

Renbo Zhao

Operations Research Center
Massachusetts Institute of Technology
Cambridge, MA, USA 02142

Telephone: +65-85800197
Email: renboz@mit.edu
Web: <http://web.mit.edu/renboz/www/>

Research Interests Large-scale optimization methods and applied probability, as well as their applications in operations research and machine learning. Specific interests include

- stochastic optimization and nonlinear programming
- online and reinforcement learning
- optimization under uncertainty
- fundamental limits of learning and optimization

Education

Massachusetts Institute of Technology

PhD in Operations Research, September 2018 – Present

- Thesis advisor: Prof. Robert M. Freund

National University of Singapore

M.Sc. (by research) in Mathematics, August 2016 – June 2018

- Thesis topic: Stochastic and Randomized Algorithms for Large-Scale Optimization in Machine Learning
- Thesis advisors: Prof. Vincent Y. F. Tan and Prof. William B. Haskell

National University of Singapore

B.Eng. in Electrical Engineering (First Class Hons), August 2011 – June 2015

- Thesis topic: Online Nonnegative Matrix Factorization with Outliers
- Thesis advisor: Prof. Vincent Y. F. Tan

Nanyang Technological University

Undergraduate student exchange program, January 2014 – May 2014

Research Experiences

Research Engineer, Dept. of Industrial Systems Engineering and Management (ISEM), National University of Singapore (NUS), Singapore

Dec. 2017 – Aug. 2018. Worked with Prof. William B. Haskell and Prof. Vincent Y. F. Tan on stochastic and randomized algorithms for large-scale optimization.

Research Intern, Laboratory for Information and Inference Systems, École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland

Summer 2017. Worked with Prof. Volkan Cevher on primal-dual algorithms for stochastic three-composite convex minimization with a linear operator.

Research Engineer, Dept. of Electrical and Computer Engineering (ECE) and Dept. of ISEM, NUS, Singapore

Sep. 2016 – Nov. 2017. Worked with Prof. Vincent Y. F. Tan and Prof. William B. Haskell on stochastic and randomized algorithms for large-scale optimization.

Research Engineer, Dept. of ECE, NUS, Singapore

Jul. 2015 – Aug. 2016. Worked with Prof. Vincent Y. F. Tan and Prof. Huan Xu on algorithms for (online) matrix factorization and ranking from pairwise comparisons.

Research Intern, Dept. of ECE, NUS, Singapore

Summer 2014. Worked with Prof. Vincent Y. F. Tan on active learning of Chow-Liu tree and online robust learning in nonnegative matrix factorization.

Undergraduate Research Project, Dept. of ECE, NUS, Singapore

Jan. 2014 – May 2014. Worked with Prof. Vincent Y. F. Tan on robust model order selection in nonnegative matrix factorization.

Research Intern, Human Language Technology Dept., Institute of Infocomm Research, Agency for Science, Technology and Research, Singapore

May 2013 – Nov. 2013. Worked with Dr. Dong-Yan Huang and Dr. Yvonne S. W. Lee on score-informed leading voice extraction.

Publications

A full list of publications is given in Appendix, or from the following webpage:

<http://web.mit.edu/renboz/www/pub.html>

Awards

2017: Student Travel Award, Conference on Uncertainty in Artificial Intelligence (UAI), Sydney, Australia

2017: Student Travel Award, International Conference for Artificial Intelligence and Statistics (AISTATS), Fort Lauderdale, FL, USA

2015: Innovation and Research Merit Award, Faculty of Engineering, NUS

2014: Innovation and Research Merit Award, Faculty of Engineering, NUS

2013: ST Electronics Prize: Top sophomore student in Electrical Engineering

2013: Third place (with Zhengchen Zhang, Dong-Yan Huang and Minghui Dong), Audio Onset Detection Task in the Music Information Retrieval Evaluation eXchange (MIREX), Curitiba, PR, Brazil

2012: Champion, Engineering Electromagnetics Challenge in the course EE2011 (out of more than 200 students)

2011 – 2015: Dean's List, every semester throughout undergraduate studies (except Sem. 2, AY 2013/14 due to student exchange program)

2011: SM2 Undergraduate Scholarship, Singapore Ministry of Education
Full funding for undergraduate studies in NUS

Professional Activities	Member, IEEE Eta Kappa Nu (IEEE-HKN) Reviewer for the following journals <ul style="list-style-type: none"> • IEEE Transactions on Signal Processing • IEEE Journal of Selected Topics in Signal Processing • IEEE Signal Processing Letters Reviewer for the following conferences <ul style="list-style-type: none"> • IEEE Int. Symposium on Information Theory (2016, 2017) • IEEE Int. Conference on Acoustics, Speech and Signal Processing (2017,2018)
Computer Skills	MATLAB, Python, LabVIEW, C, C++, Java
Languages	English (excellent), Chinese (native)

Appendix: Renbo Zhao's Publications

Preprints	Le Thi Khanh Hien, Renbo Zhao and William B. Haskell, “An Inexact Primal Dual Smoothing Framework for Large-Scale Non-Bilinear Saddle Point Problems”, submitted, Jul. 2018. Link: https://arxiv.org/abs/1711.03669 .
Journal Papers	<p>Renbo Zhao, William B. Haskell and Vincent Y. F. Tan, “Stochastic L-BFGS: Improved Convergence Rates and Practical Acceleration Strategies”, <i>IEEE Trans. Signal Process.</i>, Vol. 66, No. 5, Pages 1155—1169, Mar. 2018. Link: http://ieeexplore.ieee.org/document/8219748/.</p> <p>Renbo Zhao and Vincent Y. F. Tan, “A Unified Convergence Analysis of the Multiplicative Update Algorithm for Regularized Nonnegative Matrix Factorization”, in <i>IEEE Trans. Signal Process.</i>, Vol. 66, No. 1, Pages 129—138, Jan. 2018. Link: http://ieeexplore.ieee.org/document/8052526/.</p> <p>Changho Suh, Vincent Y. F. Tan and Renbo Zhao, “Adversarial Top-K Ranking”, in <i>IEEE Trans. Inf. Theory</i>, Vol. 63, No. 4, Pages 2201—2225, Apr. 2017. Link: http://ieeexplore.ieee.org/document/7835206/.</p> <p>Renbo Zhao and Vincent Y. F. Tan, “Online Nonnegative Matrix Factorization with Outliers”, in <i>IEEE Trans. Signal Process.</i>, Vol. 65, No. 3, Pages 555–570, Feb. 2017. Link: http://ieeexplore.ieee.org/document/7676413/.</p>

**Conference
Proceedings**

Renbo Zhao and Volkan Cevher, “Stochastic Three-Composite Convex Minimization with a Linear Operator”, in *Proc. 21st Int. Conf. Artif. Intell. Stat. (AISTATS)*, Lanzarote, Canary Islands, Spain, Apr. 2018. (Acceptance Rate: 33.2%)
Link: <http://proceedings.mlr.press/v84/zhao18a.html>.

Renbo Zhao, William B. Haskell and Vincent Y. F. Tan, “Stochastic L-BFGS Revisited: Improved Convergence Rates and Practical Acceleration Strategies”, in *Proc. 33rd Conf. Uncertain. Artif. Intell. (UAI)*, Sydney, Australia, Aug. 2017. (Acceptance Rate: 30.9%)
Link: <http://auai.org/uai2017/proceedings/papers/86.pdf>.

Renbo Zhao, Vincent Y. F. Tan and Huan Xu, “Online Nonnegative Matrix Factorization with General Divergences”, in *Proc. 20th Int. Conf. Artif. Intell. Stat. (AISTATS)*, Pages 37–45, Fort Lauderdale, FL, USA, Apr. 2017. (Acceptance Rate: 31.7%)
Link: <http://proceedings.mlr.press/v54/zhao17a.html>.

Renbo Zhao and Vincent Y. F. Tan, “A Unified Convergence Analysis of the Multiplicative Update Algorithm for Nonnegative Matrix Factorization”, in *Proc. 42nd IEEE Int. Conf. Acoust. Speech Signal Process. (ICASSP)*, Pages 2562–2566, New Orleans, LA, USA, Mar. 2017. Link: <http://ieeexplore.ieee.org/document/7952619/>.

Renbo Zhao and Vincent Y. F. Tan, “Online Nonnegative Matrix Factorization with Outliers”, in *Proc. 41st IEEE Int. Conf. Acoust. Speech Signal Process. (ICASSP)*, Pages 2662–2666, Shanghai, China, Mar. 2016. Link: <http://ieeexplore.ieee.org/document/7472160/>.

Renbo Zhao, Siu Wa Lee, Dong-Yan Huang and Minghui Dong, “Soft Constrained Leading Voice Separation with Music Score Guidance”, in *Proc. 9th ISCA/IEEE Int. Symp. Chin. Spok. Lang. Process. (ISCSLP)*, Pages 565–569, Singapore, Sep. 2014. Link: <http://ieeexplore.ieee.org/document/6936723/>.