

Rachel Cummings

CONTACT INFORMATION

Rachel Cummings
Computing and Mathematical Sciences
California Institute of Technology
E-mail: rachelc@caltech.edu
Web: <http://users.cms.caltech.edu/~rachelc/>

RESEARCH INTERESTS

My work seeks to bridge the gap between theory and practice in the formal study of privacy. This includes problems such as strategic aspects of data generation, incentivizing truthful reporting of data, impacts of privacy policy, human decision-making, and algorithm design. More broadly, I take a comprehensive approach to addressing real-world privacy challenges, using a diverse toolkit of both theoretical and practical perspectives.

EDUCATION

California Institute of Technology, Pasadena, CA

Ph.D. in Computing and Mathematical Sciences June 2017
– Advisor: Katrina Ligett
– Committee: Katrina Ligett, Adam Wierman, Aaron Roth, Federico Echenique, Rakesh Vohra
– Thesis: The Implications of Privacy-Aware Choice

Northwestern University, Evanston, IL

M.S. in Computer Science Dec. 2013
– Committee: Ronen Gradwohl, Jason Hartline, Ehud Kalai

University of Southern California, Los Angeles, CA

B.A. in Mathematics, B.A. in Economics May 2011
– Advisor: David Kempe

JOURNAL PUBLICATIONS

R. Cummings, D. M. Pennock, and J. Wortman Vaughan. *The Possibilities and Limitations of Private Prediction Markets*. ACM Transactions on Economics and Computation. In submission to special issue (by invitation).

R. Cummings, F. Echenique, and A. Wierman. *The Empirical Implications of Privacy-Aware Choice*. Operations Research, 2016.

H.L. Chen, R. Cummings, D. Doty, and D. Soloveichik. *Speed Faults in Computation by Chemical Reaction Networks*. Distributed Computing, 2015.

R. Cummings, D. Doty, and D. Soloveichik. *Probability 1 Computation with Chemical Reaction Networks*. Natural Computing, 2015.

CONFERENCE PUBLICATIONS

R. Cummings, K. Ligett, K. Nissim, A. Roth, and Z. S. Wu. *Adaptive Learning with Robust Generalization Guarantees*. Conference on Learning Theory (COLT), 2016.

R. Cummings, D. M. Pennock, and J. Wortman Vaughan. *The Possibilities and Limitations of Private Prediction Markets*. ACM Conference on Economics and Computation (EC), 2016.

R. Cummings, K. Ligett, M. Pai, and A. Roth. *The Strange Case of Privacy in Equilibrium Models*. ACM Conference on Economics and Computation (EC), 2016.

R. Cummings, K. Ligett, J. Radhakrishnan, A. Roth, and Z. S. Wu. *Coordination Complexity: Small Information Coordinating Large Populations*. Innovations in Theoretical Computer Science

(ITCS), 2016.

R. Cummings, S. Ioannidis, and K. Ligett. *Truthful Linear Regression*. Conference on Learning Theory (COLT), 2015.

R. Cummings, K. Ligett, A. Roth, Z. S. Wu, and J. Ziani. *Accuracy for Sale: Aggregating Data with a Variance Constraint*. Innovations in Theoretical Computer Science (ITCS), 2015.

R. Cummings, M. Kearns, A. Roth, and Z. S. Wu. *Privacy and Truthful Equilibrium Selection for Aggregative Games*. Conference of Web and Internet Economics (WINE), 2015.

K. Amin, R. Cummings, L. Dworkin, M. Kearns, and A. Roth. *Online Learning and Profit Maximization from Revealed Preferences*. Conference on Artificial Intelligence (AAAI), 2015.

R. Cummings, D. Doty, and D. Soloveichik. *Probability 1 Computation with Chemical Reaction Networks*. International Conference on DNA Computing and Molecular Programming (DNA), 2014.

R. Cummings, F. Echenique, and A. Wierman. *The Empirical Implications of Privacy-Aware Choice*. ACM Conference on Economics and Computation (EC), 2014.

H.L. Chen, R. Cummings, D. Doty, and D. Soloveichik. *Speed Faults in Computation by Chemical Reaction Networks*. International Symposium on Distributed Computing (DISC), 2014.

Best paper award

W. Chen, A. Collins, R. Cummings, T. Ke, Z. Liu, D. Rincon, X. Sun, Y. Wang, W. Wei, and Y. Yuan. *Influence Maximization in Social Networks When Negative Opinions May Emerge and Propagate*. SIAM Conference on Data Mining (SDM), 2011.

Cited 150 times

HONORS AND AWARDS

- Simons Award for Graduate Students in Theoretical Computer Science (2015-2017)
- Facebook Fellowship Finalist (2015)
- Best paper award, International Symposium on Distributed Computing (2014)
- Helen and Robert Piros Fellowship, Northwestern University (2011-2012)
- Discovery Scholar Distinction for Undergraduate Research, USC (Class of 2011)

PATENTS

S. Vardi and R. Cummings. *Needlestack: A Method for Protecting Browsing Privacy*. United States Provisional Patent 62/485,687. Filed 2017.

R. Cummings and S. Ioannidis. *Method and Apparatus for Incentivizing Truthful Data Reporting*. United States Patent 20,160,148,243. Awarded 2016.

RESEARCH VISITS

Hebrew University, Periodically, 2015-2016.

Visiting Graduate Student with Prof. Katrina Ligett.

Microsoft Research New York City, June-September 2015.

Research Intern with Dr. Jennifer Wortman Vaughan.

Technicolor Los Altos Research Center, June-September 2014.

Research Intern with Dr. Stratis Ioannidis.

University of Pennsylvania, January-May 2014.

Visiting Graduate Student with Prof. Aaron Roth and Prof. Michael Kearns.

California Institute of Technology, April-December 2013.

Visiting Graduate Student with Prof. Katrina Ligett.

University of Southern California, September 2009-May 2011.

Undergraduate Researcher with Prof. David Kempe.

Microsoft Research Asia, June-August 2009.

Research Intern with Dr. Wei Chen.

SELECTED
PRESENTATIONS

The Price of Privacy: Experimental Evidence for the Value of Privacy

- INFORMS Annual Meeting, Nashville, November 2016
- Hebrew University, Behavioral and Experimental Economics (BEE) Meeting, May 2016

Adaptive Learning with Robust Generalization Guarantees

- Hebrew University, Privacy Group, June 2016
- UT Austin, Algorithms and Computational Theory Seminar, March 2016
- UMass Amherst, Machine Learning Lunch, March 2016
- Caltech, Rigorous Systems Research Group (RSRG) Seminar, March 2016

The Possibilities and Limitations of Private Prediction Markets

- Technion, IE&M Game Theory Seminar, November 2016
- ACM Conference on Economics and Computation (EC), July 2016
- Hebrew University and Center for Rationality, Computation and Economics Seminar, May 2016
- Technion, CS Theory Lunch, May 2016
- MSR NYC, Tea Talk, July 2015

The Strange Case of Privacy in Equilibrium Models

- INFORMS Annual Meeting, Nashville, November 2016
- Southern California Network Economics and Game Theory Symposium (NEGT), November 2016
- ACM Conference on Economics and Computation (EC), July 2016
- Tel Aviv University, Industrial Organization Seminar, May 2016
- Barbados, Bellairs Workshop on Algorithmic Game Theory, April 2016
- Hausdorff Research Institute for Mathematics, Game Theory Workshop, December 2015

Truthful Linear Regression

- Conference on Learning Theory (COLT), July 2015
- Workshop on the Theory of Bringing Privacy Into Practice, Pasadena, April 2015
- Technicolor Research, Los Altos, September 2014

Privacy and Truthful Equilibrium Selection for Aggregative Games

- International Symposium on Mathematical Programming (ISMP), Pittsburgh, July 2015
- USC, CS Theory Lunch, January 2015
- Hebrew University and Center for Rationality, Game Theory Seminar, January 2015
- Southern California Network Economics and Game Theory Symposium (NEGT), November 2014
- Dagstuhl Seminar on Equilibrium Computation, August 2014

Online Learning from Revealed Preferences

- Caltech, Rigorous Systems Research Group (RSRG) Seminar, October 2014
- Technicolor Research, Los Altos, July 2014

The Empirical Implications of Privacy-Aware Choice

- ACM Conference on Economics and Computation (EC), June 2014
- University of Pennsylvania, CS Theory Lunch, January 2014
- Caltech, Social and Information Sciences Laboratory (SISL) Lunch, November 2013

TEACHING
EXPERIENCE

Spring 2015: Advanced Algorithms, TA for Prof. Katrina Ligett

Fall 2014: Introduction to Data Privacy, TA for Prof. Katrina Ligett

Spring 2013: Special Topics in Data Privacy, TA for Prof. Katrina Ligett

Winter 2013: Design and Analysis of Algorithms, TA for Prof. Ming-Yang Kao

SERVICE

- Member of ACM U.S. Public Policy Council and Privacy Committee
- PC member for EC 2017, WINE 2017, AGT@IJCAI 2017, TPDP 2017, SBP-BRiMS 2016, 2017
- Reviewer for AER, MOR, PNAS, Electronic Markets, Theoretical Computer Science, ToIS

- Subreviewer for AAAI, COLT, EC, SIGMETRICS, SODA, STOC, WINE
- CMS Colloquium Committee, Caltech (2014-2015)

OUTREACH

- STEM Career Day for Girls, Caltech (2015)
- Scientific Consultant for *ISA*, feature film about a gifted Latina high school student interested in computer science and mathematics (2014)
- STEM Career Day for Girls, Northwestern University (2012, 2013)