Søren Riis

Reader in Computer Science · Queen Mary University of London

Affiliation: School of EECS, QMUL (Centre for Fundamentals of AI and Computational Theory)

Email: s.riis@qmul.ac.uk

Address: Mile End Road, London E1 4NS, United Kingdom

Web: Personal webpage

Research

My research spans logic and proof complexity, information theory and network coding, and algorithmic/combinatorial methods. In recent work I also study reinforcement learning and representation/learnability barriers in games.

Employment

Queen Mary University of London

Reader in Computer Science (2000–present)

Fetch.AI (Cambridge)

Industry consultancy (part-time, 2018–2019)

Earlier academic positions and research visits include (selected): LBRICS (Aarhus), University of Leeds, Hebrew University of Jerusalem, University of Lund, and Ohio State University.

Education

University of Oxford

DPhil in Mathematics (Mathematical Logic), 1994

University of Copenhagen

MSc in Mathematics and Physics, 1989

Fellowships, service & academic activity

Fellowships & leadership

- Research fellowships: The Fields Institute (Toronto), Isaac Newton Institute (Cambridge), Institut Henri Poincaré (Paris).
- Former research fellow / visitor at institutes and universities including the Isaac Newton Institute, the Fields Institute, and others.
- Director and co-founder, Centre for Discrete Mathematics (QMUL).

Reviewing & community service

- EPSRC College of Peer Reviewers (member since 2010); served on grant-review panels (UK and international).
- Refereeing for journals and conferences in logic, complexity, information theory, combinatorics, and theoretical computer science (50+ reports).
- External examining and assessment roles (PhD and project examination).

Teaching & supervision

- 15+ years teaching experience across undergraduate and postgraduate levels (3,000+ students taught in total).
- Module organisation for large cohorts; supervision and mentoring of student projects over many years.
- Research staff / supervision in the EPSRC CDT in Intelligent Games and Game Intelligence (IGGI).

Industry & applied work

- Consultancy: Fetch.AI (Cambridge), work on governance / hard-fork models and distributed-ledger mechanisms.
- Applied machine-learning projects (e.g. game AI / reinforcement learning) alongside theoretical work.

Funding (selected)

- EPSRC grant EP/H016015/1 (flows and bottlenecks) — £414,367.
- Project leadership on funded research totalling £400k+ (research assistants and PhD students).

PhD supervision (selected)

- Stefan Dantchev (now academic; Durham).
- Sun Yun (now in industry; Deutsche Bank).
- Bei Zhou (reinforcement learning and game AI).

Publications

The list below is loaded from DBLP (with light de-duplication of preprint/journal variants).

An efficient heuristic search algorithm for discovering large Condorcet domains

Bei Zhou 0006, Søren Riis — 4OR (2025)

doi.org **DBLP**

Coherent domains and improved lower bounds for the maximum size of Condorcet domains

Alexander Karpov, Klas Markström, Søren Riis, … — Discret. Appl. Math. (2025)

doi.org **DBLP**

Condorcet domains on at most seven alternatives

Dolica Akello-Egwel, Charles R. Leedham-Green, Alastair Litterick, … — Math. Soc. Sci. (2025)

doi.org **DBLP**

Humanity's Last Exam

Long Phan, Alice Gatti, Ziwen Han, … — CoRR (2025)

doi.org **DBLP**

Arrow's single peaked domains, richness, and domains for plurality and the Borda count

Klas Markström, Søren Riis, Bei Zhou — CoRR (2024)

doi.org **DBLP**

CDL: A fast and flexible library for the study of permutation sets with structural restrictions

Bei Zhou 0006, Klas Markström, Søren Riis — SoftwareX (2024)

doi.org **doi.org** **DBLP**

Local Diversity of Condorcet Domains

Alexander Karpov, Klas Markström, Søren Riis, … — CoRR (2024)

doi.org **DBLP**

Mastering NIM and Impartial Games with Weak Neural Networks: An AlphaZero-inspired Multi-Frame Approach

Søren Riis — CoRR (2024)

doi.org **DBLP**

The largest Condorcet domain on 8 alternatives

Charles R. Leedham-Green, Klas Markström, Søren Riis — Soc. Choice Welf. (2024)

doi.org **DBLP**

Condorcet Domains of Degree at most Seven

Dolica Akello-Egwel, Charles R. Leedham-Green, Alastair Litterick, … — CoRR (2023)

doi.org **DBLP**

Exploring Parity Challenges in Reinforcement Learning through Curriculum Learning with Noisy Labels

Bei Zhou, Søren Riis — CoRR (2023)

doi.org **DBLP**

New Record-Breaking Condorcet Domains on 10 and 11 Alternatives

Bei Zhou, Søren Riis — CoRR (2023)

doi.org **DBLP**

Set-alternating schemes: A new class of large Condorcet domains

Alexander Karpov, Klas Markström, Søren Riis, … — CoRR (2023)

doi.org **DBLP**

Impartial Games: A Challenge for Reinforcement Learning

Bei Zhou, Søren Riis — CoRR (2022)

doi.org **DBLP**

Max-flow min-cut theorems on dispersion and entropy measures for communication networks

Søren Riis, Maximilien Gadouleau — Inf. Comput. (2019)

doi.org **DBLP**

Graph Guessing Games and Non-Shannon Information Inequalities

Rahil Baber, Demetres Christofides, Ntah Ahn Dang, … — IEEE Trans. Inf. Theory (2017)

doi.org **arXiv** **DBLP**

Guessing Games on Triangle-Free Graphs

Peter J. Cameron, Ntah Ahn Dang, Søren Riis — Electron. J. Comb. (2016)

doi.org **arXiv** **DBLP**

Ada Lovelace, a scientist in the archives

Søren Riis, Ursula Martin, Nick Woodhouse — Ada Lovelace Symposium (2015)

doi.org **DBLP**

Fixed Points of Boolean Networks, Guessing Graphs, and Coding Theory

Maximilien Gadouleau, Adrien Richard, Søren Riis — SIAM J. Discret. Math. (2015)

doi.org **arXiv** **DBLP**

Memoryless computation: New results, constructions, and extensions

Maximilien Gadouleau, Søren Riis — Theor. Comput. Sci. (2015)

doi.org **DBLP**

Toward a theory for the design of human technologies

Jesper Simonsen, Morten Hertzum, Jørgen Lerche Nielsen, … — OZCHI (2014)

doi.org **DBLP**

What makes a chess program original? Revisiting the Rybka case

Søren Riis — Entertain. Comput. (2014)

doi.org **DBLP**

Combinatorial representations

Peter J. Cameron, Maximilien Gadouleau, Søren Riis — J. Comb. Theory A (2013)

doi.org **DBLP**

Multiple unicasts, graph guessing games, and non-Shannon inequalities

Rahil Baber, Demetres Christofides, Ntah Ahn Dang, … — NetCod (2013)

doi.org **DBLP**

A dispersion theorem for communication networks based on term sets

Søren Riis, Maximilien Gadouleau — ISIT (2011)

doi.org **DBLP**

Computing without memory

Maximilien Gadouleau, Søren Riis — CoRR (2011)

arXiv **DBLP**

Graph-Theoretical Constructions for Graph Entropy and Network Coding Based Communications

Maximilien Gadouleau, Søren Riis — IEEE Trans. Inf. Theory (2011)

doi.org **arXiv** **DBLP**

Max-flow min-cut theorem for Rényi entropy in communication networks
Maximilien Gadouleau, Søren Riis — ISIT (2011)
doi.org **DBLP**

Max-Flow Min-Cut Theorems for Communication Networks Based on Equational Logic
Maximilien Gadouleau, Søren Riis — CoRR (2010)
arXiv **DBLP**

On the asymptotic Nullstellensatz and Polynomial Calculus proof complexity
Søren Riis — Electron. Colloquium Comput. Complex. (2009)
eccc.weizmann.ac.il **doi.org** **DBLP**

On the guessing number of shift graphs
Taoyang Wu, Peter J. Cameron, Søren Riis — J. Discrete Algorithms (2009)
doi.org **DBLP**

Graph Entropy, Network Coding and Guessing games
Søren Riis — CoRR (2007)
arXiv **DBLP**

Information Flows, Graphs and their Guessing Numbers
Søren Riis — Electron. J. Comb. (2007)
doi.org **DBLP**

Reversible and Irreversible Information Networks
Søren Riis — IEEE Trans. Inf. Theory (2007)
doi.org **DBLP**

Problems in Network Coding and Error Correcting Codes Appended by a Draft Version of S. Riis "Utilising Public Information in Network Coding"

Søren Riis, Rudolf Ahlswede — GTIT-C (2006)

doi.org **DBLP**

Assessing text-to-phoneme mapping strategies in speaker independent isolated word recognition

Juha Häkkinen, Janne Suontausta, Søren Riis, ... — Speech Commun. (2003)

doi.org **DBLP**

On Relativisation and Complexity Gap

Stefan S. Dantchev, Søren Riis — CSL (2003)

doi.org **DBLP**

On text-based language identification for multilingual speech recognition systems

Jilei Tian, Juha Häkkinen, Søren Riis, ... — INTERSPEECH (2002)

doi.org **DBLP**

"Planar" Tautologies Hard for Resolution

Stefan S. Dantchev, Søren Riis — FOCS (2001)

doi.org **DBLP**

A complexity gap for tree resolution

Søren Riis — Comput. Complex. (2001)

doi.org **DBLP**

Tree Resolution Proofs of the Weak Pigeon-Hole Principle

Stefan S. Dantchev, Søren Riis — CCC (2001)

doi.org **DBLP**

Generating hard tautologies using predicate logic and the symmetric group

Søren Riis, Meera Sitharam — Log. J. IGPL (2000)

doi.org **DBLP**

Preface

Carsten Butz, Ulrich Kohlenbach, Søren Riis, ... — Ann. Pure Appl. Log. (2000)

doi.org **DBLP**

Self-organizing letter code-book for text-to-phoneme neural network model

Kåre Jean Jensen, Søren Riis — INTERSPEECH (2000)

doi.org **DBLP**

The complexity of scheduling TV commercials

Klemens Hägele, Colm Ó'Dúnlaing, Søren Riis — MFCSIT (2000)

doi.org **DBLP**

Bootstrapping the primitive recursive functions by only 27 colors

Søren Riis — Discret. Math. (1997)

doi.org **DBLP**

Count(qq) versus the pigeon-hole principle

Søren Riis — Arch. Math. Log. (1997)

doi.org **DBLP**

Count(q) Does Not Imply Count(p)

Søren Riis — Ann. Pure Appl. Log. (1997)

doi.org **DBLP**

Non-constant Degree Lower Bounds imply linear Degree Lower Bounds

Søren Riis, Meera Sitharam — Electron. Colloquium Comput. Complex. (1997)

eccc.weizmann.ac.il **DBLP**

More on the relative strength of counting principles

Paul Beame, Søren Riis — Proof Complexity and Feasible Arithmetics (1996)

doi.org **DBLP**

Static Dictionaries on AC0 RAMs: Query Time Theta(sqrt(log n/log log n)) is Necessary and Sufficient

Arne Andersson, Peter Bro Miltersen, Søren Riis, ... — FOCS (1996)

doi.org **DBLP**

Tip: to produce a complete PDF (including the DBLP list), wait until the status says the publications are loaded, then use `Print / Save as PDF`.

Talks (recent)

- **Coin racing and waiting-time paradoxes: why fair coins are exceptional** (DIMAP Seminar, University of Warwick, 26 Jan 2026)

Awards (selected)

- Prize winner (USD 5,000), *Humanity's Last Exam* (Outlier), 2025.