Bora Basyildiz

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Education

Ph.D. Physics   California Institute of Technology   2024-
Advisor: John Preskill (Caltech)
Focus: Quantum Information Theory, Quantum Algorithms/Complexity.

M.S.   Quantum Engineering   Colorado School of Mines   2023-2024
Thesis: Quantum Optimal Control and Speed Limits of Two-Qubit Quantum Gates.
Advisors: Zhexuan Gong (Colorado School of Mines), Raymond Simmonds (National Institute of Standards & Technology).

B. S.   Applied Mathematics   Colorado School of Mines   2018-2022
B. S.   Computer Science   Colorado School of Mines   2018-2022
GPA 3.98; Outstanding Graduating Senior in Applied Mathematics; Summa Cum Laude; Honors Minor in Public Affairs.

Research Experience

- **Caltech Graduate Student Researcher**   2024-
  - Mentored by John Preskill
  - Researching topics in quantum algorithms, complexity, and information theory.
- **Rigetti Computing Research Intern**   2025
  - Mentored by Stefano Poletto and Angela Chen.
  - Leveraged optimal control methods and speed limit methodology to generate novel gates on superconducting hardware (proprietary).
- **National Institute of Standards and Technology (NICT) Visiting Researcher**   Dec 2024
  - Mentored by Sahel Ashhab
  - Developed theoretical speed limit methodology for qutrit gates and generated optimal control methods to generate speed-optimized qutrit gates.
- **NSF Quantum Engineering National Research Trainee; Master's Thesis**   2023-2024
  - Mentored by Professor Zhexuan Gong (CSM), Dr. Raymond Simmonds (NIST).
  - Studied the speed limit of two-qubit gates in experimental systems and created a machine learning-based [optimal control codebase](#) to generate fast, high-fidelity gates for superconducting qubits.
- **CSM Undergraduate Research Scholar in Mathematics**   2021–2022
  - Mentored by Dr. Scott Strong (CSM).
  - Created open-source numerical [modeling software](#) to visualize and compute Vortex Flows in Quantum Fluids.
- **Google Student Researcher**   2021
  - Mentored by Hoon Seo, Ph.D. Candidate (Google ExploreCSR).

- Created a deep neural network in Python Tensorflow package that predicts mortality rates for COVID-19 patients.
- **CSM Undergraduate Research Scholar (Physics)** 2020-2021
  - Mentored by Dr. Zhexuan Gong (Physics, CSM).
  - Derived speed limits and protocols for quantum state transfers and two-qubit gates.

Publications & Manuscripts

1. **B. Basyildiz,** Z. X. Gong, S. Ashhab, "Speed Limits of two-qutrit gates." In review, arXiv:2510.07742
2. **B. Basyildiz**; "Quantum Optimal Control and Speed Limits of Two-Qubit Quantum Gates." Master's thesis,
3. **B. Basyildiz,** C. Jameson, Z. X. Gong; "Speed limits of two-qubit gates with qudits." In review, arXiv 2312.09218
4. C. Jameson, **B. Basyildiz**, D. Moore, K. Clark, Z. X. Gong; "Time optimal quantum state transfer in a fully-connected quantum computer." Quantum Science and Technology. 9 01504 (2023)
5. J. Howard, A. Lidiak, C. Jameson, **B. Basyildiz**, K. Clark, T. Zhao, M. Bal, J. Long, D. P. Pappas, M. Singh, Z. X. Gong; "Implementing two-qubit gates at the quantum speed limit." Physical Review Research 5, 043194 (2023)

Selected Presentations

- **Talks**
  1. "Speed limits of two-qubit gates with qudits." National Institute of Information and Communications Technology (NICT), Toyko, Japan. December 2024
  2. "Speed limits of two-qubit gates with qudits." Keio University, Toyko, Japan. December 2024
  3. "Speed optimized two-qubit gates with qudits." NSF Quantum Engineering National Trainee Conference at the Colorado School of Mines, Golden, CO. October 2023
  4. "Demonstrating two-qubit gates at the quantum speed limit using superconducting qubits." Colorado School of Mines World Quantum Day, Golden, CO. April 2023
  5. "Demonstrating two-qubit gates at the quantum speed limit using superconducting qubits." APS March Meeting 2023, Las Vegas, NV. March 2023
  6. "Covid-19 Morality Prediction using Dense Neural Networks." Google CSR Hidden Talents@Mines, Golden, CO. May 2021

- **Posters**
  1. "Speed optimized two-qubit gates with qudits." Exploring Non-equilibrium Long-range Quantum Matter Conference, Kavli Institute of Theoretical Physics, Santa Barbara, CA. November 2023
  2. "Speed optimized two-qubit gate in a two-qutrit system." NSF Annual NRT Meeting, Phoenix, AZ. October 2023
  3. "Speed optimized two-qubit gate in a two-qutrit system." Quantum Simulation 2023 hosted by NSF RQS Institute, Telluride, CO. August 2023
  4. "Speed optimized two-qubit gate in a two-qutrit system." Colorado School of Mines Graduate Research and Discovery Symposium, Golden, CO. April 2023

Selected Honors & Awards

- **Major Awards:**
  - 2024: Amazon Web Service (AWS) Graduate Fellowship at Caltech.
  - 2022: Outstanding Graduating Senior in Applied Mathematics at CSM.
  - 2022: NSF Quantum Engineering National Research Trainee Fellowship at CSM.
  - 2022: [IBM Quantum Algorithm Hackathon Winner](#).
  - 2022: Professor Hereman Scholarship for first-generation mathematicians at CSM.
  - 2021: Google CSR Hidden Talents Scholar.
  - 2020: Outstanding undergraduate student in McBride Honors Society at CSM.
  - 2020: C-MAPP Amazon Scholar by CSM Computer Science Department.
  - 2019: Epic Promise Scholarship by Vail Mountain Resorts.
  - 2018: Outstanding Mathematics Student at Vail Mountain High-School.

- **Minor Awards:**
  - 2023: Distinguished Poster Presentation at CSM Graduate Research Symposium.
  - 2023: Honorable Mention in NSF Graduate Research Fellowship Program by National Science Foundation (NSF).
  - 2022: Undergraduate Research Scholar by CSM Applied Mathematics & Statistics Department.
  - 2022: CS Citizen Scholar by CSM Computer Science Department.
  - 2022: CS Algobowl hackathon 1st place winner at CSM Computer Science Department.
  - 2022: C-MAPP Gogo Air Scholar by CSM Computer Science Department.

Professional Societies

Member	Institute for Quantum Information and Matter (IQIM)	2025-
Member	Sigma Xi, Scientific Research Honor Society	2023-
Member	American Physical Society (APS)	2022-
Member	Association for Computing Machinery (ACM)	2022-

Leadership & Activities

Caltech Y Club member	2024-
President & Co-Founder of Society of Quantum Engineers at CSM	2023-2024
Lead pianist of the Evil Eye's Jazz band	2018-2023
Student Director of the McBride Honors Program at CSM	2022-2023
Quantum Engineering Seminar Organizer at CSM	2023
Diversity and Inclusion Ambassador at CSM	2022
Member of Tau Beta Pi Honor Society	2020-2022
Member of McBride Honors Program at CSM	2019-2022
Member of Order of Omega Honor Society	2019-2021
Scholarship Chair in Sigma Nu Fraternity	2019-2021
Campus Outreach Chair in Sigma Nu Fraternity	2019-2021
Brother in Sigma Nu Fraternity	2019-2021

- Member of Thorson First Year Honors Program at CSM   2018-2019

Last Updated: 11/13/2025