Pranav Sankhe

Research Interests

I am passionate about Computer Vision, Artificial Intelligence, Machine learning, expecially Deep Networks, Optimization & Internet of Things.

Education

Indian Institute of Technology Bombay, Mumbai, India — July 2015 – Present
Third Year, BTech, Department of Electrical Engineering

Scholastic Achievements

May' 15 Secured *All India rank 1191* in the selection test for the IITs out of 150,000 candidates

Feb'13 Received *Gold Medal* for excelling in the *NASA Olympiad* and selected for a visit to *NASA*

Feb'15 Received INSPIRE scholarship for being in top 1 percentile in class 12^{th} by Government of India

Feb'13 Felicitated at state level for appearing in merit list at state level in MTSE

Work Experience

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

Projects

Course Projects

Oct'16 – May'17 **Local Positioning System using WiFi Networks and Deep Learning**, *Supervised Research Exposition under Prof. Srikant Sukumar, Systems & Controls Department, IIT Bombay*.

- Designed and developed a system to locate a specific ESP8266 device on a *WiFi network of ESP8266*
- Implemented a *Deep Neural Network* taking as input received signal strength, phase of the signal, path loss exponent of each node in the network and various other abstract features and predicting 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
- Used the Python `multiprocess` module to implement parallel processing so as to combine all subsystems
- Trained the deep network with a database created using *Computer Vision* in *MATLAB*
- Achieved 4 cm accuracy on the scale of 2.16 m
- Suggested potential applications to manoeuvre a constellation of quadcopters, cars or robots.

May'17 – Present **Noise Modelling of EEG signals using Deep Learning and Computer Vision**, *Research Project with Prof. Madhav Desai & Prof. Gaurav Kasbekar Electrical Engineering, IIT Bombay*.

- Stochastic head and facial movements add a lot of noise in EEG signals. We attempt to model this noise.
- We compare the features of signal in frequency and time domains and the motion features captured by a frontal viewing camera. The combined features are used as inputs to Deep Neural Network, which improves the accuracy in detecting head movements and model the noise.
- The EEG classification into constituent waves of fixed frequency range and amplitude is being done by Gabor Wavelet transform instead of conventional transform.

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

Jun'16 – Jul'16 **Krushimitra (The Farmer's Friend)**,
Under Technical Projects, Student Technical Activities Body, IIT Bombay.

- Designed and implemented an easy to use, automatic system with a UI for farmers to decide the *optimal water content* and deliver it to crops.
- We considered various dynamic inputs such as soil moisture content, temperature and static inputs like crop & soil type as well

Apr'16 – Jun'16 **Hand Gesture Controlled Magnetic Levitation**,
Institute Technical Summer Project under the Electronics Club, IIT Bombay.

- Designed and implemented an electromagnetic system for *magnetic levitation* of magnetic object
- Implemented *PID* stabilization algorithm using Arduino microcontroller board.

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

Oct'16 **LiFi**.

- Built a visible light-based communication system to exchange text, audio and image data between 2 computers

Position of Responsibility

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

- Organized and mentored students in various institute-wide competitions, hackathons and workshops for 200+ participants
- Conducted sessions on topics like memristors, MEMS technology, basics of *Embedded programming*

Technical Strengths

Technical Skills

Languages Python, C/C++,Embedded-C, MATLAB, Verilog, HTML, LaTeX

Software Modules TensorFlow, OpenCV, NumPy, SciPy and Matplotlib, GNUPlot, Scikit-Learn Git, Vim, Altera Quartus, Altera ModelSim, GIMP

Hardware Common Microprocessors, ARM processors, CPLDs and FPGAs, Embedded Platforms

Key Courses Undertaken

Electrical Engineering		Other
Digital Communication*	Electronics Design Lab*	Digital Image Processing*
Digital Signal Processing+*	Signals & Systems	Mathematical Structures for Systems & Control
Microprocessors+*	Data Analysis	Computer Programming+
Electromagnetic Waves*	Network Analysis	Complex Analysis

+*accompanied by lab*, **to be finished by May'18*.

Extra-curricular activities

Institute Events — Awarded 1^{st} *Prize* by electrical engineering Department for designing best circuit to count the number of customers in queue

Volunteering — Conducted workshops on the Arduino microcontroller board and taught students from educationally backward areas in Mumbai the techniques of programming it

Coding — Participated regularly in *coding and electronics hackathons* and *workshops* organized in IIT Bombay

Interests — Like to read *novels*, traveling, love *gardening* and I am proud of the garden I have cultivated in front of my hostel room