# Pengyu Liu

Ph.D. Student · Computer Science Department · Carnegie Mellon University
Email: pengyul@andrew.cmu.edu · Phone: +1 412-251-2404 · Website: pengyuliu.me


---

December 8, 2025

Dear QuEra Hiring Committee,

I am a third-year Ph.D. student in Computer Science at Carnegie Mellon University, advised by Professor Umut A. Acar. I am writing to apply for the **Internship - Quantum Error Correction Research** position at QuEra Computing, where I previously interned and whose work in neutral atom quantum computing aligns closely with my research.

My research focuses on quantum error correction and fault-tolerant quantum computing. I have published in top venues (ISCA, POPL, PRL, SPAA) on topics directly relevant to QuEra's research:

- **Quantum Error Correction:** I am currently working with Dr. Chen Zhao on designing syndrome extraction circuits and decoders for atom loss errors. We doubled the effective distance and increased the threshold by up to 40% in loss-dominated regimes with no extra hardware overhead.
- **Compilation for Neutral Atoms:** My work on neutral atom compilation includes "Atomique: A Quantum Compiler for Reconfigurable Neutral Atom Arrays" (ISCA'24), "Q-Pilot: Field Programmable Qubit Array Compilation with Flying Ancillas" (DAC'24), and "Coniq: Enabling Concatenated Quantum Error Correction on Neutral Atom Arrays" (QCE'25).
- **Quantum Algorithms:** I published "Fundamental Limitation on the Detectability of Entanglement" (PRL), providing an in-depth analysis of entanglement detection algorithms. I also won first place in the ACM/IEEE Quantum Computing for Drug Discovery Challenge.

Beyond my technical contributions, I have demonstrated leadership by organizing the Quantum Computer System Lecture Series and Yao Seminar. I also have extensive collaborative experience, including remote work with MIT and the University of Maryland.

If I were to rejoin QuEra, I would like to push atom loss decoding further—either by converting it to general qLDPC decoding with existing decoders (Relay-BP, MWPF), or by developing new decoders inspired by correlated-matching or belief-matching. More broadly, I am eager to tackle any practical QEC challenges on neutral atom platforms.

I am confident that my expertise in neutral atom systems, quantum error correction, and quantum algorithms would enable me to contribute meaningfully to this internship.

Thank you for considering my application. I am looking forward to contributing to QuEra's groundbreaking work in quantum computing!

Sincerely,

Pengyu Liu
Ph.D. Student
Computer Science Department
Carnegie Mellon University