Shivaprasad Umesh Hulyal

Curriculum Vitae

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"When you change the way you look at things, the things you look at change." - Max Planck

Education

2019–2023 **Bachelor of Technology (B.Tech),** *Indian Institute of Technology (IIT) Madras*, Chennai.
CGPA : 9.25/10.00, Engineering Physics

2017–2019 **Higher Secondary School Certificate,** *Army Public School*, Bangalore.
96.2 % , Class XII, Central Board of Secondary Education

2015–2017 **Secondary School Certificate,** *The Hindu Senior Secondary School*, Chennai.
CGPA : 10/10, Class X, Central Board of Secondary Education

Professional Experience

August 2022-Present **Dual unitary gates and quantum cirucits** *Prof. Arul Lakshminarayan*,
Physics Department, IIT Madras.
I am working on theoretical Quantum Information and Computing for my year long B.Tech Thesis. Particularly, I am working on understanding the dynamics and space-time duality in these circuits of Dual-Unitary Quantum Circuits.

May 2022 - August 2022 **Ultrafast electro-optical signal processing in quantum communication** *Prof.Roberto Morandotti*,
Institut national de la recherche scientifique (INRS), Montreal, Canada, In-person.
Achieved high fiber to source (microring resonator) coupling efficiency. Demonstrated high signal-to-noise ratio performance for the resonator using AWG-based pulse waveform optimization techniques. Performed classical and quantum measurements to determine the chip performance metrics such as losses, spectral and temporal features, purity. The internship program was supported by MITACS.

May 2022 - August 2022 **High frequency superconducting qubits design** *Prof.Rainer Dumke*,
Centre for Quantum Technologies, Nanyang Technological University (NTU), Singapore, Online.
To understand the design limitations of high-frequency superconducting qubits. Studied challenges of TLS defects in transmon qubits. Learned *Ansys* and *Qiskit Metal* to simulate different qubit designs.

September 2021 - May 2022 **Simulating black holes using matrix models on quantum computer** *Prof.Ayan Mukhopadhyay*,
Physics Department, IIT Madras.
A year-long programme with paid monthly honorarium, provided research guidance by IITM faculty and participating in interactive lecture series on research skills. In this project, a matrix model is built to simulate the black hole on a quantum computer and measure the outgoing Hawking radiation. I simulated and studied how a typical black hole microstate behaves in real time.

May 2021 – October 2021 **Quantum Error Correction using Cellular Automaton Decoders** *Prof.Pradeep Kiran Sarvepalli*,
Electrical Engineering Department, IIT Madras.
Analysed the topological Cellular Automaton Decoders using only local update rules and its application in Quantum Error Correcting Codes. I simulated for different architectures and designs in the stabilizer formalism on the Toric Code and applied sweep rules to get a high threshold rates.

Dec 2020 – March 2021 **Programming of Quadrupole mass analyzer** *Prof.G Aravind*,
Physics Department, IIT Madras.
Worked under Prof.G Aravind to program Quadrupole Mass Spectrometer(QMS) for analysing Intersteller Medium Ions using Iontrap. Designed the LabVIEW interface for measurements and correlation parameters and understood the various interconnections between the hardware FPGA's and software in a team of four.

Patents

- **Enhanced Linear Induction Motor (LIM) with a modified end-teeth design**
  Nikhil Yelamarthy, Parth Shah, **Shivaprasad Hulyal**, Kishan Thakkar, Dr. Satyanaryanan Chakravarthy (Patent Application No: 202241024672, Filed 27th April 2022)

Presentations

- **Shivaprasad Hulyal**, Vishnu Jejjala , Tanay Kibe, Ayan Mukhopadhyay and Rishi Raj. Simulating quantum black holes with matrices. Poster presented at: Young Research Fellows Event; August 2022; Chennai [poster]

Scholastic Achievements

- Awarded the prestigious IITM **Young Research Fellowship** 2021 to work on a research project under the research guidance of a IITM Faculty in Physics Dept. throughout the year.
- Runner Up: The 2021 **Tayur Prize**. Demonstrated and solved the Quadratic Knapsack Problem (QKP) using Graver Augmented Multiseed algorithm (GAMA) and Quantum Annealing. Showed that it can match the commercially best solvers in accuracy, and importantly, without the rapid increase in time as the density of graph increases. [report]
- Nominated for KVPY Fellowship 2018, by Department of Science and Technology, Government of India. **(All India Rank 447)** Top 0.2% among 1.5 lakh applicants.
- JEE Advanced 2019 **All India Rank: 2360**
  It is one of the most selective engineering entrance exams in the world, with an acceptance rate of less than 1% into the prestigious Indian Institute of Technology (IITs)
- Awarded CBSE Merit Certificate for being among top **0.1%** successful candidates in CBSE Higher Secondary Physics Board Exam.
- **National Talent Search Examination** - Successfully cleared NTSE stage – I in 2017 organized by Government of India. In top 500 students in the state of Tamil Nadu.

Skills

- **Programming Languages:** Python, C++
- **Softwares:** COMSOL Multiphysics, Ansys, LabVIEW, Mathematica, MATLAB, Verilog, Spice, Qiskit
- **Documentation:** LaTeX
- Certified **Machine Learning** and **Deep Learning Scientist** from Stanford University Online by Prof. Andrew Ng. Certificate can be found here.
- **Languages known:** English, Hindi, Sanskrit, Tamil, Kannada, Telugu, German (Level A1)

Relevant Course Work

- Quantum Photonics Devices & Technology
- Computational Physics
- Quantum Computation & Quantum Information
- Quantum Mechanics
- Digital Signal Processing
- Experimental techniques for quantum computation & metrology
- Electromagnetics & Applications
- Quantum Integer Programming
- Statistical Physics & Applications
- Classical Dynamics
- Analog Systems & Lab
- Superconductivity & Applications

Co-Curricular Activities

June 2021 – Present
Science Communicator *Physics Department*, IIT Madras.
Organize weekly hour-long sessions to discuss & explain recent and intriguing scientific research results such as those of Nobel Prize winners to students so as to encourage students to take up reading research papers and brainstorm new ideas from them.

Oct 2020 – July 2021
Centre for Innovation, IIT Madras *Team Avishkar Hyperloop*,
Project Member of Propulsion System.
Designed and conducted time-dependent simulations using COMSOL Multiphysics for the Linear Induction Motor by which the Hyperloop is powered for European Hyperloop Week competition 2021. We won the most scalable Hyperloop Design Award and were among the top 5 nominees for various subsystem designs among 20 other international teams. My subsytem won the the best propulsion system award among all the international teams. We were featured in many newspapers and journals across India.

Extracurricular Activities

2019-2023
National Cultural Association *IIT Madras*.
Learnt Music and Electronic Keyboard

2014-2016
Painting and Pencil Shading.
Learnt different styles of pencil shading and sketching.

2011-2013
Trinity College of London *Electronic Keyboard*.
Awarded Grade 1 Examination in Music Performance.