**M ARUN KUMAR 173079004**

**Electrical Engineering M.Tech.**

**Indian Institute of Technology Bombay Male**

**Specialization: Communication Engineering DOB: 29-04-1994**

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| --- | --- | --- | --- | --- |
| Examination | University | Institute | Year | CPI/% |
| Post Graduation | IIT Bombay | IIT Bombay | 2020 | 8.58 |
| Gradutaion | JNTUH | ATRI | 2015 | 74.08 |
| Intermediate | Board of Intermediate | Narayana jr kalashala | 2011 | 90.2 |
| Matriculation | Board of Secondary Education | Bhashyam High School | 2009 | 90.83 |

**MAJOR PROJECT AND SEMINAR**

• **M.Tech Project: An Efficient feedback for postcoder information in MIMO systems**(*May’19 - Present*)

Guide: *Prof. Kumar Appaiah, Electrical Engineering, IIT Bombay*

**Completed work:** Parameterized the feedback for **postcoder** in massive **MIMO TDD** systems with multi antenna users.

* Formulated a lower bound on the achievable rate for systems with **perfect CSIT** and **partial CSIR**.
* Showed that less than 18 bits are requried to feedback the CSI for system with 2 antennas at UE and around 40 bits for a system with 3 antennas at UE.
* Derived a generalised expression for upper bound on the expectation of postcoder error.
* Implemented **Multi Cell MMSE based MIMO precoding** in multiple antenna cellular systems which used non-orthogonal pilots for channel estimation.

• **M.Tech Seminar: Inter cell interference in Multi Cell MIMO systems**  (*Jul’18 - Nov’18*)

Guide: *Prof. Kumar Appaiah, Electrical Engineering, IIT Bombay*

• Studied the structure and working of **MIMO systems** and impact on BER upon using Non-orthogonal pilot sequences for channel estimation.

• Simulated **BER vs SNR** for MIMO systems in Interference and Interference-free scenarios to study the impact of pilot contamination on the performance of the system.

**WORK EXPERIENCE**

• **Systems Engineer Infosys Technology Ltd** (*Dec’15 - Jul’17*)

• **Roles and responsibilities:** Part of the team which developed an application which automates billing for the customers of the client.

• Wrote code for fetching data into the module and to develop features using Oracle Peoplesoft ERM tool.

• Assisted in designing billing template in XML and in completion of Technical Document Report for the project.

**KEY PROJECTS**

• **Interview Management Software [Non-Academic Project]** (*Feb’18 - present*)

Guide: *Prof. Bikash Kumar Dey, Prof. Madhu N. Belur, Electrical Engineering, IIT Bombay*

• **Lead role** in building an online system that made **automatic coordination** across interview committees possible through their interface.

• The online system allowed committees to decide in **real-time** using a **cross platform web application** about interviews.

• Built various other **peripheral interfaces** to collect data at different times from students and other sources.

• This system was used **successfully** in the last **3** admission sessions.

• **Scheduling in 4G LTE**  (*Jan’18 - Apr’18*)

Guide: *Prof. Abhay Karandikar, Electrical Engineering, IIT Bombay*

• Studied different scheduling schemes for **resource block allocation** to users in **LTE** systems.

• Implemented **channel aware scheduling** schemes such as Maximum Throughput, Proportional Fairness, Throughput to Average and compared all three scheduling schemes based on metrics such as **cell throughput, average user throughput and Jain Fairness index**.

• **Simulation of Cellular System in Octave** (*Jan’18 - Apr’18*)

Guide: *Prof. Abhay Karandikar, Electrical Engineering, IIT Bombay*

• Computed **SIR**, **blocking probability** for different cluster sizes and **sectoring**.

• Analyzed **handover** process and **ping-pong** rate for different user mobilities and hysteresis values.

• Analyzed BER performance for **space** and **time diversity** in a slow flat fading Rayleigh channel.

• Analyzed BER performance for a single-cell and multi-cell scenario in a **CDMA** cellular system.

• **Image Dehazing**  (*Jul’18 - Nov’18*)

Guide: *Prof. Amit Sethi, Electrical Engineering, IIT Bombay*

• Implemented **Color Attenuation Prior and Dark Channel Prior** techniques to estimate the depth map.

• Reconstructed the Haze-free image using Hazy Image and its depth map.

• **Basic Image Editor tool in Python**  (*Jul’18 - Nov’18*)

Guide: *Prof. Amit Sethi, Electrical Engineering, IIT Bombay*

• Built a **GUI tool using pyQt** to implement Histogram equalisation, Gamma correction, Log transformation, Horizontal and Vertical edge detection using Sobel operators, blurring and sharpening with a mechanism to control the extent of blurring and sharpening respectively.

• Implemented **Image Deblurring** using Inverse filter, Truncated inverse filter, Weiner filter, Constrained least square filter and analysed the performance with help of metrics PSNR and SSIM.

• **Wavelet based leaders and P-leaders in Multi Fractal Analysis** (*Jul’18 - Nov’18*)

Guide: *Prof. Vikram M Gadre, Electrical Engineering, IIT Bombay*

• Studied about **p-exponents** and multi-resolution quantity called **p-leaders** used to measure negative regularity which appear in most real time signal analysis.

• Simulated p-leaders for several signals and was able to prove their convergence with **DWT based Wavelet leaders** as **p** becomes large.

• **Spam URL classification using Machine Learning** (*Jan’19 - Apr’19*)

Guide: *Prof. Gaurav S kasbekar, Electrical Engineering, IIT Bombay*

• Studied 3 among the Top-10 vulnerabilities of **OWASP** Standard mainly **XML external entity** attack, **SQL injection**, **cross site scripting** with practical implementation and proposed solutions.

• Classification of URLs using Machine Learning Techniques like **Logistic Regression, Naive Bayes, Support Vector Machine, One-vs-Rest**.

• An increase of more than **2 percent** in accuracy was obtained by replacing logistic regression by One-vs-Rest.

**RELEVANT COURSES**

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| • DSP and its Applications | • Wireless Mobile Communications | • Optimisation |
| • Statistical Signal Analysis | • Wavelets | • Network Security |
| • Applied Linear Algebra | • Image Processing | • Information Theory and Coding |

**TECHNICAL SKILLS**

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| --- | --- | --- |
| **Languages** | : | C, C++, Python, HTML, PHP, JQuery, Bash scripting. |
| **Tools** | : | MATLAB, LATEX, Git. |

**POSITIONS OF RESPONSIBILITY**

• **System Administrator: Electrical Department, IIT Bombay** (*Jul’17 - Present*)

• Building and maintaining the website of EE department, maintaining TA feedback and allotment portals.

• Providing mail service, storage space, computing facilities and network facilities to the department.

• Handled the Department M.Tech and PhD Admission process. Helped in generation of admit cards, coordinating the answer sheet corrections.

• **Web Nominee: Post Graduate Academic Council, IIT Bombay** (*Jul’18 - Jun’19*)

• Designed new web portal for PGAC which is used by all the Post Graduate students of the institute.

• **Mess Secretary: Hostel-1, IIT Bombay** (*Sep’17 - Mar’18*)

• Managed all mess related activities for a mess which catered for 250+ students with an approximate budget of 8,00,000/- per month.

**CO-CURRICULAR ACTIVITIES**

• Completed **Machine Learning** course by **Andrew Ng** from Coursera. (*2019*)

• Conducted an introductory session on **Linux, Vim and Git** as a part of Bridge Course which helps in smooth transition of new joiners to the institute. (*2019*)

• Volunteered for an introductory session on **Python** which was conducted as a part of Bridge Course. (*2019*)

• Completed a **100 hrs** course on the **Chinese** language conducted by IR office, IIT Bombay. (*2019*)

• Completed a short term course on **Digital System Design** organised by **C-DAC,** Hyderabad.(*2015*)

• An active member of **National Service Scheme (NSS)** for 2 years and attended a camp conducted in a village to perform social activities like conducting medical camps, cleaning and painting common facilities like village panchayat, temple etc. (*2013*)

• Completed basic course in the **French** language from Vivekananda Institute of Languages, Hyderabad.(*2012*)

• Volunteered for  **World Parliament on Spirituality** for a week as part of NSS activity.(*2012*)

• Completed Diploma in spoken English from Vivekananda Institute of Languages, Hyderabad. (*2012*)