

# Yuchen Zhang

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## Education

**University of California, Berkeley** 2011 - 2016

Ph.D. in Computer Science

Advised by Michael I. Jordan and Martin J. Wainwright

Research: distributed machine learning, optimization algorithms, deep learning theory

**University of California, Berkeley** 2011 - 2013

Master in Statistics

**Tsinghua University** 2007 - 2011

Bachelor in Computer Science

Supervised by Andrew C. Yao (Yao Class)

## Employment History

**Principal Researcher, Microsoft** 2018 - Now

- Build the next-generation bot framework for Microsoft, enabling a revolutionary conversational AI experience where the user can speak naturally, contextually and collaboratively to a virtual assistant just like speaking to a human. Our technology ships to a wide range of Microsoft products ([Demo in Satya Nadella's keynote](#); [Learn about the team](#))
- I lead the design and implementation of our core dialogue engine that powers arbitrarily complex natural language understanding and seamless cross-turn, cross-domain dialogue state management ([Learn about the design](#)).
- I also lead the internationalization projects, including multilingual data collection, modeling and generation for all markets outside of United States.

**Senior Research Scientist, Semantic Machines Inc.** 2018

- We are a team of world-class researchers and engineers building the next-generation conversational AI technology; acquired by Microsoft on June, 2018.

**Post-doc Researcher, Stanford University** 2016 - 2018

- Question answering system for Wikipedia: 10x faster and 10% more accurate than state-of-the-art.
- Theory for deep learning: Best Paper Award at COLT'17 (the most prestigious international conference on learning theory.)

## Research Projects

My interest spans natural language processing, machine learning and distributed systems. Below is a summary of my research projects.

### Natural language processing

- Task-oriented dialogue systems [[J1](#), [P1](#), [P2](#)].
- Semantic parsing for question answering [[C2](#)].

### Machine learning and optimization

- Deep learning and non-convex optimization [[C3](#),[C4](#),[C5](#),[C6](#),[C7](#)].

- Convex optimization [J2,C10].
- Crowdsourcing [J6,C11].
- Robust machine learning [C1].
- Personalized recommendation system [C13].
- Web search and online advertising [C17,C18,C19,C20,C21,C22]

### Distributed computing

- Distributed algorithms for machine learning [J7,J8,C8,C9,C15,C16].
- Fundamental theory of distributed computing [C12,C14].
- Programming interface for parallelizing stochastic algorithms [T1].

### Other projects

- Theoretical statistics [J3,J4,J5].
- Theoretical computer science [J9,C23].

## Patents

- [P1] **Y. Zhang**, J. Wolfe, A. Pauls and D. Hall. Updating Constraints For Computerized Assistant Actions. *U.S. Patent*, Filed by Microsoft on March 30, 2020.
- [P2] J. Andreas, A. Vorobev, A. Guo, J. Krishnamurthy, J. Bufe, J. Rusak and **Y. Zhang**. Response Generation For Conversational Computing Interface, *U.S. Patent*, Filed by Microsoft on August 12, 2019.

## Journal Publications

- [J1] **Y. Zhang** and the Semantic Machines team (alpha-beta order). Task-Oriented Dialogue as Dataflow Synthesis. *Transactions of the Association for Computational Linguistics*.
- [J2] **Y. Zhang** and L. Xiao. Stochastic Primal-Dual Coordinate Method for Regularized Empirical Risk Minimization. *Journal of Machine Learning Research*.
- [J3] X. Chen, A. Guntuboyina and **Y. Zhang**. A note on the approximate admissibility of regularized estimators in the Gaussian sequence model. *Electronic Journal of Statistics*.
- [J4] **Y. Zhang**, M. Wainwright and M.I. Jordan. Optimal prediction for sparse linear models? Lower bounds for coordinate-separable M-estimators. *Electronic Journal of Statistics*.
- [J5] X. Chen, A. Guntuboyina and **Y. Zhang** (alpha-beta order). On Bayes Risk Lower Bounds. *Journal of Machine Learning Research*.
- [J6] **Y. Zhang**, X. Chen, D. Zhou and M.I. Jordan. Spectral Methods meet EM: A Provably Optimal Algorithm for Crowdsourcing. *Journal of Machine Learning Research*.
- [J7] **Y. Zhang**, J. Duchi and M. Wainwright. Divide and Conquer Kernel Ridge Regression: A Distributed Algorithm with Minimax Optimal Rates. *Journal of Machine Learning Research*.
- [J8] **Y. Zhang**, J. Duchi and M. Wainwright. Communication-Efficient Algorithms for Statistical Optimization. *Journal of Machine Learning Research*.
- [J9] **Y. Zhang** and X. Sun. The Antimagicalness of the Cartesian Product of Graphs. *Theoretical Computer Science*.

## Conference Publications

- [C1] **Y. Zhang**, P. Liang. Defending Against Whitebox Adversarial Attacks via Randomized Discretization. *Artificial Intelligence and Statistics (AISTATS)*, 2019.
- [C2] **Y. Zhang**, P. Pasupat, P. Liang. Macro Grammars and Holistic Triggering for Efficient Semantic Parsing. *Empirical Methods on Natural Language Processing (EMNLP)*, 2017.

- [C3] **Y. Zhang**, P. Liang, M. Wainwright. Convexified Convolutional Neural Networks. *International Conference on Machine Learning (ICML)*, 2017.
- [C4] **Y. Zhang**, P. Liang, M. Charikar. A Hitting Time Analysis of Stochastic Gradient Langevin Dynamics. *Conference on Learning Theory (COLT)*, 2017 (**Best paper award**).
- [C5] **Y. Zhang**, JD. Lee, M. Wainwright and MI. Jordan. On the Learnability of Fully-connected Neural Networks. *Artificial Intelligence and Statistics (AISTATS)*, 2017.
- [C6] C. Jin, **Y. Zhang**, S. Balakrishnan, M. Wainwright, MI. Jordan. Local Maxima in the Likelihood of Gaussian Mixture Models: Structural Results and Algorithmic Consequences. *Neural Information Processing Systems (NIPS)*, 2016.
- [C7] **Y. Zhang**, JD. Lee, MI. Jordan.  $\ell_1$ -regularized Neural Networks are Improperly Learnable in Polynomial Time. *International Conference on Machine Learning (ICML)*, 2016.
- [C8] **Y. Zhang**, M. Wainwright and MI. Jordan. Distributed Estimation of Generalized Matrix Rank: Efficient Algorithms and Lower Bounds. *International Conference on Machine Learning (ICML)*, 2015.
- [C9] **Y. Zhang** and L. Xiao. DiSCO: Communication-Efficient Distributed Optimization of Self-Concordant Loss. *International Conference on Machine Learning (ICML)*, 2015.
- [C10] **Y. Zhang** and L. Xiao. Stochastic Primal-Dual Coordinate Method for Regularized Empirical Risk Minimization. *International Conference on Machine Learning (ICML)*, 2015.
- [C11] **Y. Zhang**, X. Chen, D. Zhou and MI. Jordan. Spectral Methods meet EM: A Provably Optimal Algorithm for Crowdsourcing. *Neural Information Processing Systems (NIPS)*, 2014. (**Spotlight presentation, 4.8% acceptance rate**)
- [C12] **Y. Zhang**, M. Wainwright and MI. Jordan. Lower Bounds on the Performance of Polynomial-time Algorithms for Sparse Linear Regression. *Conference on Learning Theory (COLT)*, 2014.
- [C13] **Y. Zhang**, A. Ahmed, V. Josifovski and A. Smola. Taxonomy Discovery for Personalized Recommendation. *ACM International Conference on Web Search and Data Mining (WSDM)*, 2014.
- [C14] **Y. Zhang**, J. Duchi, M. Wainwright and MI. Jordan. Information-theoretic Lower Bounds for Distributed Statistical Estimation with Communication Constraints. *Neural Information Processing Systems (NIPS)*, 2013. (**Oral presentation, 1.4% acceptance rate**)
- [C15] **Y. Zhang**, J. Duchi and M. Wainwright. Divide and Conquer Kernel Ridge Regression. *Conference on Learning Theory (COLT)*, 2013.
- [C16] **Y. Zhang**, J. Duchi and M. Wainwright. Communication-Efficient Algorithms for Statistical Optimization. *Neural Information Processing Systems (NIPS)*, 2012.
- [C17] W. Chen, D. Wang, **Y. Zhang** and Q. Yang. Understanding Click Noise: A Noise-aware Click Model for Web Search. *ACM International Conference on Web Search and Data Mining (WSDM)*, 2012.
- [C18] **Y. Zhang**, W. Chen and D. Wang, Q. Yang. User-click Modeling for Understanding and Predicting Search-behavior. *ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD)*, 2011.
- [C19] B. Hu, **Y. Zhang**, G. Wang, Q. Yang, W. Chen. Characterize Search Intent Diversity into Click Models. *International World Wide Web Conference (WWW)*, 2011.
- [C20] **Y. Zhang**, D. Wang, G. Wang, W. Chen, Z. Zhang, B. Hu and L. Zhang. Learning Click Model via Probit Bayesian Inference. *ACM International Conference on Information and Knowledge Management (CIKM)*, 2010.
- [C21] D. Wang, W. Chen, G. Wang, **Y. Zhang** and B. Hu. Explore Click Models for Search Ranking. *ACM International Conference on Information and Knowledge Management (CIKM)*, short paper, 2010.
- [C22] F. Zhong, D. Wang, G. Wang, W. Chen, **Y. Zhang**, Z. Chen and H. Wang. Incorporating Post-Click Behaviors Into a Click Model. *Annual International ACM SIGIR Conference (SIGIR)*, 2010.

- [C23] **Y. Zhang** and L. Zhang. Extracting Independent Rules: a New Perspective of Boosting. *International Symposium on Artificial Intelligence and Mathematics (ISAIM)*, 2010.

## Technical Reports

- [T1] **Y. Zhang** and MI. Jordan. Splash: User-friendly Programming Interface for Parallelizing Stochastic Algorithms. *arXiv:1506.07552*, 2015.

## Selected Awards & Honors

- 2017** Best Paper Award, Conference on Learning Theory (COLT).
- 2016** Outstanding Reviewer Award, International Conference on Machine Learning (ICML).
- 2015** Baidu Fellowship (awards 8 PhD students every year worldwide).
- 2013** Microsoft Research PhD Fellowship Finalist.
- 2006** Silver Medal in Asian Physics Olympiad.
- 2006** Gold Medal in Chinese Physics Olympiad (5<sup>th</sup> among 400,000 participants).

## Teaching

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| Graduate Student Instructor, Introduction to machine learning, UC Berkeley            | <b>2015</b> |
| Graduate Student Instructor, Randomized algorithms for matrices and data, UC Berkeley | <b>2013</b> |

## Service

**Journal Reviewer:** Journal of Machine Learning Research, Annals of Statistics, Mathematical Programming, ACM Transactions on the Web.

**Conference Reviewer:** ICML (2013 - ), NIPS (2013 - ), AISTAT (2015 - ), IJCAI (2015 - ).