



**Mohit Agarwala**  
**Electrical Engineering**  
**Indian Institute of Technology, Bombay**  
**Specialization: Communications Engineering**

**19307R004**  
**M.Tech.**  
**Gender: Male**  
**DOB: 04-11-1996**

Examination	University	Institute	Year	CPI / %
Post Graduation	IIT Bombay	IIT Bombay	2022	7.81
Graduation	MAKAUT	Heritage Institute of Technology	2018	7.85
Graduation Specialization: Electronics & Communication Engineering				
Intermediate	CBSE	D.A.V Public School	2014	86.80%
Matriculation	ICSE	Splendour High School	2012	89.28%

#### AREAS OF INTEREST

- Machine Learning
- Deep Learning in Image & Speech Processing
- Optimization

#### KEY ACADEMIC PROJECTS

- **Facial Emotion Recognition using Deep Learning**  
Guide: Prof. Preeti Jyothi, CSE Dept., IIT Bombay | Foundation of Machine Learning (Aug 2020 - Dec 2020)
  - Used **FER-13** dataset which comprises a total of **35887** pre-cropped, **48-by-48-pixel** grayscale images.
  - Trained various CNN models like VGG-16, Inception, Alex-Net and studied the evolution of their performance.
  - Deployed our best model, **VGG-16**, with **5 emotions** for real time prediction using **opencv** cascade classifier.
- **Predicting Release Year of Songs**  
Guide: Prof. Preeti Jyothi, CSE Dept., IIT Bombay | Foundation of Machine Learning (Aug 2020 - Dec 2020)
  - **Objective** : Predict the release year of a song from a set of timbre-based audio features extracted from it. Songs are mostly western, commercial tracks ranging from 1922 to 2011, with a peak in the year 2000s.
  - Implemented a **Feed Forward Neural Network** for regression task using **NumPy** from scratch.
  - Performed different data pre-processing steps like feature scaling, selection etc. to improve overall accuracy.
  - Achieved an accuracy of **88.84%** by training our neural network regressor on **Kaggle Dataset**.
- **Speech to Sign-Language(with emotions) for the Hearing-Impaired**  
Guide: Prof. Preeti Jyothi, CSE Dept., IIT Bombay | Automatic Speech Recognition (Jan 2021 - Apr 2021)
  - **Objective**: Convert Speech to Sign Language, by first converting to English text and predict the emotion.
  - Achieved **72%** accuracy by training a **ConvNet** on RAVDESS audio samples to detect emotion from speech.
  - Used a **Conformer**-based pre-trained model from **ESPNET-model zoo**, for Speech2Text.
  - Created a **streamlit** based UI to record audio, and display the corresponding predicted text and emotion.
- **Automatically Recognizing Swahili Speech using Kaldi Toolkit**  
Guide: Prof. Preeti Jyothi, CSE Dept., IIT Bombay | Automatic Speech Recognition (Jan 2021 - Apr 2021)
  - Built improved **monophone HMMs** and tied-state **triphone HMMs** for speaker recognition.
  - Implemented different smoothed **Ngram** models with the help of **SRILM** tools trained on **Swahili** corpus.
  - Explored the effect of data augmentation by speed perturbations and reestimated tied triphone models.

#### TECHNICAL SKILLS

- **Programming Languages** : C, C++, Python, HTML | **Operating Systems**: Windows, Linux
- **Tools and Software** : MATLAB/GNU Octave, TensorFlow, PyTorch, Pandas, NumPy, GNU Radio.

#### PUBLICATION

- IEEE | ONLINE PARTIAL SERVICE HOSTING AT THE EDGE** **ICCCN 2021, Greece**  
*V S Ch Lakshmi Narayana, Mohit Agarwala, Nikhil Karamchandani, Sharayu Moharir*
- Designed a solution for the **Service Hosting Problem**, which enables a fraction of the Query to be served.
  - Proposed a **Dynamic Policy**,  $\alpha$ -**Retro Renting**, and provided its performance guarantees at the Edge Server.
  - Conducted extensive **Monte-Carlo & Trace driven simulations** to demonstrate the performance of  $\alpha$ -RR.
  - Found several regimes where  $\alpha$ -RR **greatly improves cost-efficiency** and in the worst case, it is **6-optimal**.

#### RESEARCH EXPERIENCE

- **Geolife Trajectory Data Analysis for Content Caching**  
Guide: Prof. Nikhil Karamchandani, EE Dept., IIT Bombay | Research Project (May 2020 - Dec 2020)
  - Developed tools for pre-processing and map simulation from **180+ GPS Taxi data** of Beijing City.
  - Implemented **K-means** clustering of data points using **Voronoi tessellation** to the original city map.
  - Used a greedy **Fractional Knapsack** approach for **caching content** on a limited available cache size.

- **On the Latency & QoS in Haptics Simulation using Video Streaming over Wi-Fi**  
*Guide: Prof. Nikhil Karamchandani, EE Dept., IIT Bombay | M.Tech Project (June 2021 - Present)*
  - **Objective:** To develop algorithm for remote control and rendering of graphics for high bandwidth application.
  - Studied Operator/Tele-Operator based **Haptics** application to perform remote based pottery making.
  - Built a **reliable UDP** Protocol for Multi-media applications in **C++** from scratch.
  - Measured **one way packet** latency in a congested environment using **Marzullo's Intersection Algorithm**.
  - Implemented **Packet marking** for priority access to a certain type of traffic for ultra fast transmission.
- **High Throughput, Ultra-low Latency Multimedia over Wi-Fi**  
*Guide: Prof. Nikhil Karamchandani, EE Dept., IIT Bombay | M.Tech Seminar (July 2020 - Dec 2020)*
  - Studied the effect of **prioritizing traffic** in **IEEE 802.11ax** Wi-Fi, while maintaining **Fairness** and **QoS**.
  - Studied practical design choices to find **optimal configuration** of scanning process for **delay optimization**.
  - Explored the use of Wi-Fi (IEEE 802.11n/r) network for remote control of a vehicle using **video transmission** on the uplink and **control signals** for the actuator on the downlink.

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## OTHER PROJECTS

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- **Attrition Classification** | Self Project | Machine Learning *(Aug 2020 - Dec 2020)*
  - **Objective:** To predict whether an employee will leave the company or not based on 33 information points
  - Achieved accuracy of **88.47%** by training **SVM** (Support vector machine) classifier on **Kaggle dataset**.
  - Extracted relevant and less correlated features and applied One-Hot Encoding for features with multi-classes.
- **Flash No-Flash Photography**  
*Guide: Prof. Suyash P.Awate, CS Dept., IIT Bombay | Digital Image Processing (Aug 2020 - Dec 2020)*
  - Implemented denoising and detail transfer to merge the ambient qualities of the no-flash image with the high-frequency flash detail, using cross-bilateral filtering.
  - Performed white-balancing to change the color tone of ambient images, continuous flash to interactively adjust flash intensity, and red-eye removal to repair artifacts in the flash image.
- **Spatially Varying Blurring (to mimic the background-blur effect in video chats)**  
*Guide: Prof. Suyash P.Awate, CS Dept., IIT Bombay | Digital Image Processing (Aug 2020 - Dec 2020)*
  - Performed **Mean-shift Segmentation** on the given image to mask out background and foreground pixels.
  - To provide blur-effect we used **K-means clustering** to relabel the pixel values which are close to each other.
- **Routing Information Protocol (RIP) using C** | Self Project | Computer Networks *(Jan 2020 - Apr 2020)*
  - **Objective:** To implement RIP using socket programming (in **Linux**).
  - Implemented RIP (Distributed Bellman-Ford Algorithm) using C socket programming that read a given network topology and generated the cost matrix for the shortest paths between the nodes.

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## RELEVANT COURSES

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|------------------------------------|-----------------------------------|--------------------------------|
| • Statistical Signal Analysis      | • Digital Image Processing        | • Optimization & Real Analysis |
| • Fundamentals of Machine Learning | • Automatic Speech Recognition    | • DSP & its applications       |
| • Digital Message Transmission     | • Wireless & Mobile Communication | • Communication Networks       |
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## POSITIONS OF RESPONSIBILITY

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- **Institute Interview Coordinator** | Institute Placement Team, IIT Bombay *(Nov 2019 - Dec 2019)*
  - Coordinated with a team of **250+** members for interviews of **1600+** students over a period of 16 days.
  - Assisted in conducting Pre-Placement Talks, Placement Tests and Interviews for **15+** firms.
- **Mess Councillor** | Hostel Affairs Team, IIT Bombay *(July 2019 - April 2020)*
  - **Supervised, coordinated & managed** the planning & execution of food needs for **600+** hostel students.
  - Ensured **quality meals** at **minimum cost**, utmost hygiene with **zero-waste** management system.
  - **Organized** & participated in various **cultural, technical** and **sport** events for Hostel-4 IIT Bombay.

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## MISCELLANEOUS

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- Secured **98.86** percentile in **GATE-19**(Electronics & Communication Engineering) among 104782 candidates.
- Awarded **Hostel Organization Special Mention**, for exemplary contribution to Hostel-4 throughout the year.
- Won **Gem of the General Championship** (MDGC-2019) for Hostel-4, IIT Bombay as part of Dramatics team.
- Completed a short-term course on "State of the Art Microcontroller" organized by Dept. of CSE, IIT kharagpur.
- Participated in the short course on Python for 5G MU, Massive MIMO and mmWave MIMO by IIT Kanpur.
- Vocational Training in All India Radio on installation of Studios, High Power DRM medium wave transmitters.
- **Interests and Hobbies:** Cricket, Badminton, Table tennis, Listening to music.