AREAS OF INTEREST

Wireless Communication, Digital Signal Processing

MAJOR PROJECT

- **M.Tech Project: An Efficient channel estimation scheme using channel tracking and feedback in TDD MIMO Communication Systems** (*May'19 - Present*)
  Guide: *Prof. Kumar Appaiah, Electrical Engineering, IIT Bombay*
  Objective:
  - To design an efficient channel estimation scheme in 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 mulitiple antennas systems which used non-orthogonal pilots for channel estimation.
  - Implemented **covariance based channel estimation** which uses Bayesian Estimation in single cell system and analysed its performance based on rate Vs antennas.

  Ongoing and future work:
  - Working on implemention of **Kalman filter** to estimate channel in **coordinated MIMO** systems
  - Design of **efficient precoding** scheme using channel state information available using **feedback, tracking** etc to reduce the effect of **pilot contamination** on channel estimation.

WORK EXPERIENCE

- **Systems Engineer | Infosys Technology Ltd** (*Dec'15 - Jul'17*)
  - **Client:** Manpower, United States | **Tools Used:** Oracle Peoplesoft.
  - **Roles and Responsibilities:** I was a part of the team which developed an application which automates billing for the customers of the client.
  - Completed Technical Document Report of the project.

KEY COURSE PROJECTS AND SEMINAR

- **Scheduling in 4G LTE** (*Jan'18 - Apr'18*)
  Guide: *Prof. Abhay Karandikar, Electrical Engineering, IIT Bombay*
  - Implemented Device to Device communication on top of the **existing LTE** network without compromising the throughput of the cellular users communicating via base stations.
  - Used **Carrier-by-carrier in turn** algorithm for allocating resource blocks to cell users and **Bipartite graph based allocation** technique for the D2D users.
  - Achieved a **significant increase** in overall system **throughput** using this technique.
- **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.
- **Inter cell interference in Multi Cell MIMO systems [M.Tech Seminar]** (*Jul'18 - Nov'18*)
  Guide: *Prof. Kumar Appaiah, Electrical Engineering, IIT Bombay*
  - Studied the structure and working of **MIMO sy**
    sequences for channel estimate.
  - Simulated **BER vs SNR** for MIMO systems in Interference and Interference free scenarios.
- **Image Dehazing using color attenuation prior and dark channel prior**

(*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 of scene.
- 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 the corresponding multiresolution quantites called **p-leaders** which measure negative regularity which appear in most real time signal analysis.
  - Simulated Multi-scale quantities obtained by estimation using DWT based P-leader and were able to prove their convergence with Multi-scale quantities obtained by estimation using DWT based Wavelet leader as P tends to infinity.
- **Spam URL classification using Machine Learning** (*Jan'19 - Apr'19*)

  Guide: *Prof. Gaurav S kasbekar, Electrical Engineering, IIT Bombay*
  - Exposure of 3 in Top-10 vulnerabilities of **OWASP** Standard with practical implementation and proposed solutions.
  - Spam URL classification using Machine Learning Techniques like **Logistic Regression, Naive Bayes, Support Vector Machine, One-vs-Rest** : **96.97%,96.65%,98.49%,99.17%** accuracies respectively

TECHNICAL SKILLS

Languages	:	C, C++, Python, Bash scripting, HTML, PHP
Tools	:	Matlab/Octave, LaTeX, Git.

RELEVANT COURSES

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

POSITIONS OF RESPONSIBILITY

- **System Administrator: PC Lab, Electrical Department, IIT Bombay** (*Jul'17 - Present*)
  - Building and maintaining website of EE department, maintaining TA
  - Provide mail service, storage space, computing facilities and networ
  - Designed online portals and automated Interviews co-ordination in the department admission process.
- **Web Nominee: Post Graduate Academic Council, IIT Bombay** (*Jul'18 - Jun'19*)
  - Designed new web portal for PGAC.
- **Mess Secretary: Hostel-1, IIT Bombay** (*Sep'17 - Mar'18*)
  - Managed all mess related activites .
  - Responsible for verification of mess bills, coordinating vendors.
  - Reduced mess bill from Rs-140/- per student per day to around Rs- of two months.

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CO & EXTRA CURRICULAR ACTIVITIES

- Conducted a introductory session on **Linux,vim and Git** as a part of Bridge Course which helps in smooth tranisition of new joinees to institute. (*2019*)
- Voluntered for an introductory session on **Python** which was conducted as a part of Bridge Course. (*2019*)
- Completed **Machine Learning** course by **Andrew Ng** from Coursera. (*2019*)
- Completed a **100 hrs** course on **Chinese** language conducted by International Relations office IIT Bombay. (*2019*)
- Completed Basic course in **French** Language from Vivekananda Institute of Languages, Ramakrishna Mutt, Hyderabad. (*2013*)
- Completed Diploma in spoken English from Vivekananda Institute of Languages,Ramakrishna Mutt,Hyderabad. (*2012*)
- Active member of **National Service Scheme (NSS)** for 2 years and attended a camp conducted in a village to perform social activites like conducting medical camps, cleaning and painting common facilites like village panchayat,temple etc., (*2013*)
- Voluntered for 1^{st} **World Parliament on Spirituality** for a week conducted in Hyderabad as part of NSS activity. (*2012*)

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