ELIJAH TARR

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EDUCATION

B.Sc., Georgia Institute of Technology (Expected Spring 2026) **Fall 2022 – Present**
Computer Science (Intelligence & Theory) w/ Math & French minors *Atlanta, GA*
Thesis: Mapping the Superstabilizer Phase Boundary in Distributed QEC *(In Progress)*
GPA: 4.0/4.0

RESEARCH INTERESTS

Quantum Computing: Distributed quantum computing, quantum error correction (QEC), fault-tolerant system design, and decoding algorithms.
Theoretical Computer Science: Randomized algorithms, graph theory, and information theory, broadcasting on trees.

PUBLICATIONS

- Narges Alavisamani, **Elijah Tarr**, Ramin Ayanzadeh, Matthieu Bloch, Moinuddin Qureshi. RADar: Resource-Aware Entanglement Distillation for Distributed Surface Codes. *(Under Review for ISCA 2026)* **2025**

RESEARCH EXPERIENCE

Georgia Tech College of Computing **July 2025 – Present**
Undergraduate Researcher *Atlanta, GA*
- *Advised by Dr. Matthieu Bloch, Dr. Ramin Ayanzedeh, Dr. Moinuddin Qureshi. Mentored by Narges Alavisamani.*
- Co-authored a paper proposing a resource-aware framework for distributed quantum error correction, currently under review at ISCA 2026.
- Built a simulation infrastructure to analyze distributed surface codes, modeling the impact of idling errors and imperfect EPR pairs on logical performance.
- Devised a runtime controller that dynamically selects distillation depth, recovering up to 98% of monolithic fidelity in distributed environments.

Georgia Tech College of Computing **January 2025 – Present**
Undergraduate Researcher *Atlanta, GA*
- *Advised by Dr. Zongchen Chen*
- Investigating the distribution of Lipschitz functions on d-ary trees and expander graphs to understand their behavior in complex networks
- Modeling message broadcasting in imperfect network conditions to bound error with high probability

Georgia Tech College of Computing **January 2024 – May 2024**
Undergraduate Researcher *Atlanta, GA*
- *Advised by Dr. Gerandy Brito*

- Analyzed the correctness of hierarchical navigable small worlds (HNSW) algorithm using Delaunay Triangulations and Voronoi diagrams
- Explored construction bounds of approximate nearest neighbor indexes with independent proof attempts, and expert consultation with Dr. Daesung Kim and Dr. Zongchen Chen
- Applied Spectral Independence property to find tighter bounds on construction time for Delaunay Graphs

EXPERIENCE

Metathesis **January 2022 – December 2022**

Software Engineering Contractor *San Francisco, CA (Remote)*

- Deployed smart contracts with the Solana, NEAR Protocol, and Ethereum blockchains
- Programmed discord bot in TypeScript to retrieve and display data from blockchain
- Devised and implemented NFT market maker bot and token arbitrage bot to make a profit off of trading

PERSONAL PROJECTS

Stim-rs: Rust Bindings for Quantum Error Correction **September 2025 – Present**

Software Engineering/Quantum Computing Project

- Developed and maintain high-performance Rust bindings (stim-rs) for Google's C++ stim library, a key quantum error correction (QEC) simulator
- Implemented detector error model and quantum circuit simulators, enabling Rust-native quantum circuit simulation, detection event sampling, and high-speed Pauli frame tracking
- Managed the open-source repository, including documentation and examples, to facilitate adoption within the Rust quantum computing ecosystem

Large Language Model Programmed from Scratch **July 2023 – August 2023**

Machine Learning Project

- Developed and trained a transformer from basic PyTorch functions using self-attention, batch normalization, and a bigram language model
- Programmed my own embeddings using a bigram language model and implemented OpenAI embeddings using tiktoken to work with my transformer
- Built a backpropagation engine from scratch inspired by Andrej Karpathy’s deep learning course

LangModelPro Large Language Model Pipeline **May 2023 – August 2023**

Software Engineering/Machine Learning Project

- Developed a language-agnostic LLM pipeline tool for ease of creation of AI applications
- Implemented multiple different vector stores (MongoDB, ChromaDB), and LLMs (OpenAI text-davinci-003)
- Wrote detailed open-source documentation on GitHub for ease of collaboration

INVITED TALKS

Introduction to Surface Codes **October 2025**

Georgia Tech Quantum Computing Association *Atlanta GA*

AWARDS AND HONORS

Faculty Honors List **Fall 2022 – Spring 2025**
Georgia Institute of Technology

COMMUNITY OUTREACH

- **Georgia Tech Quantum Computing Association** **October 2025 – Present**
  Gave **free lectures** on quantum error correction topics, including surface codes, and designed surface code integration for their **open source software LogicalQ**
- **Delta Upsilon x Food For Lives Charity** **January 2023 – May 2025**
  Prepared and distributed food for the Atlanta homeless community in Woodruff Park and raised money through food sales on Georgia Tech campus for charity

SKILLS

Programming: Rust, Python, C/C++, JavaScript/TypeScript, R, Julia, Haskell
Languages: English (native), French (conversational).
Tools & Frameworks: PyTorch, Stim, Git, Docker, LaTeX, AWS, NodeJS, MongoDB.