Internships

May'18-Jul'18 **Honda Research Institute, Japan**, Translating Video Sequences to Text Sequences using Deep LSTM and 3D ResNet Networks.
- Implemented a *Sequence to Sequence Neural Network* model to learn translations of Sign Language
- Designed the encoder for activity recognition using *3D CNNs* and two layered *LSTM* network.
- Decreased the computation time significantly by implementing *ResNet* inspired *3D CNNs*
- Used 2 channel *Optical Flow* of the videos as the input for the learning architecture

Dec'16-Jan'17 **Arrow AI**, *Developing APIs for commercial applications of* Machine Learning *in* TensorFlow.
- Developed and implemented an API for *State Bank of India* which is the largest commercial bank of India, to *estimate expected business capital and time* for new clients
- Designed and developed a *recommendation system* for restaurants using *SVD*
- Designed and implemented an API to scrape transaction details from online PDF bank statements
- Developed an algorithm to estimate the path of consumers in stores using *OpenCV*

Apr'16-Jun'16 **SoundREX**, Hardware Development and Testing.
- Designed a circuit to estimate the location of the user based on the music around

Scholastic Achievements

Secured 99.99 percentile in JEE Advanced 2015 out of 150,000 candidates

Secured 99.96 percentile in JEE Mains 2015 among 1.6 million candidates

Received INSPIRE scholarship for being in top 1 percentile in class 12th by Government of India

Awarded the Maharashtra State Scholarship for securing 56th rank among 0.1 million participants

Bagged an All India Rank 184 out of 50k participants in National Science Olympiad (NSO) '7

Received *Gold Medal* for excelling in the *NASA Olympiad* and selected for a visit to *NASA*

Felicitated at state level for appearing in merit list at state level in MTSE

Projects

Research Projects

Oct'17-Dec'17 **Generating Adversarial attacks on Image Segmentation Neural Networks**,
Research Project with Prof. Dawn Song, Computer Science Dept, University of California, Berkeley.
- Generated *adversarial attacks* on the state of art *image segmentation neural networks*
- Implemented the *Dense Adversary Generation* algorithm to generate images to poison the network
- Achieved an accuracy drop from *68.28* % to *8.06*% thus pointing at the loopholes in the state of the art segmentation network

Oct'16-May'17 **Local Positioning System using WiFi Networks and Deep Learning**,
QuarterFinalist - India Innovation Challenge, IIM Bangalore and Texas Instruments.
- Designed and developed a system to locate a specific WiFI node on a WiFi network
- Implemented a *Deep LSTM Network* taking as input *received signal strength*, *phase* of the signal and *path loss exponent* in order to predict distance and angle of the object from the router
- Implemented *multi-array antenna model* to estimate angle of the receiver w.r.t the transmitting node
- Implemented Spatial and Time *Diversity* to cancel off *multipath fading effects*
- Achieved *4 cm* accuracy on the scale of *2.16 m*

Aug'17-Dec'17 **Music Information Retrieval from EEG signals,**
Using Music Image Information Retrieval Techniques.
- Applied *onset detecting* techniques on *EEG* recordings to extract the tempo of the corresponding stimulus.
- Implemented *temporgram* estimation using *autocorrelation* technique assuming EEG as the *novelty curve*
- Achieved a difference of *1 bpm* in the actual tempo and the calculated tempo from the EEG data

Mar'18-May'18 **Evaluating Robustness of Neural Networks,**
Using Music Image Information Retrieval Techniques.
- Implemented an L2 norm based optimization algorithm to generate adversarial images
- Attacked neural networks protected by defensive distillation and reduced their accuracy significantly

Oct'16-May'17 **Imaging Sun at Microwave and Radio Frequencies,**
Research Project with Prof. Raghunath Shevgaonkar, Electrical Engineering, IIT Bombay.
- Analyzed the propagation of *Electromagnetic Waves* in the plasma environment in the *solar corona* and obtained trajectory of rays in the Coronal atmosphere
- Obtained an analytical expression for brightness temperature using *Radiative Transfer Theory* and thus obtained a temperature image of the sun

Apr'16-Oct'16 **Modelling High Electron Mobility Transistors with Parasitic Capacitance,**
Research Project with Prof. Dipankar Saha, Electrical Engineering, IIT Bombay.
- Analysed *fringing effects* to model the resulting parasitic capacitance at scales of 10^{-12}
- Modelled the current-voltage characteristics of *high frequency transistors* to emphasize the significance of parasitic capacitance in their performance
- Established *techniques* to *reduce the transistor switching delay* introduced due to parasitic capacitance

Technical Projects

Apr'17-Present **Member of Advitiya,** *Advitiya is the 2nd student satellite of IITB, technically advanced and efficient version of the 1st, Pratham.*
- Critically analyzed Astronomical Image Processing and *Image Compression Algorithms* to decide the optimum algorithm based on parameters like compression ratio and computation time.
- Wrote *Embedded C* code to enable *ISP* programming of on-satellite microcontrollers using a master microcontroller to be able to reprogram and tweak the software while the satellite is in orbit

Jan'18-Apr'18 **PPG Signal Acquisition Module,**
Electronic Design Lab Project with professor P.C.Pandey ,Electrical Department, IIT Bombay.
- Designed and built a hardware module for faithful acquisition of the *PPG* signal
- Implemented *Baseline Restoration* and auto-LED intensity control
- Provided *bluetooth* based connectivity to display the signal on smartphone and laptop

Nov'17-Dec'17 **RISC Processor Design,**
Microprocessors Course Project with professor Virendra Singh, Electrical Department, IIT Bombay.
- Designed and implemented on *FPGA* a 6 Stgae 16 bit *Pipelined microprocessor* using only 20 states
- Implemented data forwarding and branch control to prevent structural and control hazards

May 16-Jun 16 **Intervehicular Communication System,** *Project with the Innovation Cell, IIT Bombay.*
- Implemented a server-client model to manage traffic and prevent accidents
- Created a *wireless network* of Arduino microcontrollers using using modules communicating over *amplitude-shift keying*

Hobby Projects

Nov'16 **Automatic Reminder & Event Managing System.**
- Used *Google Calendar API and Google Speech Recognition API* to create events and set reminders from the Linux terminal and voice commands

Oct'16 **Wireless Headphones.**
- Converted my wired headphones to wireless using WiFi device ESP8266 uisng *socket programming*

Dec'16 **Clustering of Sales Data.**
- Explored and implemented several clustering algorithms on sales data of retail store all over the world to analyze the progress

Oct'16 **LiFi.**
- Built a visible light-based communication system to exchange text, audio and image data between 2 embedded systems and even computers

Nov'15 **Autonomous object locating & gripping robot.**
- Built an autonomous robot which locates and grips objects around it and dumps them to a predefined position
- Used ultrasonic sensors and infared sensors along with Arduino Microcontroller to develop the bot

Position of Responsibility

2016–2017   **Convener**, *Electronics Club, IIT Bombay*.

- Responsible or organizing and mentoring year-round technical events like Competitions, Workshops and Hackathons in a team of 4 conveners for 200+ students covering topics like:
  - Basic Motor Drivers or Automated Cars
  - Conducted Group Discussion sessions on topics like memristors, MEMS technology, basics of *Embedded programming*
  - Arduino, AVR Programming and ARM programming

Technical Strengths

Technical Skills

Languages	Python, C/C++,Embedded-C, MATLAB, Verilog, HTML, LaTeX
Softwares	TensorFlow, OpenCV, NumPy, GNU-Radio, Git, Quartus
Hardware	Common Microprocessors, ARM processors, CPLDs and FPGAs, Embedded Platforms

Key Courses Undertaken

Electrical Engineering		Other
Speech Processing	Digital Signal Processing	Digital Image Processing
Estimation and Identification	Digital Communication	Movement Neuroscience
Neuromorphic Engineering	Electromagnetic Waves	Mathematical Structures for Systems & Control
Advanced Concentration Inequalities	Data Analysis	Complex Analysis

Extra-curricular activities

Volunteering	Conducted workshops on the Arduino microcontroller board and taught students from educationally backward areas in Mumbai the techniques of programming it
Music	I love playing melody on my harmonica in free time especially western classical music
Interests	I read Arundhati Roy, Franz Kafka, etc. Love to recite poems by Dylan Thomas, Auden, Gulzar, etc. Gardening is my hobby and I cultivate a garden in front of my hostel room