Ajay Ramesh Ranganathan

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EDUCATION

Integrated Master of Technology in Electronics and Communication Engineering — Aug 2017 - July 2022

International Institute of Information Technology - Bangalore (IIIT-B)

- 8th Semester Student, CGPA : **3.51 / 4.0**

EXPERIENCE

Social Entrepreneur — Jan 2021 - Present

IIIT-B Innovation Centre — Prof. Madhav Rao

- Won the MEITY TIDE 2.0 ideation grant to develop a tactile audio device for students with visual impairments.
- A prototype is complete. Currently working on product development and accessibility to the visually impaired.
- Leading a team of two interns to design and develop new features for the product.

Summer Research Internship 2020 - Food Detection for Wearable Device — Jun 2020 - Nov 2020

The University of Alabama Tuscaloosa, USA — Prof. Edward Sazonov

- Detection of Food objects from egocentric wearable camera images using the YOLO object detection networks.
- Achieved significant improvement in detection performance by creating an ensemble of networks which are merged at the NMS step. I also applied various data-preprocessing techniques including blur image rejection, low light image enhancement and extensive data augmentation to boost performance on the real-world dataset.
- Integrated a segmentation pipeline using graph-cut to segment the parts of food on a plate post object detection.
- A technical paper of the project has been submitted to IEEE EMBC 2021.

Teaching Assistant — Aug 2020 - Nov 2020

Basic Electronics Lab Course — Prof. Madhav Rao

- Responsibilities included clarifying doubts and evaluating lab reports.

Summer Internship 2019 - Analog Laser Communication and Vibrometer System — May 2019 - Jul 2019

Indian Institute of Science Bangalore (IISc) — Prof. M M Nayak

- Designed and built circuits for optical modulation and demodulation of audio signals using a 5mW laser diode and solar cell. Also, demonstrated the use of the designed circuitry as a vibrometer system capable of detecting low-frequency surface vibrations.

PUBLICATIONS

- Ajay Ramesh, Nithin Raj, TK Srikanth, Madhav Rao. *Design of a Tactile Audio Gallery for Visually Impaired Students*. In Proceedings of IEEE Sensors 2019 Conference, Montreal, Canada. Paper
- Nithin Raj, Ajay Ramesh, TK Srikanth, Madhav Rao. *Live Demonstration: A Tactile Audio Gallery for Visually Impaired Students*. In Proceedings of IEEE Sensors 2019 Conference, Montreal, Canada. Paper

PROJECTS

Surgical Tool Characterization from Neurosurgical Videos — Sep 2020 -Present

Surgical and Assistive Robotics Lab IIIT-B — Prof. Madhav Rao

- Detection of surgical tools in videos of neurosurgical procedures using CNN-based object detection networks. Four commonly used tools were considered: Suction, Cusa, Bipolar and Dissection Forceps.

- Improved the frame-wise tool detection performance in videos using bounding-box matching and interpolation techniques to identify undetected tools in intermeditate frames and also correct false detections.
- Characterized the tools based on their on-off time/frequency, total usage time and motion trajectory in the surgical procedure. These characterizations are an important indicator of surgical skill.
- The project was undertaken in collaboration with the National Institute of Mental Health and Neuro-sciences, Bengaluru. A technical paper of the project has been submitted to IEEE EMBC 2021.

Malaria Parasite Detection in Thin Blood Smear Images Oct 2019 - Dec 2019

Machine Learning Course Prof. G Srinivasaraghavan

- Classification of malaria parasite-infected blood cells using machine learning and computer vision techniques.
- Feature extraction using the SIFT algorithm and the Bag of Visual Words along with contour and blob features.
- Design and training of a Convolutional Neural Network for classification and comparison of results with traditional techniques. Project

Face Recognition System using Eigenfaces April 2020 - May 2020

Visual Recognition Course Prof. J Dinesh

- Implemented a pre-processing pipeline involving face and eye detection in order to perform face-straightening and cropping. The eye detection was performed using Haar-based classifiers in OpenCV.
- Applied the PCA algorithm to extract eigen faces and perform face recognition. Project

Speech Dialect Classification Oct 2019 - Nov 2019

Digital Signal processing Course Prof. J Dinesh

- Classification of nine different dialects in the British English language using the speech corpus IViE dataset.
- Extracted Mel Frequency Cepstral Coefficients (MFCC) features and aggregated them at the audio level.
- Classified and compared the results using the KNN, SVM, and Logistic regression classifiers.

Tactile Educational Kit for Students with Visual Impairment Oct 2018 - Mar 2019

Surgical and Assistive Robotics Lab IIIT-B Prof. Madhav Rao

- Developed a low-cost tactile-audio device to assist in self-study of tactile diagrams for visually impaired students.
- Designed a capacitive sensor array integrated its response with an audio content delivery system.
- Programmed the Arduino microcontroller to receive sensor data via I^2C protocol and integrated a real-time RFID identification system for tactile diagrams. The work was presented and demonstrated at IEEE Sensors 2019.

For a complete list of my projects and courses, please visit my Portfolio

SKILLS

Programming Languages and Embedded Systems: Python • C++ • C • MATLAB • Arduino • RaspberryPi
Computer Vision and Deep Learning: OpenCV • Tensorflow • Keras • PyTorch
Tools: Git • Simulink • LaTeX • Multisim • LTspice • Mesa (Agent-based modelling)

POSITIONS OF RESPONSIBILITY AND VOLUNTEER WORK

Co-Organizer | Assistive Technology Exhibition IIIT-Bangalore

- Invited various companies across India to showcase novel assistive technology for persons with visual impairment.
- Drafted the structure and rules of the exhibition, and managed the logistics team.

IEEE HiPC Conference Volunteer 2018

- Volunteered for the registrations and logistics team of IEEE Conference on High Performance Computing. HiPC