

EDUCATION	<p>Department of ECE, PES University Bengaluru, India <i>B.Tech. in Electronics and Communication Engineering (VLSI)</i> 2022 - 2026 (<i>expected</i>)</p> <ul style="list-style-type: none">• Advisor: Prof. Kaustav Bhowmick• Research area: Architectures for Quantum Machine Learning <p>Kendriya Vidyalaya Hebbal Bengaluru, India <i>Grade X and Grade XII</i> 2020, 2022</p>
RESEARCH INTERESTS	<p>Quantum algorithms, Quantum complexity theory; quantum property testing (especially for graphs); quantum learning/information theory; oracle based separations, resource estimation and quantification of quantum <i>advantage</i>; fault-tolerant quantum computing.</p>
INTERNSHIPS	<p>Predoctoral Fellow (SPARKS) Dept. of CSA, IISc 2025.11 – Present</p> <ul style="list-style-type: none">• Awarded one of the four predoctoral fellowships, to work on the intersection of theoretical computer science and quantum computing, advised by Prof. Sumit K Mandal. The work will focus on problems in quantum compilation, scheduling and scalable error correction architectures. <p>Dept. of CSA, IISc Advisor: Prof. Sumit K Mandal 2024.02 – 2025.10</p> <ul style="list-style-type: none">• 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.
PUBLICATIONS	<ol style="list-style-type: none">1. Prateek P. Kulkarni. Entanglement-Dependent Error Bounds for Hamiltonian Simulation. <i>21st Conference on the Theory of Quantum Computation, Communication and Cryptography (TQC 2026)</i>. [arXiv]2. Prateek P. Kulkarni. Quantum Algorithms for Approximate Graph Isomorphism Testing. <i>5th Quantum Computing Theory in Practice (QCTiP)</i>, 2026. [arXiv] Journal Version: Under review at <i>ACM Transactions on Computation Theory (TOCT)</i>3. 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</i>, 2025. [3rd Place]4. Ramaseshan R, Prateek P. Kulkarni, Sharanya Madhusudhan, Kaustav Bhowmick. A Theoretical Treatment of Optical Metasurfaces as an Efficient Basis for Quantum Correlations. <i>arXiv:2507.09517 [quant-ph]</i>, 2025. (Featured by Quantum Zeitgeist)5. 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 81, 1395</i>, 2025. [Springer Nature]

SELECTED PROJECTS	SQLFormer: Declarative Transformer Inference Using Only SQL Queries	2025.06 – 2025.7
	<i>Github Repository</i>	
	<ul style="list-style-type: none"> • 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. 	
	PipSim: Real-Time RISC-V Pipeline Simulator with Visualization for Instruction Hazards	2025.02 – 2025.02
	<i>Github Repository</i>	
	<ul style="list-style-type: none"> • 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. 	
	RegDyno.Ai: High-Accuracy Time-Series Prediction using Custom Distribution Modeling	2023.12 – 2024.06
	<i>Patent Published, Journal No. 1/2025</i>	
	<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	2024.06 – 2024.08
	<i>Github Repository</i>	
	<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) nationwide to present a poster; presented on multi-core quantum computing with superconducting qubits. 	
	2nd Workshop on Automata and Games for Synthesis 45th FSTTCS	2025.12
	<ul style="list-style-type: none"> • Selected (among ~5) 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 Fellowship, SPARKS Programme, CSA, IISc (~1/4 positions) 	2025.10
	<ul style="list-style-type: none"> • 3rd Place Globally, ACM SRC at MICRO 2025, UG Category 	2025.10
	<ul style="list-style-type: none"> • Student Travel Grant, MICRO 2025 – \$580 for ACM SRC presentation 	2025.09
	<ul style="list-style-type: none"> • Q-Pragathi Funding, KITS, Govt. of Karnataka – 1.2L INR 	2024.09
	<ul style="list-style-type: none"> • Funded Internship, ISFCR Long-Term Internship (declined), PES University 	2024.01
	<ul style="list-style-type: none"> • National Runner-up, Explain The Concept, Pravega (Undergrad Fest), IISc 	2019.02

ACADEMIC
SERVICES

Teaching Assistant for: *Quantum Transport and Logic Gates,*
PES University, Spring 2025, (Credits: 4, Class size: ~90)
Program Committee for: *HPCA 2026 - AE (Artifact Evaluation)*
Reviewer for: *IEEE Transactions on Quantum Engineering (TQE)*

REFERENCES

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