

Chaithanya Naik Mude

Ph.D. Student, Computer Sciences

University of Wisconsin–Madison

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EDUCATION

University of Wisconsin–Madison, Madison, WI.

2022–present

Ph.D. in Computer Sciences

Advisor: Prof. Swamit Tannu.

Indian Institute of Technology Bombay, Mumbai, India.

2016–2021

M.Tech. & B.Tech. in Computer Science and Engineering

Minor in Physics; minor in AI and Data Science.

RESEARCH INTERESTS

Quantum computing; quantum error correction and leakage-aware decoding; superconducting and neutral-atom qubit readout; hardware-efficient machine learning for quantum control; quantum circuit synthesis; side-channel security of multi-tenant quantum systems.

PUBLICATIONS

- Accurate Leakage Speculation for Quantum Error Correction.*
Chaithanya Naik Mude, Swamit Tannu.
58th IEEE/ACM International Symposium on Microarchitecture (**MICRO**), Seoul, Korea, 2025.
- Efficient Measurement of Neutral-Atom Qubits with Matched Filters.*
Robert M. Kent, Linipun Phuttitarn, **Chaithanya N. Mude**, Swamit Tannu, Mark Saffman, Gregory Lafyatis, Daniel J. Gauthier.
Physical Review Applied, 2025.
- Efficient and Scalable Architectures for Multi-level Superconducting Qubit Readout.*
Chaithanya Naik Mude, Satvik Maurya, Benjamin Lienhard, Swamit Tannu.
62nd Design Automation Conference (**DAC**), San Francisco, CA, 2025.
- Crosstalk-induced Side Channel Threats in Multi-Tenant NISQ Computers.*
Navnil Choudhury, **Chaithanya Naik Mude**, Sanjay Das, Preetham Tikkireddi, Swamit Tannu, Kanad Basu.
Network and Distributed System Security Symposium (**NDSS**), San Diego, CA, 2025.
- Understanding Side-Channel Vulnerabilities in Superconducting Qubit Readout Architectures.*
Satvik Maurya, **Chaithanya Naik Mude**, Benjamin Lienhard, Swamit Tannu.
IEEE International Conference on Quantum Computing and Engineering (**QCE**), Montreal, Canada, 2024.
- Scaling Qubit Readout with Hardware Efficient Machine Learning Architectures.*
Satvik Maurya, **Chaithanya Naik Mude**, William D. Oliver, Benjamin Lienhard, Swamit Tannu.
50th International Symposium on Computer Architecture (**ISCA**), Orlando, FL, 2023.

PREPRINTS AND WORKSHOP PAPERS

- Enabling Fast and Accurate Neutral Atom Readout through Image Denoising.*
Chaithanya Naik Mude, Linipun Phuttitarn, Satvik Maurya, Kunal Sinha, Mark Saffman, Swamit Tannu.
arXiv:2504.08170, 2025.

HONORS AND AWARDS

DAC Young Fellow, 62nd Design Automation Conference

2025

Second place, QED-C poster presentation competition	2024
2nd place, HCL HACK IITK (national cybersecurity hackathon)	2022
Honourable Mention, NSUCrypto, 8th International Olympiad in Cryptography	2021
Gold medal, Bosch Route Optimization, 8th Inter IIT Tech Meet	2019
All India Rank 340, IIT-JEE Advanced; AIR 90, JEE Main Paper-II	2016
Qualified for INPhO (two years) and INMO (top 300 nationally)	2014–2015
KVPY Fellowship (IISc Bangalore); NTSE Scholarship (NCERT)	2012, 2014

RESEARCH EXPERIENCE

University of Wisconsin–Madison Jan 2023–present

Graduate Research Assistant, advised by Prof. Swamit Tannu.

- Leakage-aware quantum error correction: speculation strategies that improve logical error rate by 16% and reduce leakage accumulation $2\text{--}3\times$ across QEC codes (**MICRO 2025**).
- Ongoing: ML decoder for the surface code that folds leakage speculation into decoding and uses adaptive RL to track evolving hardware error profiles.
- Superconducting multi-level readout: hardware-efficient ML and matched-filter architectures with 16% relative accuracy gain, $<8\%$ FPGA resources, and 6.6% multi-level improvement (**ISCA 2023, DAC 2025**).
- Neutral-atom readout: $70\times$ smaller ML models than prior work; matched-filter measurement with the Saffman and Gauthier groups (*Physical Review Applied*); image-denoising pipeline (arXiv 2025). Presented at APS March Meeting 2025.
- Multi-tenant quantum security: crosstalk side-channel attacks recovered victim circuits with graph neural networks (**NDSS 2025**); characterized readout-architecture side channels (**QCE 2024**).
- Ongoing: unified adaptive ML (GAIL) for Rz/unitary synthesis across dynamic hardware configurations.

INDUSTRY EXPERIENCE

Quantum Machines, Product Solutions Research Intern. Feb 2026–present

- Calibration of superconducting control stacks and readout pipelines for neutral-atom systems.

VMware Inc., Software Engineer, Avi NSX-T load balancer. Jul 2021–Aug 2022

Manager: Anurag Palsule.

- Improved load-balancer performance under heavy workloads via a Kubernetes operator.
- Contributed to an open-source Kubernetes operator supporting NSX-T and OpenShift.

TEACHING

Teaching assistant, Data Science and Quantum Computing courses, UW–Madison. 2021–2022

- Assisted with assignments and student support for data-science and quantum-computing coursework.

TALKS AND PRESENTATIONS

APS March Meeting, Neutral-atom readout with ML	2025
MICRO 2025, Accurate leakage speculation for QEC	2025
DAC 2025, Multi-level superconducting qubit readout	2025
QED-C poster presentation (2nd place)	2024
ISCA 2023, Hardware-efficient ML for qubit readout	2023

SERVICE

Artifact reviewer, ISCA	2026
Artifact reviewer, IEEE Computer Architecture Letters	2024
Graduate Student Advisory Board, CS Department, UW–Madison	2024–present

MENTORING

Mentor, deep-tech student projects in deep learning and RL (15 students)	ongoing
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Mentor, quantum computing, astronomy, and computer vision (12 students)	ongoing
Department Academic Mentor, CSE, IIT Bombay	Jun 2020–Jul 2021
Department General Secretary, CSE, IIT Bombay	Apr 2019–Jul 2020

TRAVEL FUNDING

MICRO student travel grant	2025
ISCA student travel grant	2023

PROFESSIONAL DEVELOPMENT

Near-term Quantum Algorithms Summer School, Université de Sherbrooke	2024
Vijyoshi Science Camp, Indian Institute of Science, Bengaluru	2015

SKILLS

Programming: C/C++, Python, Bash, Go, Qiskit, PennyLane, Git.
ML: PyTorch, TensorFlow, Keras, TensorFlow Quantum.

REFERENCES

Prof. Swamit Tannu	Advisor
Department of Computer Sciences, University of Wisconsin–Madison	
swamit@cs.wisc.edu	
Additional references available upon request.	