

PRATEEK P. KULKARNI

B.TECH.

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EDUCATION	Department of ECE, PES University <i>B.Tech. in Electronics and Communication Engineering (VLSI)</i> • Advisor: Prof. Kaustav Bhowmick • Research area: Architectures for Quantum Machine Learning	Bengaluru, India 2022 - 2026 (<i>expected</i>)
	Kendriya Vidyalaya Hebbal <i>Grade X and Grade XII</i>	Bengaluru, India 2020, 2022
RESEARCH INTERESTS	Quantum computer architecture and coupling map design; quantum error correction and fault-tolerant computation; randomized and probabilistic algorithms for quantum systems; hardware–software co-design for scalable quantum processors; resource estimation and quantification of quantum <i>advantage</i> .	
INTERNSHIPS	Predoctoral Fellow (SPARKS) Dept. of CSA, IISc • Awarded one of the four predoctoral fellowships, to work on the intersection of theoretical computer science and quantum computer architecture, advised by Prof. Sumit K Mandal. The work will focus on problems in quantum compilation, scheduling and scalable error correction architectures.	2025.11 – Present
	Dept. of CSA, IISc Advisor: Prof. Sumit K Mandal • Developed analytical models to estimate quantum processor fidelity and execution time based on coupling maps and platform-specific hardware constraints, validated on real quantum hardware with >98% accuracy. • Proposed an efficient algorithm to generate coupling maps that guarantee high fidelity, showing increment of upto 35% in circuit fidelity. • This work won the 3rd Prize in the ACM Student Research Competition at 58th MICRO in the UG category.	2024.02 – 2025.10
PUBLICATIONS	<ol style="list-style-type: none">1. Prateek P. Kulkarni and Sumit K. Mandal. Near-Ramanujan Graphs are All You Need to Achieve Maximum Quantum Fidelity. <i>58th IEEE/ACM Annual International Symposium on Microarchitecture (MICRO), ACM Student Research Competition, 2025</i>. [3rd Place]2. Ramaseshan R, Abhishek Kumar V S, Adith Rajeev, Prathik V, Aditya Aravind, Prateek P. Kulkarni, Kaustav Bhowmick. A Generalized Hamiltonian Approach for Designing Simple Single Photon-based Optical Quantum Devices. <i>J Supercomput</i> 81, 1395, 2025. [Springer Nature]	
SELECTED PROJECTS	SQLFormer: Declarative Transformer Inference Using Only SQL Queries <i>Github Repository</i> • Implemented the full Transformer forward pass using only SQL queries, expressing attention and normalization via JOINS, aggregations, and window functions. • Benchmarked across PostgreSQL, DuckDB, and PyTorch, providing correctness and performance analysis in an accompanying paper.	2025.06 – 2025.7
	PipSim: Real-Time RISC-V Pipeline Simulator with Visualization for Instruction Hazards <i>Github Repository</i> • Developed a Python-based simulator with real-time visualization of instruction flow, hazards, and pipeline behavior for 5-stage RISC-V. • Integrated data forwarding and branch prediction; Currently extending with advanced features such as superscalar execution and deeper pipeline support.	2025.02 – 2025.02

SELECTED PROJECTS	RegDyno.Ai: High-Accuracy Time-Series Prediction using Custom Distribution Modeling <i>Patent Published, Journal No. 1/2025</i> 2023.12 – 2024.06
	<ul style="list-style-type: none"> Built a custom distribution-based model achieving 15–25% improvement over state-of-the-art forecasting methods (ARIMA, LSTM, Prophet). Deployed a production-ready pipeline with automated noise reduction; novel methodology led to patent publication.
	surface2cirqit: Automated Surface Code to Quantum Circuit Conversion with Optimization <i>Github Repository</i> 2024.06 – 2024.08
	<ul style="list-style-type: none"> Created an automated pipeline for Surface Code to Quantum Circuit conversion with syndrome extraction and optimization. Reduced gate count by 20–40% and enabled seamless integration with Qiskit, Cirq, and other error correction frameworks.
SKILLS	Programming: Python, Julia, C, MATLAB.
	Tools/Platforms: Vivado, gem5, Qiskit, QuNetSim, Cirq, PennyLane.
	Languages: English, Kannada, Hindi
SELECTED TALKS	Systems Day 2025 Computer Science and Automation, IISc 2025.01
	<ul style="list-style-type: none"> Selected among ~20 researchers nationwide to present a poster; presented on multi-core quantum computing with superconducting qubits.
	Workshop on Automata and Games for Synthesis 45th FSTTCS 2025.12
	<ul style="list-style-type: none"> Selected to present a short talk on: <i>Quantum Communication Exponentially Speeds-up Circuit Synthesis</i>
AWARDS AND HONORS	<ul style="list-style-type: none"> Pre-Doctoral Fellow, SPARKS Programme, CSA, IISc (~1/4 positions) 2025.10 3rd Place, ACM SRC at MICRO 2025, UG Category 2025.10 Student Travel Grant, MICRO 2025 – \$580 for ACM SRC presentation 2025.09 Q-Pragathi Funding, KITS, Govt. of Karnataka – 1.2L INR 2024.09 Funded Internship, ISFCR Long-Term Internship (declined), PES University 2024.01 National Runner-up, Explain The Concept, Pravega (Undergrad Fest), IISc 2019.02
ACADEMIC SERVICES	Teaching Assistant for: <i>Quantum Transport and Logic Gates</i> , PES University, Spring 2025, (Credits: 4, Class size: ~90)
	Program Committee for: HPCA 2026 - AE (Artifact Evaluation)
	Reviewer for: <i>IEEE Transactions on Quantum Engineering (TQE)</i>
REFERENCES	Prof. Sumit K. Mandal , Assistant Professor, Dept. of CSA, Indian Institute of Science (IISc), Bangalore Email: skmandal@iisc.ac.in
	Prof. Kaustav Bhowmick , Associate Professor, Dept. of ECE, PES University, Bangalore Email: kaustavbhowmick@pes.edu

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