NISHANT ABHANGI

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EDUCATION

Massachusetts Institute of Technology (MIT) *Cambridge, MA* *September 2020 - Present*
B.S. : Computer Science and Engineering, Mathematics | Minors : Economics, Physics *GPA : 5/5*

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

SELECTED COURSEWORK

- **Computer Science** Computer Vision, Software Construction, Algorithms I & II, Machine Learning I, Theory of Computation, Computer Systems Engineering, Computation Structures, Interconnected Embedded Systems
- **Mathematics** Discrete Applied Mathematics, Statistics, Differential Equations, Linear Algebra, Calculus
- **Physics** Quantum Computation, Electromagnetism I & II, Quantum Physics I, Waves, Classical Mechanics I

AWARDS & DISTINCTIONS

- **Gold medallist** at the 49th and 50th **International Physics Olympiad** *2018, 2019*
- Achieved **All India Rank 6** in both **JEE-Advanced** and **JEE-Mains** out of **1.15 million** candidates *2019*
- Honoured with **National Child Award for Exceptional Achievement** by the **President of India** *2017*

EXPERIENCE

Decentralized Information Group, MIT CSAIL *Machine Learning Researcher* *February 2021 - Present*
- Researching **server aggregation** methods, **gradient compression** techniques, **client selection** techniques and **differential privacy** for **Federated Learning** on clients with **Non IID** image datasets for medical applications

DynamoFL *Machine Learning Researcher* *December 2020 - February 2021*
- Researched **convergence optimization** and **communication efficiency** for **Federated Learning**
- 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 *Backend Web Developer* *July 2020*
- Developed the backend server using **Django REST Framework** for the website of a Covid-19 testing technique
- Implemented 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**

PROJECTS

Robustness of Lung Disease Prediction Models *MIT 6.819 Advances in Computer Vision* *May 2021*
Presented at *International Student Conference On Artificial Intelligence 2021, NTU Singapore*
- Tested the generalizability of **CheXNet**, a **DenseNet121** model for detecting 14 lung diseases from Chest X-rays
- Demonstrated that the model is **not robust** : detailed knowledge of training set is necessary for reliable diagnosis
  - AUROC worsens by atleast 0.05 for 13 diseases when test images are rotated, translated and horizontally flipped
  - AUROC decreases by more than 0.05 for 13 diseases even with 5% mislabelling of the training set
  - AUROC drops by 0.12 for Pneumonia detection on Chest X-rays of patients in China

Spoof Resistant Face Recognition *Institute Technical Summer Project, IIT Bombay* *May 2020 - June 2020*
- Implemented a model to perform **liveness detection** and **face recognition** on faces detected from a video stream
- 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 *Seasons of Code, Web and Coding Club, IIT Bombay* *April 2020 - June 2020*
- 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

TEACHING & SERVICE

Lab Assistant, MIT 6.036 *Introduction to Machine Learning* *February 2021 - May 2021*
Grader, *Indian National Physics Olympiad* *February 2019*
Volunteer, *Green Campus, IIT Bombay* *August 2019 - August 2020*

TECHNICAL SKILLS

Programming Languages Python, Java, C++, Arduino, Minispec, RISC-V asm, SQL, MATLAB, Lua
Machine Learning Pytorch, Tensorflow, Keras, Numpy, Matplotlib, Scikit-learn, OpenCV, Pandas

[1] Transferred to MIT after completing one year at IITB