Tony Letian Tang

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Education

Carnegie Mellon University — Pittsburgh, PA

B.S. in Physics and B.S. in Computer Science (Dual Degree); **GPA: 4.0** — May 2026

Courses: (Quantum) Field Theory II, General Relativity, Quantum Information and Computation, Great Ideas in Theoretical Computer Science, Competition Programming and Problem Solving

Academy of Mathematics and Science at Fort Hays State University — Hays, KS

Early-entrance-to-college program; **GPA: 3.98** — May 2022

Changzhou Senior High School of Jiangsu Province — Changzhou, China

GPA: 3.95 — June 2021

Major Works

CAAR REU, University of Maryland (QuICS) — June 2025 - Present

Undergraduate Researcher with **Michael Gullans**

- Proved a $O(2^{-1.5t})$ gap in Pauli expectation for Clifford + T circuit with t T-gates.
- Developed noise-robust stabilizer learning algorithm with Bell Sampling
  - A finder-verifier algorithm by engineering a "filtered" purity estimable with Bell sampling.
  - For ε target accuracy, improves sample complexity from $\mathcal{O}\left(2^{O\left(\log \frac{1}{\varepsilon}\right)t}\right)$ to $\mathcal{O}(2^{2t})$ in the noisy case, $\mathcal{O}(2^t)$ in intermediate case, and $\mathcal{O}(\text{poly})$ in the clean case.
- Paper under internal revision, aiming for TQC 2026.

Computer Science Department, Carnegie Mellon University — February 2024 - April 2025

Undergraduate researcher with **Prof. Ryan O'Donnell**

- Developed more efficient algorithms for Multivariate Mean Value Estimation with no extra log factors, only $O\left(\frac{\log d + \log \frac{1}{\delta}}{\log \frac{1}{\delta}}\right)$ worse than known lower bound, no further improvements tangible.
- Proved a different property for Grover unitary with variate phases; use a variety of techniques to build two multivariate estimators with different bounds.
- Work accepted as poster for QIP 2026, aiming for TQC 2026.

Independent Research in Quantum Computing — Aug 2021 - Jan 2024

- Recruited 5 students to start research group; gave lectures to group members for 2 months.
- Developed an efficient minimization quantum algorithm generalizable as quantum subroutine.
- Presented at QIP 2024, QPQIS 2023, and QPhotoniX 2023, first author on paper(*Physica Scripta*).

Other Research Experiences

Computer Science Department, University of Pittsburgh January 2025 - Present
Undergraduate researcher with **Prof. Junyu Liu** and QSAI Group

- Identified circuit architectures exhibiting partial quantum error-correcting behavior.
- Currently generalizing to include recent works in spacetime codes and algorithmic fault tolerance.

Physics Department, Carnegie Mellon University May 2023 - Present
Undergraduate researcher with **Prof. John Alison** and CMU-CMS Group

- Automated a process to investigate the accuracy vs agreement of ML models for 4b background in ZZ and ZH production, found results contradicting previous work.
- Currently developing an auto-encoder to better learn the feature of QCD background: symmetric decoder-encoder design and automatic enforcement of jet permutation symmetry.

Collaborations

CMU Quantum Club: collaborated on a range of projects such as maximum cycle problem, contributed to logistics and outreach.

IQ Initiative at University of Pittsburgh: an interdisciplinary condensed matter initiative, gave a talk on theoretical background of quantum sensing for axion search.

Quantum Sensing Group at Tongji University: investigated the use of ssh chain with photonic coupling for the detection of gravitational waves.

Other Experiences

US Quantum Information Summer School 2024: completed coursework in topological quantum computing, ion traps, quantum machine learning, measurement-induced phase transition, and various topics; accepted as the youngest participant.

Peking University Summer School International 2023 on Fundamental Physics4: completed intensive coursework in modern particle physics, ultrafast optics, spintronics, astronomy, soft matter physics, and string theory.

Skills

Programming: C++, C, Python, Mathematica, SML/NJ, HTML, and JavaScriptt.

Honors and Awards

- Ranked 17^{th}/76 in 2022 International Collegiate Programming Contest East Central NA Regional Contest, in one of the teams for Carnegie Mellon University
- 2022-25 Carnegie Mellon University Mellon College of Science Dean's List, 2025 School of Computer Science Dean's List
- 2021 Fort Hays State University Dean's Honor Roll
- 2021 American Mathematics Competitions, Distinction (top 5%); participated in American Invitational Mathematics Examination
- 2017 and 2018 National First Prize in National Olympiads Informatics in Provinces (China)