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RUGGIERO CAVALLO

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RESEARCH SYNOPSIS

I do research in computer science and economics, mainly in the area of microeconomics called *mechanism design*. Some areas of focus are: auctions, crowdsourcing, game theory, and market design for emerging internet applications. Most recent work is a mix of applied data science and mechanism design.

EDUCATION

Harvard University, Cambridge, MA (2002–2008): Ph.D. in Computer Science, June 2008.
Dissertation: *Social Welfare Maximization in Dynamic Strategic Decision Problems*
Committee: David C. Parkes (advisor), Jerry Green, Barbara Grosz, Satinder Singh, and Leslie Valiant.
S.M. degree in computer science, June 2004.

Cornell University, Ithaca, NY (1999-2001): Bachelor of Arts with distinction in all subjects, 2001.
Major in computer science; external specialization in philosophy and mathematics.

Hamilton College, Clinton, NY (1997-1999): Two years towards BA before transferring to Cornell.

Attended the *Stanford Summer School in Neuroeconomics*, **Stanford University**, Stanford, CA (July 2006).

EMPLOYMENT

Yahoo / Verizon Media Group, New York, NY
Principal Research Scientist (April 2019 – present)
Senior Research Scientist (October 2016 – March 2019)
Research Scientist (October 2013 – October 2016)
In the Pricing and Marketplaces group. Data-driven auction design for ad marketplaces; algorithms for computing pricing functions in real-time auctions; incentives analysis and design for products such as Fantasy Sports and Yahoo Answers.

Microsoft Research, New York, NY
Associate Researcher (June 2012 – August 2013)
In the Economics and Computer Science group. A founding member of the Microsoft Research lab in New York City.

Yahoo, New York, NY
Visiting Scientist (August 2010 – June 2012)
Postdoc in the Microeconomics and Social Systems research group, led by Preston McAfee.

University of Pennsylvania, Philadelphia, PA
Postdoctoral Fellow (September, 2008 – July 2010)
In the Computer and Information Science department, advised by Prof. Michael Kearns.

Sony Computer Science Laboratory, Tokyo, Japan
Research Intern (Summer, 2003)
I explored problems related to computationally modeling aspects of human consciousness.

Space Telescope Science Institute, Baltimore, MD
Software Engineer (July 2001 – July 2002)
STScI is the research center that operates the Hubble Space Telescope for NASA. I worked on algorithmically transforming scientific specifications for Hubble observations into execution plans.

Cornell University, Ithaca, NY
Research Assistant (Summer 2000)
With Prof. Bart Selman, on a project in the area of Boolean Satisfiability (SAT).

MISCELLANY

Musician/songwriter/guitar-player; intermediate speaker of Mandarin Chinese; stint as web editor of the *Harvard Asia Quarterly*; graduate committee for the Harvard Mind/Brain/Behavior initiative.

TEACHING

Harvard University Teaching Fellow: responsible for weekly recitation sections, review sessions, occasional lecture filling-in for professor; grading of homework, exams, and course projects; office hours; helping professor design/create course material, etc.

- **CS 182**: Introduction to Artificial Intelligence (Fall 2003, Fall 2004)
- **CS 286r**: Topics at the Interface between Computer Science and Economics (Spring 2006)

Harvard University Mind, Brain, & Behavior senior workshop leader: led tutorials and group discussions among Harvard College seniors doing MBB theses (Spring 2004, Spring 2005)

PUBLICATIONS

Dissertation

Ruggiero Cavallo. Social Welfare Maximization in Dynamic Strategic Decision Problems. *Ph.D. thesis, Harvard University*, May, 2008.

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Journal papers

Ruggiero Cavallo, Preston McAfee, and Sergei Vassilvitskii. Display Advertising Auctions with Arbitrage. *ACM Transactions on Economics and Computation,* 3(3), 2015: 15.

David C. Parkes, Florin Constantin, Ruggiero Cavallo, and Satinder Singh. Dynamic Incentive Mechanisms. *Artificial Intelligence Magazine*, Volume 31, No. 4, pages 79–94, 2010.

Benjamin Lubin, Adam Juda, Ruggiero Cavallo, Sebastien Lahaie, Jeffrey Shneidman, and David C. Parkes. ICE: An Expressive Iterative Combinatorial Exchange. *Journal of Artificial Intelligence Research*, Volume 33, pages 33–77, 2008.

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Refereed conference papers

Ruggiero Cavallo, Maxim Sviridenko, Christopher A. Wilkens. Matching Auctions for Search and Native Ads. In *Proceedings of the 19th ACM conference on Electronic Commerce (EC '18)*, Ithaca, NY, 2018.

Ruggiero Cavallo, Prabhakar Krishnamurthy, Maxim Sviridenko, Christopher A. Wilkens. Sponsored Search Auctions with Rich Ads. In *Proceedings of the 26th International Conference on World Wide Web (WWW'17),* Perth, Australia, 2017.

Christopher A. Wilkens, Ruggiero Cavallo, Rad Niazadeh. GSP — The Cinderella of Mechanism Design. In *Proceedings of the 26th International Conference on World Wide Web (WWW'17),* Perth, Australia, 2017.

Aris Anagnostopoulos, Ruggiero Cavallo, Stefano Leonardi, and Maxim Sviridenko. Bidding Strategies for Fantasy-Sports Auctions. In *Proceedings of the 12th International Workshop on Internet and Network Economics (WINE'16)*, Montreal, Canada, 2016.

Ruggiero Cavallo and Christopher A. Wilkens. GSP with General Independent Click-Through-Rates. In *Proceedings of the 10th International Workshop on Internet and Network Economics (WINE'14)*, Beijing, China, 2014.

Ruggiero Cavallo. Incentive Compatible Two-Tiered Resource Allocation Without Money. In *Proceedings of the 13th International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'14)*, Paris, France, pages 1313–1320, 2014.

Refereed conference papers, cont.

Ruggiero Cavallo and Shaili Jain. Winner-Take-All Crowdsourcing Contests with Stochastic Production . In *Proceedings of the 1st AAAI Conference on Human Computation and Crowdsourcing (HCOMP–13)*, Palm Springs, CA, 2013.

Ruggiero Cavallo. Fairness and Welfare Through Redistribution When Utility is Transferable. In *Proceedings of the 26th Annual Conference on Artificial Intelligence (AAAI-12)*, Toronto, Canada, 2012.

Ruggiero Cavallo and Shaili Jain. Efficient Crowdsourcing Contests. In *Proceedings of the 11th International Conference on Autonomous Agents and Multiagent Systems (AAMAS–12)*, Valencia, Spain, 2012.

Ruggiero Cavallo. Improving Allocations Through Revenue Redistribution in Auctions with Entry. The Second *Conference on Auctions, Market Mechanisms and Their Applications (AMMA–11)*, New York, NY, 2011.

Ruggiero Cavallo. Incentives in Group Decision-Making With Uncertainty and Subjective Beliefs. *Conference on Uncertainty and Artificial Intelligence (UAI–11)*, Barcelona, Spain, 2011.

Ruggiero Cavallo. Efficient Mechanisms with Risky Participation. In *Proceedings of the 22nd International Joint Conference on Artificial Intelligence (IJCAI–11)*, pages 133-138, Barcelona, Spain, 2011.

Ruggiero Cavallo. Efficient Mechanisms with Small Subsidies. A short paper in the *Proceedings of the 9th International Conference on Autonomous Agents and Multiagent Systems (AAMAS–10)*, pages 1477–1478, Toronto, Canada, 2010.

Ruggiero Cavallo. Efficiency and Redistribution in Dynamic Mechanism Design. In the *Proceedings of the 9th ACM Conference on Electronic Commerce (EC–08)*, pages 220–229, Chicago, IL, 2008.

Ruggiero Cavallo and David C. Parkes. Efficient Metadeliberation Auctions. In the *Proceedings of the 23rd Annual Conference on Artificial Intelligence (AAAI-08)*, pages 50–56, Chicago, IL, 2008.

Sven Seuken, Ruggiero Cavallo, and David C. Parkes. Partially synchronized DEC-MDPs in Dynamic Mechanism Design. In the *Proceedings of the 23rd AAAI Conference on Artificial Intelligence (AAAI–08)*, pages 162-169, Chicago, IL, 2008.

Erik Schultink, Ruggiero Cavallo, and David C. Parkes. Economic hierarchical Q-learning. In the *Proceedings of the 23rd Annual Conference on Artificial Intelligence (AAAI-08)*, pages 689–695, Chicago, IL, 2008.

Ruggiero Cavallo, David C. Parkes, and Satinder Singh. Optimal Coordinated Planning Amongst Self-Interested Agents with Private State. In the *Proceedings of the 22nd Conference on Uncertainty in Artificial Intelligence (UAI-06)*, pages 55-62, Cambridge, MA, 2006.

Ruggiero Cavallo. Optimal Decision-Making With Minimal Waste: Strategyproof Redistribution of VCG Payments. In the *Proceedings of the 5th International Joint Conference on Autonomous Agents and Multi Agent Systems (AAMAS-06)*, pages 882–889, Hakodate, Japan, 2006. **[Nominated for the best student paper award.]**

Ruggiero Cavallo. Handling Self-Interest in Groups, with Minimal Cost. In the *Proc. of the 21st*

Refereed conference papers, cont.

National Conference on Artificial Intelligence (AAAI-06), Nectar paper track, pages 1585–1588, Boston, MA, 2006.

David C. Parkes, Ruggiero Cavallo, Nick Elprin, Adam Juda, Sebastien Lahaie, Benjamin Lubin, Loizos Michael, Jeffrey Shneidman, and Hassan Sultan. ICE: An Iterative Combinatorial Exchange. In the *Proceedings of the 6th ACM conference on Electronic Commerce (EC–05)*, pages 249-258, Vancouver, Canada, 2005.

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Refereed workshop papers

Ruggiero Cavallo, Abhradeep Thakurta, and Christopher A. Wilkens. Permutation Invariant Learning and Dynamic Mechanism Design. In the *11th Workshop on Ad Auctions, EC-15*, Portland, Oregon, 2015.

Ruggiero Cavallo, Prabhakar Krishnamurthy, and Christopher A. Wilkens. On the Truthfulness of GSP. In the *11th Workshop on Ad Auctions, EC-15*, Portland, Oregon, 2015.

Alina Beygelzimer, Ruggiero Cavallo, Joel Tetrault. On Yahoo Answers, Long Answers are Best. In *CrowdML - ICML '15 Workshop on Crowdsourcing and Machine Learning*, Lille, France, 2015.

Ruggiero Cavallo, Preston McAfee, and Sergei Vassilvitskii. Display Advertising Auctions with Arbitrage. In the *Workshop on Ad Auctions, EC-12*, Valencia, Spain, 2012.

Ruggiero Cavallo and Shaili Jain. Winner-Take-All Crowdsourcing Contests with Stochastic Production. In the *Workshop on Social Computing and User Generated Content, EC-12*, Valencia, Spain, 2012.

Ruggiero Cavallo and Shaili Jain. Efficient Crowdsourcing With Stochastic Production. In the *AAAI Spring Symposium on Wisdom of the Crowd*, Palo Alto, CA, 2012.

Ruggiero Cavallo. Fairness and Welfare in Division of Goods When Utility is Transferable. In the *Proceedings of the IJCAI-2011 Workshop on Social Choice and Artificial Intelligence*, pages 16–21, Barcelona, Spain, 2011.

Ruggiero Cavallo. Strongly Budget-Balanced and Nearly Efficient Allocation of a Single Good. In the *Workshop on Bayesian Mechanism Design, EC–11*, San Jose, CA, 2011.

Ruggiero Cavallo, David C. Parkes, and Satinder Singh. Efficient Online Mechanisms for Persistent, Periodically Inaccessible Self-Interested Agents. In *DIMACS Workshop on The Boundary between Economic Theory and Computer Science*, New Brunswick, NJ, 2007.

Ruggiero Cavallo, David C. Parkes, and Satinder Singh. Optimal Coordination of Loosely-Coupled Self-Interested Robots. In the *Workshop on Auction Mechanisms for Robot Coordination, AAAI-06*, Boston, MA, 2006.

Ruggiero Cavallo. Handling Self-Interest in Multi-Agent Decision Problems. In the *International Student Workshop on Agents*, Kyoto, Japan, 2006.

Ruggiero Cavallo, David C. Parkes, Adam Juda, Adam Kirsch, Alex Kulesza, Sebastien Lahaie, Benjamin Lubin, Loizos Michael, and Jeffrey Shneidman. TBBL: A Tree-Based Bidding Language for Iterative Combinatorial Exchanges. *IJCAI-05 Multidisciplinary Workshop on Advances in Preference Handling*, Edinburgh, Scotland, 2005.

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Other

Ruggiero Cavallo . Incentive Compatible Allocation Without Money. A letter in *ACM SIGecom Exchanges*, Volume 13, No. 1, June, 2014.

Ruggiero Cavallo. Mechanism Design for Dynamic Settings. A letter in *ACM SIGecom Exchanges*, Volume 8, No. 2, December, 2009.

Ruggiero Cavallo. Minimizing the Probability of Individual Rationality or Budget-Balance Violations in Efficient Mechanisms. *Tenth Annual Conference of the Association for Public Economic Theory (APET)*, Galway, Ireland, 2009.

SERVICE

Program committee (repetitively, in most cases) or reviewing for the following conferences and journals:

- ACM Conference on Electronic Commerce (ACM-EC)
- International Conference on World Wide Web (WWW)
- International Conference on Autonomous Agents and Multiagent Systems (AAMAS)
- The AAAI Conference on Artificial Intelligence (AAAI)
- International Joint Conference on Artificial Intelligence (IJCAI)
- Conference on Auctions, Market Mechanisms and their Applications (AMMA)
- Conference on Uncertainty in Artificial Intelligence (UAI)
- International Conference on Electronic Commerce (ICEC)
- Workshop on Internet and Network Economics (WINE)
- ACM–SIAM Symposium on Discrete Algorithms (SODA)
- Journal of Economic Theory
- Games and Economic Behavior
- Transactions on Economics and Computation
- Artificial Intelligence Journal
- IEEE Internet Computing

Nominated for best Senior Program Committee member of AAMAS–2012.

INVITED TALKS AND TUTORIALS

Welfare-Maximizing Auctions and Online Marketplaces. *Catholic University of America*, April 4, 2013.

Welfare-Maximizing Auctions and Online Marketplaces. *Bucknell University*, March 28, 2013.

Revenue Redistribution Mechanisms. *Rensselaer Polytechnic Institute*, February 5, 2013.

Efficient Crowdsourcing Contests. Guest lecture in CS286r course at *Harvard University*, November 5, 2012.

How to Make a Decision Once You've Agreed to Disagree. *MSR Economic Working Group meeting*, Cambridge, MA, September 7, 2012.

Optimal Participation Incentives for Efficient and Budget-Balanced Trade. *Decentralization conference*, Pasadena, CA, March 30, 2012.

Incentives in Group Decision-Making With Uncertainty and Subjective Beliefs. *Harvard University*, November 16, 2011.

Improving Allocations Through Revenue Redistribution in Auctions with Entry. *SISHOO conference (Caltech/Yahoo!)*, Huntington Beach, California, December 2010.

In Auctions, Small Amounts of Altruism Bear Great Fruit. *New York Academy of Sciences – rump session of the New York Computer Science and Economics Day*, New York, NY, November 9, 2009.

Efficient Metadeliberation Auctions. *INFORMS*, San Diego, CA, October 11, 2009.

A tutorial on: Dynamic Mechanism Design (co-presented with Susan Athey). *10th ACM conference on Electronic Commerce (EC '09*), Palo Alto, CA, July 7, 2009.

Minimizing the Probability of Individual Rationality or Budget-Balance Violations in Efficient Mechanisms. *Tenth annual Conference of the Association for Public Economic Theory (APET),* Galway, Ireland, June 19, 2009.

Efficient Metadeliberation Auctions. *University of Pennsylvania*, Philadelphia, PA, April 8, 2008.

Efficient Metadeliberation Auctions. *Northwestern University*, Evanston, IL, April 3, 2008.

Achieving Socially Optimal Behavior Despite Selfishness. *Mind, Brain, and Behavior seminar, Harvard University*, March 5, 2008.

Optimal Decision-Making With Minimal Waste: Strategyproof Redistribution of VCG Payments. *Brown University*, November 13, 2007.