

# NISHANT ABHANGI

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## EDUCATION

**Massachusetts Institute of Technology (MIT)** September 2020 - Present  
*Bachelor of Science, double major in Computer Science and Engineering and Mathematics* Cambridge, MA  
*Double minor in Physics and Economics | GPA : 5/5*

**Indian Institute of Technology Bombay (IIT Bombay)**<sup>1</sup> August 2019 - August 2020  
*Bachelor of Technology in Computer Science and Engineering | GPA : 10/10* Mumbai, India

## AWARDS & DISTINCTIONS

- **Institute Rank 1** among all sophomore undergraduate students at IIT Bombay 2019-2020
- **Gold Medalist (World Rank 9)** at the 50<sup>th</sup> International Physics Olympiad (IPhO) 2019
- **Gold Medalist (World Rank 40)** at the 49<sup>th</sup> International Physics Olympiad (IPhO) 2018
- **Gold Medalist (Asia Rank 18)** at the 18<sup>th</sup> Asian Physics Olympiad (APhO) 2018  
*Youngest Indian gold medalist till date*
- **Gold Medalist (World Rank 3)** at the 13<sup>th</sup> International Junior Science Olympiad (IJSO) 2016
- Achieved **All India Rank 6** in **JEE-Advanced** out of **175,000** candidates 2019
- Secured **All India Rank 6** in **JEE-Mains** out of **1.15 million** candidates 2019
- Awarded **Aditya Birla Scholarship** for academic excellence and humane leadership values 2019
- Felicitated by India's Prime Minister **Narendra Modi** and Russia's President **Vladimir Putin** 2018  
for winning Gold Medal at the International Physics Olympiad
- Honored with **National Child Award for Exceptional Achievement** in Academics 2017  
by **President of India Ram Nath Kovind**
- Secured Kishore Vaigyanik Protsahan Yojana (**KVPY**) fellowship with **All India Rank 1** 2017
- Awarded National Talent Search Examination (**NTSE**) scholarship by NCERT, Government of India 2017
- Secured a position in **top 50** in the Indian National Astronomy Olympiad (**INAO**) 2017, 2018, 2019
- Secured a position in **top 35** in the Indian National Chemistry Olympiad (**INChO**) 2019

## EXPERIENCE

**Decentralized Information Group, MIT CSAIL** February 2021 - Present  
*Machine Learning Researcher* Cambridge, MA

- Researching how to combine optimized **server aggregation** methods, **gradient compression** techniques and **Differential Privacy** for **Federated Learning** on clients with **Non IID** image datasets for medical applications

**DynamoFL** December 2020 - February 2021  
*Machine Learning Researcher* Cambridge, MA

- Researched **convergence optimization** methods and **communication efficient** techniques for using **Federated Learning** with **Differential Privacy** for computer vision datasets
- Tested **5** server optimizers, **2** communication techniques and **2** types of data distribution in clients for Federated Learning on **MNIST**, **FashionMNIST** and **CIFAR-10** datasets with focus on their effectiveness on Non IID data

**IIT Bombay Tapestry Pooling Group** July 2020  
*Backend Web Developer* Mumbai, India

- Developed the backend server using **Django REST Framework** and established the schema considering the needs of the frontend team for the website of a smart pooling technique for COVID-19 testing called tapestry pooling
- Implemented several APIs like **user authentication APIs** using **simple-jwt** for JWT authentication and **pooling tests information APIs** with filtering, searching and sorting by using the Django REST Framework **JSON API**

**Homi Bhabha Center for Science Education** February 2020  
*Grader* Mumbai, India

- Graded over **200 papers** of the **Indian National Physics Olympiad** and ensured consistency in grading by defining **detailed marking schemes** for all possible solutions and by verifying grades given by other graders
- Developed several **alternative solutions** to a **rotational dynamics** problem and analyzed it from various physical principles which culminated in a paper providing insights on the mathematical and physical analysis of such systems

<sup>1</sup>Transferred to MIT after completing one year at IITB

## PROJECTS

### Spoof Resistant Face Recognition

May 2020 - June 2020

*Institute Technical Summer Project, IIT Bombay*

- Implemented an end to end pipeline in Python using **OpenCV** and **Tensorflow** to perform **liveness detection** and **face recognition** on the faces detected from a video stream by a ResNet for **single shot detection**
- Trained a **CNN** for liveness detection and used dlib's **5-point facial landmark model** followed by a **ResNet** to extract 128 dimensional encodings of the faces which were fed to a **support vector machine** for face recognition

### Machine Learning with Kaggle

April 2020 - June 2020

*Seasons of Code, Web and Coding Club, IIT Bombay*

- Solved Kaggle problems like Titanic using **Random Forests** and Housing Prices using **Lasso Regression**
- Performed **data preprocessing** like handling missing data, minimizing skew, feature scaling and feature engineering

### Django Blog Website

March 2020

*Developers' Community, IIT Bombay*

- Built a website using **Django**, HTML and CSS which supports **user authentication** and profile picture **uploads**
- Implemented features like **sorting**, **filtering** and **pagination** to display latest blog posts and filter posts by a user

### Line Follower Bot

September 2019

*Electronics and Robotics Club, IIT Bombay*

- Built a line follower bot using **Arduino Uno** as a microcontroller and **infrared sensors** for line detection
- Added additional features like manual **bluetooth control** and **obstacle detection** using ultrasonic sensors

## PUBLICATION

### A Jarring Bullet – An Indian National Physics Olympiad 2020 problem

Accepted April 2020

Resonance: Vivek Lohani, **Nishant Abhangi**, Sitikantha Das, Amitabh Virmani

## TECHNICAL SKILLS

Each of the following are sorted in roughly decreasing order of experience.

**Programming Languages** Python, C++, Minispec, RISC-V asm, Java, Arduino, MATLAB, Lua, SQL, Julia, C#

**Machine Learning** Pytorch, Tensorflow, Keras, Numpy, Matplotlib, Scikit-learn, OpenCV, Pandas

**Web, App and Game Development** Django, HTML, JavaScript, React, Android Studio, LÖVE, Unity

**Miscellaneous** L<sup>A</sup>T<sub>E</sub>X, git, AutoCAD, SolidWorks

## POSITIONS OF RESPONSIBILITY

**Lab Assistant**, *Introduction to Machine Learning*

February 2021 - Present

**Cofounder and President**, *Physics Club, Disha Delphi Public School*

August 2017 - March 2019

- Coordinated the activities of the club, organized weekly quizzes and taught special topics for **Physics Olympiad**

**Convenor**, *Maths and Physics Club, IIT Bombay*

April 2020

- Introduced a new online 2 days long event called **Physics Cup** for challenging Physics questions

**Organizer**, *Mood Indigo and Techfest, IIT Bombay*

December 2019

- Handled the crowd and publicised events for the Lecture series at the cultural and technical fests of IIT Bombay

## COURSEWORK

- **Computer Science** Advances in Computer Vision<sup>^</sup>, Elements of Software Construction<sup>^</sup>, Design and Analysis of Algorithms<sup>^</sup>, Introduction to Algorithms, Introduction to Deep Learning, Introduction to Machine Learning, Theory of Computation, Computer Systems Engineering<sup>^</sup>, Computation Structures, Interconnected Embedded Systems<sup>^</sup>, Fundamentals of Programming, Abstractions and Paradigms in Programming, Introduction to Computer Science and Programming
- **Mathematics** Principles of Discrete Applied Mathematics<sup>^</sup>, Fundamentals of Statistics, Differential Equations, Mathematical Methods for Multidimensional Statistics, Linear Algebra, Calculus
- **Physics** Quantum Computation, Electromagnetism II, Quantum Physics I, Vibrations and Waves, Electromagnetism I, Classical Mechanics I, Physics Lab
- **Economics** Principles of Microeconomics, Principles of Macroeconomics<sup>^</sup>
- **Others** Biology, Physical Chemistry, Inorganic and Organic Chemistry, Chemistry Lab, Engineering Graphics and Design, Workshop Practice

<sup>^</sup> To be completed by Spring 2021

## EXTRACURRICULAR

- Selected for the Undergraduate Practice Opportunities Program (**UPOP**) at MIT 2020-2021
- Secured **All India Rank 1** in Technothlon Mains, an exam of logic conducted by **IIT Guwahati** students 2016
- Volunteer at Green Campus, IIT Bombay under the **National Service Scheme** 2019-2020
- Secured **All India rank 3** in Mimamsa, conducted by IISER Pune 2021
- Secured **Rank 1** in the RESEARCHx Quiz, IIT Bombay 2019
- Acheived **Rank 3** in the Energy Quiz, IIT Bombay 2019