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Electrical Engineering
Indian Institute of Technology, Bombay
Specialization: Communications Engineering

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M.Tech.
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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

Online Partial Service Hosting At The Edge | *IEEE Xplore* [ICCCN 2021]

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** [Jun'21 - Present]

Guide: Prof. Nikhil Karamchandani, EE Dept., IIT Bombay | Master's Thesis

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**(NTP)
- 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

- **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**
- **Digital Photography with Flash No-Flash Image Pairs** [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
- **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
- **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

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

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|-----------------------------------|--------------------------------|----------------------------|
| • 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