

# Bo Waggoner

## *Curriculum vitae*

Assistant Professor, Computer Science

University of Colorado, Boulder

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<https://www.bowaggoner.com>

*Areas*      Theoretical computer science; algorithmic game theory; mechanism design;  
theoretical machine learning; artificial intelligence.

*Keywords*      Information elicitation, theoretical machine learning, privacy, online learning, information  
aggregation, market design.

*Education*      **Harvard University**      2011 - 2016  
PhD, Computer Science  
Advisor: Yiling Chen  
Thesis: **Acquiring and Aggregating Information from Strategic Sources**  
Siebel Scholar (2015-16)  
ACM SIGECOM Dissertation Award, Honorable Mention (2016)

**Duke University**      2007 - 2011  
B.S. Mathematics/Computer Science  
*magna cum laude*, with High Distinction

*Appointments*      **University of Colorado, Boulder**      August 2019 - present  
Assistant Professor, Computer Science.

**Microsoft Research, NYC**      July 2018 - June 2019  
Postdoctoral Fellow, Algorithmic Game Theory group.

**University of Pennsylvania**      August 2016 - July 2018  
Postdoctoral Fellow  
The Warren Center for Network and Data Sciences  
Supervisors: Michael Kearns, Aaron Roth.

**Intern, Microsoft Research New England**      Summer 2015  
Host: Brendan Lucier, Cambridge, MA.  
Topics: data marketplaces; signalling in games.

**Intern, Google Research** Summer 2013  
Host: Aranyak Mehta, Mountain View CA.  
Topics: approximation algorithms, auction design, online matching.

**Intern, Google Research** Summer 2012  
Host: Aranyak Mehta, Mountain View CA.  
Topics: crowdsourcing and maximum-likelihood; online matching; auction theory.

**Research Assistant, Duke University** Summer 2011  
Advisor: Vincent Conitzer  
Topic: false-name manipulations in voting settings.

**PRUV Fellow, Duke University** Summer 2010 - Summer 2011  
Advisor: Elizabeth Bouzarth  
Topic: modeling the foot in motion. A model and simulation of the dynamics of impact, stance, and takeoff in barefoot running.

*Publications\** **Trading off Consistency and Dimensionality of Convex Surrogates for the Mode.**  
Enrique Nueve, Bo Waggoner, Dhamma Kimpara, and Jessie Finocchiaro.  
*Proceedings of the Thirty-Sixth Annual Conference on Neural Information Processing Systems (NeurIPS 2024).*

**Matching with Nested and Bundled Pandora Boxes.**  
Robin Bowers and Bo Waggoner.  
*Proceedings of the Twentieth Conference on Web and Internet Economics (WINE 2024).*

**Recent Trends in Information Elicitation.**  
Rafael Frongillo and Bo Waggoner.  
*SIGecom Exchanges (SIGecom Exch., 2024).*

**An Axiomatic Characterization of CFMMs and Equivalence to Prediction Markets.**  
Rafael Frongillo, Maneesha Papireddygar, and Bo Waggoner.  
*Proceedings of the 15th Innovations in Theoretical Computer Science Conference (ITCS 2024).*

**An Embedding Framework for the Design and Analysis of Consistent Polyhedral Surrogates.**  
Jessie Finocchiaro, Rafael M. Frongillo, and Bo Waggoner.  
*Journal of Machine Learning Research (JMLR, 2024).*

**High-Welfare Matching Markets Via Descending Price.**  
Robin Bowers and Bo Waggoner.

*Proceedings of the Nineteenth Conference on Web and Internet Economics (WINE 2023).*

**Agreement Implies Accuracy for Substitutable Signals.**

Rafael Frongillo, Eric Neyman, and Bo Waggoner.

*Proceedings of the Twenty-Fifth ACM Conference on Economics and Computation (EC 2023).*

**Proper Losses for Discrete Generative Models.**

Dhamma Kimpara, Rafael Frongillo, and Bo Waggoner.

*Proceedings of the Fortieth International Conference on Machine Learning (ICML 2023).*

**Contracts with Information Acquisition, via Scoring Rules.**

Maneesha Papireddygar and Bo Waggoner.

*Proceedings of the Twenty-Fourth ACM Conference on Economics and Computation (EC 2022).*

**Surrogate Regret Bounds for Polyhedral Losses.**

Rafael Frongillo and Bo Waggoner.

*Proceedings of the Thirty-Third Annual Conference on Neural Information Processing Systems (NeurIPS 2021).*

**Unifying Lower Bounds on Prediction Dimension of Consistent Convex Surrogates.**

Jessica Finocchiaro, Rafael Frongillo, and Bo Waggoner.

*Proceedings of the Thirty-Third Annual Conference on Neural Information Processing Systems (NeurIPS 2021).*

**Efficient Competitions and Online Learning with Strategic Forecasters.**

Rafael Frongillo, Robert Gomez, Anish Thilagar, and Bo Waggoner.

*Proceedings of the Twenty-Third ACM Conference on Economics and Computation (EC 2021).*

**Prophet Inequalities with Linear Correlations and Augmentations.**

Nicole Immorlica, Sahil Singla, and Bo Waggoner.

*Proceedings of the Twenty-Second ACM Conference on Economics and Computation (EC 2020).*

**Channel Auctions.**

Eduardo M. Azevedo, David M. Pennock, Bo Waggoner, E. Glen Weyl.

*Management Science, 2020.*

**Embedding Dimension of Polyhedral Losses.**

Jessica Finocchiaro, Rafael Frongillo, and Bo Waggoner.

*Proceedings of the Thirty-Third Annual Conference on Learning Theory (COLT 2020).*

**Preventing Arbitrage from Collusion When Eliciting Probabilities.**

Rupert Freeman, David M. Pennock, Dominik Peters, and Bo Waggoner.

*Proceedings of the Thirty-Fourth AAAI Conference on Artificial Intelligence*

(AAAI 2020).

**Computing Equilibria of Prediction Markets via Persuasion.**

Jerry Anunrojwong, Yiling Chen, Bo Waggoner, and Haifeng Xu.

*Proceedings of the Fifteenth Conference on Web and Internet Economics (WINE 2019).*

**Toward a Characterization of Loss Functions for Distribution Learning**

Nika Haghtalab, Cameron Musco, and Bo Waggoner.

*Proceedings of the Thirty-Third Annual Conference on Neural Information Processing Systems (NeurIPS 2019).*

**An Embedding Framework for Consistent Polyhedral Surrogates**

Jessie Finocchiaro, Rafael Frongillo, and Bo Waggoner.

*Proceedings of the Thirty-Third Annual Conference on Neural Information Processing Systems (NeurIPS 2019).*

**Equal Opportunity in Online Classification with Partial Feedback**

Yahav Bechavod, Katrina Ligett, Aaron Roth, Bo Waggoner, and Z. Steven Wu

*Proceedings of the Thirty-Third Annual Conference on Neural Information Processing Systems (NeurIPS 2019).*

**Decentralized & Collaborative AI on Blockchain**

Justin D. Harris and Bo Waggoner.

*Proceedings of the Second IEEE International Conference on Blockchain (IEEE-Blockchain 2019).*

**Multi-Observation Regression.**

Rafael Frongillo, Nishant Mehta, Tom Morgan, and Bo Waggoner.

*Proceedings of the Twenty-Second International Conference on Artificial Intelligence and Statistics (AISTATS 2019).*

**Local Differential Privacy for Evolving Data.**

Matthew Joseph, Aaron Roth, Jonathan Ullman, and Bo Waggoner.

*Proceedings of the Thirty-Second Annual Conference on Neural Information Processing Systems (NeurIPS 2018).*

*full version in Journal of Privacy and Confidentiality, Vol. 10 No. 1 (2020).*

**A Smoothed Analysis of the Greedy Algorithm for the Linear Contextual Bandits Problem.**

Sampath Kannan, Jamie Morgenstern, Aaron Roth, Bo Waggoner, and Z. Steven Wu.

*Proceedings of the Thirty-Second Annual Conference on Neural Information Processing Systems (NeurIPS 2018).*

**Bounded-Loss Private Prediction Markets.**

Rafael Frongillo, Bo Waggoner.

*Proceedings of the Thirty-Second Annual Conference on Neural Information Processing Systems (NeurIPS 2018).*

**Strategic Classification from Revealed Preferences.**

Jinshuo Dong, Aaron Roth, Zachary Schutzman, Bo Waggoner, and Z. Steven Wu.

*Proceedings of the Twentieth ACM Conference on Economics and Computation (EC 2018).*

**Active Information Acquisition for Linear Optimization.**

Shuran Zheng, Bo Waggoner, Yang Liu, and Yiling Chen.

*Proceedings of the Thirty-Fifth Conference on Uncertainty in Artificial Intelligence. (UAI 2018)*

**An Axiomatic Study of Scoring Rule Markets.**

Rafael Frongillo and Bo Waggoner.

*Proceedings of the Ninth Innovations in Theoretical Computer Science Conference (ITCS 2018).*

**Accuracy First: Selecting a Differential Privacy Level for Accuracy-Constrained ERM.**

Katrina Ligett, Seth Neel, Aaron Roth, Bo Waggoner, and Z. Steven Wu.

*Proceedings of the Thirty-First Annual Conference on Neural Information Processing Systems (NIPS 2017).*

*full version in Journal of Privacy and Confidentiality, Vol. 9 No. 2 (2019).*

**Multi-Observation Elicitation.**

Sebastian Casalaina-Martin, Tom Morgan, Rafael Frongillo, and Bo Waggoner.

*Proceedings of the Thirtieth Annual Conference on Learning Theory (COLT 2017).*

**The Complexity of Stable Matchings under Substitutable Preferences.**

Yuan Deng, Debmalya Panigrahi, and Bo Waggoner.

*Proceedings of the Thirty-First AAAI Conference on Artificial Intelligence (AAAI 2017).*

**Informational Substitutes.**

Yiling Chen and Bo Waggoner.

*Proceedings of the Fifty-Sixth Annual IEEE Symposium on Foundations of Computer Science (FOCS 2016).*

**Descending Price Optimally Coordinates Search.**

Robert Kleinberg, E. Glen Weyl, and Bo Waggoner.

*Proceedings of the Seventeenth ACM Conference on Economics and Computation (EC 2015).*

**A Market Framework for Eliciting Private Data.**

Bo Waggoner, Rafael Frongillo, and Jacob Abernethy.

*Proceedings of the Twenty-Ninth Annual Conference on Neural Information Processing Systems (NIPS 2015).*

**Low-Cost Learning via Active Data Procurement.**

Jacob Abernethy, Yiling Chen, Chien-Ju Ho, and Bo Waggoner.

*Proceedings of the Sixteenth ACM Conference on Economics and Computation (EC 2015).*

**Fair Information Sharing for Treasure Hunting.**

Yiling Chen, Kobbi Nissim, and Bo Waggoner.  
*Proceedings of the Twenty-Ninth AAI Conference on Artificial Intelligence (AAAI 2015).*

**$\ell_p$  Testing and Learning of Discrete Distributions.**

Bo Waggoner.  
*Proceedings of the Sixth Conference on Innovations in Theoretical Computer Science (ITCS 2015).*

**Online Stochastic Matching with Unequal Probabilities.**

Aranyak Mehta, Bo Waggoner, and Morteza Zadimoghaddam.  
*Proceedings of the Twenty-Sixth Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2015).*

**Output Agreement Mechanisms and Common Knowledge.**

Bo Waggoner and Yiling Chen.  
*Proceedings of the Second AAI Conference on Human Computation and Crowdsourcing (HCOMP 2014).*

**Designing Markets for Daily Deals.**

Yang Cai, Mohammad Mahdian, Aranyak Mehta, and Bo Waggoner.  
*Proceedings of the Ninth Conference on Web and Internet Economics (WINE 2013).*

**Evaluating Resistance to False-Name Manipulation in Elections.**

Bo Waggoner, Lirong Xia, and Vincent Conitzer.  
*Proceedings of the Twenty-Sixth AAI Conference on Artificial Intelligence (AAAI 2012).*

*\* In most venues listed, author order is generally alphabetical by convention of the field.  
Conference proceedings listed above are considered full archival publications in Computer Science.*

<i>Teaching</i>	<b>CU Boulder CSCI 2824: Discrete Structures</b> Undergraduate introduction to discrete mathematics, with Prof. Murray Cox.	Fall 2024
	<b>CU Boulder CSCI 5454: Design and Analysis of Algorithms</b> First-year graduate lecture-based course.	Fall 2023
	<b>CU Boulder CSCI 5454: Design and Analysis of Algorithms</b> First-year graduate lecture-based course.	Fall 2022
	<b>CU Boulder CYBR 5240: Introduction to Blockchain</b> Graduate seminar course.	Spring 2022
	<b>CU Boulder CSCI 5454: Design and Analysis of Algorithms</b> First-year graduate lecture-based course.	Fall 2021
	<b>CU Boulder CSCI 3104: Algorithms</b> Undergrad lecture-based course.	Fall 2021

**CU Boulder CSCI 4830 / INFO 4871: Fairness and Bias in AI** Spring 2021  
Undergrad topics course taught jointly with Prof Robin Burke (INFO).

**CU Boulder CSCI 7000 / APPM 5490 / APPM 4490: Theory of Machine Learning** Spring 2021  
Advanced graduate course based on lectures, homework, and projects.

**CU Boulder CSCI 5454: Design and Analysis of Algorithms** Fall 2020  
First-year graduate lecture-based course.

**CU Boulder CSCI 7000: Topics in Algorithmic Game Theory** Spring 2020  
Seminar course based on readings and discussions.

**CU Boulder CSCI 5454: Design and Analysis of Algorithms** Fall 2019  
First-year graduate lecture-based course.

**Penn NETS 412: Algorithmic Game Theory** Spring 2018  
Advanced-undergraduate lecture-based course.

*Service*

**Local Co-Chair, EC 2022**

The ACM Conference on Economics and Computation, Boulder, CO  
July 15-19, 2022. With Rafael Frongillo.  
<https://ec22.sigecom.org/>

**Local Co-Chair, COLT 2021**

The Conference on Learning Theory, Boulder, CO  
August 15-19, 2021. With Rafael Frongillo.  
<https://www.learningtheory.org/colt2021/>

**Co-Organizer, DIMACS Workshop on Forecasting: From Forecasts to Decisions**

March 17-19, 2021, virtual format.  
With David Pennock and Rafael Frongillo.  
<http://dimacs.rutgers.edu/events/details?eID=1531>

**Co-Organizer, Workshop on Economics of Privacy and Data Labor**

at the 2020 International Conference on Machine Learning (ICML)  
with Nikolaos Vasiloglou, Rachel Cummings, Glen Weyl, Paris Koutris, Meg Young, Ruoxi Jia, and David Dao.  
<https://vasiloglou.github.io/EcoPaDL/>

**Co-Organizer, Tutorial on Information, Persuasion, and Decision Making**

at the 2018 ACM Conference on Economics and Computation (EC)  
with Haifeng Xu.  
<https://www.haifeng-xu.com/information-ec18/>

**Co-Organizer, Workshop on Forecasting**

at the 2017 ACM Conference on Economics and Computation (EC)  
with Rafael Frongillo and David Rothschild.  
<http://www.bowaggoner.com/ec-forecasting/>

### **Co-Organizer, Tutorial on Elicitation**

at the 2016 ACM Conference on Economics and Computation (EC)  
with Rafael Frongillo.

<https://sites.google.com/site/informationelicitation/>

### **Technical Blog “The Tiger’s Stripes”**

<https://www.bowaggoner.com/blog/>

Dedicated to accessible tutorials on research or fundamentals in math, computer science, and game theory.

### **Senior Program Committee**

Economics and Computation (EC).

### **Program Committee**

International Joint Conference on Artificial Intelligence (IJCAI), International Conference on Autonomous Agents and Multiagent Systems (AAMAS), AAAI Conference on Artificial Intelligence (AAAI), International Conference on Machine Learning (ICML), Advances in Neural Information Processing Systems (NeurIPS), International Conference on World Wide Web (WWW), ACM Conference on Equity and Access in Algorithms, Mechanisms, and Optimization (EAMMO).

### **Referee/Reviewer**

ACM-SIAM Symposium on Discrete Algorithms (SODA); ACM WSDM Conference; AAAI Conference on Artificial Intelligence (AAAI); International Symposium on Algorithmic Game Theory (SAGT); International Conference on Machine Learning (ICML); ACM Symposium on Theory of Computing (STOC); Conference on Learning Theory (COLT); International Joint Conference on Artificial Intelligence (IJCAI); International World Wide Web Conference (WWW); IEEE Symposium on Foundations of Computer Science (FOCS); Advances in Neural Information Processing Systems (NeurIPS); International Symposium on Information Theory (ISIT); Foundations and Trends in Theoretical Computer Science (Fn-TCS); Games and Economic Behavior; Journal of Artificial Intelligence; Transactions on Algorithms; Transactions on Economics and Computation; Information Processing Letters; Mathematics of Operations Research.

### **Grant Reviewer**

National Science Foundation, 2019, 2020, 2023.

### **Online Computer Science Community**

Regular contributor to question-and-answer sites {cs,cstheory,math}.stackexchange.com, mathoverflow.net.

*Grants  
Awards*

#### 📄 **Google Research Scholar (2024-)**

Funding organization: Google

Award Title: *Multi-Stage Pandora’s Box for Search and Decision Making*

#### **Next Steps for Weitzman’s Pandora’s Box Problem in Mechanism Design (2023-)**

Funding organization: The National Science Foundation, CISE, Algorithmic Foundations

Award No: 2329431



**Design of Automated Market Makers from Prediction Market Principles (2023-)**

Funding organization: The Ethereum Foundation, Academic Grants Round

Award No: FY23-1027

**Governance Based On Preferences, Incentives, and Information (2022-)**

Funding organization: The Ethereum Foundation, Academic Grants Round

Award No: FY22-0716

*Miscellanea*

**Doctoral Dissertation Award - Honorable Mention**

Association for Computing Machinery's Special Interest Group on Electronic Commerce (ACM-SIGecom).

**Siebel Scholarship**

Funded final year of doctoral studies via the Siebel Scholars Foundation.

**ACM International Collegiate Programming Competition (ICPC)**

World Finalist, 2011. Member of 80th-place team from Duke University.

*Competitive  
Running*

**Post-collegiate competition**

Qualifier, 2016 USA Olympic Trials Marathon, via 1:04:50 half-marathon performance.

**Division I Athletics**

Personal records: 4:06.8 mile, 14:06 5k, 29:14 10k.

Member and captain of three varsity athletic teams at Duke:

*Cross-Country* 4-time All-ACC, placing 5th as a senior;  
team 21st place at the 2010 NCAA Championships.

*Indoor Track* All-ACC; Duke school records in 3000m and 5000m.

*Outdoor Track* NCAA Finalist and 21st place at the 2011 NCAA Championships  
in the 10000m.

2010 COSIDA Academic All-America in Cross-Country/Track and Field.

2010 ACC Male Scholar-Athlete of the Year in Indoor Track and in Cross-Country.