# Gregory Rosenthal

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Appointments

- Postdoc, University of Cambridge and University of Warwick<sup>1</sup>, May 2023 Apr. 2025.
  - Supervised by Tom Gur and Animesh Datta.
  - Postdoctoral Research Associate at Trinity Hall, Cambridge, Sep. 2023 Apr. 2025.

## Education

- PhD in Computer Science, University of Toronto, Jan. 2019 Aug. 2023.
  - Thesis: Quantum State and Unitary Complexity. https://www.cs.toronto.edu/~rosenthal/ thesis.pdf.
  - Supervised by Benjamin Rossman and Henry Yuen.
- MSc in Computer Science, University of Toronto, Sep. 2017 Jan. 2019.
- Thesis: Beating Treewidth for Average-Case Subgraph Isomorphism.
- Supervised by Benjamin Rossman.
- BA in Mathematics *cum laude* & minor in Computer Science, Cornell University, Aug. 2013 May 2017.

# **Research Papers**

#### Preprints

- Rosenthal, Gregory, Hugo Aaronson, Sathyawageeswar Subramanian, Animesh Datta, and Tom Gur. "Quantum Channel Testing in Average-Case Distance". 2024. arXiv: 2409.12566.
- Rosenthal, Gregory. "Query and Depth Upper Bounds for Quantum Unitaries via Grover Search". In submission at *Quantum*. 2021. arXiv: 2111.07992.

#### **Conference Papers**

- Rosenthal, Gregory. "Efficient Quantum State Synthesis with One Query". In: Proceedings of the 2024 Annual ACM-SIAM Symposium on Discrete Algorithms (SODA). 2024, pp. 2508–2534. DOI: 10.1137/1.9781611977912. arXiv: 2306.01723.
- Rosenthal, Gregory and Henry Yuen. "Interactive Proofs for Synthesizing Quantum States and Unitaries". In: 13th Innovations in Theoretical Computer Science Conference (ITCS 2022). Vol. 215. 2022, 112:1–112:4. DOI: 10.4230/LIPIcs.ITCS.2022.112. arXiv: 2108.07192.
- Rosenthal, Gregory. "Bounds on the QAC<sup>0</sup> Complexity of Approximating Parity". In: 12th Innovations in Theoretical Computer Science Conference (ITCS 2021). Vol. 185. 2021, 32:1–32:20.
  DOI: 10.4230/LIPIcs.ITCS.2021.32. arXiv: 2008.07470. Best Student Paper Award.
- Rosenthal, Gregory. "Beating Treewidth for Average-Case Subgraph Isomorphism". In: 14th International Symposium on Parameterized and Exact Computation (IPEC 2019). Vol. 148. 2019, 24:1–24:14. DOI: 10.4230/LIPICS.IPEC.2019.24. arXiv: 1902.06380. Best Student Paper Award.

<sup>&</sup>lt;sup>1</sup>Affiliated with the Computer Science and Physics departments at Warwick, with long-term visitor status in the Computer Science department at Cambridge (and living in Cambridge) from Sep. 2023 – Apr. 2025.

#### **Journal Papers**

Rosenthal, Gregory. "Beating Treewidth for Average-Case Subgraph Isomorphism". In: Algorithmica (2021). DOI: 10.1007/s00453-021-00813-y. arXiv: 1902.06380. Special Issue for IPEC 2019.

## **Reference Letter Writers**

- Henry Yuen
- Tom Gur
- Benjamin Rossman

### Talks

- Efficient Quantum State Synthesis with One Query
  - Quantum Information Processing (QIP) 2024.
  - Symposium on Discrete Algorithms (SODA) 2024.
  - NYU Theory Seminar, 16 Nov. 2023, https://csefoundations.engineering.nyu.edu/seminar. html.
  - Complexity Network meeting at University of Warwick, 2 Dec. 2023, https://sites.google.com/view/complexitynetwork/.
- Connections between quantum circuit complexity of states, unitaries, and functions Simons Institute for the Theory of Computing, 2 Aug. 2023.
- Query and Depth Upper Bounds for Quantum Unitaries via Grover Search
  - Theory of Quantum Computation, Communication and Cryptography (TQC) 2022.
  - Poster at QIP 2022.
  - Scott Aaronson's research group meeting, 22 Nov. 2021.
- Interactive Proofs for Synthesizing Quantum States and Unitaries
  - Quantum cryptography seminar at University of Ottawa, 30 Sep. 2022, https://quasarlab. org.
  - IQC-QuICS Math and Computer Science Seminar, 28 Apr. 2022, https://iqc-quics-seminar. umiacs.io/.
  - QIP 2022.
  - ITCS 2022.
- $\bullet\,$  Bounds on the QAC  $^0$  Complexity of Approximating Parity
  - TQC 2021.
  - Poster at QIP 2021.
  - ITCS 2021.
- Beating Treewidth for Average-Case Subgraph Isomorphism IPEC 2019.

## Service

- Conference reviews: CCC, FOCS, FSTTCS, ICALP, ITCS (x2), QIP (x9), SODA, STOC (x3), TQC (x3).
- Journal reviews: ACM Trans. Quantum Comput., IEEE Trans. Comput. Aided Des. Integr. Circuits Syst., Quantum (x2), Quantum Inf. Comput., SIAM J. Comput., Theory Comput. (x2).
- Triager for graduate admissions in University of Toronto Dept. of Computer Science, Dec. 2021.
- Coordinated food for the Theory Student Seminar (https://www.cs.toronto.edu/tss/) in the University of Toronto Dept. of Computer Science, Feb. 2022 Apr. 2022.

- Social Coordinator for the University of Toronto Computer Science Graduate Student Benevolent Society (CSGSBS), Jan. 2018 July 2019.
  - Each week a student would volunteer to bring in food to share; I coordinated logistics and reimbursement.

# Awards and Scholarships

- Best Student Paper Awards for "Bounds on the QAC<sup>0</sup> Complexity of Approximating Parity" (ITCS 2021) and "Beating Treewidth for Average-Case Subgraph Isomorphism" (IPEC 2019).
- Natural Sciences and Engineering Research Council of Canada (NSERC) Postgraduate Scholarships – Doctoral program (PGS D), Sep. 2019 – Aug. 2022.
- C.C. Gotlieb (Kelly) Graduate Fellowship in the Department of Computer Science, University of Toronto, Nov. 2018.
  - Awarded on the basis of academic merit (research and coursework).

# Teaching Assistantships

### University of Toronto

- Fall 2022: Introduction to Quantum Algorithms (CSC 2332), half TAship.
- Fall 2021: Topics in the Theory of Computation: Algebraic Gems in Theoretical Computer Science and Discrete Mathematics (CSC 2429).
- Fall 2020: Topics in the Theory of Computation: Advanced Topics in Quantum Information Theory (CSC 2429), half TAship.
- Fall 2020: Fundamentals of Cryptography (CSC 2426), half TAship.
- Summer 2020: Numerical Methods (CSC 336).
- Winter 2020: Computational Complexity and Computability (CSC 463).
- Fall 2019: Algorithm Design, Analysis and Complexity (CSC 373).
- Summer 2019: Data Structures and Analysis (CSC 263).
- Winter 2019: Algorithms for Collective Decision Making (CSC 2556).
- Fall 2018: Quantum Computing: Foundations to Frontier (CSC 2451).
- Summer 2018: Mathematical Expression and Reasoning for Computer Science (CSC 165).
- Winter 2018: Advanced Algorithm Design (CSC 473).
- Fall 2017: Algorithm Design, Analysis and Complexity (CSC 373).

### **Cornell University**

• Spring 2016: Introduction to Analysis of Algorithms (CS 4820).