

Shusen Wang

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Research

Keywords Machine learning, randomized linear algebra, convex optimization, big data, distributed computing.

Summary I am most interested in computational methods for machine learning. The goal of my research is making large-scale machine learning, matrix computation, and optimization more efficient. My thesis work is randomized algorithms for speeding up machine learning and matrix computation with loss of a limited amount of accuracy. My postdoctoral work at Berkeley is mainly large-scale machine learning, optimization, and data analysis via distributed computing.

Education

2011-2016 **Doctor of Engineering;** Zhejiang University (Hangzhou, China)
Major: Computer Science
Advisor: Zihua Zhang
Thesis: Large-Scale Machine Learning: A Randomized Approach and Theoretical Analysis

2007-2011 **Bachelor of Engineering;** Zhejiang University (Hangzhou, China)
Major: Computer Science

Work Experience

2016-Now **Postdoctoral Scholar;** Department of Statistics, UC Berkeley (Berkeley, CA, USA)
Advisor: Michael W. Mahoney
Research: randomized linear algebra and implementation

2014-2015 **Research Intern;** Baidu Big Data Lab (Beijing, China)
Mentor: Tong Zhang
Research: optimization algorithms

2012 **Research Intern;** Google Research (Beijing, China)
Research: randomized algorithms

2011-2012 **Intern;** Microsoft Research Asia (Beijing, China)
Mentors: Haixun Wang and Yangqiu Song

Academic Service

- **Journal Reviewer**
 - Journal of Machine Learning Research 2015, 2016, 2017
 - SIAM Journal on Scientific Computing, 2017
 - ACM Transactions on Mathematical Software, 2017
 - Journal of Econometrics, 2017
 - SIAM Journal on Matrix Analysis and Applications, 2017
- **Conference Reviewer or Committee Member**
 - NIPS 2014, 2015, 2017
 - ICML 2017
 - IJCAI 2015, 2017
 - AAAI 2016, 2018

Selected Honors & Awards

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| 2014 | Baidu Scholarship , awarded to 8 Chinese students in the world, US\$30,000 |
| 2013 | Microsoft Research Asia Fellow , awarded to 10 students in Asia Pacific, US\$10,000 |
| 2012 | Scholarship Award for Excellent Doctoral Student Granted by Ministry of Education , US\$5,000 |
| 2012-2014 | National Scholarship for Graduate Students , 3 times, each time US\$5,000 |

Journal Papers

- **Towards More Efficient SPSD Matrix Approximation and CUR Matrix Decomposition.** Shusen Wang, Zihua Zhang, and Tong Zhang. *Journal of Machine Learning Research*, 17(210):1–49, 2016. (JMLR 2016).
- **SPSD Matrix Approximation via Column Selection: Theories, Algorithms, and Extensions.** Shusen Wang, Luo Luo, and Zihua Zhang. *Journal of Machine Learning Research*, 17(49):1-49, 2016. (JMLR 2016).
- **Improving CUR Matrix Decomposition and the Nystrom Approximation via Adaptive Sampling.** Shusen Wang and Zihua Zhang. *Journal of Machine Learning Research*, 14: 2729-2769, 2013. (JMLR 2013).
- **EP-GIG Priors and Applications in Bayesian Sparse Learning.** Zihua Zhang, Shusen Wang, Dehua Liu, and Michael I. Jordan. *Journal of Machine Learning Research*, 13: 2031-2061, 2012. (JMLR 2012).

Preprints

- **GIANT: Globally Improved Approximate Newton Method for Distributed Optimization.** Shusen Wang, Farbod Roosta-Khorasani, Peng Xu, and Michael W. Mahoney. *arXiv:1709.03528*, 2017.
- **A Bootstrap Method for Error Estimation in Randomized Matrix Multiplication.** Miles E. Lopes, Shusen Wang, Michael W. Mahoney. Under the review of *Journal of Machine Learning Research*; available at *arXiv:1708.01945*, 2017.

- **Scalable Kernel K-Means Clustering with Nystrom Approximation: Relative-Error Bounds.** Shusen Wang, Alex Gittens, and Michael W. Mahoney. Under the review of *Journal of Machine Learning Research*; available at *arXiv:1706.02803*, 2017.
- **Sketched Ridge Regression: Optimization Perspective, Statistical Perspective, and Model Averaging.** Shusen Wang, Alex Gittens, and Michael W. Mahoney. Under the review of *Journal of Machine Learning Research*; a short version is published in *ICML 2017*.
- **Improved Analyses of the Randomized Power Method and Block Lanczos Method.** Shusen Wang, Zihua Zhang, and Tong Zhang. *arXiv:1508.06429*, 2015.

Conference Papers

- **Sketched Ridge Regression: Optimization Perspective, Statistical Perspective, and Model Averaging.** Shusen Wang, Alex Gittens, and Michael W. Mahoney. In *International Conference on Machine Learning*, 2017. (ICML 2017).
- **Towards Real-Time Geologic Feature Detection from Seismic Measurements using a Randomized Machine-Learning Algorithm.** Youzuo Lin, Shusen Wang, Jayaraman Thiagarajan, George Guthrie, and David Coblentz. In *Proceeding of Society of Exploration Geophysics (SEG)*, 2017.
- **Open Domain Short Text Conceptualization: A Generative + Descriptive Modeling Approach.** Yangqiu Song, Shusen Wang, and Haixun Wang. In *International Joint Conference on Artificial Intelligence*, 2015. (IJCAI 2015).
- **Improving the Modified Nystrom Method Using Spectral Shifting.** Shusen Wang, Chao Zhang, Hui Qian, and Zihua Zhang. In *the 20th ACM SIGKDD Conference on Knowledge Discovery and Data Mining*, 2014. (KDD 2014).
- **Efficient Algorithms and Error Analysis for the Modified Nystrom Method.** Shusen Wang and Zihua Zhang. In *Proceedings of the 17th International Conference on Artificial Intelligence and Statistics, JMLR W&CP*, 2014. (AISTATS 2014).
- **Making Fisher Discriminant Analysis Scalable.** Bojun Tu, Zihua Zhang, Shusen Wang, and Hui Qian. In *the International Conference on Machine Learning*. (ICML 2014).
- **Exact Subspace Clustering in Linear Time.** Shusen Wang, Bojun Tu, Congfu Xu, and Zihua Zhang. In *the 28th AAAI Conference on Artificial Intelligence*. (AAAI 2014).
- **Using The Matrix Ridge Approximation to Speedup Determinantal Point Processes Sampling Algorithms.** Shusen Wang, Chao Zhang, Hui Qian, and Zihua Zhang. In *the 28th AAAI Conference on Artificial Intelligence*. (AAAI 2014).
- **Transfer Understanding from Head Queries to Tail Queries.** Yangqiu Song, Haixun Wang, Weizhu Chen, and Shusen Wang. In *the 23rd ACM International Conference on Information and Knowledge Management*. (CIKM 2014).
- **Nonconvex Relaxation Approaches to Robust Matrix Recovery.** Shusen Wang, Dehua Liu, and Zihua Zhang. In *International Joint Conference on Artificial Intelligence*. (IJCAI 2013).
- **A Scalable CUR Matrix Decomposition Algorithm: Lower Time Complexity and Tighter Bound.** Shusen Wang and Zihua Zhang. In *Advances in Neural Information Processing Systems 25*. (NIPS 2012).
- **Colorization by Matrix Completion.** Shusen Wang and Zihua Zhang. In *the 26th AAAI Conference on Artificial Intelligence*. (AAAI 2012).
- **Efficient Subspace Segmentation via Quadratic Programming.** Shusen Wang, Xiaotong Yuan, Tiansheng Yao, Shuicheng Yan, and Jialie Shen. In *the 25th AAAI Conference on Artificial Intelligence*. (AAAI 2011).