Cliff Sun

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Education

University of Illinois Urbana-Champaign May 2027

B.S. Physics, B.S Mathematics, Minor in Computer Science (Honors) *GPA: 3.93/4.0*

Courses: Quantum Mechanics I & II, Classical Mechanics I & II, Advanced Electrodynamics I & II, Graduate Partial Differential Equations, Real Analysis

Publications and Patents

- **Sun, C.**, & Bezryadin, A. *Multiple-Nanowire Superconducting Quantum Interference Devices: Critical Currents, Symmetries, and Vorticity Stability Regions.* IOPScience Nano Express, August 2025.
- **Sun, C.**, Zhao, Z., & Bezryadin, A. *Perfect Superconducting Diode and Supercurrent Range Controller.* Elsevier Physics Letters A, Oct. 2025.
- **Sun, C.**, & Bezryadin, A. *A Dayem Loop Qubit Based on Interfering Superconducting Nanowires.* Submitted, Mar. 2026.
- (Patent) **Sun, C.**, & Bezryadin, A. *Two Nanowire Qubit.* Patent Filed, Mar. 2026.

Research Experience

Bezryadin Condensed Matter Laboratory | Undergraduate Researcher Sept. 2023 – Present

- Applied group theory and topology to analyze superconducting nanowire devices, revealing symmetry-breaking mechanisms analogous to particle physics enabling memory and diode design
- Derived a superconducting diode effect in nanowire devices by breaking space and time symmetry
- Developed nanowire-based transmon qubit concept with magnetic field tunable anharmonicity
- Designed, built, and automated a time-resolved circuit-QED measurement setup using microwave circuitry and LabVIEW to lead the group's first time-resolved investigation of non-linear cavity-coupled nanowire physics
- Developed a parallelizable inverse-modeling framework using gradient-based optimization to non-invasively infer Josephson junction parameters, achieving 90% validation accuracy

Johns Hopkins Applied Physics Laboratory | Quantum Machine Learning Intern Sept. 2025 – Present

- Designed Transformer decoder quantum compilation pipeline of Matrix Product States, achieving 99% speed-up acceleration in NISQ-aware compilation compared to traditional methods while preserving high state fidelity
- Demonstrated transformer's zero-shot generalization to larger qubit systems without retraining
- Developed tokenization algorithm for holographic openQASM scripts, demonstrating a 80% more compact total gate operation representation compared to traditional quantum circuit tokenization algorithms
- Demonstrated transformer's capabilities of learning ground state phase diagram of XXZ Heisenberg Hamiltonian

Johns Hopkins Applied Physics Laboratory | Quantum Machine Learning Intern May 2025 – Aug. 2025

- Implemented and trained a holographic generative quantum machine learning algorithm on quantum-encoded NIST handwritten numbers, achieving state generation accuracy of 99%
- Designed and implemented Reinforcement Learning framework to speed-up current quantum compilation by 20%
- Proposed Quantum Annealing approach to high-dimensional dynamic radar search through QUBO formulation. First APL intern to independently propose research project; now awaiting funding
- Applied genetic algorithms to optimize radar resource allocation, producing data-driven recommendations

Presentations

- *Multiple-Nanowire Superconducting Quantum Interference Devices: Critical Currents, Symmetries, and Vorticity Stability Regions.* Chicago Quantum Exchange, November 2025. **(Primary Presenter)**
- *Holographic Quantum Tensor Networks and Quantum Annealing.* Johns Hopkins Applied Physics Laboratory Intern Exposition, Aug. 2025. **(Primary Presenter)**
- *ECLIPSE: Efficient Cryogenic Low Invasive Propellant Supply Exchange.* NASA Marshall Space Flight Center, June 2025. **(Primary Presenter)**

- *Model-fitting algorithm for disordered Josephson Junction Arrays.* UIUC Undergraduate Research Exposition, September 2024. **(Primary Presenter)**
- *HINDER: Holistic Integration of Navigational Dynamics for Erosion Reduction.* NASA Marshall Space Flight Center, June 2024.
- *Analyzing Disorder and Symmetries in random Josephson Junction Arrays.* UIUC Undergraduate Research Exposition, April 2024. **(Primary Presenter)**

Awards

- **2026 Goldwater Scholarship Finalist** (1 of 4 UIUC students nominated; status pending)
- **2025 Astronaut Scholarship Finalist** (1 of 4 UIUC students nominated)
- **2025 Texas Instruments Research Scholar** (1 of 8 UIUC students selected)
- **Best Undergraduate Poster in 2025 Chicago Quantum Exchange** (out of 40 competing students)
- **Selected to present to Johns Hopkins APL Leadership** (out of 400 interns)
- **2nd Place in 2024 NASA Human Lander Challenge** (out of 100 participating teams)
- **Best Technical Presentation in 2025 NASA Human Lander Challenge** (out of 100 participating teams)

Leadership and projects

NASA's Human Lander Challenge: Advanced Cryogenics | UIUC Team Lead Sept. 2024 – June 2025

- Led team of 40+ in designing a holistic cryogenic propellant transfer architecture for NASA's Artemis Missions
- Awarded $10,000 and invited to present solution architecture at NASA Marshall Space Flight Center
- Directed simulation efforts and secured advisory sponsorships from NASA, Aerospace Corporation, and start-ups

UIUC Office of Undergraduate Research | Undergraduate Research Ambassador Jan. 2024 – Present

- Led research panels and research workshops to guide undergraduates in their research journey
- Host one-on-one's covering cold emails, research opportunities, and application reviews

Skills

Languages: Python, C++, MATLAB
Quantum & ML Frameworks: Qiskit (QAOA), PyTorch, TensorFlow
Tools: Git, LabVIEW, NumPy, SciPy, Matplotlib, Jupyter