M ARUN KUMAR **173079004**
Electrical Engineering **M.Tech.**
Indian Institute of Technology Bombay **Male**
Specialization: Communication Engineering **DOB: 29-04-1994**

Examination	University	Institute	Year	CPI / %
Post Graduation	IIT Bombay	IIT Bombay	2020	7.60
Undergraduate Specialization : Electronics & Communication Engineering				
Graduation	JNTUH	Aurora's Technological and Research Institute	2015	74.08
Intermediate/+2	Board of Intermediate	Narayana Junior Kalashala	2011	90.20
Matriculation	Board of Secondary Education	Bhashyam High School	2009	90.83

AREAS OF INTEREST

Wireless Communication, Digital Signal Processing, Image Processing.

MAJOR PROJECT AND SEMINAR

- **M.Tech Project: An efficient channel estimation scheme in MIMO TDD systems** (*May'19 - Present*)
  Guide: *Prof. Kumar Appaiah, Electrical Engineering, IIT Bombay*
  Objective: To design an **efficient channel estimation** scheme in Time Division Duplexing (TDD) with the help of **feedback** in MIMO Communication which will reduce the effect of pilot contamination on MIMO channel estimation.
  Completed work: Implemented **Multi Cell MMSE based MIMO precoding** in multiple antenna cellular systems which used non-orthogonal pilots for channel estimation.
  - Analysed and implemented **covariance based channel estimation** which uses Bayesian estimation in single cell multi antenna system and observed its performance based on rate vs number of antennas.
  - Implemented **Kalman estimation** for multi antenna cellular system.
  - 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**.

  Ongoing work: Working on implementing a basic precoder which utilises the information obtained from **Kalman** estimate in **coordinated MIMO** systems.
- **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 on using Non-orthogonal pilot sequences for channel estimate.
  - 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*)
  - **Tools Used:** Oracle Peoplesoft.
  - **Roles and responsibilities:** Part of the team which developed an application which automates billing for the customers of the client (Manpower group).
  - 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 MATLAB** (*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.
  - Implemented **Guided Filter** to reconstruct 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** which 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

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

TECHNICAL SKILLS

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.

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 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 1^{st} **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*)