Yangyang Xu

Department of Mathematical Sciences
Rensselaer Polytechnic Institute Amos Eaton 301
110 8th Street, Troy, NY 12180
Email: xuy21@rpi.edu

Education

Rice University, Houston, TX, USA.
Ph.D. in Computational and Applied Mathematics — 2014
Thesis: "Block coordinate update method in tensor optimization"
Advisor: Professor Wotao Yin

Chinese Academy of Sciences, Beijing, China.
M.S. in Operations Research — 2010

Nanjing University, Nanjing, China.
B.S. in Computational Mathematics — 2007

Employment

Rensselaer Polytechnic Institute
Assistant Professor — Fall 2017 –

University of Alabama, Tuscaloosa
Assistant Professor — Fall 2016 – Summer 2017

University of Minnesota, Twin Cities
Postdoctoral Associate — Fall 2015 – Summer 2016
Mentor: Professor Shuzhong Zhang

University of Waterloo
Postdoctoral fellow — Fall 2014 – Summer 2015
Advisors: Professors Stephen Vavasis and Henry Wolkowicz

Siemens Corporate Research
Intern. Mentors: Drs. Ioannis Akrotirianakis and Amit Chakraborty — Summer 2012
Developed fast algorithms for binary and multi-class Support Vector Machines with applications to microarray and texture classifications.

Research Interests

Optimization:	nonlinear programming, tensor optimization, stochastic programming
Methods:	block update methods, stochastic approximation, first-order methods, operator splitting
Computing:	asynchronous parallel computing
Applications:	compressed sensing, machine learning, signal processing, data mining

Publication list

Published or accepted

30. X. Gao, **Y. Xu** and S. Zhang. Randomized primal-dual proximal block coordinate updates, *Journal of the Operations Research Society of China*, 7(2), pp. 205–250, 2019.

29. **Y. Xu**. Asynchronous parallel primal-dual block coordinate update methods for affinely constrained convex programs, *Computational Optimization and Applications*, 72(1), pp. 87–113, 2019.
28. N. Zhou, **Y. Xu**, H. Cheng, Z. Yuan and B. Chen. Maximum Correntropy Criterion based Sparse Subspace Learning for Unsupervised Feature Selection. *IEEE Transactions on Circuits and Systems for Video Technology*, 29(2), pp. 404–417, 2019.
27. Z. Peng, **Y. Xu**, M. Yan and W. Yin. On the convergence of asynchronous parallel iteration with unbounded delays. Special issue on *Journal of the Operations Research Society of China*, 7(1), pp. 5–42, 2019.
26. **Y. Xu**. Hybrid Jacobian and Gauss-Seidel proximal block coordinate update methods for linearly constrained convex programming. *SIAM Journal on Optimization*, 28(1), pp. 646–670, 2018.
25. D. Oliveira, H. Wolkowicz and **Y. Xu**. ADMM for the SDP relaxation of the QAP. *Mathematical Programming Computation*, 10(4), pp. 631–658, 2018.
24. Y. Chen, J. Zhang and **Y. Xu**. Adaptive lasso for accelerated hazards models. *Journal of Statistical Computation and Simulation*, 88(15), pp. 2948–2960, 2018.
23. (Conference) B. Liu, T. Xie, **Y. Xu**, M. Ghavamzadeh, Y. Chow, D. Lyu and D. Yoon. A Block Coordinate Ascent Algorithm for Mean-Variance Optimization, NeurIPS, pp. 1073–1083, 2018.
22. (Conference) X. Li, J. Ren, S. Rambhatla, **Y. Xu** and J. Haupt. Robust PCA via dictionary based outlier pursuit, ICASSP, pp. 4699–4703, 2018.
21. **Y. Xu** and S. Zhang. Accelerated Primal-Dual Proximal Block Coordinate Updating Methods for Constrained Convex Optimization. *Computational Optimization and Applications*, 70(1), 91–128, 2018.
20. **Y. Xu**. On the convergence of higher-order orthogonality iteration. *Linear and Multilinear Algebra*, 66(11), pp. 2247–2265, 2018.
19. **Y. Xu**. Accelerated first-order primal-dual proximal methods for linearly constrained composite convex programming. *SIAM Journal on Optimization*, 27(3), 1459–1484, 2017.
18. **Y. Xu** and W. Yin. A globally convergent algorithm for nonconvex optimization based on block coordinate update. *Journal of Scientific Computing*, 72(2), 700–734, 2017.
17. F. Wen and **Y. Xu**. HOSVD Based Multidimensional Parameter Estimation for Massive MIMO System from Incomplete Channel Measurements. *Multidimensional Systems and Signal Processing*, 29(4), pp. 1255–1267, 2018.
16. **Y. Xu**. Fast algorithms for higher-order singular value decomposition from incomplete data. *Journal of Computational Mathematics, Special Issues on Optimization and Structured Solution*, 35(4), 395–420, 2017.
15. Z. Peng, **Y. Xu**, M. Yan and W. Yin. ARock: an algorithmic framework for asynchronous parallel coordinate updates. *SIAM Journal on Scientific Computing*, 38(5), pp. A2851–A2879, 2016.
14. Z. Peng, T. Wu, **Y. Xu**, M. Yan and W. Yin. Coordinate Friendly Structures, Algorithms and applications. *Annals of Mathematical Sciences and Applications*, 1(1), 57–119, 2016.
13. N. Zhou, **Y. Xu**, H. Cheng, J. Fang and W. Pedrycz. Global and local structure preserving sparse subspace learning: an iterative approach to unsupervised feature selection. *Pattern Recognition*, 53, pp. 87–101, 2016.
12. **Y. Xu** and W. Yin. A fast patch-dictionary method for whole image recovery, *Inverse Problems and Imaging*, 10(2), 563–583, 2016.
11. **Y. Xu**, I. Akrotirianakis and A. Chakraborty. Proximal gradient method for Huberized support vector machine, *Pattern Analysis and Applications*, 19(4), 989–1005, 2016.
10. **Y. Xu** and W. Yin. Block stochastic gradient iteration for convex and nonconvex optimization, *SIAM Journal on Optimization*, 25(3), 1686–1716, 2015.

9. **Y. Xu**, R. Hao, W. Yin and Z. Su. Parallel matrix factorization for low-rank tensor completion, *Inverse Problems and Imaging*, 9(2), 601–624, 2015.
8. **Y. Xu**. Alternating proximal gradient method for sparse nonnegative Tucker decomposition. *Mathematical Programming Computation*, 7(1), 39–70, 2015.
7. **Y. Xu**, I. Akrotirianakis and A. Chakraborty. Alternating direction method of multiplier for regularized multiclass support vector machines. *Lecture Note in Computer Science*, 2015.
6. **Y. Xu**, W. Yin and S. Osher. Learning circulant sensing kernels. *Inverse Problems and Imaging*, 8(3), 901–923, 2014.
5. **Y. Xu** and W. Yin. A block coordinate descent method for multi-convex optimization with applications to nonnegative tensor factorization and completion. *SIAM Journal on Imaging Sciences*, 6(3), 1758–1789, 2013.
4. M. Lai, **Y. Xu** and W. Yin. Improved iteratively reweighted least squares for unconstrained smoothed ℓ_q minimization. *SIAM Journal on Numerical Analysis*, 51(2), pp. 927–957, 2013.
3. (Conference) Q. Ling, **Y. Xu**, W. Yin and Z. Wen. Decentralized low-rank matrix completion, *IEEE International Conference on Acoustics, Speech and Signal Processing* (ICASSP), pp. 2925–2928, 2012.
2. **Y. Xu** and J. Cui. Multi-task n-vehicle exploration problem: complexity and algorithms. *Journal of Systems Science and Complexity*, pp. 1080–1092, 2012.
1. **Y. Xu**, W. Yin, Z. Wen and Y. Zhang. An alternating direction algorithm for matrix completion with nonnegative factors. *Journal of Frontiers of Mathematics in China, Special Issues on Computational Mathematics (Springer)*, 2011, pp. 365–384.

Under review

6. **Y. Xu**. Iteration complexity of inexact augmented Lagrangian methods for constrained convex programming. Submitted to *Mathematical Programming, Series A*, minor revision.
5. N. Zhou, B. Chen, T. Jiang, Y. Du and **Y. Xu**. Maximum Correntropy Criterion based Robust Semi-supervised Concept Factorization for Image Representation. Submitted to *IEEE Transactions on Neural Networks and Learning Systems*, minor revision.
4. T. Sun, Y. Sun, **Y. Xu** and W. Yin. Markov Chain Block coordinate descent.
3. **Y. Xu**. Primal-dual stochastic gradient method for convex programs with many functional constraints.
2. Y. Ouyang and **Y. Xu**. Lower complexity bounds of first-order methods for convex-concave bilinear saddle-point problems.
1. **Y. Xu**. First-order methods for constrained convex programming based on linearized augmented Lagrangian function.

Grants

NSF, Division of Mathematical Sciences
Sole PI: Novel numerical approaches for structured optimization problems, 2017–2020 (total $96,000).

Patents

US Patent App. 10/332,025, 2019. **Y. Xu**, I. Akrotirianakis and A. Chakraborty. Proximal gradient method for huberized support vector machine.

Teaching Experience

Rensselaer Polytechnic Institute	
MATP 6610: Computational Optimization	Spring 2019
MATP 6600: Introduction to Optimization	Fall 2018
MATH 6490: Topics in Optimization	Spring 2018
MATP 6600: Introduction to Optimization	Fall 2017
University of Alabama	
Math 410/510: Numerical Linear Algebra	Spring 2017
Math 227: Calculus III	Spring 2017
Math 126: Calculus II	Fall 2016
University of Waterloo	
Math 137: Calculus I	Summer 2016

Invited talks

- Lower complexity bounds of first-order methods for convex-concave bilinear saddle-point problems.

  UCLA Applied Math Colloquium. Nov. 06, 2018;
  SUST Math Colloquium, May 08, 2019.

- Primal-dual block coordinate update methods for multiblock structured affinely constrained problems.

  Math seminar, Nanjing Normal University, Nanjing, June 21, 2018.
  Data and Computer Science, Sun Yat-Sen University, Guangzhou, May 10, 2019.

- Iteration complexity of inexact augmented Lagrangian method for nonlinearly constrained convex optimization problems.

  INFORMS International Meeting, Taiwan, June 18, 2018.
  INFORMS Annual Meeting, Phoenix, Nov. 05, 2018.

- First-order methods for convex programs with functional constraints.

  Applied Math Colloquium, UCLA , Feb. 07, 2018;
  INFORMS Optimization Society Conference, Denver, March 24, 2018.
  SPOC, Nanjing University, June 23, 2018;
  Renmin University, Math Colloquium, Beijing, June 28, 2018;
  Analysis and Data Science Seminar, SUNY Albany, Oct. 08, 2018;
  SCUT, Math Colloquium, Guangzhou, May 09, 2019.

- Optimal first-order methods for constrained convex programs.

  Chinese Academy of Sciences, Computational Math seminar, Beijing, June 26, 2018.

- Block coordinate update methods.

  ICCM First Annual Meeting, Guangzhou, Dec. 27, 2017.

- Asynchronous parallel primal-dual block update method.

  MOPTA, Lehigh University, Aug. 16–18, 2017.

- Accelerated primal-dual methods for linearly constrained convex problems.

  SIAM Conference on Optimization. Vancouver, Canada, May 22–25, 2017.

- Orthogonal Candecomp/Parafac Tensor Decomposition.

  SIAM Conference on CSE. Atlanta, GA, Feb. 27 – March 03, 2017.
  SIAM Conference on Applied Linear Algebra. Hong Kong, May 04, 2018.

– Primal-dual methods for affinely constrained problems.

Seminar of Mathematical Sciences, Clemson University, Oct. 20, 2016.
Colloquium of Math, University of Alabama Bermingham, March 10, 2017.
Seminar of Computational Math, Louisiana State University, Sep. 26, 2017.

– Randomized primal-dual block coordinate updates.

SIAM Conference on Imaging Sciences. Albuquerque, NM, May 23–26, 2016.

– Block stochastic gradient update method.

INFORMS Annual Meeting. Philadelphia, PA, Nov. 1–4, 2015.

– On the convergence of higher-order orthogonality iteration and its extension.

SIAM Conference on Applied Linear Algebra, Atlanta, GA, Oct. 26–30, 2015.

– Compressed higher-order singular value decomposition.

AMMCS-CAIMS Congress. Wilfrid Laurier University, Waterloo, Cananda, June 7–12, 2015

– Low-rank tensor recovery via matrix factorization.

SIAM Conference on CSE. Salt Lake City, March 14–18, 2015.

– Large-scale Optimization via Block Coordinate Update.

Colloquium of Math, University of Central Florida, Orlando, Feb. 03, 2015.
Colloquium of Statistics and Operations Research, University of North Carolina, Chapel Hill. Feb. 11, 2015.

– Parallel matrix factorization for low-rank tensor completion.

SIAM Conference on Optimization. San Diego, CA, May 19–22, 2014.

– Block coordinate descent in tensor optimization.

Colloquium of Math Department, National University of Singapore, Feb. 10, 2014.

– Block coordinate descent for multi-convex optimization.

14th International Conference on Approximation Theory. San Antonio, TX, April 7–10, 2013.

– Decentralized low-rank matrix completion.

CAAM Graduate Seminar, Rice University, Nov. 2, 2011.

– Matrix completion with nonnegative factors.

Colloquium of Math Department, Shanghai Jiaotong University, Aug. 17, 2011.

Professional activities

Session Organizer

INFORMS International Meeting, Taiwan, June 17 – 20, 2018
SIAM Conference on Applied Linear Algebra, Hong Kong, May 04 – 08, 2018
SIAM Conference on CSE, Atlanta, GA, Feb. 27 – March 03, 2017
SIAM Conference on Optimization, San Diego, CA, May 19–22, 2014
INFORMS Optimization Society Conference, Houston, TX, March 6–8, 2014

Journal Referee

Applied Mathematics and Computation
Computational Optimization and Applications
IEEE Signal Processing

IEEE Neural Network and Learning System
IEEE Transactions on Pattern Analysis and Machine Intelligence
INFORMS Journal on Optimization
Journal of Computational Mathematics
Journal of Global Optimization
Journal of Machine Learning Research
Journal of Mathematical Imaging and Vision
Journal of Operations Research Society of China
Journal of Optimization Theory and Application
Journal of Scientific Computing
Mathematics of Operations Research
Mathematical Programming
Optimization
Pattern Recognition
SIAM Journal on Imaging Sciences
SIAM Journal on Optimization
SIAM Journal on Scientific Computing

Honors and Awards

Gold paper award, International Consortium of Chinese Mathematicians 2017
Alan Weiser Memorial Travel Award, Rice University 2014