

# AKSHAY RANCHHOD PATIL

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## Career Objective

A Quantum Computing Enthusiast looking for a platform to apply my present skillset and continuously learn a new skillset and innovate in the field of Quantum Technologies particularly in Quantum AI and ML domains to solve real-life problems. I am an adaptable, avid, quick, self-learner, and hard worker with all my efforts directed toward solving problems I am working on effectively and innovatively.

## Academic Details

Qualification	Institute	Board / University	Year	Percentage/CGPA
MTech in Quantum Technology	IISc Bangalore		2023	8.2
BTech/B.E: Mechanical	Sanjivani College of Engineering, Kopergaon.	Savitribai Phule Pune University	2016	72 %
HSC	S.S.G.M College of Engineering, Kopergaon	Pune University	2012	94.17%
SSC	Seva Niketan Convent School, Kopergaon	Pune University	2010	88.53%

## Technical Skills

- Programming Languages – Python3.
- Tools – MATLAB, Ansys Lumerical, COMSOL, VS Code, Spyder, Jupiter, Overleaf LATEX, PRO E, UG-NX.
- Python libraries- Qiskit, Qutip, PennyLane, Numpy, Matplotlib, Pandas, Tensorflow, Keras, Scikit Learn, NLTK.

## Experience & Relevant Learnings

- **Quantum Meta surfaces LANSPE @ IISc Intern** from 25<sup>th</sup> April 2022 to 25<sup>th</sup> May 2022:
  - Experimentally optimizing the thickness of Selenium Deposition on the wafer then optimizing the time and temperature for perfect dewetting and creating perfect Meta surfaces.
  - Measuring the reflectivity of the sample via FTIR in Mid-IR Range & simulating the sample on Lumerical as well as COMSOL to get the theoretical results and comparing it with the practical results.
  - Skill Gained – Simulations, Optimization, Mathematical Modelling.
- **Self-Learning via Available Open Sources** from 25<sup>th</sup> April 2022 to 30<sup>th</sup> July 2022:
  - Completed close to 10 YouTube Open-Source Playlists covering wide topics in Quantum Technologies mainly in Quantum ML, Machine Learning for Physicists, Quantum Communications and Cryptography, Quantum Information Science, Quantum Cavity Opto Mechanics, Quantum Materials Transport, Solid State Physics, Solid State Chemistry, Quantum Computing, and Advanced Quantum Mechanics.
  - Skills Learnt - Learnt Basics and in certain depth all the above-mentioned courses, Adaptability, Exploring and Effective Learning of New Topics in Minimal Time in Quantum Technologies, Self-passion.
- **Q – Hacks 2022** from Feb 2022:
  - Solved four problems using pennylane in a time interval of just 3 days.
  - Skill Learnt & Applied – PennyLane, Python, OOP, Search Algorithm, Optimization.

## Project Works

- **Probing Quantum Capacitance in 2D materials (Masters Project from Jan 2023 to July 2023):**  
Project Guide: **Prof. Chandni Usha.**
  - This project aims to probe the Quantum Capacitance of 2D materials in which I theorized with experimental proof a novel technique, a much-simplified way of already available experimentally complex techniques of Probing.
  - Skills Learnt & Applied – Quantum Materials, Quantum Chemistry, Process Optimization, Innovation, Quantum Mechanics, Solid State Physics, Mathematical Modelling of Physical Systems, Experimental Physics, Latex, Python Programming, Data Science, etc.
- **Grover's Search Algorithm Implementation on Qiskit (QC):**
  - Theoretical in detail explanation and Practical Simulation of Grover's Algorithm on IBM Quantum Processor and scaling it to n qubits.
  - Skills Learnt and Applied – Quantum Algorithm, Quantum Real Life Applications, Linear Algebra, Noise Models, Quantum Simulations, Qiskit, Python, Theoretical In Detail Analyzing, and Report Writing.
- **Optimizing the set of POVMs to Achieve HOLEVO Bound:**
  - Maximizing the Mutual Information between Bob's Measurement & Alice's Transmission by optimizing a set of POVMs to achieve HOLEVO Bound.
  - Achieved a max mutual Info of 0.815 by optimizing a set of 3 POVMs for the 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 POVMs to achieve Holevo Bound (Scope of Future Work).
  - Skills Learnt & Applied – Quantum Information Theory, Optimization, Python, Explored Machine Learning Options.
- **Report on Data Pre-processing, Cleaning and Visualization, and Data Story:**
  - A mini project on Data Cleaning, Preprocessing, Visualization, and writing a Data Story on Indian Tourism Data for the year 2020-21.
  - Skills Honed – Python, Data Story Writing, Data Visualization and Analysis, Python Programming.
- **Stock Market Prediction by Sentiment Analysis of News Headlines:**
  - Data Exploration and Data Preprocessing by Stemming, Lemmatization, stemming then Lemmatization, Lemmatization then Stemming, Explored the basics of ML models (Random Forest, Decision Trees, SVM, KNN) for sentiment analysis.
  - Skills Honed – Python, Data Science, Machine Learning Models.

## Relevant Courses

- Quantum Information Theory, Quantum Computation, Quantum Communication and Cryptography, Basic and Advanced Quantum Laboratory, Mathematics for Quantum Technologies, Applied Solid State Physics, Computing Via AI and Machine Learning, Materials for Quantum Technologies, Discrete Photonics, and Quantum Analogies, Quantum Measurement & Sensing, Art of Communication for Leaders and Policy Making in Quantum Technologies.
- Classical and Quantum Mechanics, Numerical Optimization Techniques, Classical Thermodynamics, Operation Research and Logistics, Theory of Machines, Design of Mechanical Systems, Production Engineering, Mechanical System Simulations, Basic and Advanced Engineering Mathematics, Heat Transfer, Fluid Mechanics & Computations, and Aptitude Skills. I believe some of these classical courses Simulations and Real-Life Applications can undergo Quantum Speedup using Quantum Mechanical Principles.

## References

1. Prof. Apoorva D Patel: Indian Institute of Science,  
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