Zhiwei Steven Wu

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(Last updated: 10/12/2019)

Research Interests

Machine Learning, Data Privacy, Algorithmic Fairness, Algorithmic Economics

Employment

University of Minnesota   Twin Cities, Minnesota USA

Assistant Professor of Computer Science   August 2018 –

Microsoft Research-New York City   New York City, New York USA

Postdoctoral Researcher   July 2017 – June 2018
- Research Groups: Machine Learning & Algorithmic Economics

Education

University of Pennsylvania   Philadelphia, Pennsylvania USA

Ph.D., Computer Science   September 2012 – June 2017
Thesis: *Data Privacy Beyond Differential Privacy*
Advisors: Michael Kearns & Aaron Roth
Received the Morris and Dorothy Rubinoff Dissertation Award (Best Thesis)

Bard College   Annandale, NY USA

B.A., Mathematics   May 2012
B.A., Computer Science   May 2012
Distinguished Scientist Scholarship (four-year full scholarship)

Budapest Semesters in Mathematics (BSM), Budapest, Hungary

Study-abroad program in mathematics   Fall 2010

Honors and Awards

2019 - Google Faculty Research Award
2019 - J.P. Morgan Research Faculty Award
2019 - Facebook Mechanism Design for Social Good Research Award
2017 - Morris and Dorothy Rubinoff Dissertation Award for Best Thesis
2017 - Simons-Berkeley Research Fellowship (declined)
2011 - Kenneth Bush Memorial Scholarship in Mathematics
2010 - BSM Mathematics Competition Honorable Mention
2010 - Mathematical Association of America Presentation Prize
2008–2012 - Distinguished Scientist Scholarship (four-year full scholarship)

Research Funding

Total amount awarded: $1,075,747. **Total amount pending**: $1,249,647.
- Role: PI
  (Co-PIs: Alexandra Chouldechova(CMU), Min Kyung Lee (CMU), Haiyi Zhu (CMU))
  Funding Agency: NSF
  (Pending) "FAI: Advancing Fairness in AI with Human-Algorithm Collaborations"
  1/1/2020–12/31/2022
  Total award amount: $1,249,647

- Role: UMN PI
  (PI: Haiyi Zhu (CMU), co-PIs: Mark Snyder, Loren Terveen)
  Funding Agency: NSF
  (Awarded) "EAGER: AI-DCL: Capture, Explain and Negotiate the Inherent Trade-offs in Machine Learning Algorithms"
  10/01/2019–9/30/2021
  Total award amount: $295,713

- Role: Co-PI
  (PI: Haiyi Zhu (CMU), co-PIs: Mark Snyder, Loren Terveen)
  Funding Agency: NSF
  (Awarded) "CHS: Small: Incorporating and Balancing Stakeholder Values in Algorithm Design"
  8/1/2019–7/31/2022
  Total award amount: $500,000

- Role: PI
  (Co-PI: Haiyi Zhu (CMU))
  Funding Agency: Facebook
  (Awarded) "Promoting Diversity in Peer Production through Mechanism Design"
  1/1/2019–12/31/2019
  Total award amount: $50,000

- Role: Sole PI
  Funding Agency: J.P. Morgan
  (Awarded) "Preventing Unfair Discrimination in Interactive Learning"
  3/4/2019–3/3/2021
  Total award amount: $155,034

- Role: Sole PI
  Funding Agency: Google
  (Awarded) "Incentive-Aware Learning via Algorithmic Stability"
  Total award amount: $50,000

- Role: Sole PI
  Funding Agency: Mozilla
  (Awarded) "DP-Fathom: Private, Accurate, and Communication-Efficient"
  Total award amount: $25,000

JOURNAL
PUBLICATIONS

(Unless specified otherwise, authors in all papers are listed in alphabetical order.)

- Brett K. Beaulieu-Jones, Zhiwei Steven Wu, Chris Williams, Ran Lee, Sanjeev P Bhavnani, James Brian Byrd, Casey S. Greene and Casey S. Greene. Privacy-preserving generative deep neural networks support clinical data sharing. In *Circulation: Cardiovascular Quality and Outcomes 2019; 12* (Contributional order)

- Paul W. Goldberg, Francisco J. Marmolejo Cossío, and Zhiwei Steven Wu. Logarithmic query complexity for approximate nash computation in large games. *Theory of Computing Systems* (**TOCS**), 2019. Special issue for selected papers from SAGT 2016

- Michael Kearns, Aaron Roth, Zhiwei Steven Wu, and Grigory Yaroslavtsev. Private algorithms for the protected in social network search. *Proceedings of the National Academy of Sciences* (**PNAS**), 113(4), 2016

- Justin Hsu, Zhiyi Huang, Aaron Roth, Tim Roughgarden, and Zhiwei Steven Wu. Private matchings and allocations. *SIAM Journal on Computing* (**SICOMP**), 2016. Previously published in ACM SIGACT Symposium on Theory of Computing (STOC 2014)

- Marco Gaboardi, Emilio Jesús Gallego Arias, Justin Hsu, Aaron Roth, and Zhiwei Steven Wu. Dual query: Practical private query release for high dimensional data. *Journal of Privacy and Confidentiality* (**JPC**), 2016. Previously published in International Conference on Machine Learning (ICML 2014)

CONFERENCE PUBLICATIONS

- Mark Bun, Gautam Kamath, Thomas Steinke, and Zhiwei Steven Wu. Private hypothesis selection. In *Advances in Neural Information Processing Systems 32: Annual Conference on Neural Information Processing Systems,* **NeurIPS**, 2019

- Matthew Joseph, Janardhan Kulkarni, Jieming Mao, and Zhiwei Steven Wu. Locally private Gaussian estimation. In *Advances in Neural Information Processing Systems 32: Annual Conference on Neural Information Processing Systems,* **NeurIPS**, 2019

- Yahav Bechavod, Katrina Ligett, Aaron Roth, Bo Waggoner, and Zhiwei Steven Wu. Equal Opportunity in Online Classification with Partial Feedback. In *Advances in Neural Information Processing Systems 32: Annual Conference on Neural Information Processing Systems,* **NeurIPS**, 2019

- Arindam Banerjee, Qilong Gu, Vidyashankar Sivakumar, and Zhiwei Steven Wu. Random quadratic forms with dependence: applications to restricted isometry and beyond. In *Advances in Neural Information Processing Systems 32: Annual Conference on Neural Information Processing Systems,* **NeurIPS**, 2019

- Seth Neel, Aaron Roth, and Zhiwei Steven Wu How to Use Heuristics for Differential Privacy In *Proceedings of The 60th Annual IEEE Symposium on Foundations of Computer Science,* **FOCS**, 2019

- Alekh Agarwal, Miroslav Dudik, Zhiwei Steven Wu Fair Regression: Quantitative Definitions and Reduction-based Algorithms In *Proceedings of the 36th International Conference on Machine Learning,* **ICML**, 2019

- Aaron Schein, Zhiwei Steven Wu, Alexandra Schofield, Mingyuan Zhou, and Hanna Wallach. Locally private bayesian inference for count models. In *Proceedings of the 36th International Conference on Machine Learning,* **ICML**, 2019. (Contributional order)

- Miruna Oprescu, Vasilis Syrgkanis, and Zhiwei Steven Wu Orthogonal Random Forest for Causal Inference In *Proceedings of the 36th International Conference on Machine Learning,* **ICML**, 2019

- Guy Aridor, Kevin Liu, Aleksandrs Slivkins, Zhiwei Steven Wu. The Perils of Exploration under Competition: A Computational Modeling Approach In *The 20th ACM conference on Economics and Computation* **EC**, 2019

- Nicole Immorlica, Jieming Mao, Alex Slivkins, and Zhiwei Steven Wu. Bayesian Exploration with Heterogeneous Agents In *The Web Conference 2019* **TheWebConf (Oral presentation)**, 2019

- Michael J. Kearns, Seth Neel, Aaron Roth, and Zhiwei Steven Wu. An empirical study of rich subgroup fairness for machine learning. In *Proceedings of the second Annual ACM Conference on Fairness, Accountability, and Transparency,* **FAT***, 2019

- Sampath Kannan, Jamie Morgenstern, Aaron Roth, Bo Waggoner, and Zhiwei Steven Wu. A smoothed analysis of the greedy algorithm for the linear contextual bandit problem. In *Advances in Neural Information Processing Systems 30: Annual Conference on Neural Information Processing Systems,* **NeurIPS (Spotlight)**, 2018

- Manish Raghavan, Aleksandrs Slivkins, Jenn Wortman Vaughan, and Zhiwei Steven Wu. The unfair externalities of exploration and how data diversity helps exploitation. In *The 31st Annual Conference on Learning Theory,* **COLT**, 2018

- Michael J. Kearns, Seth Neel, Aaron Roth, and Zhiwei Steven Wu. Preventing fairness gerrymandering: Auditing and learning for subgroup fairness. In *Proceedings of the 35th International Conference on Machine Learning,* **ICML**, 2018

- Akshay Krishnamurthy, Zhiwei Steven Wu, and Vasilis Syrgkanis. Semiparametric Contextual Bandits. In *Proceedings of the 35th International Conference on Machine Learning,* **ICML**, 2018. (Contributional order)

- Jinshuo Dong, Aaron Roth, Zachary Schutzman, Bo Waggoner, and Zhiwei Steven Wu. Strategic classification from revealed preferences. In *The 19th ACM conference on Economics and Computation* **EC**, 2018

- Yishay Mansour, Aleksandrs Slivkins, and Zhiwei Steven Wu. Competing bandits: Learning in competition. In *Proceedings of the 2018 ACM Conference on Innovations in Theoretical Computer Science,* **ITCS**, 2018

- Katrina Ligett, Seth Neel, Aaron Roth, Bo Waggoner, and Zhiwei Steven Wu. Accuracy first: Selecting a differential privacy level for accuracy-constrained ERM. In *Advances in Neural Information Processing Systems 29: Annual Conference on Neural Information Processing Systems,* **NIPS**, 2017

- Sampath Kannan, Michael Kearns, Jamie Morgenstern, Mallesh M. Pai, Aaron Roth, Rakesh V. Vohra, and Zhiwei Steven Wu. Fairness incentives for myopic agents. In *Proceedings of the 2017 ACM Conference on Economics and Computation,* **EC**, 2017

- Aaron Roth, Aleksandrs Slivkins, Jonathan Ullman, and Zhiwei Steven Wu. Multidimensional dynamic pricing for welfare maximization. In *Proceedings of the 2017 ACM Conference on Economics and Computation,* **EC**, 2017. Invited to the special issue of ACM Transactions on Economics and Computation for EC'17

- Michael Kearns, Aaron Roth, and Zhiwei Steven Wu. Meritocratic fairness for cross-population selection. In *Proceedings of the 34th International Conference on Machine Learning,* **ICML**, 2017

- Michael Kearns and Zhiwei Steven Wu. Predicting with distributions. In *Proceedings of the 30th Conference on Learning Theory,* **COLT**, 2017

- Shahin Jabbari, Ryan Rogers, Aaron Roth, and Zhiwei Steven Wu. Learning from rational behavior: Predicting solutions to unknown linear programs. In *Advances in Neural Information Processing Systems 28: Annual Conference on Neural Information Processing Systems,* **NIPS**, 2016

- Yishay Mansour, Aleksandrs Slivkins, Vasilis Syrgkanis, and Zhiwei Steven Wu. Bayesian exploration: Incentivizing exploration in bayesian games. In *Proceedings of the 2016 ACM Conference on Economics and Computation,* **EC**, 2016. Invited to the special issue of ACM Transactions on Economics and Computation for EC'16 (declined)

- Aaron Roth, Jonathan Ullman, and Zhiwei Steven Wu. Watch and learn: optimizing from revealed preferences feedback. In *Proceedings of the 48th Annual ACM SIGACT Symposium on Theory of Computing,* **STOC**, 2016

- Rachel Cummings, Katrina Ligett, Kobbi Nissim, Aaron Roth, and Zhiwei Steven Wu. Adaptive learning with robust generalization guarantees. In *Proceedings of the 29th Conference on Learning Theory,* **COLT**, 2016

- Paul W. Goldberg, Francisco J. Marmolejo Cossío, and Zhiwei Steven Wu. Logarithmic query complexity for approximate nash computation in large games. In *Proceedings of the 9th International Symposium on Algorithmic Game Theory,* **SAGT**, 2016. Invited to the special issue of Theory of Computing Systems for SAGT'16

- Justin Hsu, Zhiyi Huang, Aaron Roth, and Zhiwei Steven Wu. Jointly private convex programming. In *Proceedings of the Twenty-Seventh Annual ACM-SIAM Symposium on Discrete Algorithms,* **SODA**, 2016

- Rachel Cummings, Katrina Ligett, Jaikumar Radhakrishnan, Aaron Roth, and Zhiwei Steven Wu. Coordination complexity: Small information coordinating large populations. In *Proceedings of the 2016 ACM Conference on Innovations in Theoretical Computer Science,* **ITCS**, 2016

- Rachel Cummings, Michael Kearns, Aaron Roth, and Zhiwei Steven Wu. Privacy and truthful equilibrium selection for aggregative games. In *Proceedings of the 11th International Conference on Web and Internet Economics,* **WINE**, 2015

- Ryan Rogers, Aaron Roth, Jonathan Ullman, and Zhiwei Steven Wu. Inducing approximately optimal flow using truthful mediators. In *Proceedings of the Sixteenth ACM Conference on Economics and Computation,* **EC**, 2015

- Rachel Cummings, Katrina Ligett, Aaron Roth, Zhiwei Steven Wu, and Juba Ziani. Accuracy for sale: Aggregating data with a variance constraint. In *Proceedings of the 2015 Conference on Innovations in Theoretical Computer Science,* **ITCS**, 2015

- Sampath Kannan, Jamie Morgenstern, Aaron Roth, and Zhiwei Steven Wu. Approximately stable, school optimal, and student-truthful many-to-one matchings (via differential privacy). In *Proceedings of the Twenty-Sixth Annual ACM-SIAM Symposium on Discrete Algorithms,* **SODA**, 2015

- Marco Gaboardi, Emilio Jesús Gallego Arias, Justin Hsu, Aaron Roth, and Zhiwei Steven Wu. Dual query: Practical private query release for high dimensional data. In *Proceedings of the 31th International Conference on Machine Learning,* **ICML**, 2014

- Justin Hsu, Zhiyi Huang, Aaron Roth, Tim Roughgarden, and Zhiwei Steven Wu. Private matchings and allocations. In *Proceedings of the 46th ACM Symposium on Theory of Computing,* **STOC**, 2014. Invited to the special issue of ACM Transactions on Economics and Computation for STOC'14 (declined)

Pre-prints

- Giuseppe Vietri, Grace Tian, Mark Bun, Thomas Steinke and Zhiwei Steven Wu. New Oracle-Efficient Algorithms for Private Synthetic Data Release *Manuscript*, 2019 (Contribution order)

- Bowen Yu, Ye Yuan, Loren Terveen, Zhiwei Steven Wu, and Haiyi Zhu Designing Interfaces to Help Stakeholders Comprehend, Navigate, and Manage Algorithmic Trade-Offs *Manuscript*, 2019 (Contribution order)

- Gautam Kamath, Janardhan Kulkarni, Zhiwei Steven Wu and Huanyu Zhang. Privately Learning Markov Random Fields *Manuscript*, 2019

- Chris Jung, Michael Kearns, Seth Neel, Aaron Roth, Logan Stapleton, and Zhiwei Steven Wu. Eliciting and Enforcing Subjective Individual Fairness. *Manuscript*, 2019

- Seth Neel, Aaron Roth, Giuseppe Vietri, and Zhiwei Steven Wu. Differentially Private Objective Perturbation: Beyond Smoothness and Convexity. *Manuscript*, 2019

- Nicole Immorlica, Jieming Mao, Alex Slivkins, and Zhiwei Steven Wu. Incentivizing Exploration with Unbiased Histories *Manuscript*, 2018

- Xiangyi Chen*, Tiancong Chen*, Haoran Sun, Zhiwei Steven Wu, and Mingyi Hong. Distributed Training with Heterogeneous Data: Bridging Median- and Mean-Based Algorithms *Manuscript*, 2019 (Contributional order)

SURVEYS/ NEWSLETTERS	• Aaron Roth, Jonathan Ullman, and Zhiwei Steven Wu. Watch and learn: optimizing from revealed preferences feedback. *SIGecom Exchanges*, 2015

ADVISING

Ph.D. Students

- Giuseppe Vietri (co-advised by Maria Gini). 2018–present

- Logan Stapleton. 2019–present

- Dung Ngo. 2019–present

- Hao-Fei Cheng (co-advised by Haiyi Zhu). 2019–present

Thesis Committees

- Vidyashankar Sivakumar (Univ. of Minnesota)

- Qilong Gu (Univ. of Minnesota)

- Anthony Zhenhuan Zhang (Univ. of Minnesota)

- Gautam Goel (Caltech)

TEACHING

University of Minnesota   Twin-Cities, MN
Instructor
- CSCI 5525: Machine Learning   Fall 2019
- CSCI 8980: The Algorithmic Foundations of Data Privacy   Fall 2018

Bard Prison Initiative,   Eastern Correctional Facility, NY
Math tutor: gave math tutorials to inmates   Spring 2011

SERVICE AND
OUTREACH

Organizer of Recent Developments in Research on Fairness. The Simons Institute for the Theory of Computing, Berkeley, CA. July 8-10, 2019.

Program Committee: ICLR 2020 (Area Chair), WWW 2020, EC 2020, TPDP 2019, EC 2019, FAT* 2019 (Track chair on ML/Stats/Data Mining), AAAI 2019, EC 2018, WWW 2018, ICML 2018, ICML 2017.

Conference Reviewer: STOC 2019, SODA 2018, ITCS 2018, NIPS 2017, ALT 2017, FOCS 2017, EC 2017, ICALP 2017, SODA 2017, COLT 2016, ESA 2016, TEAC, WINE 2015, ISAAC 2015, NIPS 2015, FOCS 2015, STOC 2015, FOCS 2014, WINE 2014, WINE 2013

Journal Reviewer: Proceedings of the National Academy of Sciences of the United States of America (PNAS), Machine Learning, Journal of Machine Learning Research, Operations Reserach, Journal of Privacy and Confidentiality, Transactions on Pattern Analysis and Machine Intelligence.

SELECTED TALKS

Locally Private Bayesian Inference for Count Models
- Simons Workshop on Privacy and the Science of Data Analysis, April 2019

How to Use Heuristics for Differential Privacy
- Simons Institute Seminar, Feb 2019
- IMA Workshop: Recent Themes in Resource Tradeoffs: Privacy, Fairness, and Robustness, June 2019

Preventing Fairness Gerrymandering: Auditing and Learning for Subgroup Fairness
- Google Research Seminar, April 2018
- CalTech Theory Seminar, March 2018

Privacy-Preserving GANs Support Clinical Data Sharing
- Microsoft Research-NYC tea talk, March 2019
- Banff workshop on "Mathematical Foundations of Data Privacy", May 2018

A Smoothed Analysis of the Greedy Algorithm for the Linear Contextual Bandit Problem
- Rutgers/DIMACS Theory of Computing Seminar, Oct 2017
- UMass Machine Learning and Friends Lunch (MLFL), Nov 2017

Differential Privacy: A Rigorous Notion for Data Privacy
- Muhlenberg College Math/CS Colloquium, May 2017
- Carleton College CS Tea Talk, Oct 2019

Leveraging No-Regret Algorithms in Private Data Analysis
- Princeton CS theory lunch, Feb 2017

Social Norms for Data-Driven Algorithms: Privacy, Incentive-Compatibility and Fairness
- SIGAI CNC, Boston, MA, Oct 2016
- NY Area Theory Day, New York, NY, Dec 2016

Adaptive Data Analysis and Differential Privacy
- Guest Lecture in the course Computational Learning Theory at UPenn

Adaptive Learning with Robust Generalization Guarantees
- COLT, New York City, June 2016

Coordination Complexity: Small Information Coordinating Large Populations
- Northeastern University Theory Seminar, January 2016
- UPenn Theory Lunch, September 2015
- University of Hong Kong, Theory Seminar, December 2015

Bayesian Exploration: Incentivizing Exploration in Bayesian Games
- Harvard EconCS Seminar, September 2016
- EC, Maastricht, July 2016
- Microsoft Research NYC Tea Talk, July 2015

Watch and Learn: Optimizing from Revealed Preferences Feedback
- STOC, Cambridge, June 2016
- Caltech Theory Lunch, April 2015
- The First Workshop on Algorithmic Game Theory and Data Science, Portland, June 2015

Inducing Approximately Optimal Flow Using Truthful Mediators
- EC, Portland, June 2015

Privacy for the Protected (Only)
- Columbia CS Seminar, Dec. 2016
- Cornell Theory Seminar, Nov. 2016
- Workshop on The Theory of Bringing Privacy into Practice, Pasadena, April 2015

Privacy and Truthful Equilibrium Selection in Aggregative Games
- UPenn Theory Lunch, September 2014

- WINE, December 2015

Dual Query: Practical Private Query Release for High Dimensional Data
- ICML, Beijing, June 2014

Private Matchings and Allocations
- STOC, New York, June 2014
- UPenn Theory Lunch, May 2014