

Hoda Heidari

CONTACT INFORMATION

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RESEARCH INTERESTS

- Societal Aspects of AI (Fairness and Explainability)
- Data-driven Decision-making and Machine Learning
- Algorithmic Economics and Mechanism Design

POSITIONS

- Post-doctoral Associate, **Cornell University**, Ithaca, NY Sep 2019–present
- *Supervisor:* Professors Jon Kleinberg, Karen Levy, and Solon Barocas
 - *Affiliation:* AI, Policy, and Practice initiative, Computer Science Department
- Post-doctoral Fellow, **ETH Zürich**, Switzerland Aug 2017–Aug 2019
- *Supervisor:* Professor Andreas Krause
 - *Affiliation:* Learning and Adaptive Systems Group at the Machine Learning Institute

EDUCATION

- University of Pennsylvania**, Philadelphia, PA 2017
- Ph.D. in Computer and Information Science
- *Thesis:* “Essays in Algorithmic Market Design under Social Constraints”
 - *Advisors:* Prof. Michael Kearns and Prof. Ali Jadbabaie
 - *Committee:* Rakesh Vohra, Aaron Roth, Shivani Agrawal, Vahab S. Mirrokni
 - *Elective Coursework:* Microeconomics I (Decision Theory and General Equilibrium Theory), Microeconomics II (Game Theory and Mechanism Design), Market Design, Discrete Convexity & Submodularity, Convex Optimization, Computational Learning Theory
- Wharton School of Business**, Philadelphia, PA 2017
- M.Sc. in Statistics
- *Thesis:* “What Can Machine Learning Teach Econometrics?”
 - *Supervisor:* Prof. Dylan Small
 - *Coursework:* Applied Econometrics I, Mathematical Statistics, Probability, Stochastic Processes, Statistical Learning Theory, Data Analysis, Statistical Computing
- Sharif University of Technology**, Tehran, Iran 2011
- B.Sc. in Computer Engineering
- *Thesis:* “Toward Optimal Vaccination Strategies for Probabilistic Models”
Joint work with Z. Abbassi, supervised by Prof. Mohammad Ghodsi.
 - *Elective Coursework:* Linear Algebra, Algorithmic Game Theory (graduate course)

WORK EXPERIENCE

- Summer Intern, **Google Research**, New York 2015
- *Collaborators:* Hossein Azari, Mohammad Mahdian, Umar Syed, Sergei Vassilvitskii
 - *Project:* Collaborated with the ad-exchange team to improve pricing and callouts. Worked with Google’s large-scale data manipulation tools (Sawzall, Dremel, MapReduce).
- Summer Intern, **Microsoft Research**, New York 2014
- *Collaborators:* Sebastien Lahaie, David Pennock, Jenn Wortman Vaughan
 - *Project:* Designed an algorithmic mechanism to execute limit orders fairly in continuous prediction markets.

PUBLICATIONS

- [1] *Algorithmic Notions vs. Human Perceptions of Fairness: A Descriptive Approach to Selecting a Suitable Fairness Metric*. Megha Srivastava, Hoda Heidari, and Andreas Krause. **ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD)**, 2019.
- [2] *On the Long-term Impact of Algorithmic Decision Policies: Effort Unfairness and Feature Segregation through Social Learning*. Hoda Heidari, Vedant Nanda, and Krishna P. Gummadi. **The International Conference on Machine Learning (ICML)**, 2019.
- [3] *On the Impact of Choice Architectures on Inequality in Online Donation Platforms*. Abhijnan Chakraborty, Nuno Mota, Asia J. Biega, Krishna P. Gummadi and Hoda Heidari. **The Web Conference (WWW)**, 2019
- [4] *A Moral Framework for Understanding of Fair ML through Economic Models of Equality of Opportunity*. Hoda Heidari, Michele Loi, Krishna P. Gummadi, and Andreas Krause. **ACM conference on Fairness, Accountability, and Transparency (FAT*)**, 2019.
- [5] *Fairness Behind a Veil of Ignorance: A Welfare Analysis for Automated Decision Making*. Hoda Heidari, Claudio Ferrari, Krishna P. Gummadi, and Andreas Krause. **Neural and Information Processing Systems (NeurIPS)**, 2018.
Featured in "5 Great Human-Centered AI Papers from 2018", Medium
- [6] *A Unified Approach to Quantifying Algorithmic Unfairness: Measuring Individual and Group Unfairness via Inequality Indices*. Till Speicher*, Hoda Heidari*, Nina Grgic-Hlaca, Krishna P. Gummadi, Adish Singla, Adrian Weller, Muhammad Bilal Zafar. **ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD)**, 2018.
- [7] *Preventing Disparate Treatment in Sequential Decision Making*. Hoda Heidari and Andreas Krause. **The International Joint Conference on Artificial Intelligence (IJCAI)**, 2018.
- [8] *Fairness in Criminal Justice Risk Assessments: The State of the Art*. Richard Berk, Hoda Heidari, Shahin Jabbari, Michael Kearns, and Aaron Roth. **Sociological Methods and Research**, 2018.
- [9] *Pricing a Low-regret Seller*. Hoda Heidari, Mohammad Mahdian, Umar Syed, Sergei Vassilvistskii, and Sadra Yazdanbod. **The International Conference on Machine Learning (ICML)**, 2016.
- [10] *Tight Policy Regret Bounds for Improving and Decaying Bandits*. Hoda Heidari, Michael Kearns and Aaron Roth. **The International Joint Conference on Artificial Intelligence (IJCAI)**, 2016.
- [11] *Integrating Market Makers, Limit Orders, and Continuous Trade in Prediction Markets*. Hoda Heidari, Sebastien Lahaie, David Pennock, and Jenn Wortman Vaughan. **The Economics and Computation Conference (EC)**, 2015.
Full version was invited for publication, and appeared in the ACM Transactions on Economics and Computation (TEAC).

- [12] *Learning from Contagion (Without Timestamps)*. Kareem Amin, Hoda Heidari, and Michael Kearns. **The International Conference on Machine Learning (ICML)**, 2014.
- [13] *New Models for Competitive Contagion*. With Moez Draief and Michael Kearns. **The AAAI Conference on Artificial Intelligence (AAAI)**, 2014.
- [14] *Competitive Contagion in Networks*. Sanjeev Goyal, Hoda Heidari, and Michael Kearns. **Games and Economic Behavior Journal (GEB)**, 2014.
- [15] *Depth-Workload Tradeoffs for Workforce Organization*. Hoda Heidari and Michael Kearns. **The Conference on Human Computation & Crowdsourcing (HCOMP)**, 2013.

HONORS

- Selected to participate in the *Rising Stars in EECS* workshop 2019
- *Travel Award*, Women in Machine Learning (WiML) workshop 2017
- *Travel Award*, Women in Theory (WiT) workshop 2016
- *Doctoral Fellowship*, University of Pennsylvania 2011-2017
- Awarded a 4-year grant from the *National Foundation of Elites* for outstanding academic success 2007-2011
- *Silver Medal* in National Mathematical Olympiad, Iran 2006

TEACHING
EXPERIENCE

Lecturer, ETH Zürich

- **Designed and taught a new course on *Fairness, Explainability, and Accountability for Machine Learning*** (listed as 263-5215-00L) Spring 2019

Advising Students, ETH Zürich

- Mohammad Yaghini, M.Sc. Thesis: “*A Human-in-the-loop Framework to Construct Context-dependent Mathematical Formulations of Fairness*” Spring 2019
- Filipe Janicki, Semester Project: “*Explaining the Decisions Made by a Black-box Model*” Fall 2018
- David Lindner, Semester Project: “*Unfairness as Policy Regret in Sequential Decision Making*” Fall 2018
- Megha Srivastava, Summer Internship: “*Mathematical Notions vs. Human Perception of Algorithmic Fairness*” Summer 2018
- B.Sc. Thesis: “*Fairness Behind a Veil of Ignorance: A Welfare Analysis for Supervised Learning*” by Claudio Ferrari Spring 2018

Teaching Assistant, ETH Zürich

- *Introduction to Machine Learning* Prof. A. Krause Spring 2018
- *Probabilistic Artificial Intelligence*. Prof. A. Krause Fall 2017

Teaching Assistant, University of Pennsylvania

- *Decision Models*. Prof. R. Vohra Fall 2014
- *Market and Social Systems on the Internet*. Prof. M. Kearns and A. Roth Spring 2013
- *Networked Life*. Prof. M. Kearns Fall 2012

Instructor, Sharif University of Technology

Prolog Programming Language, Part of the Artificial Intelligence course syllabus. Spring 2010

SERVICE

Organizer

- **NeurIPS Workshop on “Human-centric Machine Learning”**, co-organizer 2019
- **Tutorial on “Economic Theories of Distributive Justice for Fair ML”** 2019
Presented at the **30th Web Conference (WWW)**
- **Weekly reading group on the “Societal Aspects of AI”**, ETHZ 2017, 2018
Attended by students and researchers from a wide range of disciplines, including computer science, economics and law, mathematics, psychology, political philosophy, and bioethics.

Program Committee

- ACM Conference on Fairness, Accountability, and Transparency (ACM FAT*) 2019
- The AAI Conference on Human Computation and Crowdsourcing (HCOMP) 2019
- The International Conference in Machine Learning (ICML) 2016—2019
- The Conference on Economics and Computation (EC) 2015, 2018
- The Conference on Artificial Intelligence (AAAI) 2018, 2020

Reviewer

- Journal of Machine Learning Research (JMLR)
- The Conference on Neural Information Processing Systems (NIPS) 2013–’15, ’17, ’19
- The Operations Research Journal (OR)
- Mathematics of Operations Research (MOR)
- The Network Science Journal
- Transactions on Economics and Computation (TEAC)
- Transactions on Signal Processing (TSP)
- Information Processing Letters (IPL)

External Reviewer

- Conference on Learning Theory (COLT)
- The Conference on Web and Internet Economics (WINE)
- The Symposium on Discrete Algorithms (SODA) (2013, 2017)
- The Symposium on Foundations of Computer Science (FOCS)
- The International Joint Conference on Artificial Intelligence (IJCAI)
- Conference on Decision and Control (CDC)

Misc.

- Scientific Body Representative at a *Faculty Recruiting Committee*. Department of Computer Science, ETHZ Mar 2019
- Speaker at the *Digital Life Workshop*, ETHZ Aug 2018
Organized by the *Chair of Bioethics*, Prof. E. Vayena
- Expert Feedback at *ETH Week: Manufacturing the Future*, ETHZ Sep 2017

PRESENTATIONS & DISCUSSIONS

- Invited discussant at the “*Philosophical Questions about AI, Law, and Governance*”,
Workshop organized by the *Faculty of Law, UZH* (Prof. Christoph Graber), and *Berkman Klein Center of Internet and Society, Harvard University* Feb 2018
- Invited discussant at the *Governance of Decision-making Algorithms—How to Address Risks?* Expert Workshop organized by *Swiss Re* Jul 2018
- Invited discussant at the *UZH Digital Forum: Can Algorithms be Fair?* Dec 2018
Organized by the *Digital Society Initiative* & the *Swiss Alliance for Data-Intensive Services*
- Invited panel at the *AI and Intellectual Property* workshop
Organized by the *the Max Planck Institute for Innovation and Competition* Jun 2019

- “*What Can Fair ML Learn from Economic Theories of Distributive Justice?*”
- Invited speaker at the *Swisscom* Jul 2019
 - The AI frontiers series, *Microsoft Research*, Cambridge, UK Jan 2019
 - Invited speaker at the *Workshop on Ethical, Social and Governance Issues in AI* co-located with NeurIPS Dec 2018
 - Speaker at the lunch series, invited by Prof. Elliott Ash
Department of Humanities, Social and Political Sciences (GESS), ETHZ Sep 2018
- “*Fairness in Sequential Decision Making*”
- *Cambridge University* Jan 2019
 - Invited talk at the *Max Planck Institute for Software Systems (MPI-SWS)* Nov 2018
- “*A General Framework for Evaluating Callout Mechanisms in Repeated Auctions*”
- Invited talk at the *Institute für Automatik (IfA), ETHZ* Apr 2018
 - Contributed talk at *Women in Machine Learning (WiML) workshop, NIPS* Dec 2017
 - *Microsoft Research NYC* Jan 2016
- “*Pricing a low-regret seller*”, *Carnegie Mellon University’s AI lunch series* Jan 2017
- “*Market Makers, Limit Orders, and Continuous Trade in Prediction Markets*”,
Google Research NYC Jun 2015

REFERENCES

Prof. Krishna P. Gummadi

- Faculty and Scientific Director, Max Planck Institute for Software Systems
- *E-mail:* gummadi@mpi-sws.org
- *Phone:* +49 681 9325 670

Prof. Michael Kearns

- Professor and National Center Chair, Department of Computer and Information Science, University of Pennsylvania
- *E-mail:* mkearns@cis.upenn.edu
- *Phone:* +1 215 898 7888

Prof. Jon Kleinberg

- Tisch University Professor, Departments of Computer and Information Science, Cornell University
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- *Phone:* +1 607 255 9197

Prof. Andreas Krause

- Professor of Computer Science, Institute for Machine Learning, ETH Zürich
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- *Phone:* +41 44 632 63 22

Dr. Jenn Wortman Vaughan

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