Luke Qi

Graduate Student · Department of Applied Physics · Department of Physics · Department of Electrical Engineering and Computer Science

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Education

Stanford University *Stanford, CA*

PhD. Student in Applied Physics *Sep. 2021 - Present*

- Academic Advisor: Prof. Ian Fisher
- GPA: 3.695
- Select Courses: Atoms Fields and Photons, Nonlinear Optics, Quantum Hardware, Advanced Micro and Nano Fabrication Laboratory, Nanophotonics

Massachusetts Institute of Technology *Cambridge, MA*

S.B. in Physics, S.B. in Electrical Engineering *Sep. 2017 - Jun. 2021*

- Academic Advisors: Prof. Rajeev Ram, Prof. Joseph Formaggio
- GPA: 5.0/5.0
- Select Courses: Photonics, Experimental Physics, Machine Learning, Quantum Nonlocality, Quantum Mechanics I, II & III Analog Electronics Laboratory, Electromagnetics and Applications, Statistical Mechanics, Inference

Research Experience

Laboratory for Integrated Nano-Quantum Systems *Stanford, CA*

PhD Student *Jan. 2022 - Present*

- Advisors: Prof. Amir Safavi-Naeini
- Nonlinear photonics devices in periodically-poled thin-film lithium niobate

Fan Group *Stanford, CA*

PhD Rotation Student *Sept. - Dec. 2021*

- Advisors: Prof. Jonathan Fan, Prof. Juan Rivas-Davila
- Studied and designed high frequency inverter topologies
- Conducted numerical simulations of power transfer and efficiency of AC inductive heating of metallic nanoparticles

Photonics and Modern Electro-Magnetics Group *Cambridge, MA*

Undergraduate Researcher *Feb. - Jun. 2021*

- Advisors: Prof. Marin Soljacic, Dr. Yi Yang
- Studied quantum walker protocols immersed in non-Abelian fields. Found indicators of spin-orbit coupling
- Numerically determined quasienergy dispersions and topological phase transitions of an effective Hamiltonian

Nanostructures and Computation Group *Cambridge, MA*

Undergraduate Researcher *Feb. - Jun. 2021*

- Advisors: Prof. Steven Johnson, Dr. Raphael Pestourie
- Built a fast approximate Maxwell solver for electromagnetic scattering through layered photonic devices variable surface-impedance structures. Written in Julia

MIT Quanta Group *Cambridge, MA*

Keel Foundation Undergraduate Research and Innovation Scholar *Aug. 2019 - Jun. 2021*

- Advisors: Prof. Isaac Chuang, Dr. John Chiaverini, Mr. Jules Stuart, Dr. Jeremy Sage
- Launched a collaboration with Gonzalo Muga's theoretical physics group to develop robust Shortcuts-to-Adiabaticity protocols based off my simulation results. Review paper in progress
- Developed an end-to-end numerical simulation pipeline to optimize voltage waveforms in future ion shuttling experiments
- Built remote laser shutter controllers and characterized the system's high-voltage amplifier

MIT Aerospace Controls Lab *Cambridge, MA*

Undergraduate Researcher *Sep. - Dec. 2018*

- Advisors: Prof. Jonathan How, Dr. Golnaz Habibi
- Implemented human detection algorithms on a system with one Velodyne lidar and six RGB cameras
- Built a full computer vision pipeline to extract human trajectories and collected data throughout Boston

Industry Experience

IonQ Inc. *College Park, MD*

Summer Intern *Jun. - Aug. 2021*

- Advisors: Dr. Jeremy Sage, Dr. Jason Amini
- Built software to optimize ion trap designs using topology optimization techniques

Trace Matters Scientific *Somerville, MA*

Hardware Engineering Intern *Feb. - Aug. 2019*

- Advisor: Dr. Mazdak Taghioskoui
- Built a backend data acquisition system for the company's prototype mass spectrometer using a PYNQ System-on-a-Chip
- Implemented a quadropole mass filter controller and low-latency communication with front-end server

The Aerospace Corporation *Los Angeles, CA*

Technical Intern II in the Innovation Lab *Jun. - Aug. 2018*

- Advisor: Dr. Will Bezouska
- Developed computer vision algorithms that work in space using point cloud data and AR tags
- Programmed two Arduino robots with PID controls and infrared communication to demonstrate swarm robotics techniques

Awards, Fellowships, & Grants

2021-2024	**Shoucheng Zhang Graduate Fellowship**, Stanford University	*$49,640/yr*
2021	**Phi Beta Kappa, Sigma Pi Sigma**,	
2019	**Undergraduate Research and Innovation Scholar**, Keel Foundation	*$6,000*
2017	**Top Academic Student**, Fayetteville-Manlius High School	
	Bronze Medal, United States Physics Olympiad	
2016	**Silver Medal**, International Olympiad on Astronomy and Astrophysics	
	Semifinalist, National Merit Scholarship Corporation	*$2,500*
2015	**Bronze Medal**, International Olympiad on Astronomy and Astrophysics	

Published Work

Presentations

Qi, L. *Optimizing Voltage Waveforms for Ion Shuttling Operations.* DAMOP, 3 June 2021.

Taghioskoui, M., Qi, L. *Low-Pressure ICP-MS for Planetary Trace Elemental Analysis.* Harsh-Environment Mass Spectrometry Workshop, 16-19 September 2019, Myrtle Beach, SC.

Publications

Qi, Luke, et al. "Fast and robust particle shuttling for quantum science and technology." EPL (Europhysics Letters) 134.2 (2021): 23001.

Outreach & Professional Development

Service and Outreach

2020–21 **MIT Interdisciplinary Quantum Information Science and Engineering**, Outreach & iQuHACK Committees

Leadership

2018–20 **MIT Ridonkulous Dance Team**, Captain, VP External

Teaching and Grading

Spr 2021 **8.044 Statistical Physics I**, Grader
Fall 2020 **6.003 Signal Processing**, HKN Tutor
Fall 2019 **6.002 Circuits and Electronics**, Lab Assistant
8.022 Physics II, Grader
Fall 2018 **8.03 Physics III**, Grader

Class Projects

Spr 2022 **ENGR241 Advanced Micro and Nano Fabrication Laboratory**, Physical Sputtering of Superconducting NbN Thin Films
EE237 Solar Energy Conversion, Artificial Photosynthesis: Hybrid Photoelectrochemical and Photovoltaic Devices
Win 2022 **AP228 Quantum Hardware**, Towards Quantum-Enhanced Biosensing
Fall 2021 **AP203 Atoms, Fields, and Photons**, Real-Time Quantum Feedback
Fall 2020 **6.621 Fundamentals of Photonics**, The Frontiers of Deep Learning and Nanophotonics
6.S979 Quantum Nonlocality, A survey on the Verifier-on-a-Leash and Dog-Walker protocols
21A.504 Cultures of Computing, Quantum Computing: Cultural Dimensions and Cultural Shifts
Spr 2020 **8.06 Quantum Physics III**, Physics of Quantum Dots: the Brus Equation and the Jaynes-Cummings Model
6.101 Analog Electronics Lab, Sigma Delta Analog-to-Digital Converter
Fall 2018 **18.353 Nonlinear Dynamics: Chaos**, Dynamics of the Interplanetary Transport Network

Skills

Software **Python: (SciPy, NumPy, PyTorch), MATLAB, COMSOL, Julia, SPICE, Xilinx Vivado, Lumerical, Verilog, C++, ROS, KiCAD**,
Hardware **Nanofabrication, Table-top Optics, Arduino, Pynq SoC, Oscilloscopes, VNA, PCB design, FPGA programming**,