Akshay Patil

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EDUCATION

Masters in Quantum Technology
Indian Institute Of Science *08 2021-08 2023*
CGPA - 8.2 Benguluru, Karnataka

Mechanical Engineering
Sanjivani College Of Engineering Kopargaon *05 2012 – 05 2016*
Percentage - 72% Kopargaon, Maharashtra

12th Vocational - Electronics
S.S.G.M College *05 2010 – 05 2012*
Percentage - 94.17% Kopargaon, Maharashtra

10th Seva Niketan Convent School **03 2010**
Percentage - 88.53% *Kopargaon, Maharashtra*

COURSEWORK / SKILLS

- Quantum Mechanics
- Quantum Computation
- Quantum Communication
- Engineering Physics of Quantum Technologies
- Mathematical Methods for Physics
- Quantum Materials
- Optical Materials and Devices
- Art of Communication
- Basic and Advanced Quantum Technology Lab
- Entrepreneurship And Ethics
- Discrete Photonics And Quantum Analogies
- Materials for Electrical,Electromechanical and Electrooptical Functions
- Quantum Information Theory
- Introduction to Computing Via AI and Machine Learning

PROJECTS/COURSE PROJECTS/REPORTS

A.Quantum Materials

Probing Techniques For Compressibility and Capacitance Measurements In TBG | 2023

- **Novel Technique to Probe Quantum Capacitance of 2D material which can give us mathematical expressions on Number of Modes , Transmission Functions, Mean Free Path , Compressibility which can be used as an identifier that whether the 2D material is a potential candidate for , 1.Fault Tolerant Quantum Computer in Ballistic Region of Graphene. 2.Negative Capacitances in Graphene. 3.Superconductivity at Room Temperature and Pressure. 4.Quantum Memory or Repeator Devices. and also some other outlooks are possible such as , 1.Updating Theoritical Hamiltonian from Experimentally extracted Quantum Capacitances. 2.Industrially Synthesizing the Large Sheets of Monolayers of Graphene by Lap Joint/Butt Joint.**
- **Designing and Creating a Vander-Waal Hetero-structure Stack for compressibility and capacitance measurement of any 2D material and then calculating quantities like Fermi-Velocity,Density of States etc.of that 2D material by already existing mathematical models.**

Reflecting the Mid-IR Spectrum Range via Meta-surfaces | **03 2022**

- **Creating an array of circular cavities on Silicon Wafer and then experimentally optimizing the thickness of Selenium Deposition on the wafer then optimizing the time and temperature for perfect dewetting i.e complete filling of circular cavities (perfect Metasurface) and then measuring the reflectivity of the sample via FTIR in Mid-IR Range and also simulating the sample on Lumerical as well as COMSOL (in progress) to get the theoritical results and comparing it with the practical results.**

Moire Superlattices Twisted Bilayer Graphene | **03 2022**

- **Discussed few of the infinite possiblities of vanderwaal heterostructures via the Moire Superlattice of Twisted Bilyer Graphene.**

MoS2/Graphene Photodetector Array for Real Life Imaging Systems | **03 2022**

- **Summary Report on how Metameterials can be used in real life imaging systems.**

Ferro-Electric Negative Capacitances | **12 2022**

- **Theoritically studied the basics of Landau Khalatnikov Theory of Non-Linear dielectrics and also studied the theoritical model of how these Negative Capacitances(N.C) can be stabilized for realization of Practical NC Devices which can have applications Low Power Computing,building efficient SRAMs for computers etc.**

B.Quantum Algorithms

Grover's Algorithm | **02 2022**

- **Theoritical in detail explaination and Practical Simulation of Grover's Algorithm on IBM Quantum Processor and scaling it to n qubits which is not given in any literature as far as I know.**

C.Qubit Architecture for Superconducting Platform

Handwritten Report on Mathematical Calculations of Hamiltonians for two Qubit Couplings | **03**

- **A Step by step Mathematical Calculation of Hamiltonian for two Qubit Coupling Circuits by first and second quantization for mainly fixed coupling via Capacitor,fixed coupling via Resonator,Tunable Coupling Via Squid/Transmon.**

D.Quantum Information Theory

Optimising the set of POVM's to Achieve HOLEVO Bound | **11 2022**

- **Maximising the Mutual Information between Bob's Measurement And Alice's Transmission by optimising the set of POVM's to achieve HOLEVO Bound.Achieved a max mutual Info of 0.815 by optimizing set of 3 POVM's for exercise problem for given Alice's Quantum States given in Nelson and Chuang in which the Holevo Bound was 1.0 .Machine Learning Models can be developed to further optimize and generalize the POVM's to achieve Holevo Bound (Scope of Future Work).**

E.Data Cleaning , AI , ML and Data Story

Report on Data Pre-processing,Cleaning and Visualization and Data Story | **10 2022**

- **A mini-project on Data Cleaning,Preprocessing,Visualization and writing a Data Story on the Indian Tourism Data for the year 2020-21.**

Stock Market Prediction by Sentiment Analysis of News Headlines | **12 2022**

- **Data Exploration and Data Preprocessing by Stemming,Lemetization,Stemming then Lemetization,Lemetization then Stemming,Explored the basics of ML models (Random Forest,Decision Trees,SVM,KNN) for sentiment analysis.**

F.Mechanical Bachelors Project

Electro-Pneumatic Hybrid Car | **02 2016**

- **Practically Designed and deviced a prototype of a car working on compressed air as main power source via oscillating cylinder engine and electric energy for brakes as well as smoothening out the fluctuation caused by oscillating cylinder engine.**

TECHNICAL SKILLS

Languages: Python 3
Tools/Software: VS Code, Spyder,Jupyter,Overleaf,Ansys Lumerical,PRO E,UG-NX,Latex,Matlab
Libraries: Pennylane, Qiskit ,Qutip,Numpy,Matplotlib,Pandas,Tensorflow,Keres,Scikit Learn,NLTK

CERTIFICATIONS

- Catia- A software used for modelling mechanical components to later do strain and stress analysis on it.

EXTRA-CURRICULAR ACTIVITIES

1.Class Representative for the first year of my bachelors.
2.Won Second Place in Chess Competition at intercollege level.
3.First Place in Engineering Knowlegde Test At intercollege level.
4.Runner Up in Johndeere Technical Innovation Competition 2015.
5. Q - Karyashala Workshop IISc 2023.

You-tube Videos to get to know me better !!!

(Assignments on Art of Communication Course)

1.Scientific Inventions in my birth-year 1995 - 01/22

2.Lighting a spark in high school students for STEM - 02/22

References

1. Prof. Apoorva D Patel: Indian Institute of Science,
Address: Center for High Energy Physics IISc, Bangalore, India Phone: +91-80-2360-0569, Mail: adpatel@iisc.ac.in
2. Prof. Baladitya Suri: Indian Institute of Science,
Address: Instrumentation and Applied Physics IISc, Bangalore, India Phone: +91-80-2293-2228, Mail: surib@iisc.ac.in.
3. Prof. Chandni Usha: Indian Institute of Science ,
Address: Instrumentation and Applied Physics IISc, Bangalore, India Phone: +91-94-8222-9640, Mail: chandniu@iisc.ac.in.