Parth Jatakia

Princeton University
✉ pjatakia@princeton.edu, ✉ parth.jatakia@gmail.com

EDUCATION

Princeton University *2020 - 2025*
Ph.D. Candidate, GPA - 3.8/4.0,
Advisor : Prof. Andrew Houck, Houck Lab

Indian Institute of Technology Bombay *2015 - 2020*
BTech. & M.Tech. (Dual Degree) in **Engineering Physics** with specialization in **Nanoscience**,
Minor in **Computer Science**, GPA - 9.2/10

PUBLICATIONS

1. Jatakia, P., Vinjanampathy, S., Saha, K. (2021). Detecting initial correlations via correlated spectroscopy in hybrid quantum systems. Scientific reports, 11(1), 1-11.

CONFERENCE PRESENTATION AND POSTERS

1. Heaviness dependent characterization of coherence of fluxonium, APS March Meeting, Chicago *March 2022*
2. Characterizing Initial Correlation via Spectroscopy, QFF - RRI, Bangalore *January 2020*
3. Characterizing Initial Correlation via Spectroscopy, APS March Meeting, Boston *March 2019*

ACADEMIC ACHIEVEMENTS

- Awarded Ilian Mihov *96 Graduate Fellowship *2020-21*
- Ranked **1028**th nationwide among 1.5 lakh students in Joint Entrance Examination for IITs. *2015*
- Ranked **1740**th nationwide among 13 lakh students in Joint Entrance Exam for all engineering colleges in India. *2015*
- Awarded **INSPIRE** scholarship by Maharashtra government for placing in top 1% of students appearing for matriculation exam. *2015*
- Awarded Scholarship By Maharashtra State Council of Examination. *2007*

RESEARCH EXPERIENCE

Quantum Phase Slip Junctions *Mar 2022 - Present*
Prof. Andrew Houck, Princeton University
- Material engineering for enhancing the coherence of quantum phase slip events in superconductors.
- Detection of phase slip events using DC and spectroscopy based measurements.
- Designing junctions to employ quantum phase slips to generate novel Hamiltonians.

Heaviness dependent characterization of coherence properties of fluxonium qubit *Mar 2021 - May 2022*
Prof. Andrew Houck, Princeton University
- Understanding coherence limitations of the $0-\pi$ qubit by recreating similar coherence dynamics in fluxonium at zero flux.
- Finding the limiting coherence dynamics observed in the fluxonium qubit at zero flux by characterizing it against heaviness of the qubit.
- Identifying and quantifying sources of flux noise present causing dephasing in the fluxonium qubit.

Double quantum dot in silicon as a two-qubit spin quantum computing architecture *Sep 2018 - May 2020*
Prof. Suddhasatta Mahapatra, IIT Bombay
- Nanofabrication of nano-scale devices in semiconductor heterostructure (Si - SiGe).
- Optimised all recipes for processes such as lithography of nanoscale gates, ion implantation, metal deposition, etc required for realizing the quantum architecture.
- Fabricated heterostructure based devices to observe quantum hall effect and coulomb blockade.

Detecting Initial Correlations via Correlated Spectroscopy in Quantum Systems *July 2018 - May 2020*
Prof. Kasturi Saha, IIT Bombay & Prof. Sai Vinjanampathy, IIT Bombay
- Developed a general method for detecting and characterizing initial correlation present between the system & environment.
- Applied on NV centers placed within a cavity to extract information like pairwise coupling, decay rates, hidden within the initial correlations.

Spin Squeezing in Nitrogen Vacancy Centre (NV) *Jan 2019 - May 2020*

Prof. Kasturi Saha, IIT Bombay & Prof. Saikat Guha, University of Arizona

- Worked on Hamiltonain engineering for NV ensemble interacting with optical cavity mode to generate spin squeezing.
- Modelled open quantum system dynamics of the NVs interacting with the cavity modes (upto 100 NVs).
- Optimising control sequence to generate maximum spin squeeze to create metrologically superior states.

CNOT gate using Nitrogen Vacancy (NV) Centre and ^{15}N nuclear spin *May 2018 - July 2018*

Prof. Dieter Suter, TU Dortmund

- Numerically optimized phases of the pulse sequence to effectively generate CNOT gate between NV spin and adjacent nitrogen-15 nuclear spin
- Characterized the delay between I/O of the Direct Digital Synthesizer (DDS) to obtain time-delay in the pulse sequence.
- Improved contrast of SNR of the wide-field image of NVs in the diamond by rebuilding part of the optical setup.

ACADEMIC PROJECTS

Measurement-Induced State Transitions in a Superconducting Qubit Quantum Optics, Princeton: *Spring 2021*

- Recreated results from Sank et al 2016 using Qiskit and IBM Armonk to investigate the possibility of driving the qubit to higher energy states by populating the cavity with a large number of photons.

Exotic Topological Order in Fractal Spin Liquids Adv Quantum Mech, Princeton: *Spring 2021*

- Recreate and understand the calculations presented in Yoshida 2013 paper on exotic topological ordering of $2D$ and $3D$ spin liquids

Electrical & Optical nature of reduced graphene oxide, Adv Techniques in Nano, IIT Bombay: *Spring 2019*

- Measured transmittance and resistivity of multiple hydrazine reduced graphene oxide films with variations in reduction.

Hardware Emulation of Quantum Algorithms, Electronics Lab III, IIT Bombay : *Spring 2017*

- Simulated two qubit Fourier transform on Field Programmable Gate Arrays (FPGAs) using parallelism feature.

Microwave Plasma CVD of Diamond, Prof. Kantimay Das Gupta, IIT Bombay : *Winter 2016*

- Improved and deposited diamond using MPCVD system, and further characterized them using Raman spectroscopy.

Turing Pattern in Reaction Diffusion System Non-Linear Dynamics, IIT Bombay: *Autumn 2016*

- Studied non-linear dynamical equations for a reaction diffusion system through linear stability analysis and bifurcation.
- Simulated reactions in 2D for various initial & boundary conditions to obtain striped and spotted Turing patterns

POSITION OF RESPONSIBILITY

Assistance in Instruction, ECE 511 Quantum Mechanics, Princeton: *Fall 2021*

- Teaching and grading graduate level quantum mechanics course to a batch of 15 graduate students.

Department Academic Mentor, IIT Bombay: *2019-2020*

- Mentoring weak performing senior students to help them navigate their undergraduate life.

Teaching Assistant, Electronics Transistor lab, IIT Bombay: *Fall 2019, Spring 2020*

- Mentored a batch of 15 students through lab and help sessions, and graded their assignments and paper.

Convener, Maths & Physics Club, IIT Bombay: *2016-17*

- As part of a team of eight students, organized group discussions, lab visits, competitions and talks

PUBLIC TALK

- **Quantum Computing Workshop :** Introduced various quantum systems and respective architectures to realize a qubit and further a quantum computer. *2019, 2020*

SKILLS & EXPERIENCE

Programming & Softwares : Python, QuTip, Solidworks, MATLAB, Mathematica, , C/C++, QISKIT, HTML, VHDL, AutoCAD, TensorFlow, NumPy, SciPy, ScQubits, HFSS, COMSOL Multiphysics

Fabrication Tools : Electron Beam Lithography, Photolithography, Scanning Electron Microscopy, Atomic Force Microscopy, Sputtering, Thermal Evaporator, Reactive Ion Etchning, Plasma Ion Immersed Implantation, Atomic Layer Deposition, Plasma Asher

EXTRACURRICULAR

- **Quantum Reading Group :** Organised 6 seminars by professors, students and alumni in Quantum Technology.
- **Academic Volunteer Program :** Conducted help session in Quantum Mechanics II & Condensed Matter Physics.
- **Mentor for Summer Reading :** Mentored students interested in quantum computing during summer for 3 years.
- **National Service Scheme :** Teaching science and mathematics to underpriviledged students.