



Rucha Joshi
Electrical Engineering
Indian Institute of Technology, Bombay
Specialization: Communications Engineering

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M.Tech.
Gender: Female
DOB: 20-10-1996

Examination	University	Institute	Year	CPI / %
Post Graduation	IIT Bombay	IIT Bombay	2021	null
Graduation	Pune	College of Engineering Pune	2018	8.67
Graduation Specialization: Electronics and Telecommunication				
Intermediate	HSC	A. D. Joshi Junior College	2014	92.77%
Matriculation	SSC	Little Flower Convent High School	2012	94.00%

AREAS OF INTEREST

Wireless Communication, Information Theory, Digital Signal Processing, Machine Learning

SCHOLASTIC ACHIEVEMENTS

- Secured **AIR 40** and **99.96** percentile among **1,04,782** candidates in GATE (ECE stream) (2019)
- Secured **4th position** in order of merit in **B.Tech** in class of 93 students (2018)
- Secured **AA grade** in **MTech Seminar** and **Statistical Signal Analysis** course (2019)
- Won **2 Gold Medals** for standing **1st** in School in **International Mathematics Olympiad** (2008, 2011)

MAJOR PROJECTS & SEMINAR

- Large System Analysis of Linear Precoding in MU-MISO Broadcast Channels**
Guide: Prof. Kumar Appaiah, Electrical Engineering, IIT Bombay *M.Tech Project (Apr'20 - Present)*
Objective: To enhance the sum rate of **MU-MISO Broadcast systems** with **optimized parameters** under temporally varying channel conditions by exploiting **channel correlation** of users
Completed work:
 - Performed simulations of **channel estimation** of **multiple-antenna wireless model** for BPSK, QPSK, 16-QAM symbols and evaluated BER performance for varying SNR
 - Derived **deterministic equivalents** of **SINR** under RZF and ZF precoding for MU-MISO wireless systems
 - Analysed effect of **varying channel transmit correlation** and **quality of channel estimate** on sum rate
 - Studied and implemented **practical optimization problems** like optimal number of users, power allocation, optimal feedback in FDD and optimal training in TDD systems for maximizing the sum rate of system**Ongoing and future work:**
 - Extend the system to adopt **adaptive differential feedback** in time-varying multi-user MISO channels
 - Study the impact of introduction of **users with multiple antennas** and co-operation among users
 - Study impact of introducing **OFDM** (Orthogonal Frequency-Division Multiplexing) technique in the model
- Pilot Contamination in Multi-cell TDD Systems**
Guide: Prof. Kumar Appaiah, Electrical Engineering, IIT Bombay *M.Tech Seminar (Aug'19 - Nov'19)*
 - Conducted a study on **CSI acquisition** through pilot-based training in uplink, channel estimation and downlink data transmission of a **Massive MIMO** wireless systems
 - Studied the limitations of FDD over TDD and factors leading to **pilot contamination** in TDD systems
 - Performed simulations of pilot-based training for a **two-cell MIMO system** and evaluated **BER** performance for **varying SNR** and **varying inter-cell propagation constant**
- Automatic Fold Length Setting on Folding Machine**
Guide: Prof. Sushil Ronghe, COEP, and Pratham Technologies, Pune *B.Tech Project (Aug'17 - May'18)*
 - Designed a system to control stepper motor through **PLC** (Programmable Logic Controller) programming in order to automate fold length setting in folding machine and developed a **HMI user interface**
 - Studied **Ladder Logic** to program PLC and micro-stepping used for increasing resolution of stepper motor
 - Tested the implementation on folding tray, which was almost **78%** time efficient after automation

INTERNSHIP EXPERIENCE

- Creation of Network Design | Bharti Airtel Limited, M & G circle, Pune**
Guide: Rhythm Kothari, Network Manager, Bharti Airtel Ltd. (May'17 - Jul'17)
 - Created **network designs post redundancy** for Airtel's Maharashtra and Goa circle and planned corrections in case of same MUX or path in transportation links
 - Studied and designed the **MORAN** (Multi-Operator Radio Access Network) connectivity, order management system and **Intra-circle roaming network** for Telenor and Airtel
 - Visited **MSC location at Pune** to understand basic structure of **VoLTE** (Voice over LTE) calls and working of hardware and networks for Airtel's **Packet Core connectivity**

COURSE PROJECTS

- **MIMO-OFDM transmission and reception from scratch** | Digital Message Transmission
Instructor: Prof. Sibiraj Pillai, Electrical Engineering, IIT Bombay | GNU Radio (Nov'19)
 - Observed **Power Distribution** of multiplexed signal after Orthogonal Frequency Division Multiplexing
 - Plotted the **Constellation diagram** of the 2x2 MIMO-OFDM demultiplexed signal with QPSK transmission
- **Restoration of Degraded Image using Inverse & Wiener Filtering** | Image Processing
Instructor: Prof. Shabbir Merchant, Electrical Engineering, IIT Bombay | Python (Oct'19)
 - Implemented an algorithm, wherein given an input image, Inverse and Wiener filtering was performed on a degraded image with IID Gaussian noise of different values of standard deviations added in it
 - Evaluated **RRMSE** of filtered image and degraded image w.r.t. original image and plotted it against standard deviation of noise, which was observed to be increasing with standard deviation
- **Staircase Alignment** | Image Processing
Instructor: Prof. Shabbir Merchant, Electrical Engineering, IIT Bombay | Python (Sep'19 - Nov'19)
 - Implemented an algorithm, wherein given an input image containing a staircase, the direction in which robot needs to turn in order to align with the staircase is found, incorporating **human-robot coexistence**
 - Implemented it using the image processing concepts like **Canny edge detector** and **Hough transform**
- **Gender Recognition using Voice/Speech Analysis and ML Techniques** | Machine Learning
Instructor: Prof. Amit Sethi, Electrical Engineering, IIT Bombay | Python (Mar'20 - Jun'20)
 - Implemented two approaches for feature extraction on the different datasets of voice samples viz. **Statistical & Signal Processing Approach** and trained different classifiers based on ML Techniques on training data
 - Obtained best accuracy of **87%** with **XGBoost Classifier** on **Real-time voice samples**, using Signal Processing Approach and almost **100%** accuracy on Training and Validation data
- **Attrition Classification** | Machine Learning
Instructor: Prof. Amit Sethi, Electrical Engineering, IIT Bombay | Python (Mar'20)
 - Performed classification on **Kaggle dataset of Employee Attrition Problem** using various ML Techniques and obtained best accuracy using **AdaBoost Classifier**
 - Secured **15th position** on the leaderboard in competition among 195 participants, obtaining **89.7%** accuracy
- **SVM Classifier from scratch** | Machine Learning
Instructor: Prof. Amit Sethi, Electrical Engineering, IIT Bombay | Python (Feb'20)
 - Implemented and trained SVM Classifier using **gradient descent** method and visualised it in **Python**
 - Visualised the decision boundary implemented by classifier trained on linearly non-separable data too

RELEVANT COURSES

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|---------------------------------|-------------------------------|------------------------------------|
| • Digital Message Transmission | • Network Security | • Introduction to Machine Learning |
| • Information Theory and Coding | • Applied Linear Algebra | • Image Processing |
| • Communication Networks | • Statistical Signal Analysis | • DSP & its Application |

TECHNICAL SKILLS

- **Programming Languages:** C, C++, Python
- **Other Tools and Softwares:** GNU Octave, MATLAB, GNU Radio, Code Composer Studio, Microsoft Visio

POSITIONS OF RESPONSIBILITY

- **Teaching Assistant, Electrical Department, IIT Bombay** (Jul'19 - Present)
 - **Communication lab:** Assisted instructor in conducting lab sessions and exams for a batch of **131** students
 - **Digital Signal Processing lab:** Helped students to understand lab experiments and their implementation
 - **Communication systems course:** Assisted instructor to conduct online classes, quizzes and assignments
- **Student Companion, Institute Student Companion Program, IIT Bombay** (May'20 - Present)
 - **Mentoring new entrants**, helping them on academic and non-academic fronts during the Covid-19 pandemic
 - Worked in a **team of 177 people** for conducting **e-orientation** at the department level for junior students

EXTRA CURRICULAR ACTIVITIES

- Won **Stage 2 Consolation Award** for the project proposal titled **Autoshut off mechanism for glazing machine** submitted in **TATA Pioneer's Mini Makerthon** (Mar'17)
- Secured **1st position** in **Circuit Fixer-2** of **MindSpark'16** organised by College of Engineering Pune (Sep'16)
- Stood **3rd at State & 2nd at National Level Abacus and Mental Arithmetic** Competition (Nov'06, Jan'07)
- Participated in **Punt Formation** event as a part of **87th Regatta** in College of Engineering Pune (Mar'15)
- Volunteered in **Bull Run** event in **MindSpark'14** organised by College of Engineering Pune (Sep'14)
- **Interests:** Dancing, Writing blogs, Reading novels, Listening music.

Scholastic achievements and extracurricular activities are not verified by the Placement Cell