Mohit Agarwala | **19307R004**
Electrical Engineering | **M.Tech.**
Indian Institute of Technology, Bombay | **Gender: Male**
Specialization: Communications Engineering | **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*

- Designed a solution for the **Service Hosting Problem**, which enables a 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 regimes where α-RR **greatly improves cost-efficiency** and, in the worst case, it is **6-optimal**.

RESEARCH EXPERIENCE

• **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 an algorithm for remote control & 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 **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.

• **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.

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 - 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 conversion.
- Created a **streamlit** based UI to record audio and display the corresponding predicted text and emotion.

• **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.

- **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 adjust flash intensity interactively, 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 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.

- **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.

- **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.

- **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**.

- **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.

RELEVANT COURSES

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

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 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 the **zero-waste** management system.
  - **Organized** & participated in various **cultural**, **technical**, and **sports** events for Hostel-4 IIT Bombay.

MISCELLANEOUS

- 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) Hostel-4, IIT Bombay, as part of the Dramatics team.
- 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.