

Kartik Patekar

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Education

IITB (Indian Institute of Technology, Bombay)

CGPA : 9.93/10

THIRD YEAR UNDERGRADUATE

Aug. 2016 - Present

- Major : Engineering Physics with Honors
- Minor : Mathematics

CBSE (Central Board of Secondary Education)

Percentage : 91.6

INTERMEDIATE/+2

July 2015 - Mar. 2016

Scholastic Achievements

ICHO 2016 (International Chemistry Olympiad)

Aug. 2016

- Selected among the **four students** to **represent India** at IChO 2016 held in **Tbilisi, Georgia**.
- Received **silver medal** for my performance in practical and theoretical exams.

IIT-B Academic Excellence Award

Aug. 2016-Mar. 2017

- Received **10/10 CGPA** in academic year 2016-2017, and secured **Institute Rank 1** in IIT-Bombay.

IIT-JEE (Indian Institute of Technology - Joint Entrance Exam)

May. 2016

- Secured **All India Rank 6** amongst 200,000 students who appeared in the entrance exam for IIT.

KVPY (Kishore Vaigyanik Protsahan Yojana)

Feb. 2016

- KVPY is an on-going national program of **fellowship in basic sciences**, funded by Dept. of Science and Technology, Government of India, for highly motivated students.
- Obtained **All India Rank 5** in selection test for KVPY fellowship

ANCQ (Australian National Chemistry Quiz)

2013-2015

- Scored **100 percentile** for 3 consecutive years in ANCQ, an annual international quiz organized by **Royal Australian Chemical Institute**.

Key Projects

Superconducting Quantum Circuits

[Report URL](#)

GUIDE: PROFESSOR STEVEN GIRVIN, YALE UNIVERSITY

May. 2018 - July 2018

- Studied the Theory of **Circuit Quantization** and applied it to various circuit. Realised about **Uncoupled modes** as mentioned in Chapter 2 of report.
- Understood the **theory of Transmission line** and **Input output theory**, both in **Classical** as well as **Quantum case**. Also, studied the theory of **Amplification using Transmission line and negative resistance**.
- Studied about **3 wave mixing circuits** and devised a simple circuit for three wave mixing which can be solved analytically.
- Read about **Coherent States** and understood its importance in Quantum Computing to obtain **Cat states**.
- Studied different superconducting qubits, namely **fluxonium qubit**, **Phase qubit** and **Charge qubit**.

Quantum Measurement Problem

[Report URL](#)

GUIDE: PROFESSOR T. P. SINGH, TATA INSTITUTE OF FUNDAMENTAL RESEARCH

Dec. 2017 - Mar. 2018

- Studied various collapse model including **QMSL** and **CSL** models.
- Read about a Collapse model proposed recently by "Apoorva Patel" and "Parveen Kumar" and Compared it with standard collapse models.
- Read the theory of **Open Systems** and derivation of Lindblad equation under Markovian Approximation.
- Read about restrictions imposed by impossibility of **Superluminal Signalling** and understood **Gisin Theorem**
- Also studied **Stochastic calculus** and integration of SDE in **ito form** and **stratonovich form**.

Silicon detector Calibrator

[Report URL](#)

GUIDE: PROFESSOR PRADEEP SARIN, PHYSICS DEPARTMENT, IIT-B

Apr. 2017 - Jul. 2017

- Designed and fabricated a high precision **low time-period pulse Generator** for use in calibration of Detector readout systems.
- Converted the voltage pulse into **current pulse** using an **Operational Transconductance Amplifier**.
- Minimised the reflection in the device through impedance matching
- Understood and tested **Signal Transmission and Reflection** in Coaxial Cables.

Terminating Tether

FOR ADVITIY-SECOND GENERATION SATELLITE OF IIT-B

Jan. 2017 - Feb. 2017

- Worked on developing a **de-orbiting mechanism** of student satellite using tether system which operates on electromagnetic principles.
- Studied the effects of ionosphere on a moving bare metal strip.
- **Simulated** motion of Satellite using MATLAB.
- Studied in details about **thermionic electron emitters**, **hollow cathode emitters** and **field emitters**.

Autonomous Bot

ITSP - INSTITUTE TECHNICAL SUMMER PROJECT

Apr. 2017 - Jul. 2017

- Engineered an autonomous bot capable of reaching a given coordinate on map using **GPS navigation**.
- Wrote a program to find identify coordinates in an image of map and identify the shortest route to the destination.
- The bot was equipped with **Ultrasonic Sensors** and **Sharp Sensors** to make it capable of avoiding stationary obstacles.

Course Projects

Chaos in Special Relativistic Dynamics

GUIDE: PROFESSOR PUNIT PARMANANDA, PHYSICS DEPARTMENT, IIT-B

Sept. 2017

- Studied the **relativistic analog of Euler's three body problem** in case of Electrostatics.
- Understood **Relativistic Capture** using hamiltonian formalism.
- **Simulated** both Newtonian and Relativistic Version of the problem to visualise the difference between the two cases.
- Realized that the system shows **Transient Chaos** and plotted the phase space to observe the occurrence of **Fractional Attractor Basin Boundary**.

Random Walker on FPGA

GUIDE: PROFESSOR PRADEEP SARIN, PHYSICS DEPARTMENT, IIT-B

Mar. 2018 - Apr. 2018

- Configured FPGA to simulate **300 random walkers** which moved a step with probability 0.5 on pressing a switch.
- Stored the position of each random walker on FPGA which was transferred to PC in real time to obtain the **statistics** of random walks.

RSA encryption

GUIDE: PROFESSOR BERNARD MENEZES, COMPUTER SCIENCE DEPARTMENT, IIT-B

Oct. 2016

- Wrote a C++ program which can **encrypt and decrypt** large amount of data securely using **RSA algorithm**.
- Created a **Big Integer** class using character array. Provided methods to the class to implement various mathematical operations.

Socket Programming

GUIDE: PROFESSOR MYTHILI VUTUKURU, COMPUTER SCIENCE DEPARTMENT, IIT-B

Aug. 2017

- Created a **server application** which can be used to manage a database from anywhere on the globe.
- Used **select method** to provide multiple client handling functionality to the server.

Technical Skills

Programming

- Have used **OOMMP** and **COMSOL** for simulations.
- Familiar with **C, C++ and Python**.
- Comfortable using **running simulations** using MATALB, python and SciLab.
- Proficiency in Visual Studio for **app development**.
- **Socket Programming**

Electronics

- Knowledge about **microcontrollers** such as AT-mega328. I have also used **Arduino** in some of my projects.
- Familiar with Eagle to **design circuit boards**.
- Experience with various electronic devices like GPS shield, bluetooth module, sensors and GPRS module.
- Experience in preparing boards with various types of components (Surface mount and Through hole)

Relevant Courses

- **Physics** : Quantum Physics and Application, Quantum Mechanics I, Quantum Mechanics II, Quantum Mechanics III, Basics of electricity and magnetism, Quantum Information and Computing, Photonics, Waves and Oscillations, Thermal Physics, Group Theory Methods, special theory of relativity, Classical Mechanics, Non-Linear Dynamics, Physics Lab.
- **Mathematics** : Real Analysis, Complex Analysis, Differential Equations, Numerical Analysis.
- **Electronics** : Digital Electronics, Introduction to Electronics, Electronics Lab: Basic Circuits, Electronics Lab: Analog Circuits, Electronics Lab: Digital Circuits.
- **Others** : Computer Programming, Computer Networks, Data Structures and Algorithms, Data Analysis and Interpretation.

Positions of Responsibility

Manager, Maths and Physics Club

IIT-BOMBAY

Apr. 2018 - Present

- Leading a team of six to foster enthusiasm in Physics and Mathematics, tending to a community of over 500 on campus and an outreach of over 7000 online.
- Prepared questions and Handled Judges in Bazinga, an Institute wide quiz on Physics and Mathematics.
- Organised **group discussions** on various topics such as **Paradoxes in Physics**, Quantum entanglement.
- Administered lectures by notable researchers and professors in their field of interest.
- Conducted **Summer of Science**, an initiative to help students study their chosen topics during summers through the guidance of mentors assigned to them. More than 400 students participated in SoS-2018.

Organizer, Sixth Sense Workshop

TECHFEST, IIT-BOMBAY

Dec. 2016

- Coordinated a **two day workshop** on robotics during IIT-B's annual technical festival.
- More than **250 people** attended the workshop from India and learnt about Image recognition and AVR coding

Team Leader, Physics Brawl

PHYSICS QUIZ

Nov. 2016

- I was the **leader** of a 5 member team in **Physics brawl**, an international online physics competition for undergraduates.
- We secured **17 position** in the quiz amongst international participants.

Extracurricular Activity

Adventure Activities

Aug-2016 - PRESENT

- Attended a 15 day **Mountaineering Adventure Course** in Jammu and Kashmir (India) organised by **Jawahar Institute of Mountaineering and Winter Sports**.
- Took part in a **5 day trek** in Himachal Pradesh, India during December, 2016.
- **Trekged** on Kalavanti Durg having elevation of 7300 meters. I have also camped overnight on several occasions.

Other Activities

- Attended 3-day **Vijyoshi Camp**, organised by **Indian Institute of Science**, where many leading researchers in various branches of Science and Mathematics gave lectures.
- Completed 80 hours of **Social Service** under Events department of **National Social Service**, and organised various events for upliftment of poor people.
- Selected in **Jigyasa**, an annual science quiz organised by Centre for Excellence in Basic sciences, Mumbai.
- Played Hockey and have basic knowledge of Kung Fu.
- Made a **Remote Controlled Bot**.
- Wrote a python code which can **detect and identify the constellations** present in a given photograph for **Python Hackathon** organised by Wwb and Coding Club-IITB, in which my team stood Second.