Nathan Song

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EDUCATION

University of California, Berkeley — Berkeley, CA
B.A. in Physics, Mathematics (Double Major). GPA: 3.63/4.0 — *Aug. 2021 – May 2025*

Honors: Cal Alumni Leadership Award *(2021,2022,2023)*, Rose Hills Scholarship *(2024)*, BPURS Scholar *(2023, 2024)*
Relevant Coursework: *Quantum Algorithms (Math 275), Quantum Coding Theory, (CS 294), Special Topics in Many-Body Physics, (Phys 216), Quantum and Nonlinear Optics, (Phys 130), Quantum and Optical Electronics, (EE 236)*

Research Interests
Neutral Atom Arrays, Atomic Physics, Many-Body Physics, Quantum Algorithms

PUBLICATIONS

(2023) N. Song, et. al, *Powering Wire-Mesh Circuits Through MEMS Fiber-Grippers*, IEEE FLEPS
(2023) Islam et. al, *Thermally Driven MEMS Fiber-Grippers*, Journal of Micro and Bio Robotics

RESEARCH EXPERIENCE

Ultracold Atomic Group (Rubidium Experiment) | Research Assistant — January 2023 – Present
PI: Prof. Dan Stamper-Kurn — *Berkeley, CA*

- Discovered aberration-free in plane and out of plane movement of optical tweezers using two 2D AODs that enables dynamical move access to 3D atom arrays for the first time. Exploring additional consequences for multi-tweezer movement and persistent out of plane tweezers with Shepard tones.
- Built a fast shutter camera (500 ns frame time) with an acousto-optic modulator and RF circuitry to image how optical tweezers made with an acousto-optic deflector change during movement.
- Made diffraction-limited 2D tweezer arrays with $> 99\%$ homogeneity using a spatial light modulator. Currently building an SLM/DMD/AOD system to enable fast (50 us) single-site addressing of 2D arrays.
- Obtained an NSF grant for summer funding in 2024 and a Rose Hills Summer scholarship.

PARADIM REU @ Johns Hopkins | Research Assistant — June 2023 – August 2023
PI: Prof. Tyrel McQueen — *Baltimore, MD*

- Designed metric predicting the likelihood of a material to form an oxide layer(s) based on formation energies. Predicted metric, critical temperature (Tc), and % of removable oxide for 170k known /theorized materials using machine learning algorithms like XG Boost, Nelder-Mead, and convolutional neural networks.
- Ran MD calculations and force-field simulations on JHU's Rockfish supercluster for promising transmon candidates.

IMPACT-NG REU @ U. of Louisville | Research Assistant — June 2022 – August 2022
PI: Prof. Cindy Harnett — *Louisville, KY*

- Designed and fabricated Microelectromechanical (MEMS) grippers to integrate micro-LED circuits with flexible, detached wire meshes. Published in IEEE FLEPs and the Journal of Micro and Bio Robotics.

Ultrafast NanoOptic Group | Research Assistant — September 2021 – May 2022
PI: Prof. Feng Wang, Mentor: Zheyu Lu — *Berkeley, CA*

- Fabricated ultrathin heterostructures to explore novel properties of 2D materials.

WORK EXPERIENCE

Fluxergy | Junior Web Developer — April 2021 – August 2022
Marketing Team — *Berkeley, CA*

- Created current Fluxergy.com website while communicating directly with CEO/Advisory Board members.

University of California, Berkeley | Course Reader — September 2022 – December 2022
for Prof. Rakesh Bhandari — *Berkeley, CA*

- Graded essays and quizzes for ISF 10 (Enduring Questions and Great Books of the Western Tradition).

ACTIVITIES

Quantum Computing at Berkeley | *Co-President*   August 2022 – Present
- Teach weekly hardware subgroup for ∼15 students on atomic physics and quantum algorithms that include journal clubs, lab tours, literature reviews, and student-lead projects.
- Lead officer team to host subgroups on quantum error correction / computing / hardware to ∼40 students. Organize seminars and conferences from industry and academia such as our DeepTech conference, which had ∼100 attendees and speakers from IBM, Sandbox, and Classiq.

Physics Directed Reading Program | *Mentee*   August 2021 – December 2021
- Covered Annett's superconductivity covering Bose-Einstein condensates and statistical thermodynamics. Gave departmental presentation at end of semester on Type I/II superconductors.

POSTER PRESENTATIONS

2024   "Optical Tweezers for Ultracold Atoms", **Nathan Song**, Physics and Astronomy Undergraduate Poster Session, UC Berkeley

        "Acousto-Optic Deflectors for 3D Atomic Movements", **Nathan Song**, Quantum Computing at Berkeley's end-semester Spark Talks, UC Berkeley

2023   "Powering Wire-Mesh Circuits through MEMS Fiber-Grippers", **Nathan Song**, IEEE International Conference on Flexible Printable Sensors and Systems, Northeastern University

        "Predicting high-Tc Transmon candidates with minimal Oxide Thickness", **Nathan Song**, PARADIM REU Final Presentations, Cornell University and Johns Hopkins University

        "Sentiment Analysis Using Quantum Neural Networks", **Nathan Song**, Quantum Computing at Berkeley's DeepTech conference, UC Berkeley

2022   "Electrical Characterization of MEMS Microgrippers in Circuits", **Nathan Song**, NNCI Nano and Additive Manufacturing Summit, University of Louisville

SKILLS

Code: Python, Matlab, Julia, HTML+CSS

Computational Packages: OpenCV, LAMMPS, SciPy, NumPy, Pandas, Matplotlib

Experimental Tools: Radio Frequency Circuitry, Photolithography, Photomask Design, Scanning Electron Microscopy, Atomic Force Microscopy, Wirebonding, Xenon Etching, Metal Deposition, Plasma cleaning, Wet etching, Parylene deposition, Probe station