Ying Sun

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Education

- 09/2011-07/2016: Ph.D. (advisor: Prof. Daniel P. Palomar)
  Electronic and Computer Engineering, The Hong Kong University of Science and Technology
- 01/2016-03/2016: Visiting Ph.D. student (advisor: Prof. Gesualdo Scutari)
  School of Industrial Engineering, Purdue University
- 09/2007-06/2011: B.Eng.
  Electronic and Information Engineering, Huazhong University of Science and Technology, Wuhan, China

Working Experience

- 01/2021-Present: Assistant professor
  School of Electrical Engineering and Computer Science, The Pennsylvania State University, PA, USA
- 08/2016-12/2020: Postdoctoral researcher
  School of Industrial Engineering, Purdue University, IN, USA

Research Interest

- **Data science and analytics:**

  Optimization for machine learning, distributed and parallel optimization, stochastic optimization, computational statistics, majorization-minimization algorithms
- **Statistical learning over networks:**

  Decentralized estimation and inference, federated learning
- **Statistical signal processing:**

  High dimensional covariance matrix estimation, sparse component analysis

Awards and Honors

- 2020 **Young Author Best Paper Award** by the IEEE Signal Processing Society

Y. Sun, P. Babu, and D. P. Palomar, "Majorization-minimization algorithms in signal processing, communications, and machine learning," **overview article**, *IEEE Transactions on Signal Processing*, vol. 65, no. 3, pp. 794-816, Feb. 2017.

- 2016 **Best Student Paper Award** (coauthor) by IEEE CAMSAP

  I. Notarnicola*, Y. Sun*, G. Scutari, and G. Notarstefano, "Distributed Big-Data Optimization via Block Communications," in *Proc. IEEE CAMSAP*, Curaçao, Dutch Antilles, Dec. 2017. (*equal contribution)

Funding Experience

- Co-PI of the proposal "Distributed robust nonconvex optimization over time-varying networks: tradeoffs and guarantees," Army Research Office (ARO), (PI Gesualdo Scutari, 2018).
- Co-PI of the proposal "High-dimensional Statistical Inference and Optimization over Networks: Designs, Guarantees, and Tradeoffs," Office of Naval Research (ONR), (submitted Aug. 2020, PI Gesualdo Scutari).

Research Areas and Selected Papers

Computational Statistics and Machine Learning

- A. Daneshmand, Y. Sun, G. Scutari, F. Facchinei, and B. M. Sadler, "Decentralized dictionary learning over time-varying digraphs," *Journal of Machine Learning Research*, vol. 20, no. 139, pp. 1-62, Sept. 2019.
- Y. Sun, P. Babu, and D. P. Palomar, "Majorization-minimization algorithms in signal processing, communications, and machine learning," **overview article**, *IEEE Transactions on Signal Processing*, vol. 65, no. 3, pp. 794-816, Feb. 2017.
- K. Benidis, Y. Sun, P. Babu, D. P. Palomar, "Orthogonal sparse PCA and covariance estimation via Procrustes reformulation," *IEEE Transactions on Signal Processing*, vol. 64, no. 23, pp. 6211-6226, Dec. 2016.
- Y. Sun, P. Babu, and D. P. Palomar, "Regularized Tyler's scatter estimator: existence, uniqueness, and algorithms," *IEEE Transactions on Signal Processing*, vol. 62, no. 19, pp. 5143-5156, Oct. 2014.

Distributed and Parallel Nonconvex Optimization Algorithms

- G. Scutari* and Y. Sun* (***alphabetical order**),"Parallel and distributed successive convex approximation methods for big-data optimization," In *Multi-agent Optimization*, Eds. F. Facchinei and J.-S. Pang, Lecture Notes in Mathematics, Springer, 2018, pp. 141-308.
- G. Scutari* and Y. Sun* (***alphabetical order**), " Distributed nonconvex constrained optimization over time-varying digraphs," *Mathematical Programming, Series B*, vol. 176, no. 1, pp. 497-544, July 2019.
- I. Notarnicola*, Y. Sun*, G. Scutari, G. Notarstefano (***equal contribution**), "Distributed big-data optimization via block-wise gradient tracking," *IEEE Transactions on Automatic Control* (early access), July 2020.
- Y. Tian, Y. Sun, and G. Scutari, "Achieving linear convergence in distributed asynchronous multi-agent optimization," *IEEE Transactions on Automatic Control*, vol. 65, no. 12, pp. 5264-5279, Dec. 2020.
- Y. Sun, A. Daneshmand, and G. Scutari, "Distributed optimization based on gradient-tracking revisited: enhancing convergence rate via surrogation," *SIAM Journal on Optimization* (under revision), 2020. [Online]. Available: arXiv:1905.02637v2.

Complete Publication List

Book Chapter

[B1] G. Scutari* and Y. Sun* (***alphabetical order**),"Parallel and distributed successive convex approximation methods for big-data optimization," In *Multi-agent Optimization*, Eds. F. Facchinei and J.-S. Pang, Lecture Notes in Mathematics, Springer, 2018, pp. 141-308.

Preprints

[J13] Y. Sun, A. Daneshmand, and G. Scutari, "Distributed optimization based on gradient-tracking revisited: enhancing convergence rate via surrogation," *SIAM Journal on Optimization* (under revision), 2020. [Online]. Available: arXiv:1905.02637v2.

Journal Papers

[J12] X. Yu, D. Xu, Y. Sun, D. W. K. Ng and R. Schober, "Robust and secure wireless communications via intelligent reflecting surfaces," *IEEE Journal on Selected Areas in Communications*, vol. 38, no. 11, pp. 2637-2652, Nov. 2020.

[J11] I. Notarnicola*, Y. Sun*, G. Scutari, G. Notarstefano (***equal contribution**), "Distributed big-data optimization via block-wise gradient tracking," *IEEE Transactions on Automatic Control* (early access), July 2020.

[J10] Y. Tian, Y. Sun, and G. Scutari, "Achieving linear convergence in distributed asynchronous multi-agent optimization," *IEEE Transactions on Automatic Control*, vol. 65, no. 12, pp. 5264-5279, Dec. 2020.

[J9] A. Daneshmand, Y. Sun, G. Scutari, F. Facchinei, and B. M. Sadler, "Decentralized dictionary learning over time-varying digraphs," *Journal of Machine Learning Research*, vol. 20, no. 139, pp. 1-62, Sept. 2019.

[J8] G. Scutari* and Y. Sun* (***alphabetical order**), " Distributed nonconvex constrained optimization over time-varying digraphs," *Mathematical Programming, Series B*, vol. 176, no. 1, pp. 497-544, July 2019.

[J7] S. Shen, Y. Sun, S. Song, D. P. Palomar, and R. D. Murch, "Successive Boolean optimization of planar pixel antennas," *IEEE Transactions on Antennas and Propagation*, vol. 65, no. 2, pp. 920-925, Feb. 2017.

[J6] Y. Sun, P. Babu, and D. P. Palomar, "Majorization-minimization algorithms in signal processing, communications, and machine learning," overview article, *IEEE Transactions on Signal Processing*, vol. 65, no. 3, pp. 794-816, Feb. 2017.

- 2020 **Young Author Best Paper Award** by the IEEE Signal Processing Society
- **Highly cited paper** (Web of Science)

[J5] K. Benidis, Y. Sun, P. Babu, D. P. Palomar, "Orthogonal sparse PCA and covariance estimation via Procrustes reformulation," *IEEE Transactions on Signal Processing*, vol. 64, no. 23, pp. 6211-6226, Dec. 2016.

[J4] Y. Sun, A. Breloy, P. Babu, D. P. Palomar, F. Pascal, and G. Ginolhac, "Low-complexity algorithms for low rank clutter parameters estimation in radar systems," *IEEE Transactions on Signal Processing*, vol. 64, no. 8, pp. 1986-1998, Apr. 2016.

[J3] Y. Sun, P. Babu, and D. P. Palomar, "Robust estimation of structured covariance matrix for heavy-tailed elliptical distributions," *IEEE Transactions on Signal Processing,* vol. 64, no. 14, pp. 3576-3590, July 2016.

[J2] Y. Sun, P. Babu, and D. P. Palomar, "Regularized robust estimation of mean and covariance matrix under heavy-tailed distributions," *IEEE Transactions on Signal Processing*, vol. 63, no. 12, pp. 3096-3109, June 2015.

[J1] Y. Sun, P. Babu, and D. P. Palomar, "Regularized Tyler's scatter estimator: existence, uniqueness, and algorithms," *IEEE Transactions on Signal Processing*, vol. 62, no. 19, pp. 5143-5156, Oct. 2014.

Conference Papers

[C13] J. Xu, Y. Tian, Y. Sun, G. Scutari, "Accelerated primal-dual algorithms for distributed smooth convex optimization over networks", in *Proc. of the 23rd International Conference on Artificial Intelligence and Statistics (AISTAT)*, Online, Aug. 26-28, 2020, pp. 2381-2391.

[C12] J. Xu, Y. Sun, Y. Tian and G. Scutari, "A unified contraction analysis of a class of distributed algorithms for composite optimization," in *Proc. of the 2019 IEEE 8th International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*, Le gosier, Guadeloupe, Dec. 15-18, 2019, pp. 485-489.

[C11] Y. Tian, Y. Sun, B. Du, and G. Scutari, "ASY-SONATA: Achieving geometric convergence for distributed asynchronous optimization," in *proc. of the Allerton Conference on Communication, Control, and Computing (Allerton)*, Monticello, IL, Oct. 2-5, 2018, pp. 543-551.

[C10] I. Notarnicola*, Y. Sun*, G. Scutari, G. Notarstefano (***equal contribution**), "Distributed big-data optimization via block-iterative convexification and averaging," in *Proc. of the 56th IEEE Conference on Decision and Control (CDC)*, Melbourne, Australia, Dec. 12-15, 2017, pp. 2281-2288.

[C9] I. Notarnicola*, Y. Sun*, G. Scutari, and G. Notarstefano (***equal contribution**), "Distributed big-data optimization via block communications," in *Proc. of the 2017 IEEE workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*, Curaçao, Dutch Antilles, Dec. 10-13, 2017, pp. 1-5.

- **Best Student Paper Award**

[C8] Y. Sun and G. Scutari, "Distributed nonconvex optimization for sparse representation," in *Proc. of the 42nd IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP),* New Orleans, Mar. 2017, pp. 4044-4048.

[C7] A. Daneshmand, Y. Sun, G. Scutari, and F. Facchinei, "D^2L: Decentralized dictionary learning over dynamic networks," in *Proc. of the 42nd IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP),* New Orleans, Mar. 2017, pp. 4084-4088.

[C6] Y. Sun, G. Scutari, and D. P. Palomar, "Distributed nonconvex multiagent optimization over time-varying networks," in *Proc. of the 50th Asilomar Conference on Signals, Systems, and Computers,* Asilomar, Nov. 2016, pp. 788-794. [Online]. Available: arXiv:1607.00249.

[C5] A. Breloy, Y. Sun, P. Babu, and D. P. Palomar, "Block majorization-minimization algorithms for low-rank clutter subspace estimation," in *Proc. 24th European Signal Processing Conference (EUSIPCO)*, Budapest, Aug. 2016, pp. 2186-2190.

[C4] A. Breloy, Y. Sun, P. Babu, G. Ginolhac, D. P. Palomar, and F. Pascal, "A robust signal subspace estimator," in *Proc. IEEE Statistical Signal Processing Workshop (SSP),* Palma de Mallorca, June 2016, pp. 1-4.

[C3] K. Benidis, Y. Sun, P. Babu, and D. P. Palomar, "Orthogonal sparse eigenvectors: A procrustes problem," in *Proc. of the 2016 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP),* Shanghai, Mar. 2016, pp. 4683-4686.

[C2] Y. Sun, P. Babu, and D. P. Palomar, "Robust estimation of structured covariance matrix for heavy-tailed distributions," in *Proc. of the 2015 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Brisbane, Apr. 2015, pp. 5693-5697.

[C1] Y. Sun, P. Babu, and D. P. Palomar,"Regularized robust estimation of mean and covariance matrix under heavy tails and outliers," in *Proc. of the IEEE 8th Sensor Array and Multichannel Signal Processing Workshop (SAM),* A Coruña, June 2014, pp. 125-128.

Talks

- " Distributed inference over networks: geometrically convergent algorithms and statistical guarantees," *the INFORMS Annual Meeting, Oct. 2019.*
- "Achieving geometric convergence for distributed asynchronous optimization," *the 23rd International Symposium on Mathematical Programming, July 2018.*
- "ASY-SONATA: achieving geometric convergence for distributed asynchronous optimization," *INFORMS Optimization Society Conference, Mar. 2018.*
- "Distributed nonconvex optimization for sparse representation," *the 42nd IEEE International Conference on Acoustics, Speech, and Signal Processing, Mar. 2017.*
- "Distributed nonconvex multiagent optimization over time-varying networks," *the IEEE Asilomar Conference on Signals, Systems, and Computers, Nov. 2016.*
- "Robust estimation of structured covariance matrix for heavy-tailed distributions," *the 40th IEEE International Conference on Acoustics, Speech, and Signal Processing, Apr. 2015.*
- "Regularized robust estimation of mean and covariance matrix under heavy tails and outliers," *the 8th IEEE Sensor Array and Multichannel Signal Processing Workshop, June 2014.*

Student Mentorship

Purdue University

- **Amir Daneshmand** (Ph.D. student)

  Project: complexity analysis of distributed optimization algorithms with gradient tracking. [J13]

  Project: distributed dictionary learning. [C7, J9]
- **Ivano Notarnicola** (visiting Ph.D. student)

  Project: distributed large-scale optimization algorithms. [C9, C10, J11], Best student paper award [C9]
- **Ye Tian, Bin Du** (Ph.D. stduent)

  Project: asynchronous distributed optimization algorithms. [C11, C12, J10]
- **Yao Ji** (Ph.D. stduent)

  Project: statistical learning over networks.

HKUST

- **Konstantinos Benidis** (Ph.D. student)

  Project: fast algorithms for orthogonal sparse PCA. [C3, J5]
- **Shanpu Shen** (Ph.D. student)

  Project: Boolean optimization for planar antenna design. [J7]

Teaching

Graduate courses

- Teaching Assistant, ELEC 6910J *Error Control Coding* (instructor: Prof. E. Sanvicenet), Spring, 2013.
- Teaching Assistant, ELEC 5470 *Convex Optimization* (instructor: Prof. D. P. Palomar), Fall, 2014.

Undergraduate courses

- Teaching Assistant, ELEC 3100 *Signal Processing and Communications* (instructor: Prof. D. P. Palomar)
- Teaching Assistant, ELEC 2200 *Digital Circuits and Systems* (instructor: Prof. L. Yobas)

Academic Society Activities

- Technical program committee member, GlobalSIP 2019, GlobalSIP 2018.
- Reviewer for
  - IEEE Transactions on Automatic Control
  - IEEE Transactions on Signal Processing
  - IEEE Journal of Selected Topics in Signal Processing
  - IEEE Transactions on Signal and Information Processing over Networks
  - IEEE Transactions on Network Science and Engineering
  - Signal Processing
  - Optimization and Engineering
  - GlobalSIP 2019, CDC 2019, GlobalSIP 2018, CDC 2018, SAM 2018, IEEE CAMSAP 2017, IEEE ITW 2017, IEEE ITW 2013, ISIT 2013