pp. 1–17, 2021.
4. S. Li, D. Gaydos, P. Nayeri, and M. Wakin, "Adaptive interference cancellation using atomic norm minimization and denoising," *IEEE Antennas and Wireless Propagation Letters*, vol. 19, no. 12, pp. 2349–2353, 2020.
5. S. Li, H. Mansour, and M. B. Wakin, "Recovery analysis of damped spectrally sparse signals and its relation to MUSIC," *Information and Inference: A Journal of the IMA*, 2020.
6. J. Qin, S. Li, D. Needell, A. Ma, R. Grotheer, C. Huang, and N. Durgin, "Stochastic greedy algorithms for multiple measurement vectors," *Inverse Problems and Imaging*, vol. 15, no. 1, pp. 79-107, 2020.
7. S. Li, Q. Li, Z. Zhu, G. Tang, and M. B. Wakin, "The global geometry of centralized and distributed low-rank matrix recovery without regularization," *IEEE Signal Processing Letters*, vol. 27, pp. 1400-1404, 2020.
8. S. Li, M. B. Wakin, and G. Tang, "Atomic norm denoising for complex exponentials with unknown waveform modulations," *IEEE Transactions on Information Theory*, vol. 66, no. 6, pp. 3893-3913, 2020.
9. S. Li, D. Yang, G. Tang and M. B. Wakin, "Atomic norm minimization for modal analysis from random and compressed samples," *IEEE Transactions on Signal Processing*, vol. 66, no. 7, pp. 1817-1831, 2018.

CONFERENCE/WORKSHOP PAPERS – MACHINE LEARNING

1. S. Li, W. Swartworth, M. Takáč, D. Needell, and R. M. Gower, "SP2: A second order stochastic Polyak method," to appear in *Eleventh International Conference on Learning Representations (ICLR)*, May 2023.
2. S. Li and Q. Li, "Local and global convergence of general Burer-Monteiro tensor optimizations," *The Thirty-Sixth AAAI Conference on Artificial Intelligence (AAAI)*, vol. 36, no. 9, pp. 10266-10274, February 2022.
3. S. Li, G. Tang, and M. B. Wakin, "The landscape of non-convex empirical risk with degenerate population risk," *The Thirty-third Conference on Neural Information Processing Systems (NeurIPS)*, pp. 3502-3512, December 2019.
4. S. Li, Q. Li, G. Tang, and M. B. Wakin, "Geometry correspondence between empirical and population games," in *Bridging Game Theory and Deep Learning Workshop NeurIPS 2019 (Smooth Games Optimization and Machine Learning Series)*, December 2019.
5. S. Li, Y. Xie, Q. Li, and G. Tang, "Cubic regularization for differentiable games," in *Bridging Game Theory and Deep Learning Workshop NeurIPS 2019 (Smooth Games Optimization and Machine Learning Series)*, December 2019.

CONFERENCE/WORKSHOP PAPERS – SIGNAL PROCESSING

1. R. Grotheer, S. Li, A. Ma, D. Needell, and J. Qin, "Stochastic natural thresholding algorithms,"to appear in *The 57th Asilomar Conference on Signals, Systems and Computers (ACSSC)*, October 2023.
2. S. Li, D. Needell, and W. Swartworth, "An untrained one-layer convolutional network-based method for line spectral estimation," *The 55th Asilomar Conference on Signals, Systems and Computers (ACSSC)*, November 2021.
3. N. Durgin, R. Grotheer, C. Huang, S. Li, A. Ma, D. Needell, and J. Qin, "A simple recovery framework for signals with time-varying sparse support," *WiSDM Workshop Proceedings*, 2020.
4. S. Li, S. Becker, and M. Wakin, "Nuclear norm based spectrum estimation for molecular dynamic simulations," *The 54th Asilomar Conference on Signals, Systems and Computers (ACSSC)*, November 2020.
5. S. Li, D. Gaydos, P. Nayeri, and M. Wakin, "Adaptive interference cancellation using atomic norm minimization," *2020 International Applied Computational Electromagnetics Society (ACES) Symposium*, Monterey, California, March 2020.
6. R. Grotheer, S. Li, A. Ma, D. Needell, and J. Qin, "Stochastic iterative hard thresholding for low-Tucker-rank tensor recovery," to appear in *Proc. Information Theory and Applications*, La Jolla, CA, February 2020.
7. N. Durgin, R. Grotheer, C. Huang, S. Li, A. Ma, D. Needell, and J. Qin, "Jointly sparse signal recovery with prior info," *The 53rd Asilomar Conference on Signals, Systems and Computers (ACSSC)*, November 2019.
8. N. Durgin, R. Grotheer, C. Huang, S. Li, A. Ma, D. Needell, and J. Qin, "Fast hyperspectral diffuse optical imaging method with joint sparsity," *The 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, July 2019.
9. S. Li, G. Tang and M. B. Wakin, "Simultaneous Blind Deconvolution and Phase Retrieval with Tensor Iterative Hard Thresholding," *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, May 2019.
10. N. Durgin, R. Grotheer, C. Huang, S. Li, A. Ma, D. Needell, and J. Qin, "Sparse randomized kaczmarz for support recovery of jointly sparse corrupted multiple measurement vectors," *Research in Data Science, Proc. WiSDM (ICERM)*, 2018.

11. N. Durgin, R. Grotheer, C. Huang, S. Li, A. Ma, D. Needell, and J. Qin, "Compressed anomaly detection with multiple mixed observations," *Research in Data Science, Proc. WiSDM (ICERM)*, 2018.

12. Y. Xie, S. Li, G. Tang, and M. B. Wakin, "Radar signal demixing via convex optimization," *The 22nd International Conference on Digital Signal Processing (DSP)*, August 2017.

13. S. Li, D. Yang and M. B. Wakin, "Atomic norm minimization for modal analysis with random spatial compression," *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, March 2017.

14. Q. Li, S. Li, H. Mansour, M. B. Wakin, D. Yang and Z. Zhu, "JAZZ: a companion to MUSIC for frequency estimation with missing data," *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, March 2017.

15. S. Li, D. Yang and M. B. Wakin, "Atomic norm minimization for modal analysis," *IEEE International Conference on Multimedia and Expo Workshops (ICMEW)*, July 2016.

16. S. Li, Q. Li, G. Li, X. He and L. Chang, "Iteratively Reweighted Least Squares for Block-sparse Recovery," *International Conference on Industrial Engineering Applications (ICIEA)*, June 2014.

17. Q. Li, S. Li, H. Bai, G. Li and L. Chang, "Joint Rank and Positive Semidefinite Constrained Optimization for Projection Matrix," *IEEE International Conference on Industrial Engineering Applications (ICIEA)*, June 2014.

18. S. Li, Q. Li, G. Li, L. Chang and X. He, "Simultaneous Sensing Matrix and Sparsifying Dictionary Optimization for Block-sparse Compressive Sensing," *IEEE International Conference on Mobile Ad-Hoc and Sensor Systems (ICMASS)*, October 2013.

19. S. Li, Z. Zhu, G. Li, L. Chang and Q. Li, "Projection Matrix Optimization for Block-sparse Compressive Sensing," *IEEE International Conference on Signal Processing, Communications and Computing (ICSPCC)*, August 2013.

20. Q. Li, Z. Zhu, G. Li, L. Chang and S. Li, "Robust Projection Matrix Optimization from the MSE View for Compressive Sensing Systems," *IEEE International Conference on Signal Processing, Communications and Computing (ICSPCC)*, August 2013.

INVITED PRESENTATIONS

1. "Local optimality of general Burer-Monteiro tensor optimizations," *the minisymposium on "Advances in Low-dimensional Representations in Imaging Science" at the SIAM Conference on Imaging Science*, May 2024.

2. "Local and global convergence of general Burer-Monteiro tensor optimizations," *Computational and Applied Mathematics Seminar, Iowa State University*, February 2024.

3. "Local and global convergence of general Burer-Monteiro tensor optimizations," *ECpE Department Seminar, Iowa State University*, November 2023.

4. "Non-convex optimization in data science," *Electrical Engineering Graduate Seminar, California Polytechnic State University*, February 2023.

5. "Non-convex optimization in data science," *Applied Math Seminar, University of California, Irvine*, November 2022.

6. "Stochastic iterative hard thresholding for low-Tucker-rank tensor recovery," *the minisymposium on "Tensor Methods in Image Processing" at the SIAM Conference on Imaging Science*, July 2020.

7. "Simultaneous blind deconvolution and phase retrieval with tensor iterative hard thresholding," *the special session on "Iterative Methods for Large-Scale Data Analysis" at the AMS Joint Mathematics Meeting in Denver*, January 2020.

8. "Optimization for high-dimensional analysis and estimation," *Stats, Optimization, and Machine Learning Seminar, University of Colorado Boulder*, March 2019.

POSTER & CONTRIBUTED PRESENTATIONS

1. "An untrained one-layer convolutional network-based method for line spectral estimation," *The 55rd Asilomar Conference on Signals, Systems and Computers (ACSSC)*, November 2021.
2. "Geometry and algorithms for differentiable games," *The 54rd Asilomar Conference on Signals, Systems and Computers (ACSSC)*, November 2020.
3. "Nuclear norm based spectrum estimation for molecular dynamic simulations," *The 54rd Asilomar Conference on Signals, Systems and Computers (ACSSC)*, November 2020.
4. "The landscape of non-convex empirical risk with degenerate population risk," *NeurIPS*, December 2019.
5. "Cubic regularization for differentiable games," *NeurIPS*, December 2019.
6. "Geometry correspondence between empirical and population games," *NeurIPS*, December 2019.
7. "Atomic norm minimization for modal analysis from compressive measurements," *Dynamics Days, Denver*, January 2018.
8. "Atomic norm minimization for modal analysis with random spatial compression," *Graduate Research And Discovery Symposium (GRADS), Colorado School of Mines*, April 2017.
9. "Atomic norm minimization for modal analysis with random spatial compression," *ICASSP*, March 2017.
10. "Atomic norm minimization for modal analysis with random spatial compression," *Computing-Mines Affiliates Partnership Program (C-MAPP) Award Event, Colorado School of Mines*, January 2017.
11. "Modal analysis with atomic norm minimization," *Graduate Research And Discovery Symposium (GRADS), Colorado School of Mines*, March 2016.
12. "Modal analysis with atomic norm minimization," *Computing-Mines Affiliates Partnership Program (C-MAPP) Award Event, Colorado School of Mines*, January 2016.
13. "Iteratively reweighted least squares for block-sparse recovery," *ICIEA*, June 2014
14. " Simultaneous sensing matrix and sparsifying dictionary optimization for block-sparse compressive sensing," *ICMASS*, October 2013.
15. "Projection matrix optimization for block-sparse compressive sensing," *ICSPCC*, August 2013.

WORKSHOP ATTENDED

1. Women in Data Science and Mathematics Research Collaboration Workshop (WiSDM), University of California, Los Angeles, USA, August 2023.
2. Summer Research for Women in Mathematics (SWiM), University of California, Los Angeles, USA. August 2022.
3. Bridging Game Theory and Deep Learning Workshop NeurIPS 2019 (Smooth Games Optimization and Machine Learning Series), Vancouver Convention Center, Vancouver, Canada, December 2019.
4. Summer Research for Women in Mathematics (SWiM), MSRI, University of California, Berkeley, USA. June 2019.
5. Collaborate@ICERM, Brown University, Providence, USA, August 2018.
6. Women in Data Science and Mathematics Research Collaboration Workshop (WiSDM), ICERM, Brown University, Providence, USA, July 2017.

7. The 1st International Workshop on Compressive Sensing in Cyber-Physical Systems (CSCPS), Zhejiang University, Hangzhou, China, October 2013.

8. The 1st International Workshop on Signal Processing, Zhejiang University of Technology, Hangzhou, China, May 2013.

9. International Workshop on Networked Control and Mutli-agent systems, Zhejiang University, Hangzhou, China, November 2011.

TRAVEL GRANTS

1. "WiSDM workshop Travel Award," travel grant to attend *Women in Data Science and Mathematics Research Collaboration Workshop (WiSDM), University of California*, Los Angeles, USA, August 2023.

2. "AMS-Simons Travel Grant," travel grant to support early-career mathematicians with $2,500 per year for two years to be used for research-related travel, 2022-2024.

3. "SIAM Student Travel Award," travel grant to attend *the 2020 SIAM Conference on Imaging Science (IS20)*, Sheraton Centre Toronto Hotel, Toronto, Canada, July 2020.

4. "NeurIPS 2019 Travel Award," travel grant to attend *the Thirty-third Conference on Neural Information Processing Systems*, Vancouver Convention Center, Vancouver, Canada, December 2019.

5. "Mathematical Sciences Research Institute (MSRI) Travel Award," travel grant to attend *Summer Research for Women in Mathematics (SWiM), UC Berkeley*, Berkeley, USA, June 2019.

6. "Learning for Dynamics and Control (L4DC) Travel Award," travel grant to attend and take notes for *Learning for Dynamics and Control (L4DC), Massachusetts Institute of Technology*, Cambridge, MA, USA, May 2019.

7. "Collaborate@ICERM workshop Travel Award," travel grant to attend *Collaborate@ICERM, Brown University*, Providence, USA, August 2018.

8. "WiSDM workshop Travel Award," travel grant to attend *Women in Data Science and Mathematics Research Collaboration Workshop (WiSDM), Brown University*, Providence, USA, July 2017.

9. "FFT Travel Award," travel grant to attend *2016 February Fourier Talks – FFT 2016, Norbert Wiener Center for Harmonic Analysis and Applications, Department of Mathematics, University of Maryland*, College Park, Maryland, USA, February 2016.

STUDENT SUPERVISION AND ADVISING

PhD Students
Xiao Liang, Aug. 2024 - current
Gaojun Dong, Jan. 2025 - current

Doctoral Committees
Silpa Babu, Dept. of Electrical and Computer Engineering, ISU
Advisor: Dr. Namrata Vaswani

Chenyu Xu, Dept. of Electrical and Computer Engineering, ISU
Advisor: Dr. Sang Kim, and Dr. Zhengdao Wang

Ahmed Ali Abbasi, Dept. of Electrical and Computer Engineering, ISU
Advisor: Dr. Namrata Vaswani

Aaron Fonseca, Dept. of Electrical and Computer Engineering, ISU
Advisor: Dr. Julie Dickerson

Master Committees
Mogilipalepu Komal Krishna, Dept. of Electrical and Computer Engineering, ISU
Advisor: Dr. Namrata Vaswani

TEACHING EXPERIENCE

Instructor:	Fall 2025	EE224	*Signals and Systems I*	ISU
	Spring 2025	EE571	*Introduction to Convex Optimization*	ISU
	Fall 2024	EE224	*Signals and Systems I*	ISU
	Spring 2024	EE224	*Signals and Systems I*	ISU
	Fall 2021	MATH164	*Optimization*	UCLA
	Spring 2021	MATH164	*Optimization*	UCLA
	Fall 2019	EENG310	*Information Systems Science I*	CSM
Teaching Assistant:	Spring 2020	EENG310	*Information Systems Science I*	CSM
	Spring 2019	EENG310	*Information Systems Science I*	CSM
	Fall 2013		*Signals and Systems*	ZJUT

PROFESSIONAL ACTIVITIES

Reviewer (journals):
IEEE Transactions on Information Theory
IEEE Transactions on Signal Processing
IEEE Transactions on Image Processing
IEEE Journal of Selected Topics in Signal Processing
IEEE Signal Processing Letters
IEEE Communications Letters
IEEE Control Systems Letters
Applied and Computational Harmonic Analysis
IET Image Processing
Signal Processing
Recent Patents on Computer Science
SIAM Journal on Imaging Sciences (SIIMS)
Mathematical Programming
Inverse Problems and Imaging
European Journal of Remote Sensing
European Journal of Operational Research
La Matematica. Official Journal of the Association for Women in Mathematics

Reviewer (conferences):
International Conference on Artificial Intelligence and Statistics (AISTATS)
International Conference on Digital Signal Processing (DSP)
IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)
IEEE International Symposium in Information Theory (ISIT)
Asilomar Conference on Signals, Systems, and Computers
Sampling Theory and Applications (SampTA)

Session chair: The Asilomar Conference on Signals, Systems, and Computers, session "Matrix Recovery", November 2020.

Session organizer: The Asilomar Conference on Signals, Systems, and Computers, special session "Tensor Models for Signal Processing and Machine Learning", Pacific Grove, CA, USA, October 2024 (with Zhihui Zhu).

Associate member: IEEE SPS MLSP Technical Committee, 2023.12-now.

Area chair: IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), April 2025.

Chapter chair: IEEE Central Iowa Section Joint Chapter of Signal Processing, Communications, and Circuit and Systems, 2025.08-now.

DEPARTMENT SERVICE

2024.07-2025.06 Member Seminar Series Committee (Communications and Signal Processing Area)

OUTREACH

- Volunteer tutor, ISU CyMath program, weekly tutoring for K-12 students, Sep. 2024 - present.