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 • Optimization • Computer Networks • 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* **[paper]**

- 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** [*Jun'21 - Present*]
  Guide: Prof. Nikhil Karamchandani, EE Dept., IIT Bombay | M.Tech Project
  - **Objective :** To implement QoS for remote control & rendering of graphics in high bandwidth applications
  - **Completed Work :**
    - ⋆ Studied Operator/Tele-Operator-Based Haptics application to perform low latency tasks in a wired medium
    - ⋆ Built a **reliable UDP** Protocol for **Multi-media applications** in **C++/Python** from scratch
    - ⋆ Measured **one-way** latency in a congested environment using **Marzullo's Intersection Algorithm**
    - ⋆ Studied the cause of packet drop in low reliable UDP protocols with **Wireshark** & ways to reduce it
    - ⋆ Implemented **Packet marking** for priority access to a certain type of traffic for **ultra-fast** transmission
  - **Future Work :** To build a reliable UDP protocol with **QoS support** for low latency tasks over WiFi / cellular medium and to further demonstrate these algorithms **'in action'** on a **live testbed**
- **High Throughput, Ultra-low Latency Multimedia over Wi-Fi** [*Jul - Dec'20*]
  Guide: Prof. Nikhil Karamchandani, EE Dept., IIT Bombay | M.Tech Seminar
  - 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** [*May - Dec'20*]
  Guide: Prof. Nikhil Karamchandani, EE Dept., IIT Bombay | Research Project
  - 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

- **Routing Information Protocol (RIP) using C** | *Self project* | Communication Networks [*Jan - Apr'20*]
  - **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
- **Speech to Sign-Language(with emotions) for the Hearing-Impaired** [*Jan - Apr'21*]
  Guide: Prof. Preethi Jyothi, CSE Dept., IIT Bombay | Automatic Speech Recognition
  - Trained **Convolutional Neural Network** 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
- **Facial Emotion Recognition using Deep Learning** [*Aug - Dec'20*]
  Guide: Prof. Preethi Jyothi, CSE Dept., IIT Bombay | Foundations of Machine Learning
  - 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, AlexNet** and studied 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** | Kaggle Competition [*Aug - Dec'20*]
  Guide: Prof. Preethi Jyothi, CSE Dept., IIT Bombay | Foundations of Machine Learning
  - **Objective :** Predict the release year of a song from a set of **timbre-based audio features** extracted from it
  - 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
  - Limited RMSE to **11.15** by performing **Mini-Batch GD** & using **ADAM Optimizer** on **MSD** Dataset
- **Flash No-Flash Photography** [*Aug - Dec'20*]
  Guide: Prof. Suyash P.Awate, CSE Dept., IIT Bombay | Digital Image Processing
  - 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
- **Spatially Varying Background Blur-Effect in Videos** [*Aug - Dec'20*]
  Guide: Prof. Suyash P.Awate, CSE Dept., IIT Bombay | Digital Image Processing
  - Performed **Mean-shift Segmentation** on the given image to mask out **background** and **foreground** pixels
  - Used **K-means clustering** to provide **blur effect** by relabeling the pixel values which are close to each other
- **Employee Attrition Classification** | Kaggle Competition [*Aug - Dec'20*]
  Guide: Prof. Amit Sethi, EE Dept., IIT Bombay | Machine Learning
  - **Objective:** To predict whether an employee will leave the company or not based on **33 information points**
  - Extracted relevant and less correlated features and applied **One-Hot Encoding** for **multi-classes** features
  - Achieved an accuracy of **88.47%** by training **SVM** (Support vector machine) classifier on **IBM HR dataset**
- **Automatically Recognizing Swahili Speech using Kaldi Toolkit** [*Jan - Apr'21*]
  Guide: Prof. Preethi Jyothi, CSE Dept., IIT Bombay | Automatic Speech Recognition
  - 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
- **Mini Face Recognition System** | Digital Image Processing [*Aug - Dec'20*]
  Guide: Prof. Suyash P.Awate, CSE Dept., IIT Bombay | Digital Image Processing
  - Used **ORL** Database of Faces which contains **400 images** from 40 distinct subjects taken at varying conditions
  - Implemented the recognition system using **Singular Value Decomposition** on an appropriate **Data Matrix**
  - Experimented with varying parameters and cross-validated recognition rates with **Yale Face Database**

TRAINING & CERTIFICATION

- **Vocational Training in All India Radio** | Kolkata [*Jun - Jul'17*]
  - Trained at the Installation of Studios, High Power DRM Medium Wave Transmitters, FM Transmitters
  - Acquainted with the different aspects of electronics instruments used in AM/FM & Satellite Broadcasting
- Participated in short course on "Python for **5G MU**, **Massive MIMO**, and **mmWave MIMO**" by IIT Kanpur

TECHNICAL SKILLS

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

RELEVANT COURSES

• Statistical Signal Analysis	• Digital Message Transmission	• Digital Image Processing
• Foundations of Machine Learning	• Automatic Speech Recognition	• DSP & its Applications
• Wireless & Mobile Communication	• Optimization	• Communication Networks

POSITIONS OF RESPONSIBILITY

- **Institute Interview Coordinator** | Institute Placement Team, IIT Bombay [*Nov - Dec'19*]
  - Coordinated with a team of **250**+ members for interviews of **1600**+ **students**
  - Assisted in conducting Pre-placement Talks and Tests for **15**+ **firms**
- **Mess Councillor** | Hostel Council Team, IIT Bombay [*Aug'19 - Apr'20*]
  - **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
- Completed a short course on "**State of the Art Microcontroller**" organized by Dept. of CSE, IIT Kharagpur
- **Interests and Hobbies**: Cricket, Badminton, Table tennis, Listening to music