Curriculum Vitae

# Tarun Kumar Allamsetty

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## EDUCATION

**M.S. in Electrical and Computer Engineering (Quantum Computing Track)** *Aug 2025 – Present*
Duke University

**B.Tech in Electronics and Telecommunication Engineering** *Aug 2018 – May 2022*
College of Engineering Pune, Technological University

## RESEARCH INTEREST

Interested in the experimental realization of quantum computers, with a focus on how qubits are physically built, controlled, and stabilized. My goal is to contribute to lab-based hardware research, particularly the design, operation, and calibration of quantum devices that advance scalability and reliability.

## PROJECTS

**Open source contributions**
*Pennylane*

- **Enhanced** the unit testing suite of PennyLane (**217 contributors**, **199 monthly pull requests**) by refactoring multiple operator-equality kernels and corresponding test cases to return detailed explanations for operator mismatches instead of simple boolean outputs, improving **debugging clarity** and **developer experience** by helping contributors interpret test failures more easily. (PR #5780).
- **Implemented** the `QutritChannel` operation (PR #5793), extending PennyLane's noise-modelling framework from qubits to qutrits. Added corresponding tests and documentation; the feature is part of the public API (docs).
- **Improved** shot-sampling efficiency in `shots.bins()` (PR #5476), implemented between PennyLane `v0.35.1` and `v0.36` optimizing internal sampling logic and achieving an **50% performance increase**.
- **Implemented** the `process_counts` feature (PR #5256 and PR #5395), extending PennyLane's sample-based measurement framework to process count-dictionary data produced by external devices.

*Amazon braket python SDK*

- **Resolved** a naming conflict in the Amazon Braket SDK by enforcing validation against OpenQASM-reserved identifiers, eliminating runtime errors and ensuring reliable execution of parameterized circuits. (Issue #603, PR #999)

*Qiskit*

- Contributed to fixing Issue #12106, addressing synth_cnot_count_full_pmh for synthesizing linear reversible circuits.

*Qbraid-Qir*

- Identified that qbraid-qir generated QIR using a custom profile rather than the expected Base Profile; raised a GitHub issue #215 to highlight the missing support, which later implemented by the community.

**Quantum Tic Tac Toe**

- Developed Quantum Tic Tac Toe, an educational game integrating quantum mechanics concepts like superposition, entanglement, and measurement into classic tictactoe gameplay to enhance understanding of quantum principles
- Deployed the game on a website for easy access and containerized it with Docker, enabling players to run it locally on their machines.
- Link to source code.

## PROFESSIONAL EXPERIENCE

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**ION Group** *Jun 2022 – Jun 2025*
*Foundation*

- Optimized file reading in a data load process after analyzing performance issues using flame graphs, reducing load time from 21 minutes to 7.5 seconds.
- Designed and implemented support for Excel-based import/export in Foundation applications, enabling clients to manage complex nested entities through a tabular format with upsert functionality.
- Developed a wrapper tool for Ion-Foundation to convert Excel-based entity definitions into Java metamodels, allowing non-technical users to auto-generate fully functional CRUD applications without writing code.

*iCM-Limits - Core Maintainer*

- Developed core components of a new in-memory calculation engine for computing availability (Limit + Utilization), consumed by FNMA to auto-generate DLOD reports.
- Contributed to implementation of real-time APIs that validate incoming transactions and flag potential limit breaches before persisting to the system.
- Designed and optimized initialization of calculation matrices, eliminating redundant structures to improve memory efficiency and reduce computation time.
- Built rule-based filter matching logic to classify and aggregate transactions per account and date, enabling flexible and extensible business configurations.
- Implemented rule-based timezone assignment for accounts, supporting attribute-based matching with implicit priority resolution.
- Integrated cross-currency calculations by interfacing with FX conversion components and applying approximation policies to ensure accurate limit evaluations.
- Integrated diagnostics into the calculation engine to explain calculation failures (e.g., missing opening balances), improving debuggability for support teams.
- Optimized Java `HashMap` usage in critical calculation paths, reducing iteration latency from 6µs to 300ns per cycle.
- Implemented logging assertions in the testing infrastructure to detect silent exceptions and validate expected log outputs during end-to-end flows.
- Achieved 92% code coverage with 1000+ Cucumber test cases; FNMA reported zero bugs post-production, demonstrating delivery quality and system reliability.
- Contributed to a shared code review framework adopted by all developers, reducing dependency on architects and improving code consistency.

*iCM-RefData – Core Maintainer*

- Architected a reusable approval workflow adopted by 5 teams, enabling faster development and consistent business logic implementation.
- Refactored Angular front-end, eliminating 2000+ lines of duplicate code and standardizing UI components for better maintainability.
- Implemented audit history tracking with Hibernate Envers, allowing users to view change logs directly in the UI.
- Developed a Cucumber-based integration testing framework, reducing manual testing efforts during upgrades and accelerating release cycles.
- Reviewed code across a shared codebase used by 5 teams, ensuring code quality and enforcing best practices.
- Collaborated with platform teams to propose enhancements to the Ion-Foundation framework and led multiple upgrade rollouts.

**Securonix** *May 2021 – Aug 2021*
*Security Software Engineer Intern*

- Enhanced policy compatibility with the Securonix SNYPER tool by identifying and reporting on incompatible policies, facilitating swift remediation by cross-functional teams.
- Optimized threat hunting operations by developing a Flask web application to efficiently transfer and process Indicators of Compromise (IOCs), enhancing threat detection capabilities.
- Streamlined team workflows and improved efficiency by creating automation scripts for various tasks, including web scraping and SQL query generation, resulting in time savings and increased productivity threat detection.

**MindSpark'19, COEP** *May 2019 – Oct 2019*
*Web Developer*

- Designed the event's website section as part of the web development team.
- Collaborated on an Android app that achieved over 1,000 downloads within a week.

## TEACHING AND MENTORSHIP EXPERIENCE

*ION Group*

- Conducted onboarding sessions for new undergraduate hires for 3 consecutive years, delivering talks on **SOLID principles** and **Clean Code**.
- Mentored new team members in iCM_Limits teams by explaining the architecture of the `iCM_Limits` product and pairing with them on initial tasks; all became independent within 3 sprints.

*DSAI Club, COEP*

- Delivered a technical session explaining the **EfficientNet** paper, covering hyperparameter tuning in CNNs to help juniors understand modern research in deep learning.

## WORKSHOP, SCHOOLS AND CERTIFICATIONS

- Earned an Advance badge in the IBM Quantum Explorer program. (Certificate link)
- Finished among the top 100 in coding challenges at QHack 2024. (Certificate link)
- Successfully completed four bounties under the UnitaryHack. (Link to contributions)
- Completed IBM Quantum Challenge 2024. (Link to badge)
- Attended the Qiskit Global Summer School 2024. (Certificate link)

## SCHOLARSHIPS

**Duke ECE merit award** *Aug 2025 – Dec 2026*

- Awarded $3,386 per semester for all three full-time semesters at Duke.