Hao-Jun Michael Shi

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RESEARCH INTERESTS

Numerical Optimization • Deep Learning • Machine Learning

EDUCATION

NORTHWESTERN UNIVERSITY
PhD in Industrial Engineering and Management Sciences
Expected June 2021 | Evanston, IL
Advisor: Jorge Nocedal

Management for Scientists and Engineers Certificate
Kellogg School of Management
August 2020 | Evanston, IL

MS in Industrial Engineering and Management Sciences
December 2017 | Evanston, IL
Cumulative GPA: 3.91/4.00

UNIVERSITY OF CALIFORNIA, LOS ANGELES
BS in Applied Mathematics
June 2016 | Los Angeles, CA
Cumulative GPA: 3.77/4.00
College and Departmental Honors
Dean's Honors List (9 quarters)

AWARDS

ICML Top 5% Reviewer (2019)

NSF Graduate Research Fellowship
Honorable Mention (2016, 2017)

Walter P. Murphy Fellowship (2016-17)

IEMS Departmental Service Award (2016-17, 2017-18)

SKILLS

SOFTWARE/LANGUAGES
Python • C++ • Matlab • Fortran • AMPL • Gurobi

RELATED PACKAGES
NumPy • SciPy • scikit-learn • PyTorch • Keras • Tensorflow

EXPERIENCE

FACEBOOK
Research Intern
January 2019 - May 2019 | Menlo Park, CA

- Cleaned and incorporated Criteo Ad datasets to DLRM repository (Facebook's open-sourced neural recommendation system).
- Investigated multi-pass training of neural recommendation systems.
- Developed novel embedding decomposition techniques for reducing model complexity.
- Interned under AI System System/Hardware Co-Design team.
- Mentor: Dheevatsa Mudigere

NORTHWESTERN UNIVERSITY
Research Assistant
April 2017 - Present | Evanston, IL

- Developing algorithms for noisy derivative-free optimization.
- Developed second-order optimization algorithms that can tolerate inaccurate function and gradient evaluations.
- Developed stochastic second-order methods for training deep neural networks.
- Developed PyTorch-LBFGS module (a modular L-BFGS implementation in PyTorch).
- Advisor: Jorge Nocedal

PUBLICATIONS

PREPRINTS

1. H.-J.M. Shi, M. Xuan, F. Oztoprak, and J. Nocedal. "On the Numerical Performance of Derivative-Free Optimization Methods Based on Finite-Difference Approximations". In preparation.

2. H.-J.M. Shi, Y. Xie, R. Byrd, and J. Nocedal. "A Noise-Tolerant Quasi-Newton Algorithm for Unconstrained Optimization". Submitted. [ArXiv Link].

3. M. Naumov, D. Mudigere, H.-J.M. Shi, J. Huang, N. Sundaraman, J. Park, X. Wang, U. Gupta, C.-J. Wu, A.G. Azzolini, D. Dzhulgakov, A. Mallevich, I. Cherniavskii, Y. Lu, R. Krishnamoorthi, A. Yu, V. Kondratenko, S. Pereira, X. Chen, W. Chen, V. Rao, B. Jia, L. Xiong, M. Smelyanskiy. "Deep Learning Recommendation Model for Personalization and Recommendation Systems". Preprint. [ArXiv Link].

4. H.J.M. Shi, S. Tu, Y. Xu, and W. Yin. "A Primer on Coordinate Descent Algorithms". Preprint. [ArXiv Link].

1st January 2021

COURSEWORK

Applied Mathematical Statistics (IEMS 401)
Stochastic Simulation (IEMS 435)
Mathematical Optimization II (IEMS 450-2)
Stochastic Optimization (IEMS 451)
Combinatorial Optimization (IEMS 452)
Large Scale Optimization (IEMS 454)
Convex Optimization (IEMS 459)
Statistical Learning (IEMS 490)
Distributed Optimization (EECS 424)
Probabilistic Graphical Models (EECS 474)
Dynamic Optimization in Economics (MECS 560-2)
Statistical Learning for Sequential Decision Making (OPNS 525)

TEACHING

IEMS 351: Optimization Methods in Data Science
Instructor (Spring 2020)
IEMS 455: Machine Learning
Grader/Teaching Assistant (Spring 2018)
IEMS 1st Year Boot Camp: Analysis
Instructor (Summer 2017)

OTHER ACTIVITIES

Northwestern INFORMS Student Chapter
Webmaster (2017 - 2018)
Member (2016 - Present)
Northwestern SIAM Student Chapter
Member (2016 - Present)
SIAM Journal on Optimization
Reviewer (2021)
Neural Information Processing Systems
Reviewer (2018, 2019)
International Conference on Learning Representations
Reviewer (2019, 2020)
International Conference on Machine Learning
Reviewer (2019)

LINKS

Github • Google Scholar • LinkedIn

CONFERENCE PROCEEDINGS

1. H.-J.M. Shi, D. Mudigere, M. Naumov, and J. Yang. "Compositional Embeddings Using Complementary Partitions for Memory-Efficient Recommendation Systems". KDD, Virtual Conference, August 2020. [ArXiv Link].

2. R. Bollapragada, D. Mudigere, J. Nocedal, H.-J.M. Shi, and P.T.P. Tang. "A Progressive Batching L-BFGS Method for Machine Learning". International Conference on Machine Learning (ICML), Stockholm, Sweden, July 2018. [ArXiv Link]

3. H.-J.M. Shi, M. Case, X. Gu, S. Tu, and D. Needell. "Methods for Quantized Compressed Sensing". Proc. Information Theory and Applications (ITA), La Jolla, CA, Jan. 2016. [ITA Link].

JOURNAL PUBLICATIONS

1. J. Luo, K. Shapiro, H.-J.M. Shi, Q. Yang, and K. Zhu. "Practical Algorithms for Learning Near-Isometric Linear Embeddings". SIAM Undergraduate Research Online, vol. 9, 2016. [SIURO Link].

TECHNICAL REPORTS

1. X. Gu, S. Tu, H.-J.M. Shi, M. Case, D. Needell, and Y. Plan. "Optimizing Quantization for Lasso Recovery". IEEE Signal Processing Letters, vol. 25, issue 1, Jan. 2018. [IEEE Link].

2. C. Abrahamson, H.-J.M. Shi, and B. Yang. "Ground Motion Prediction Equations for Arias Intensity Consistent with the NGA-West2 Ground Motion Models". Pacific Earthquake Engineering Research (PEER) Report, July 2016. [PEER Report Link].

PRESENTATIONS

ORAL PRESENTATIONS

1. H.J.M. Shi. "A Noise-Tolerant Quasi-Newton Method for Unconstrained Optimization". INFORMS 2020, Remote, Nov. 2020.

2. H.J.M. Shi. "Compositional Embeddings Using Complementary Partitions for Memory-Efficient Recommendation Systems". ACM SIGKDD, Remote, Aug. 2020.

3. H.J.M. Shi. "Compositional Embeddings Using Complementary Partitions for Memory-Efficient Recommendation Systems". PeRSoNAI tutorial, ISCA 2020, Remote, May 2020.

4. H.J.M. Shi. "Towards Understanding Embeddings and Optimization in Deep Neural Recommendation Systems". INFORMS 2019, Seattle, Washington, Oct. 2019.

5. H.J.M. Shi. "Recent Advancements in Stochastic Quasi-Newton Methods". Facebook, Menlo Park, California, Feb. 2019.

6. H.J.M. Shi. "A Progressive Batching L-BFGS Method for Machine Learning". Chicago Area SIAM Student Conference 2018, Chicago, Illinois, Apr. 2018.

POSTER PRESENTATIONS

1. R. Bollapragada, D. Mudigere, J. Nocedal, H.J.M. Shi, and P.T.P. Tang. "A Progressive Batching L-BFGS Method for Machine Learning". Midwest Machine Learning Symposium 2018, Chicago, Illinois, June 2018.

2. J. Luo, K. Shapiro, H.J.M. Shi, Q. Yang, and K. Zhu. "Learning Near-Isometric Linear Embeddings". Joint Mathematics Meetings 2015, San Antonio, Texas, Jan. 2015.