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Current appointment: (since July 2013) Professor (RS4), Department of Computer Science, Oxford University.

Research interests: Algorithmic game theory (and its applications to AI); computational complexity (in particular, classification of total search problems in NP); computational learning theory

Appointments held

August 2006 – June 2013 Reader, then Professor, Dept. of Computer Science, Uni. of Liverpool.

October '97 – August '06 Lecturer, then Reader, Dept. Computer Science, Uni of Warwick.

Oct '95 – Oct '97 Postdoctoral researcher, Neural Computing Research Group, Aston University. (Supervisor: Christopher Bishop)

January 1993 – September 1995

Researcher, Department of Algorithms and Discrete Maths, Sandia National Laboratories, Albuquerque, New Mexico, USA.

Education/Qualifications

October 1989 – November 1992

PhD in Computer Science (awarded March 1993), University of Edinburgh

Supervisor: Mark Jerrum

Research area: Computational learning theory

September 1988 – September 1989

MSc in Computer Systems Engineering

University of Edinburgh, and Université Paris-Sud, France

Supervisor: Jean-Pierre Jouannaud

October 1985 – June 1988

B.A. in Mathematics, Oxford University

PhD supervision 11 graduated students: Nicholas Palmer (Warwick, 2008), Pattarawit Polpinit (Liverpool, 2009), Neelam Gohar (Liverpool, 2012), Antony McCabe (Liverpool 2012), Jinshan Zhang (Liverpool, 2013), Bo Tang (Liverpool, 2015), Matthias Gerstgrasser (Oxford 2018), Francisco Marmolejo Cossío (Oxford 2020), Edwin Lock (Oxford, 2021), Alexandros Hollender (Oxford, 2021), Matthew Katzman (Oxford, 2023), Abheek Ghosh (June 2024)

(Zhang and Tang were supervised jointly with Xiaotie Deng; Gerstgrasser was supervised jointly with Elias Koutsoupias; Ghosh was supervised jointly with Edith Elkind)

Current students: Matan Gilboa (jointly with Elias Koutsoupias); Giannis Tyrovolas (jointly with Alex Hollender)

Recognition

- Paper (12): ACM Test of Time award (2022); *Game Theory and Computer Science Prize*, The prize is awarded once every four years at the World Congress of the Game Theory Society, following an open nomination process. One of the three winning papers of the 2011 SIAM Outstanding Paper Prizes.

2022 ACM SIGecom test of time award.

- 2021: best paper in the 53rd STOC conference for paper (2) below. (Featured in Quanta magazine and Wired magazine.)
- *Outstanding paper award* at the 9th ACM Conference on E-commerce (ACM-EC 2008) for the paper “Uncoordinated Two-Sided Matching Markets” (11 below)

Editorial Roles, program chair roles

- Editor-in-Chief *ACM Transactions on Economics and Computation* (since Sept. 2023), jointly with Utku Ünver.
Associate editor of *Journal of the ACM* (since Oct. 2022); *SIAM Journal on Computing* (2019–2025); *Journal of Mechanism and Institution Design* (since May 2017).
- Program chair of the 8th Workshop in Internet and Network Economics (WINE), Liverpool, Dec 2012. Proceedings published as volume 7695 in Springer LNCS. Program co-chair of the 2nd International Workshop on Computational Social Choice (COMSOC-2008) (Liverpool, Sept. 2008).
- Main organiser of workshop *Game Theory Meets Computational Learning Theory (Dagstuhl Seminar 17251)*

Other service and leadership in the research community

Founding head of Economics and Computation (EcCo) research group, while at Liverpool.

On steering committee of the annual WINE conference since June '17. General chair of WINE 2018. Served on EATCS Fellows selection committee, 2013–18.

I have served on many program committees of conferences in Algorithmic Game Theory and analysis of algorithms, including: ACM-EC, WINE, SAGT, ICALP, Algorithmic Decision Theory (ADT), Conference on World Wide Web (WWW), IJCAI, COLT, NeurIPS.

Keynote talks, presentations plenary talks at the annual Conference on Web and Internet Economics, Symposium on Algorithmic Game Theory, British Colloquium on Theoretical Computer Science, British Combinatorial Colloquium. Tutorial presentations at other meetings including annual Symposium on Theoretical Aspects of Computer Science, and ACM-EC 2022.

Funded research projects

- *Optimisation for Game Theory and Machine Learning*, EPSRC (ref. EP/X040461/1); value 624k (Feb 2024–Jan 2027). (PDRAs: Edwin Lock and Abheek Ghosh)
- *Driving Behaviour in Multi-winner Voting* (originally awarded to Edith Elkind, transferred to me Nov. 2024), EPSRC (ref. EP/X038548/1); value 461k (Jan '24–Dec '26). (PDRA: Tomasz Waś)
- *Price discovery via decentralised networks of trading agents*, JP Morgan faculty research award; supported Edwin Lock as RA; value \$85k (Sept 2022–Aug 2023).
- *Efficient Algorithms for Mechanism Design Without Monetary Transfer*, EPSRC. (ref. EP/K01000X/1). Joint Liverpool/Glasgow/Oxford project with Liverpool as lead RO; I was co-I; PIs were Piotr Krysta at Liverpool and David Manlove at Glasgow. value 329k at Liverpool, 269k at Glasgow (Feb. 2013–Jan 2016).

- *Efficient Decentralised Approaches in Algorithmic Game Theory*, EPSRC. (ref. EP/G069239/1). Joint Liverpool/Warwick project with Liverpool as lead RO; I was PI; (PDRAs Carmine Ventre and Troels Bjerre Sørensen). value 398k at Liverpool, 352k at Warwick (Oct. 2009–Feb. 2013).
- *Concatenation State Machines and Simple Functions (algorithms and complexity)*, EPSRC; I was co-I; value 52k (2008).
- *Algorithmics of Network-sharing Games*, EPSRC. (PDRA: Edith Elkind.) I was PI; co-I's were Leslie Goldberg and Mike Paterson. value 89k (2005–2007).
- *Unsupervised learning for classification*, EPSRC. (Supported PhD student Nick Palmer). I was PI; value 61k (2003–2006).
- Participated in EU COST actions Gamenet (since Jan. '18), Computational Social Choice (from Jan. '12); EU Network of Excellence PASCAL (2002-04); EU consortia ALCOM-IT, ALCOM-FT (1997–2002).

Selected papers

Out of about 50 journal papers and 75 conference papers, I highlight the following based on significance or relevance to my current interests.

1. John Fearnley, Paul W. Goldberg, Alexandros Hollender, Rahul Savani. The Complexity of Computing KKT Solutions of Quadratic Programs. *STOC conference*, pp. 892–903 (June 2024)
2. John Fearnley, Paul W. Goldberg, Alexandros Hollender, and Rahul Savani. The Complexity of Gradient Descent: $CLS=PPAD \cap PLS$. *Journal of the ACM* 70(1) (2023). (one of three “best papers” at STOC 2021).
3. Aris Filos-Ratsikas and Paul W. Goldberg. The Complexity of Necklace Splitting, Consensus-Halving, and Discrete Ham Sandwich. *SIAM J. Comput.* (special issue for the STOC 2019 conference)
4. Riccardo Colini-Baldeschi, Paul Goldberg, Bart de Keijzer, Stefano Leonardi, Tim Roughgarden, and Stefano Turchetta. Approximately Efficient Two-Sided Combinatorial Auctions. *ACM Trans. Economics and Comput.*, 8(1), pp. 4:1–4:29 (2020).
5. Elizabeth Baldwin, Paul W. Goldberg, Paul Klempner, Edwin Lock. Solving Strong-Substitutes Product-Mix Auctions. *Mathematics of Operations Research* (August 2023)
6. Paul W. Goldberg, Francisco J. Marmolejo Cossío. Learning Convex Partitions and Computing Game-theoretic Equilibria from Best-response Queries. *ACM Trans. Economics and Comput.* 9(1): 3:1–3:36 (2021).
7. Paul Goldberg, Alexandros Hollender, Warut Suksompong. Contiguous Cake Cutting: Hardness Results and Approximation Algorithms. *J. Artif. Intell. Res.* 69: 109–141 (2020).
8. Riccardo Colini-Baldeschi, Paul W. Goldberg, Bart de Keijzer, Stefano Leonardi, Tim Roughgarden, Stefano Turchetta. Approximately Efficient Two-Sided Combinatorial Auctions. *ACM Trans. Economics and Comput.* 8(1): 4:1–4:29 (2020).
9. John Fearnley, Martin Gairing, Paul W. Goldberg, Rahul Savani. Learning equilibria of games via payoff queries. *J. Mach. Learn. Res.* 16: 1305–1344 (2015).

10. P.W. Goldberg, C.H. Papadimitriou and Rahul Savani. The Complexity of the Homotopy Method, Equilibrium Selection, and Lemke-Howson Solutions. *ACM Transactions on Economics and Computation* **1**(2) pp.9:1–9:25 (2013).
11. Heiner Ackermann, Paul W. Goldberg, Vahab Mirrokni, Heiko Röglin, and Berthold Vöcking. Uncoordinated Two-Sided Matching Markets. *SIAM Journal on Computing* **39**(1) pp. 195–259 (2009).
12. C. Daskalakis, P.W. Goldberg and C.H. Papadimitriou. The Complexity of Computing a Nash Equilibrium. *SIAM Journal on Computing* **39**(1) pp. 195–259 (2009).
13. Petra Berenbrink, Tom Friedetzky, Leslie Ann Goldberg, Paul W. Goldberg, Zengjian Hu, Russell A. Martin. Distributed Selfish Load Balancing. *SIAM J. Comput.* 37(4): 1163–1181 (2007).
14. Paul W. Goldberg, Mark Jerrum: Bounding the Vapnik-Chervonenkis Dimension of Concept Classes Parameterized by Real Numbers. *Mach. Learn.* 18(2-3): 131–148 (1995).

Teaching and administration (since 2013)

- Foundations of Computer Science (MSc in CS, MFoCS), 2013–18.
- Computational Complexity (Part B, MSc, MFoCS), 2018–23.
- Algorithms and Data Structures (Part A), 2023–.
- Project supervision over period 2013–23: 27 part B/C projects; 21 master's (CS MSc/MFoCS) projects.

I have served as course director of the MSc in Computer Science (oversaw the change to Advanced MSc), and course director of the MSc in Mathematics and Foundations of Computer Science (MFoCS), which is run jointly by the CS and Mathematics departments. I have chaired the exams boards of these courses.