AREAS OF INTEREST

Machine Learning, Digital Signal Processing, Wireless Communication

MAJOR PROJECTS

- **M.Tech Project: Generalized Frequency Division Multiplexing (GFDM) for Modern Wireless Communication Systems** (*May'18 - Present*)
  Guide: *Prof. Kumar Appaiah, Electrical Engineering, IIT Bombay*
  Completed work:
  - Implemented a **GFDM transmitter and receiver** prototype in Python, with pulse shaping **RRC filter**.
  - Analyzed the SER performance of the system with **various receivers** and compared it with OFDM.
  - Explored the trade-off between BER performance and out-of-band emissions (OOB) for various pulse shapes and analyzed the **flexibility** of GFDM in terms of data rate and latency.
  - Pilot based channel estimation for MIMO-GFDM, with **precoding** at the transmitter.

  Ongoing and future work:
  - Design GFDM modulation matrix for optimal OOB emissions constrained on the Noise Enhancement Factor.
  - Explore the **applications** of GFDM in M2M, high throughput communications in **5G**.

- **B.Tech Project: PC Based Wireless Data Acquisition System** (*Jul'13 - Apr'14*)
  Guide: *Prof. A. M. Shah, Electronics & Telecommunication Engineering, GCOE Amravati*
  - **Designed** a wireless data acquisition system with **I2C** and **SPI** protocol implementation.
  - Acquisition of data from a set of remote sensors to a system i.e. on-board system and hyperterminal of PC, where the **analysis** of the acquired data is done continuously and in **real-time**.
  - Used 433 MHz Tx-Rx module for communication between the remote terminal unit and master control unit.

WORK EXPERIENCE

- **Programmer Analyst | Cognizant Technology Solutions India Private Ltd** (*Nov'14 - Jun'16*)
  - **Client:** T-Systems, Germany | **Tools Used:** CRMT Siebel, Process Availability Tool, AR-Tool.
  - **Roles and Responsibilities:** Test scenario analysis, created and executed test cases, performed Functional and **System Integration Testing**, logged and tracked defects till closure in Action Request Tool.
  - Developed an Excel-VBA based tool for generating Daily Status Report (DSR) of the executed test cases which **reduced** the **effort** time from **20 minutes** to **2 minutes**.

KEY COURSE PROJECTS AND SEMINAR

- **Flappy Bird Game AI using Reinforcement Learning** (*Jul'17 - Nov'17*)
  Guide: *Prof. Ganesh Ramakrishanan, Computer Science Engineering, IIT Bombay*
  - Implemented **Deep-Q learning** and **Genetic algorithms** using reinforcement learning.
  - Replaced 5 layer deep CNN with 2 layer fully connected network using **feature engineered** variables to reduce training time from 4 days to 2 hours on a CPU machine.
  - Achieved a **high score** of **2141** in the game, the neural network was built using **Keras**.

- **Neural Network for Poker hand Predictions** *(Jul'17 - Nov'17)*
  Guide: *Prof. Ganesh Ramakrishanan, Computer Science Engineering, IIT Bombay*
  - Implemented Neural Network **from scratch** in Python to predict the poker hand from 10 possible outcomes.
  - Performed regularization using **Data Augmentation** and implemented **Momentum update** in **Gradient Descent**. Tuned the Hyperparameters with **k-cross validation**.

- **Resource Allocation and Interference Cancellation in D2D Communication** (*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 which **improved** overall system **throughput**.

- **Plotting and Analysis of the Spectral Data of MST Radar** (*Jan'18 - Apr'18*)
  Guide: *Prof. Kushal Tuckley, Electrical Engineering, IIT Bombay*
  - Analyzed power spectral data taken from **Indian MST Radar** at NARL, Gadanki using the **Doppler spectrum** of range bins after some data pre-processing.
  - Obtained the **wind profile** at different altitudes by tracing the spectral peaks in the Doppler power spectra plotted for all range bins using various **Wind Profiling Algorithms**.
- **Implementation of Adaptive filters in Python** (*Jan'17 - Apr'17*)
  Guide: *Prof. Kumar Appaiah, Electrical Engineering, IIT Bombay*
  - Performed noise cancellation using **Wiener filters** of different order and implemented **Least Mean Square** and **Recursive Least Square** algorithms for **adaptive linear prediction**.
  - Estimated a third order **auto-regressive process** with white noise using **Kalman filter**.
- **Maximum Likelihood (ML) Decoder in GNU Radio** (*Jan'17 - Apr'17*)
  Guide: *Prof. Sibi Raj Pillai, Electrical Engineering, IIT Bombay*
  - Designed custom blocks in GNU Radio to generate **random codebook** of given size and transmitted the codeword corresponding to the symbol through a AWGN channel.
  - Decoded the received signal using **minimum distance** decoder and analyzed the BER performance.
- **Bit-Interleaved Coded Modulation for Fading Channels [M.Tech Seminar]** (*Jul'17 - Nov'17*)
  Guide: *Prof. Kumar Appaiah, Electrical Engineering, IIT Bombay*
  - Studied the structure and information theoretical view of Bit-Interleaved Coded Modulation (BICM).
  - Simulated **Channel Capacity vs SNR** for AWGN and Rayleigh fading channels with different coding schemes i.e. Gray labelling and Set-partitioning considering the different signal sets.
  - Studied error-probability analysis and the **design criteria** of BICM.
- **Digital Image Watermarking using Discrete Wavelet Transform** (*Jan'17 - Apr'17*)
  Guide: *Prof. Vikram Gadre, Electrical Engineering, IIT Bombay*
  - Embedded a watermark image into the low **frequency sub-band** of the cover image which can be deciphered only by **authentic users** using a key. The watermark insertion is done using alpha blending technique.

TECHNICAL SKILLS

Languages	:	C, C++, Python, Bash scripting, HTML, PHP
Tools	:	Matlab, GNU Radio, LaTeX, Git, Circuit Wizard, Keil, Proteus

RELEVANT COURSES

- Digital Message Transmission
- Wireless and Mobile Communications
- Information Theory and Coding
- DSP and its Applications
- Adaptive Signal Processing
- Statistical Signal Analysis
- Foundations of Machine Learning
- Error Correcting Codes
- Radar Systems

POSITIONS OF RESPONSIBILITY

- **System Administrator: PC Lab, Electrical Department, IIT Bombay** (*Jul'16 - Present*)
  - Building and maintaining website of EE department, maintaining TA feedback and allotment portals.
  - Provide mail service, storage space, computing facilities and network facilities to department.
  - Designed online portals and coordinated for the **automation** of the activities in department admission process.
- **Student Companion: Institute Student Companion Program, IIT Bombay** (*Jul'17 - Jun'18*)
  - **Mentored** 7 new entrants and ensured their smooth transition into the curriculum of institution.
  - Helped them in institute activities, course selection, technical and non-technical development.
- **Interview Coordinator: Institute Placement Team, IIT Bombay** (*Nov'16 - Dec'16*)
  - Assisted in the placement of 1600 students within a team of 200 students over a period of 16 days.
  - Helped in conducting online and written tests and interviews of companies.
- **Tutor at Abhyasika**, a student initiative of IITB to teach underprivileged children. (*Jul'18 - Present*)

CO & EXTRA CURRICULAR ACTIVITIES

- Learned **German** language (Level-0) with **95** score through GLTP conducted by Cognizant Academy. (*2016*)
- **Teaching Assistant** for Signal and Systems course in Department Bridge Course Program. (*2017*)
- Won **Gold** medal in Kho-Kho in PG General Championship, IIT Bombay. (*2017*)
- Participated in **Robotics** events: Wall follower and Robowar in National level tech-fest. (*2011-12*)
- Hobbies: Travelling, watching and playing cricket.