

Shusen Wang

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Research

- Keywords** Machine learning (ML), randomized linear algebra, optimization, big data, distributed computing.
- Summary** I am most interested in statistical ML and computational methods for ML. The goal of my research is making large-scale ML more accurate and efficient. My thesis work is randomized algorithms for speeding up ML and matrix computation with loss of a limited amount of accuracy. My postdoctoral work at Berkeley is mainly the design of parallel ML and data analysis algorithms and the implementation using Apache Spark. I am also working on statistical ML theories and application of ML.

Work Experience

- from 2018** **Tenure-track assistant professor;** Department of Computer Science, Stevens Institute of Technology (Hoboken, NJ, USA)
- 2016-2018** **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
Project: probabilistic knowledge base

Education

- 2011-2016** **Doctor of Engineering;** Zhejiang University (Hangzhou, China)
Major: Computer Science
Advisor: Zhihua Zhang

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

Academic Service

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

Major Honors & Awards

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

- **Scalable Kernel K-Means Clustering with Nystrom Approximation: Relative-Error Bounds.** Shusen Wang, Alex Gittens, and Michael W. Mahoney. **Accepted by** *Journal of Machine Learning Research (JMLR)*, **conditioned on minor revisions**; available at *arXiv:1706.02803*, 2017.
- **Sketched Ridge Regression: Optimization Perspective, Statistical Perspective, and Model Averaging.** Shusen Wang, Alex Gittens, and Michael W. Mahoney. *Journal of Machine Learning Research (JMLR)*, 18:1-50, 2018.
- **Efficient Data-Driven Geologic Feature Characterization from Pre-stack Seismic Measurements using Randomized Machine-Learning Algorithm.** Youzuo Lin, Shusen Wang, Jayaraman Thiagarajan, George Guthrie, and David Coblentz. *Geophysical Journal International*, ggy385, 2018.
- **Alchemist: An Apache Spark \Leftrightarrow MPI Interface.** Alex Gittens, Kai Rothauge, Michael W. Mahoney, Shusen Wang, Lisa Gerhardt, Prabhat, Jey Kottalam, Michael Ringenburt, and Kristyn Maschhoff. *Concurrency and Computation Practice and Experience (CCPE)*, Special Issue on the Cray User Group, 2018.

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

Preprints

- **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.
- **Improved Analyses of the Randomized Power Method and Block Lanczos Method.** Shusen Wang, Zhihua Zhang, and Tong Zhang. *arXiv:1508.06429*, 2015.

Conference Papers

- **GIANT: Globally Improved Approximate Newton Method for Distributed Optimization.** Shusen Wang, Farbod Roosta-Khorasani, Peng Xu, and Michael W. Mahoney. Accepted by *Advances in Neural Information Processing Systems (NIPS)*, 2018. Preprint available at *arXiv:1709.03528*.
- **Error Estimation for Randomized Least-Squares Algorithms via the Bootstrap.** Miles E. Lopes, Shusen Wang, and Michael W. Mahoney. In *International Conference on Machine Learning (ICML)*, 2018.
- **Accelerating Large-Scale Data Analysis by Offloading to High-Performance Computing Libraries using Alchemist.** Alex Gittens, Kai Rothauge, Shusen Wang, Michael W. Mahoney, Lisa Gerhardt, Prabhat, Jey Kottalam, Michael Ringenburt, and Kristyn Maschhoff. In *ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD)*, 2018.
- **Sketched Ridge Regression: Optimization Perspective, Statistical Perspective, and Model Averaging.** Shusen Wang, Alex Gittens, and Michael W. Mahoney. In *International Conference on Machine Learning (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 (IJCAI)*, 2015.
- **Improving the Modified Nystrom Method Using Spectral Shifting.** Shusen Wang, Chao Zhang, Hui Qian, and Zhihua Zhang. In *the 20th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD)*, 2014.

- **Efficient Algorithms and Error Analysis for the Modified Nystrom Method.** Shusen Wang and Zhihua Zhang. In *Proceedings of the 17th International Conference on Artificial Intelligence and Statistics, JMLR W&CP (AISTATS)*, 2014.
- **Making Fisher Discriminant Analysis Scalable.** Bojun Tu, Zhihua 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 Zhihua 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 Zhihua 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 Zhihua 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 Zhihua Zhang. In *Advances in Neural Information Processing Systems (NIPS)*, 2012.
- **Colorization by Matrix Completion.** Shusen Wang and Zhihua 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.