



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

- Wireless Communication
- Machine Learning
- Deep Learning in Image & Speech Processing

PUBLICATION

IEEE | ONLINE PARTIAL SERVICE HOSTING AT THE EDGE *ICCCN 2021, Greece*
V S Ch Lakshmi Narayana, Mohit Agarwala, Nikhil Karamchandani, Sharayu Moharir

- Key novelty of this work is that we allow **Partial hosting** which enables fraction of the query to be served.
- Proposed a **Dynamic policy α -Retro Renting** and provided its performance guarantees at the edge server.
- Conducted extensive **Monte-Carlo & trace driven simulations** to demonstrate the performance of α -RR.
- Found several parameter regimes where α -RR's ability to store partially **greatly improves cost-efficiency**.

MAJOR PROJECTS AND SEMINARS

- **On the Latency & QoS in Haptics simulation using Video Streaming over Wi-Fi**
Guide: Prof. Nikhil Karamchandani, EE Dept., IIT Bombay | M.Tech Project (March 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**.
 - Studied the cause of packet drop in low reliable UDP protocols with **Wireshark**.
 - 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 latest **IEEE 802.11ax** wifi, 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.
- **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 & map simulation from **180+ GPS Taxi data** of Beijing City.
 - Implemented **K-means** clustering of data points using **Voronoi** Diagram to the original city map.
 - Used a greedy **Fractional Knapsack** approach for **caching content** on a limited cache size available to us.

KEY ACADEMIC PROJECTS

- **Speech to Sign-Language(with emotions) for the Hearing-Impaired**
Guide: Prof. Preeti Jyothi, CSE Dept., IIT Bombay | Automatic Speech Recognition (Jan 2021 - Jun 2021)
 - **Objective:** To classify the text data into either a positive or a negative sentiment.
 - Trained various neural networks LSTM, GRU, Bi-LSTM and Bi-GRU on IMDB Dataset, and studied the evolution of their performance on changing the number of units and layers.
 - Studied the effects of using different learning-rate schedulers like Cosine Annealing scheduler, Exponential rate scheduler, Step scheduler and Reduce Learning Rate on Plateau scheduler.
 - Achieved an accuracy of **87%** using BiGRU model and around **86%** accuracy using LSTM model with Reduce Learning Rate on Plateau Scheduler.
- **Routing Information Protocol (RIP) using C** | Self Project | Communication 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.

• 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.

• 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 VGG-16, Inception, Alex-Net and studied the evolution of their performance.
- Deployed our best model i.e, **VGG-16 with 5 emotions** for real time prediction using **cv2** cascade classifier.

• 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.

• Support Vector Machine | Self Project | Machine Learning

(Aug 2020 - Dec 2020)

- **Objective:** Implement the modified SVM algorithm in the paper titled **Pegasos: Primal Estimated sub-GrAdient Solver** for SVM using NumPy.
- Use SVM classifier on linear data and kernelized-SVM on non-linear data.

• Feed Forward Neural Network

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 Feedforward 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**.

• Automatically Recognizing Swahili Speech using Kaldi Toolkit

Guide: Prof. Preeti Jyothi, CSE Dept., IIT Bombay | Automatic Speech Recognition (Jan 2021 - Jun 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.

POSITIONS OF RESPONSIBILITY

- **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.

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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MISCELLANEOUS

- Secured **98.86** percentile in **GATE-19**(Graduate Aptitude Test in Engineering) among 104782 candidates.
- Awarded **Hostel Organization Special Mention**, for exemplary contribution to hostel throughout the year.
- Won **Gem of the General Championship** (MDGC-2019) for Hostel-4, IIT Bombay as part of Dramatics team.
- **Interests and Hobbies:** Cricket, Badminton, Table tennis, Listening to music.