Sana Naaz | **18307R001**
Electrical Engineering | **M.Tech.**
Indian Institute of Technology, Bombay | **Gender: Female**
Specialization: Communications Engineering | **DOB: 31-07-1995**

Examination	University	Institute	Year	CPI / %
Post Graduation	IIT Bombay	IIT Bombay	2021	8.98
Graduation	RGPV	SGSITS	2018	8.22
Graduation Specialization: Electronics & Telecommunication Engineering				

AREAS OF INTEREST

• Signal Processing • Image Processing • Communication • Machine Learning • Computer Vision • Deep Learning

SCHOLASTIC ACHIEVEMENTS

- Secured **99.43** percentile in **GATE (EC)** among **1,25,870** appeared candidates (2018)
- Scored all India **96.38** percentile in **JEE Main** among nearly **14 lakh** candidates (2014)

PUBLICATIONS

- R. Kamran, S. Naaz, S. Goyal and S. Gupta, **"High-Capacity Coherent DCIs Using Pol-Muxed Carrier and LO-Less Receiver,"** in Journal of Lightwave Technology, July 1, 2020
- R. Kamran, S. Naaz, S. Manikandan, S. Goyal, R. Ashok and S. Gupta, **"Self-Homodyne 16-QAM Scheme for Low Complexity 200 Gbps Data Center Interconnects,"** IEEE OI, Santa Fe, NM, USA, 2019
- R.Ashok, S.Naaz, R.Kamran, A.Sidhique, S.Gupta **"Endless Optical Phase Delay Based Phase Synchronization in Low-power Coherent DCIs"** accepted for IEEE Photonics Conference (IPC), 2020
- R.Ashok*, R.Kamran*, S.Naaz*, S.Gupta, **"Demonstration of a PMC-SH link using a phase recovery IC for low-power high capacity DCIs"** (*Authors with equal contribution) accepted in CLEO 2020

MAJOR PROJECTS AND SEMINAR

- **Project Research and M.Tech Thesis** (Jun'18-Present)
  Guide: *Prof. Shalabh Gupta, Department of Electrical Engineering, IIT Bombay*
  Adaptive Polarization Control
  - Experimentally implemented adaptive polarization control in real-time for **32 Gbaud (128 Gb/s)** Polarization multiplexed Carrier Self Homodyne **(PMC-SH) 16-QAM** link using the **gradient descent** approach

  Non-Linear Equalization in Optical Communication using ML techniques
  - Conducted an extensive literature survey on various state of the art algorithms to mitigate non-linearities
  - In-depth study and implementation of **Reservoir Computing(RC)** in Python, a variant of RNN due to training of only output layer making it computationally inexpensive at low learning cost
  - **Future work:** Analysis of algorithm's performance on real time generated data from optical test bench

  Demonstration of an Endless Optical Phase Delay (EOPD) generator
  - **Objective:** To adapt the voltage biases and signal gains for external variations
  - Design and analysis of EOPD which can generate any amount of desired phase delay
  - Automatic control of 3 bias voltages and 2 voltage gains for optical IQ modulator using **statistical methods**
  - **Future work: Real-time demonstration** of the system with the coherent optical system with robustness to non-linear variations in the system
- **M.Tech Seminar : Non Linear Equalization in Optical Communication** (Jul'19 - Dec'19)
  Guide: *Prof. Shalabh Gupta, Department of Electrical Engineering, IIT Bombay*
  - Studied various non-linearities existing in optical fiber and recognized the need to mitigate them
  - Comprehensively surveyed various algorithms such as Digital Back-Propagation(DBP), Volterra Series Based Nonlinear Equalizer(VNLE), Phase Conjugation(PC), Inter-Subcarrier Nonlinear Interference Canceler(INIC)

KEY COURSE PROJECTS & ASSIGNMENTS

- **Automatic Image Captioning - Flicker8k Dataset** (Jul'19 - Dec'19)
  Guide: *Prof. Amit Sethi, EE Department, IIT Bombay — Advanced ML*
  - Every word of the caption is mapped to a 200 fixed length vector by using **Glove model** for **Word embeddings**
  - **Transfer learning** to extract features of images by using pretrained **Inceptionv3** and **Resnet50**
  - **Long Short Term Memory** network is used for training to generate image captions
  - Got BLEU-1=50.23, BLEU-2=39.38 and BLEU-3=24.71
- **Augmented Reality, Overlaying of the synthetic book on a plane in an image** (Feb'20)
  Guide: *Prof. Sharat Chandan, CSE Department, IIT Bombay — Computer Vision Lab*
  - Calculated rotation and translation vectors by using 3-D world, 2-D image coordinates and intrinsic matrix
  - **Projection** of 3-D coordinates on image plane followed by **perspective transformation** and mask generation
- **Blind Channel Equalization** (Jan'19-May'19)
  Guide: *Prof. V.RajBabu, EE Department, IIT Bombay — Advanced topics in Signal Processing*
  - The main objective was to eliminate the need of training sequence while equalizing the received signal
  - Implemented equalization of QPSK using **Constant Modulus Algorithm** and QAM using modified CMA

- **EEG based Eye State Detection - Dataset from UCI ML Repository** (July19-Dec'19)
  Guide: *Prof. Sunita Swargi, CSE Department, IIT Bombay — Foundations of ML*
  - Data visualization and data preprocessing for removing outliers to achieve **65%** and **60%** test accuracy after training by **Recurrent Neural Network** and **Neural Network** respectively
  - Surveyed literature to find instance based algorithm such as **K-star** giving best accuracy in this task
- **Contrast enhancement, Edge enhancement and Denoising of an image** (Sep'19)
  Guide: *Prof. Shabbir Merchant, EE Department, IIT Bombay — Image Processing*
  - Implemented **Log transform**, **Anti Log transform** and **Histogram equalization** for contrast enhancement
  - Enhancement of the edges of image using sharpening **Laplacian filter** in both spatial and Fourier domain
  - Comparison of performance of Ideal, Butterworth and **Gaussian** filters in frequency domain
- **Edge Detection of an image on FPGA** (Jan'19-May'19)
  Guide: *Prof. Sachin.B Patkar, EE Department, IIT Bombay — VLSI Design Lab*
  - Implemented **Sobel Edge detection** on DEO-Nano FPGA board
  - Algoritm was implemented by using FIFO and shift registers and the output was verified on MATLAB
- **RIP and TCP Congestion Control Implementation** (Mar'19)
  Guide: *Prof. D Manjunath, EE Department, IIT Bombay — Communication Networks*
  - Implemented Routing Information Protocol using distributed **Bellman-ford algorithm**
  - Simulated **TCP congestion control** method including features like slow-start, DupAcks on timeout, additive increase multiplicative decrease (AIMD), fast retransmit and fast recovery
- **Short Term Projects**
  - Implemented **Least Mean Square** and **Recursive Least Square** for adaptive linear predictions (Apr'19)
  - Implemented of **Inverse** and **Wiener** filtering on degraded images (Oct'19)
  - Image retrieval using **SIFT**, **ORB** feature detectors and Brute force, **FLANN** for features matching (Feb'20)
  - **Document scanner** using **Canny edge detection**, contours and **Perspective transformation** (Jan'20)
  - Implemented **Linear Regression** for predicting bike rental count using data preprocessing techniques (Aug'19)
  - Achieved **97.8%** accuracy and secured top 13% position in Kaggle for **MNIST digit recognition** (Oct'19)
  - Achieved **85.3%** accuracy by training MNIST using **Restricted Boltzman machine**(RBM) features (Nov'19)

RELEVANT COURSES

- Digital Message Transmission
- Digital Signal Processing
- Statstical Signal Analysis
- Advanced topics in Signal Processing
- Computer Vision Lab
- VLSI Design Lab
- Communication Networks
- Advanced ML
- Image Processing

TECHNICAL SKILLS

- **Programming Languages:** C, C++, Python, VHDL
- **Tools & Libraries:** MATLAB, Altium Designer, Altera Quartus, Pytorch, Keras, LaTeX

ADDITIONAL LEARNING

- **Sequence Models by deeplearning.ai** *Instructor: Andrew Ng, Coursera* (Jul'20)
  - Learned about applications of sequence models for **text synthesis**, **speech recognition** and **music synthesis**
  - Learned about **Attention** mechanism and **Debiasing** of word embeddings
- **Natural Language Processing with Classification and Vector Spaces** *Coursera(ongoing)* (Aug'20)
  - Learned about **Sentiment analysis** of tweets using Logistic Regression and Naive Bayes
- **Credit card fraud detection** *Guide: Prof. Biplab Banerjee, CSRE, IIT Bombay* (Feb'19)
  - Implemented Support Vector Machine to achieve an accuracy of **87.5%** on credit card dataset from Kaggle
- **Internship** *Guide: Prof. Kishor M. Bhurchandi, EC Department, VNIT Nagpur* (May'16-Jun'16)
  - Face localization and Face recognition

POSITIONS OF RESPONSIBILITY

- **Project Research Assistant at Communication Lab, EE Department, IIT Bombay** (Jul'18-Present)
  - Responsible for lab management while coordinating with fellow RAs and PhDs
  - Responsible for maintaining high-speed equipment
- **Bridge Course on OCTAVE/MATLAB, EE Department, IIT Bombay** (Jul'19)
  - Taught basics of programming in MATLAB/OCTAVE to a class of **100**+ PG freshmen
  - Developed the course content which included codes and software installation steps
- **Chief Technical Officer at SGSITS Robotics Club** (Jul'16-Jul'17)
  - Recruited new members in SRC and headed the team of **40**+ students in club
  - Mentored junior students for their technical projects in SGSITS Robotics Club

EXTRA CURRICULAR ACTIVITIES

- **Interview Coordinator** for Online PhD admissions at EE Department in IIT Bombay (Jul'20)
- **Volunteered** in **IMaRC**, IEEE conference at IIT Bombay (Dec'19)
- Assisted in the GNU Radio workshop in a class of **25**+ PG freshmen in EE Department (Jul'19)
- Runner up in intra-college basketball tournament at SGSITS, Indore (Sep'15)