PRATEEK P. KULKARNI B.TECH.

(+91) 9113237754
pkulkarni2425@gmail.com
http://prateekpkulkarni.github.io

EDUCATION

Department of ECE, PES University — Bengaluru, India
B.Tech. in Electronics and Communication Engineering (VLSI) — 2022 - 2026 *(expected)*
- Advisor: Prof. Kaustav Bhowmick
- Research area: Quantum Machine Learning

Kendriya Vidyalaya Hebbal — Bengaluru, India
Grade X and Grade XII — 2020, 2022

INTERNSHIPS

Future Computing Systems Lab | CSA, IISc — Feb 2024 – Present
- Working on distributed quantum computing architectures and analytical models for evaluating quantum processor performance, advised by Prof. Sumit K Mandal.
- Developing analytical models to estimate quantum processor fidelity and execution time based on coupling maps and platform-specific hardware constraints.

PUBLICATIONS

1. **Prateek P. Kulkarni** and Sumit K. Mandal. Near-Ramanujan Graphs are All You Need to Achieve Maximum Quantum Fidelity. *58th IEEE/ACM Annual International Symposium on Microarchitecture (MICRO), Student Research Competition*, 2025.

2. **Prateek P. Kulkarni**. MEMEDGE: Adaptive In-Memory Architecture for Energy-Efficient TinyML Inference at the Edge. *11th IEEE International Symposium on Smart Electronic Systems (iSES), Student Research Forum*, 2025.

3. **Prateek P. Kulkarni**. DIRECT: Enabling Scalable Processing-In-Memory via DPU-to-DPU Communication. *6th India ESD Workshop (Peer-reviewed Poster)*, 2025. [Abstract]

4. Ramaseshan R, **Prateek P. Kulkarni**, Sharanya Madhusudhan, Kaustav Bhowmick. A Theoretical Treatment of Optical Metasurfaces as an Efficient Basis for Quantum Correlations. *arXiv:2507.09517 [quant-ph]*, 2025. [arXiv]

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. *The Journal Of Supercomputing*, 2025.

6. **Prateek P. Kulkarni**. RAPID: Row-Access Pattern-Aware In-DRAM Prefetching. *International Conference on Emerging Technologies for Intelligent Systems (ETIS)*, 2025. [IEEE Xplore]

7. **Prateek P. Kulkarni**. A Low-Latency Memory Architecture using 3D XPoint and Memristor Technologies. *5th IEEE International Conference on Communication, Computing and Industry 6.0 (C2I6)*, 2024. [IEEE Xplore]

SKILLS

Languages: English, Kannada, Hindi

Programming: `Python`, `C`, `MATLAB`, `Rust`.

Tools/Platforms: `Vivado`, `gem5`, `Qiskit`, `Cirq`, `PennyLane`.

PROJECTS

SQLFormer: Declarative Transformer Inference Using Only SQL Queries
Github Repository   2025.06 – 2024.7

- 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
Github Repository   2025.02 – 2025.02

- 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
Patent Published, Journal No. 1/2025   2023.12 – 2024.06

- 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
Github Repository   2024.06 – 2024.08

- 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.

AWARDS AND HONORS

- **Student Travel Grant**, MICRO 2025 – $580 for SRC presentation   2025.09
- **Q-Pragathi Funding**, KITS, Govt. of Karnataka – $1,320   2024.09
- **Workshop Selection**, Present & Future Computing Systems (~80), IISc   2024.01
- **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: *Quantum Transport and Logic Gates,*
                        PES University, Spring 2025, (Credits: 4, Class size: ~90)
Reviewer for: *IEEE Transactions on Quantum Engineering (TQE),*
                IEEE DMC 2025,
                IEEE CONECCT 2025,
                IEEE INDICON 2025

REFERENCES

Prof. Sumit K. Mandal, Assistant Professor, CSA, IISc, Bangalore
Email: skmandal@iisc.ac.in

Prof. Kaustav Bhowmick, Associate Professor, ECE, PES University, Bangalore
Email: kaustavbhowmick@pes.edu

Last updated: September 2025