

Arjun Bhamra

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EDUCATION

Georgia Institute of Technology

Atlanta, GA

Bachelor of Science in Computer Science, GPA: 3.86

May 2026

Relevant Coursework: Design/Analysis of Algorithms, Advanced Algorithms (IP), Operating Systems (IP)

EXPERIENCE

IBM Research

May 2024 – August 2024

Software Engineering Intern

Yorktown Heights, NY

- Developed key components for IBM's hardware-level production Quantum Assembly (QASM) quantum compiler that improved speed by 7x and memory usage by 3.5x
- Spearheaded the development of a 85x faster data parsing and caching API for quantum hardware configuration information and waveform data through binary (de)serialization
- Implemented the compiler's intermediate representations (IRs) at the pulse calibration level
- Added additional support for QASM parsing, enabling extensibility and more language coverage

Quantinuum

May 2023 – August 2023

Software Engineering Intern

Broomfield, CO

- Created a Pythonic Domain Specific Language (DSL) to aid internal theory team in parsing code to Quantum Intermediate Representation (QIR) with a 30% improvement in workflow efficiency
- Leveraged the Python Abstract Syntax Tree (AST) to build a high level compiler from custom language to LLVM IR that enables conditional branching on quantum measurements and dynamic circuits
- Added constant folding, constant propagation, method inlining and loop unrolling optimizations which reduced output QIR by 15% for faster compilation

RESEARCH

Quantum Programming Languages Researcher

July 2023 – Present

Georgia Tech CRNCH-TINKER Lab - Dr. Tom Conte

Atlanta, GA

- Aided in the design and implementation of Qwerty, a quantum programming language that moves away from gate-based quantum computing and towards higher abstractions
- Engineered custom ASTs and optimization passes for the Qwerty compiler using the Python AST, C++, and custom MLIR dialects and rewrite passes

Quantum Algorithms Researcher

Aug 2022 – July 2023

Georgia Tech Computational Physics Lab - Dr. Spencer Bryngelson

Atlanta, GA

- Created two variational quantum algorithms (VQAs) for solving PDEs with Qiskit, etc.
- Expanded upon Variational Quantum Linear Solver (VQLS) and VQE for fluid dynamics applications

PROJECTS

Quill: Quantum Programming from the Middle Ages | *Rust*

- Created a quantum programming language using Shakespearean syntax, with a streamlined parsing and AST generation process through the Pest crate
- Laid out a plan to implement peephole optimization and code generation through QIR

Open Source Contributor to IBM Quantum repositories | *Rust, Python, unittest, Git*

- Added necessary quality of life changes for the Rustworkx repository, a Rust-based Python graph library used in Qiskit
- Added major feature support for the OpenQASM 3 Parser, a performant parser based on rust-analyzer

rs_micrograd: Mini Automatic Differentiation Engine | *Rust*

- Designed an auto-diff engine with Rust based on Andrej Karpathy's Python micrograd engine
- Implemented expression graph-based gradient calculations for efficient neural network backpropagation

TECHNICAL SKILLS

Languages: Rust, Python, Java, C, C++, LLVM, MLIR, JavaScript, LaTeX

Developer Tools: Git, Gitlab, Google Cloud Platform, BitBucket, Atlassian Tools, Bazel

Libraries: pandas, NumPy, Matplotlib, unittest, Qiskit, PennyLane, PyTorch, Scikit-learn, Python AST, functools