Kartik Patekar

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Education

IITB (Indian Institute of Technology, Bombay)

CGPA : 9.93/10

Second Year Undergraduate — *Aug. 2016 - Present*

- Major : Engineering Physics
- Minor : Computer Science and Engineering

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

Quantum Measurement Problem

Guide: Professor T. P. Singh, Tata Institute of Fundamental Research — *Dec. 2017 - Present*

- 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 **Gissin Theorem**
- Also studied **Stochastic calculus** and integration of SDE in **ito form** and **stratonovich form**.
- Understood **Von-Newmann Measurement** Scheme and **Arthurs–Kelly joint measurement**.

Silicon detector Calibraton

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 impedence 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 shortst route to the destination.
- The bot was equipped with **Ultrasonic Sensors** and **Sharp Sensors** to make it capable of avoiding stationary obstacles.

Constellation Recognition

for Python Hackathon *Jan. 2017*

- Wrote a python code which can **detect and identify the constellations** present in a given photograph.
- The program showed **high accuracy** after being trained using a small data set.

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**.

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.

Temperature Analysis

Guide: Professor Vikram Rentala, Physics Department, IIT-B *Aug. 2017*

- Analyzed the global temperature variation between 1880 and 2014 using the data collected by Berkeley Earth.
- Used Python to plot various graphs to visually understand the temperature variation.

Technical Skills

Programming

- 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, Basics of electricity and magnetism, Introduction to special theory of relativity, Classical Mechanics, Physics Lab.
- **Mathematics :** Real Analysis, Complex Analysis, Differential Equations, Real Algebra.
- **Electronics :** Introduction to Electronics, Electronics Lab: Basic Circuits, Electronics Lab: Analog Circuits.
- **Computer Science :** Computer Programming and Utilisation, Computer Networks.
- **Others :** Non-Linear Dynamics, Data Analysis and Interpretation.

Positions of Responsibility

Convener, Math and Physics Club

IIT-Bombay *Aug. 2017 - Present*

- Working in a team of seven 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.

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.
- **Trekked** 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**, an autonomous **Line Follower bot**, and an autonomous **wrestling bot**.