Joseph Carolan

Graduate Student

Joint Center For Quantum Information and Computer Science
University of Maryland, College Park
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Education

2022-Present **PhD Student**, *University of Maryland, College Park*

Advisor- Andrew Childs

2018-2022 **BS in Computer Science, Physics**, *University of Illinois, Urbana Champaign*

Received dual degrees in computer science (with a focus in theory) and physics (with a focus in computational physics). GPA- 4.0/4.0

Honors

- Recipient of the Lanczos Graduate Research Fellowship, providing two years of research assistantship funding and tuition coverage. *UMD, 2022*
- Recipient of the Deans Fellowship, providing a two year stipend. *UMD, 2022*
- Recipient of Bronze Tablet Award, equivalent to highest honors. *UIUC, 2022*
- Recipient of James Scholar Award. *UIUC, 2018*

Papers & Preprints

(1) "(Quantum) Indifferentiability and Pre-Computation" Joseph Carolan, Alexander Poremba and Mark Zhandry. **QIP 2025**

(2) "Succinct Fermion Data Structures" Joseph Carolan and Luke Schaeffer. **ITCS 2025**

(3) "Quantum Advantage and Lower Bounds in Parallel Query Complexity" Joseph Carolan, Amin Shiraz Gilani, Mahathi Vempathi. **ITCS 2025, QIP 2025**

(4) "Quantum One-Wayness of the Single Round Sponge with Invertible Permutations" Joseph Carolan, Alexander Poremba. **CRYPTO 2024, QIP 2025**

(5) "Quantum Computation of Dynamical Quantum Phase Transitions and Entanglement Tomography in a Lattice Gauge Theory." Niklas Mueller, Joseph Carolan, Andrew Connelly, Zohreh Davoudi, Eugene F. Dumitrescu, and Kübra Yeter-Aydeniz. **PRX Quantum** 4, 030323 – Published 18 August 2023

Posters and Presentations

(1) "Quantum One-Wayness of the Single Round Sponge with Invertible Permutations", Joseph Carolan. **Presented at CRYPTO 2024**

(2) "Quantum One-Wayness of the Single Round Sponge with Invertible Permutations", Joseph Carolan. **Presented at QCRYPT 2024**

(3) "Limitations of Quantum Algorithms for Fluid Dynamics", Joseph Carolan. **Presented at Burgers Symposium 2024**

(4) "Quantum Money with Minimal Quantum", Joseph Carolan. **Presented at UMD Quantum Cryptography with Classical Communication Seminar**

(5) "Machine Learning Approximated Nucleon Matrix Elements with Domain Wall Fermions", Akio Tomiya, Joseph Carolan, Andrew Connelly, Taku Izubuchi, Luchang Jin, Chulwoo Jung, Christopher Kelly, Meifeng Lin, Sergey Syritsyn. **Co-Presented at Lattice 2021**

Work Experience

Summer 2021 **Research Intern**, The Aerospace Corporation

Summer 2020 **Research Intern**, Brookhaven National Lab

Summer 2019 **Software Engineering Intern**, John Deere

Summer 2018 **Software Engineering Intern**, Concorde Software Solutions

Summer 2017 **Research Intern**, Fermi National Accelerator Laboratory

Teaching

Fall 2020, Spring 2021 Advanced Algorithms (TA)

Spring 2019, Fall 2021 Introduction to Algorithms and Models of Computation (TA)

Spring 2019, Fall 2019 Software Design Studio (TA)

Service

Conference Reviewer, QIP 2024, QSim 2024, TQC 2024, QIP 2025, EUROCRYPT 2025, STOC 2025

Fall 2022 **Textbook Contributor,** Computational Intractability: A Guide to Algorithmic Lower Bounds