

# Arpit Aggarwal

COGNITIVE SCIENCE · SIGNAL PROCESSING · IoT

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## Education

### Birla Institute of Technology Mesra

B.E. IN MECHANICAL ENGINEERING | CGPA: 7.91/10

Ranchi, India

Jul. 2012 - May. 2016

#### INDEPENDENT COURSEWORK

- **Udacity** - Intro to Parallel Programming; Deep Learning.
- **Coursera** - Python for Everybody; Machine Learning; Algorithms: Design and Analysis; Audio Signal Processing for Music Applications.
- **edX** - Embedded Systems Shaping the World; Introduction to Computer Science.

## Research Experience

### MeitY, GoI - BIT Mesra

JUNIOR RESEARCH FELLOW | *Speech Based Access for Agricultural Commodity Price and Weather Information*

Ranchi, India

Dec. 2016 - Present

- Setup Asterisk based Voice Server for ASR based IVR.
- Collected phonetically rich Hindi (Jharkhandi) audio data of 1500 speakers in real time environment.
- Extracted real time agricultural commodity prices and weather information through web crawling.
- Used Kaldi for preparing ASR system and TTS for knowledge delivery.

### Bachelor's Thesis

TEAM MEMBER | *A.T.O.M. - A Tool for Music transcription*

Ranchi, India

Aug. 2015 - May 2016

- Prepared an audio-visual database of monophonic isolated guitar notes.
- Performed audio-visual recognition using ASP, CV & Machine Learning algorithms on MATLAB and Python.
- Designed a hardware prototype using Raspberry Pi.
- Developed the back-end architecture using Django, uWSGI, nginx and PostgreSQL on AWS EC2 instance.

### Birla Institute of Technology Mesra

SUMMER RESEARCH INTERN | *Study of changes in recognition efficiency of SVM for different free parameters*

Ranchi, India

May. 2015 - Jul. 2015

- Implemented Support Vector Machines for Spoken Digit Recognition and Text-Dependent Speaker-Identification on MATLAB.
- Developed a grid search algorithm for mapping changes in accuracy with changing kernels and their respective parameters.
- Analysed the relation between type of SVM, training:testing ratio and recognition accuracy of the network.

### Birla Institute of Technology Mesra

UNDERGRADUATE RESEARCH STUDENT | *Feed-forward neural networks for Hindi digit recognition*

Ranchi, India

Oct. 2014 - Nov. 2014

- Studied the basics of Machine Learning & Artificial Neural Networks.
- Implemented Feed-forward and Pattern-network on MATLAB for Hindi Digit Recognition.

## Key Projects

### Cognitive Interfaces

FOUNDER AND CHIEF ENGINEER | *Research & Development*

Bengaluru, India

Oct. 2016 - Present

- 3D reconstruction of Indian map using CesiumJS, SketchUp, Digital Globe and OSM.
- ASR and NLP with NodeJS backend for interaction in VR mode.
- Open data and 3D object visualization using MapServer, Map Tiler, Blender.

### Wrappup Inc.

MACHINE LEARNING INTERN | *Wrappid: Wrappup Inc.'s ASR and Audio Search Platform*

Dubai, UAE

Jun. 2016 - Sept. 2016

- Responsible for end to end development of platform.
- Designed phoneme recognition and keyword spotting models using SVM and DNN.
- Developed ASR framework using Python, Bash and C++.

## Dice Automations (Early Stage Startup)

Bengaluru, India

TECHNICAL LEAD | *Entrepreneurship and Product Development*

Dec. 2015 - Feb. 2016

- Developed product roadmap focusing on Home Automation, Healthcare, Logistics, Retail and Media industry verticals.
- Principal Engineer for hardware and server backend framework.
- Deployed a cloud application for IR Voice Remote using Google Voice API and NLP back-end.

## Jamalpur Locomotive Workshop

Jamalpur, India

RESEARCHER | *CTRB Bearing Defect Analyzer - Phase I*

Jul. 2015 - Sep. 2015

- Studied different faults and their causes in roller bearings.
- Designed a test rig to develop an IoT based sensor module to record vibrational signals for different faults.
- Studied BSS to extract vibrational signals of bearing elements in a mixed source problem environment.
- Studied the application of ANN, SVM based models to classify signals from good and faulty bearings.

## Texas Instruments Innovation Challenge India Design Challenge 2015

India

QUARTER FINALIST | *Development of a stand-alone speech recognition SoC to assist in mail and courier sorting*

Dec. 2014 - May. 2015

- Designed and fabricated a stand-alone voice recognition system to assist in sorting packages at various hubs.
- The system was an external attachment with pre-stored address and worked by identifying a spoken word, comparing it with the stored word and releasing an audible beacon upon finding a match. [\[Video Link\]](#)
- Patent filed on its extended application as an external attachment to everyday devices to assist in their location when lost.

## Publications

### PATENTS

1. "Apparatus and method for locating misplaced item," *Application number: 3135/DEL/2015.*

### JOURNALS

1. Tanvi Sahay, **Arpit Aggarwal** and Mahesh Chandra, "Location of Objects using Embedded Speech Recognition System," *IEEE Transactions on Emerging Topics in Computing*. [\[Under Review\]](#)

### CONFERENCES

1. **Arpit Aggarwal**, Rajeev Kumar, Tanvi Sahay and Mahesh Chandra, "GuiTones-I: An Audio Visual Database of Monophonic Guitar Tones," in *TENCON 2016-2016 IEEE Region 10 Conference*, Nov. 2016.
2. **Arpit Aggarwal**, Tanvi Sahay, Annu Bansal and Mahesh Chandra, "Grid Search Analysis of nu-SVC for Text-Dependent Speaker-Identification," in *2015 Annual IEEE India Conference (INDICON)*, Dec. 2015, pp. 1-5. [\[Best Paper Award\]](#) [\[IEEEXplore Link\]](#)
3. Tanvi Sahay, **Arpit Aggarwal**, Annu Bansal and Mahesh Chandra, "SVM and ANN: A Comparative Evaluation," in *Next Generation Computing Technologies (NGCT), 2015 1st International Conference on*, Sept. 2015, pp. 960-964. [\[IEEEXplore Link\]](#)
4. **Arpit Aggarwal**, Tanvi Sahay and Mahesh Chandra, "Performance Evaluation of Artificial Neural Networks for Isolated Hindi Digit Recognition using LPC and MFCC," in *Advanced Computing and Communication Systems, 2015 International Conference on*, Jan. 2015, pp. 1-6. [\[Best Paper Award\]](#) [\[IEEEXplore Link\]](#)

## Skills

### COMPUTER SCIENCE

- Python, C, C++,  $\text{\LaTeX}$ , JS.
- NodeJS, Django, nginx.
- SQL, PostgreSQL, SQLite.
- Linux [Debian based systems].
- Git, Bash, HTML5, CSS3.

### ELECTRONICS

- MATLAB, OpenCV.
- Keil  $\mu$ vision, CCS.
- ATMEL and TI  $\mu$ Controllers.
- Raspberry Pi, BeagleBone Black.
- EAGLE, ExpressPCB, KiCAD.

### MECHANICAL DESIGN

- AutoCAD, CATIA V5, Blender.
- ANSYS.
- OpenGL, WebGL.

## Extra Curricular Activities

- Semi-finalist iTech 2016 AR/VR Hackathon - Agriculture Challenge, ITC Bangalore.
- Designed a screen printing apparatus and solar powered LED lamp for residents of Vikas village, Ranchi, Jharkhand.
- Participated in IndiaHacks 2016 IoT Track and developed a voice controlled TV remote.
- Advisor to the President, Music Club, B.I.T. Mesra for the year 2015-16.
- Semi-finalist iTech 2015 IoT Hackathon, ITC Bangalore.
- Quarter-finalist TIIC IDC 2015, TI India.
- Participated in Annual Cultural Fest Bitotsav 2014 in Battle of Bands as Lead Guitarist of CrankCase.
- Built a Hydraulically Actuated Pick and Drop Mechanism from ice cream sticks for a robot in Pantheon 2013, B.I.T. Mesra.