

Jules Hedges

Curriculum vitae

Research statement

I am an EPSRC mathematical sciences post-doctoral research fellow at the University of Oxford's Department of Computer Science. My main research area involves applying category theory (and related areas like logic and functional programming) to game theory and more general economic theory. The long-term aim is to work towards large scale applications where existing theories are impractical to apply.

Contact details

- Email: julian.hedges@cs.ox.ac.uk
- Website: julesh.com

Academic history

- June 2016 – present: Postdoctoral researcher, University of Oxford, department of computer science
- January 2015 – April 2015: Visiting Ph.D. student, University of Mannheim, department of economics
- June 2012 – May 2016: Ph.D. student, Queen Mary University of London, department of electronic engineering & computer science
- October 2008 – June 2012: Master and BA in mathematics & computer science, University of Oxford

History of research funding

- Currently I am an EPSRC mathematical sciences research fellow, grant ref. EP/N021282/1
- My Ph.D. was funded by an EPSRC doctoral training grant, ref. EP/K50290X/1, awarded to Queen Mary University of London

Publications (published or accepted)

- *Towards functorial language-games* (with Martha Lewis). To appear in *Post-proceedings of Compositional Approaches for Physics, Natural Language and Social Sciences (CAPNS) 2018. Electronic Notes in Theoretical Computer Science* 283:89-102, 2018.
- *Backward induction for repeated games*. In *Proceedings of Mathematically Structured Functional Programming (MSFP) 2018. Electronic Proceedings in Theoretical Computer Science* 275:35-52, 2018.
- *Compositional game theory* (with Neil Ghani, Viktor Winschel and Philipp Zahn). In *Proceedings of Logic in Computer Science (LiCS) 2018. ACM*, 2018.

- *Morphisms of open games*. To appear in *Proceedings of Mathematical Foundations of Programming Semantics (MFPS) 2018*. *Electronic Notes in Theoretical Computer Science*.
- *A generalised quantifier theory of natural language in categorical compositional distributional semantics with bialgebras* (with Mehrnoosh Sadrzadeh). To appear in *Post-proceedings of Workshop on Logic, Language, Information and Computation (WoLLIC) 2015*. *Mathematical Structures in Computer Science*.
- *Higher-order decision theory* (with Paulo Oliva, Evguenia Sprits, Viktor Winschel and Philipp Zahn). In *Proceedings of Algorithmic Decision Theory (ADT) 2017*. *Lecture Notes in Artificial Intelligence 10576:241-254*, 2017.
- *Selection equilibria of higher-order games* (with Paulo Oliva, Evguenia Sprits, Viktor Winschel and Philipp Zahn). In *Proceedings of Practical Aspects of Declarative Languages (PADL) 2017*. *Lecture Notes in Computer Science 10137:136-151*, 2017.
- *Dialectica categories and games with bidding*. In *Post-proceedings of TYPES 2014*. *LIPICs 39:89-110*, 2015.
- *Monad transformers for backtracking search*. In *Proceedings of Mathematical Structured Functional Programming (MSFP) 2014*. *Electronic Proceedings in Theoretical Computer Science 153:31-50*, 2014.
- *A generalisation of Nash's theorem with higher-order functionals*. In *Proceedings of the Royal Society A*, 2013.

Supervision

- I am a co-supervisor of D.Phil. (Oxford Ph.D.) student Josef Bolt, with Bob Coecke and Michael Wooldridge

Teaching

- 2018 (Oxford): Covered a 2-hour lecture in quantum computer science (a masters-level course)
- 2016 (Oxford): Teaching assistant for the same quantum computer science course
- 2012, 2013, 2014, 2015 (QMUL): Teaching assistant for functional programming (a masters-level course)
- 2014, 2016 (QMUL): Automata and formal languages (a compulsory second-year undergraduate course); in 2016 I was involved in marking coursework

Community activities

- Reviewing for journals: *Mathematical Structures in Computer Science*, *Foundations of Physics*, *Studia Logica*
- Reviewing for conferences with formal proceedings: *Formal Structures for Computation and Deduction*, *Mathematical Foundations of Programming Semantics*, *Quantum Physics and Logic*, *Computer Science Logic*
- Organiser: *2019 Applied Category Theory summer school*, *Workshop on Compositional Approaches for Physics, NLP and Social Sciences*, *Second Workshop on Open Games*
- Programme committee: *Second Workshop on Compositional Structures*, *2019 Workshop on Bidirectional Transformations*, *2019 Tbilisi Symposium on Logic, Language and Computation*
- Edited conference proceedings: *Workshop on Compositional Approaches for Physics, NLP and Social Sciences*

Selected invited research talks

- November 2018: Shonan seminar ‘Diagrammatic methods for linear and nonlinear systems’, Japan
- September 2018: First Symposium on Compositional Structures (SYCO), University of Birmingham, UK
- December 2016: Modelling and Analysis of Complex Monetary Economies (MACME), Université Paris 13, France
- July 2016: Workshop on Statistical and Logical Methods of Meaning (SaLMoM), at North American Summer School on Logic, Language and Information (NASSLLI), Rutgers University, USA
- February 2016: Logics for Social Behaviour (LSB), ETH Zürich, Switzerland
- January 2015: Dagstuhl seminar ‘Coalgebraic semantics of reflexive economics’, Germany

Other activities

- I am passionate about science communication and am active on Twitter in a professional capacity (twitter.com/_julesh_), as well as using my website and blog for nontechnical writing related to my research (julesh.com/blog/)