Mahadevan Subramanian
Engineering Physics
Indian Institute of Technology Bombay

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UG Second Year
Male
DOB: 24-03-2002

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2021	9.48
Intermediate/+2	Maharashtra State Board of Higher Secondary Education	Pace Junior Science College, Thane	2019	89.69
Matriculation	Council for the Indian Certificate of Secondary Education	Billabong High International School, Thane	2017	95.67

Pursuing **Honors** in **Physics** and a **Minor** in **Computer Science and Engineering**

Scholastic Achievements

- Secured **Department Rank 4** (of 51 students) after first year of B.Tech (Department of Physics) *June 2020*
- **Joint Entrance Exam**
  - Achieved **99.58 percentile** in **JEE Advanced** among **200,000 participants** for entrance to IITs. *May 2019*
  - Among **top 0.09** percentile in **JEE Main Paper 1** amongst **1.5 million students** across India. *April 2019*
- **SAT Scores**
  - SAT I: Scored 800/800 in Mathematics section, and a total score of 1460/1600. *May 2018*
  - SAT Subject Test: Scored 800/800 in Mathematics II and Physics tests. *October 2018*
- Recipient of the esteemed **Kishore Vaigyanik Protsahan Yojana (KVPY) Fellowship** from IISc *May 2018*

Key Projects

Measurement Theory in Quantum Mechanics
Guide: Professor Amber Jain, IIT Bombay *April 2020 – August 2020*

- Reviewed the different interpretations of quantum mechanics including **Bohmian Mechanics**, **Many Worlds Interpretation** and the **Ghirardi–Rimini–Weber** theory in order to appreciate their different approaches to measurement.
- Inspected the possible breaking points for each of these theories and also understanding their respective advantages.
- Investigated papers on experimental methods aimed at bringing out the differences between these multiple interpretations.
- Examined certain experiments which aimed to find the quantum to classical transition point according to the **Ghirardi–Rimini–Weber** and **Continuous Spontaneous Localization** models.

Resynchronization of circadian oscillators and the east-west asymmetry of jet-lag
Prof: Amithabha Nandi, Course Project, Non-linear Dynamics *September 2020–Present*

- Modelling **suprachiasmatic nucleus** cells which are responsible for circadian rhythms to understand the process of jet-lag.
- Making use of the **Forced Kuramoto model** and studying the east-west asymmetry of jet-lag by simulating this model.

Quantum Information and Computing
Reading Project, Summer of Science, Maths and Physics Club, IIT Bombay *April 2020 - June 2020*

- Studied and compiled a comprehensive report on the fundamentals of quantum computing including **reversible computation**, **quantum measurement** and **quantum circuits** of various algorithms.
- Explored **quantum protocols** such as teleportation, superdense coding and the BB84 protocol.
- Analysed **quantum algorithms** including Grover's search algorithm and quantum fourier transform along with its application for solving the **hidden subgroup problem** more efficiently.
- Implemented unitary decompositions, phase estimation, discrete logarithms and the BB84 protocol using **Qiskit** and **Q#**.

Deep Learning for Leaf Disease Detection
Institute Technical Summer Project, Institute Technical Council *April 2020 - June 2020*

- Developed a **DenseNet** model in **TensorFlow** which diagnoses diseases in apple leaves with over **95%** accuracy.
- Analysed Heatmaps and Intermediate Layer Activations to further improve the model performance on unseen data.
- The aforementioned model could classify any given image of apple leaf as healthy or having rust or scab disease or both.
- Built and deployed a **website** where one can upload images of apple leaves and obtain the results predicted by the model. The backend of the website was developed on Django, and HTML, CSS and JS were used for the frontend.

Bluetooth Controlled Bot and Line Follower Bot
Hobby Projects, Electronics and Robotics Club, IIT Bombay *September 2019*

- **XLR8 :** Assembled a **Bluetooth** controlled bot that was capable of navigating an obstacle course.
- **Line Follower :** Modified the aforementioned bot using an **Arduino** and **IR** sensors and made it follow black lines and navigate paths made of such lines.

Positions of Responsibility

Convener, Maths and Physics Club, IIT Bombay
Institute Technical Council, IIT Bombay *May 2020 – Present*

- Working in a team of eight students to foster enthusiasm in Physics and Mathematics, tending to a community of over **1,000 students** on campus and **10,000 enthusiasts** online.
- Adapted the structure and events of the club to an **online format** in order to engage enthusiasts during the COVID-19 pandemic by organizing online talks by students and professors all over the world, conducting online quizzes and contributed to writing blog posts on various scientists and scientific concepts.
- Hosted and prepared questions for an online quizzing event titled "Trivia Time" for quizzing on Math and Physics trivia.

Moderator, Quantum Computing Workshop
Maths and Physics Club, IIT Bombay *July 2020 – August 2020*

- Developed course-content to moderate an 8-day **Quantum Computing Workshop** for introducing **Qiskit** and basic concepts of Quantum Computing which attracted **500+** students from multiple universities across India.
- Designed questions involving coding to supplement theoretical understanding of topics such as **BB84 protocol**, **Grover's algorithm** and **Quantum Fourier transform** and their applications such as period finding and finding discrete logarithms.
- Conducted live hands-on-sessions and created presentations for guiding the participants to understand the underlying concepts and clearing doubts and moderated a forum with 200+ active participants for clearing doubts.

Technical Skills

- **Languages:** C++, Python
- **Packages & Softwares:** NumPy, SciPy, Matplotlib, Pandas, TensorFlow, Qiskit
- **Others:** HTML, CSS, AutoCAD, Solidworks, Arduino IDE, Q#

Relevant Courses

- **Physics :** Classical Mechanics*, Introduction to Special Theory of Relativity*, Non-linear Dynamics*, Thermal Physics*, Basics of Electricity and Magnetism, Quantum Physics and Application
- **Math :** Complex Analysis*, Differential Equations II*, Linear Algebra, Calculus
- **Electronics :** Digital Systems*, Introduction to Electronics
- **Computer Science :** Logic for Computer Science*, Computer Programming and Utilization
- **MOOCs :** Completed Deep Learning Specialization offered by **deeplearing.ai** (Coursera)
- **Other :** Data Analysis and Interpretation*, Economics*, Biology, Physical Chemistry, Organic and Inorganic Chemistry

**To be completed by Autumn 2020*

Extracurricular Activities

Core and Technical

- Completed the **IBM Quantum Challenge**, a quantum programming challenge based on **Qiskit**. *May 2020*
- Secured **1st** place in the **Observation Planning GC** (inter-hostel astronomy competition). *October 2019*

Culturals

- **Institute Cultural Summer Project** *August 2020*
  - Composed two original songs using a digital audio workstation which have been released on various streaming platforms under **Symphony**, music club of IIT Bombay.
- **Goonj GC, Music Arcade GC** (inter-hostel music competitions) *February, March 2020*
  - Performed keyboard in **Goonj GC** and arranged an original piece that was performed by our band.
  - Secured **2nd** position in **Music Arcade GC** and was awarded best keyboardist.
- Performed keyboard in **Surbahaar**, an annual musical event in IIT Bombay with an audience of 2,000 people