

# Sravan Patchala

UNDERGRADUATE AT INDIAN INSTITUTE OF TECHNOLOGY - BOMBAY, INDIA

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## Contact Information

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## Summary

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Passionate about math intensive tasks involving signal (image) processing, machine learning, optimisation, and also applications of these in robotics. Successfully completed various technical projects in these fields, both self-motivated and under guides. Possess ability to lead and motivate high performance teams. Possess good communication and management skills. Enthusiastic in taking up responsibilities and in confronting and solving challenging problems using analytical thinking.

## Education and Scholastic Achievements

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- Pursuing a Dual Degree (BTech + MTech) in Electrical Engineering at IIT Bombay, India with a specialisation in Communication and Signal Processing.
- Secured an All India Rank of 433 in the Joint Entrance Exam (Advanced)-2014 out of 150,000
- Secured an All India Rank of 639 in the Joint Entrance Exam (Mains)-2014 out of 1,400,000
- Qualified for INSPIRE Scholarship for being in the top 1%ile in Intermediate 2014 after securing 91.69% in the HSC Board Examinations - 2014
- Secured 95.71% in matriculation in the ICSE Board Examinations - 2012

## Key Technical Projects

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### Machine Learning in Wireless Sensor Networks

[Summer '16]

Guide: Prof Shabbir Merchant

*Minimising energy consumption in Wireless Sensor Networks using Machine Learning algorithms*

- Implemented an algorithm in Python to minimise the number of sensors needed to cover targets for random arrangements of nodes and targets by calculating a waiting time parameter
- Devised and implemented an improved K-Means clustering algorithm for positioning relays, while minimising energy usage by the sensors and maintaining base-station connectivity
- Implemented a job-set assignment algorithm to optimise the computational resource utilisation in the cluster-cloud

### Visible Light Communication with a smart-phone

[Winter '15]

Guide: Prof Kumar Appaiah

*Communication between an Arduino and a smart-phone using the flashlight of the phone*

- Inspired by the upcoming Light Fidelity technology, developed an Android app to use the smart-phone's flashlight to send messages to the receiver made with an arduino and infrared LEDs
- Boosted the SNR by thresholding and averaging out the difference in readings of two LEDs
- Assembled and tested the whole setup to achieve a transmission rate of 40 bits per second

### Cubli - A self balancing bot

[Summer '15]

*Students' Technical Activities Body*

*A self-balancing frame that stabilises using the principle of angular momentum conservation*

- Modelled the mechanical structure using SolidWorks and programmed on an Arduino
- Processed the inertial measurement unit's readings and used them for motion detection and motion mapping to control motors for providing restoring torque

## Key Course Projects

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### Microprocessor design

[Autumn '16]

Guide: Prof Virendra Singh (EE309 Course Project)

*A 16 bit microprocessor that implements 15 instructions*

- Designed 8-bit Multicycle and Pipelined Processors using VHDL from scratch and synthesized the same on Altera DE0 Nano FPGA.
- Implemented Branch Predictors, Priority Encoders and Hazard Detection Units to reduce latencies and significantly reduce the branch hazards

### Document Scanner

[Autumn '16]

Guide: Prof Ajit Rajwade (CS663 Course Project)

*An image processing technique to reconstruct a large document using several smaller overlapping images*

- Implemented a stitching pipeline that extracts the feature points using the ORB function of OpenCV and calculates the homography matrix for a pair of images using RANSAC algorithm
- Processed the aggregate image using gain compensation and multi-band blending techniques to remove prominent edges in the reconstructed image

### Capturing and Displaying Analog signals using Digital Systems

[Spring '16]

Guide: Prof Saurabh Lodha (EE214 Course Project)

*A mixed-signal system, made for the Digital Lab project, to sample, store and display an analog signal*

- Interfaced and developed a controller for an ADC0804 and an SRAM with the Krypton CPLD board and programmed a central control unit for the controllers using VHDL
- Sampled and displayed the signal in a wraparound manner at 1kHz frequency
- Generated Gate-level simulations of the control units using ModelSim

### Library Book Bar-Code Scanner

[Spring '15]

Guide: Prof Kavi Arya (CS101 Course Project)

*A fully automated bot to scan a shelf and generate the details of bar-codes of the books in a shelf*

- Implemented an image processing module to detect and decode bar-codes placed on books using the OpenCV library on C++
- Implemented wireless communication to relay data to and from the bot using XBee
- Programmed the Firebird V's movement along a shelf of books using Atmel Studio

## Positions of Responsibility

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### Institute Robotics Secretary

[Apr '16 - Present]

*Students' Technical Activities Body*

- Leading a team of 6 members to organise technical events and discussions for the robotics-enthusiast community, which has a strength of over 500 students from all years
- Addressed a crowd of over 200 people on introductory and advanced talks on mechanical grippers, image processing and electrical motors and also mentored students on these topics
- Coordinated the Institute Technical Summer Projects, a platform to develop self-ideated projects; Saw huge participation from about 350 sophomore students and 90 projects

### Department Student Mentor

[Apr '16 - Present]

*Department Academic Mentorship Program*

- Among the 6 selected out of 141 third year students to help academically weak students improve their academic standing
- Responsible for guiding 12 sophomore students to increase their overall performance and to help them cope up with the academics, hostel life and social culture in the institute
- Facilitating and improving faculty-student interaction within the department

*Students' Technical Activities Body*

- Planned and executed XLR8, institute's biggest annual technical competition, which saw 500 students participating, a 100% increase in participation from the previous year
- Pioneered weekly 'Informal Hangouts' sessions with video calls to share and discuss about various technical topics and successfully motivated people to take it up as a medium for technical discussions
- Pioneered 'How Things Work' sessions which accumulated very large enthusiastic audience and was subsequently adopted and followed by other bodies

## Key Technical Skills

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|-----------|-----------|--------------|-----------|-------------------|
| • Python  | • Java    | • C/C++      | • MATLAB  | • $\text{\LaTeX}$ |
| • Jekyll  | • SPICE   | • SolidWorks | • Arduino | • AutoCAD         |
| • Android | • Unity3D | • VHDL       | • HTML    | • OpenCV          |

## Relevant Coursework

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|--------------------|---|
| <b>Electrical</b>  | Network Theory, Analog Circuits, Digital Systems, Signals and Systems, Electrical Devices and Circuits, Electrical Machines and Power Electronics, Communication Systems, EM Waves, Probability and Random Processes, Digital Image Processing, Data Analysis and Interpretation, Microprocessors |
| <b>Mathematics</b> | Linear Algebra, Calculus, Complex Analysis, Ordinary and Partial Differential Equations, Matrix Computations, Optimisation Models   |
| <b>MOOCs</b>       | Machine Learning, Game Theory, Introduction to Marketing  |

## Extra-Curricular Activities

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### Technical

- Developed CoinRaider, an open-world game, on Unity3D for the Lenovo Game Jam [2015]
- Stood first in the annual physics quiz competition involving all year students of IITB [2015]
- Stood third representing Hostel-3 in the campus wide Logic General Championship [2015]
- Stood first representing Hostel-3 in the campus wide Electrical General Championship [2016]
- Built RF-controlled car and an RC plane for various competitions [2014]

### Miscellaneous

- Member of National Sports Organisation (NSO) Football and represented my hostel in the Football General Championship and Freshers Football League [2015]
- Proficient in playing Violin and Flute
- Can solve a 3x3x3 Rubik's cube in within 100 seconds