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*)