

Arka Sadhu

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Education

- 2018–Present **PhD Computer Science.**
University of Southern California
Institute for Robotics and Intelligent Systems (IRIS)
Advisor: Prof. Ram Nevatia
CGPA -/-
- 2014–2018 **Bachelor of Technology in Electrical Engineering.**
Indian Institute of Technology Bombay
Honours in Electrical Engineering
Minor in Computer Science
CGPA 9.44/10

Research Internships

- May'18-Aug'18 **Automatic grading of TSM Images, Wadhvani Institute for AI,**
Supervised by Prof. Subhasis Chaudhuri, Rahul Panicker.
- Achieved state of the art performance on automatic grading of ZN Stained Tuberculosis Sputum Microscopy test. Analyzed different methods from patch-based classification to end-to-end neural segmentation. Proposed three network architectures for mobile computations with upto 94% F1-score. The best performing model gave a relative counting error of less than 5%.
 - Preparing to submit to ISBI 2019 and NIPS Workshop.
- May'17-July'17 **Media Forensics via Image Matching , University of Southern California,**
[\[Report\]](#) [\[Code\]](#), Supervised by Prof. Ram Nevatia.
- A spoofed image contains a scene image and a donor image. Aimed at recovering the scene image belonging to a set of world images.
 - Used feature extraction methods and clustering algorithms to identify the similar base images. Achieved around 85% accuracy on nimble dataset 2017 (publicly available) for baseline matching.
- May'16-July'16 **Robust Loop Closures, Aalto University,**
[\[Report\]](#), Supervised by Prof. Juho Kannala.
- Model 3D indoor environments using point cloud data from Google Tango.
 - Enforced loop closures using a new cost function to automatically refine and improve the geometry estimations.
 - Analyzed the role of switch variables to understand the contributions of different parts of the loss functions.

Notable Projects

- Mar'18-May'18 **Inference Networks for Structured Prediction Energy Networks**, *Course Project* [[Report](#)] [[Code](#)], Advisor: Prof. Sunita Sarawagi.
- A tensorflow implementation to perform multi-label classification experiments from the paper Learning Approximate Inference Networks for Structured Prediction. Performed further analysis on the knowledge base FIGMENT dataset. Further extended the paper to include WGAN like training and showed that the latter gave much more stable training curves.
- Sep'17-Apr'18 **Graph Convolution Networks for ECG analysis**, *Undergraduate Thesis* [[Code](#)], Prof. Subhasis Chaudhuri.
- Proposed new networks for analysis of ECG signals considering them as graph signals. Used Graph Convolutional Networks in conjunction with normal convolutional networks and achieved 96% accuracy and 94% f1 points on classification of myocardial infarction as well as classification of generalized anterior myocardial infarction.
- Aug'17-Nov'17 **Voice Conversion using GANs**, *Course Project* [[Report](#)] [[Code](#)], Advisor: Prof. Preethi Jyothi.
- Participated in the Voice Conversion Challenge 2018 in both parallel and non-parallel corpus track. Showed superior performance of voice synthesis using GANs and sentence embeddings of transcriptions and achieved mean opinion score of 3.8 which was a significant improvement over a simple Variational AutoEncoder.
- Aug'17-Nov'17 **Learning to Run:NIPS Challenge 2017**, *Course Project* [[Report](#)] [[Code](#)], Advisor: Prof. Shivaram Kalyanakrishnan.
- Explored standard algorithms from Deep Deterministic Policy Gradient to Proximal Policy Optimizations on the open simulator challenge to provide correct activation functions for the muscles of the skeleton allowing it to run. Our best model achieved score of 32 points. Also proposed a solution using reward shaping and made ablation studies on the effect of parameter noise and layer normalization at train time.
- Aug'17-Nov'17 **Neural Networks with Memory**, *Course Project* [[Code](#)], Advisor: Prof. Ganesh Ramakrishnan.
- Designed an OpenAI gym maze environment where the agent needs to collect a key and then open a door (a toy version of Montezuma's Revenge) with varying maze sizes. Experimentally verified that only deep networks with explicit memory (Memory Q-Network and Recurrent Memory Q-Network) are able to learn the optimal policy for a 7x7 grid.
- Mar'17-Apr'17 **Image Noise Modeling via Skellam Distribution**, *Course Project* [[Report](#)] [[Code](#)], Advisor: Prof. Ajit Rajwade.
- Modeled the noise characteristics of a DSLR-camera via difference based imaging of a colored chart. Used the model to perform background subtraction and edge detection and verified its usability in the wild.
- Oct'16-Nov'16 **Document Scanner via Image Stitching**, *Course Project* [[Report](#)] [[Code](#)], Advisor: Prof. Ajit Rajwade.
- Stitched images of overlapping parts of a large document to produce a high resolution picture. Implemented Homography Transformation, Multi-View Blending and Bundle Adjustment from scratch in python.
- May'15-Jul'15 **Virtual Reality Controller and Headset**, *Technical Project* [[Code](#)] [[Video](#)].
- Designed a low cost (~ \$20) headwear and controller for virtual reality applications. Demoeed it on the popular game of Counter-Strike. This won the Best Idea Project 2016 in the Technical and Research Exposition 2015, IIT Bombay.

Technical Skills

- **Programming Languages:** Proficient in: C++, Python, Matlab, Bash, Embedded-C, Assembly
- **Deep Learning Frameworks:** Pytorch, Tensorflow, Caffe.
- **Computer Vision Frameworks:** OpenCV, Scikit-Image, Scikit-Learn
- **Web Dev:** Javascript, Django, Laravel, Bootstrap

Academic and Technical Achievements

- Placed 3rd at the IFood Challenge which was a part of the FGVC5 (Fifth Workshop on Fine Grained Visual Categorization) as a part of CVPR 2018. [Code]
- Awarded Annenberg Graduate Fellowship at University of Southern California, 2018.
- Awarded Viterbi-India Scholarship to pursue research at Viterbi School of Engineering (summer'17)
- Awarded Aalto Research Assistant fellowship to pursue research at Aalto University (summer'16)
- Secured All India Rank 134 in JEE Advance 2014 among 1.5 lakh selected candidates.
- Received the Best Idea Award for our project on Virtual Reality at the Tech and RnD Expo 2015.

Key Courses Taken

Computer Vision	Natural Language Processing	Reinforcement Learning
Optimization	Automatic Speech Recognition	Adv Machine Learning
Graphics	Probability	Image Processing
Real Analysis	Discrete Structures	Matrix Computations
Markov Process	Adv Image Processing	Algorithms

Positions of Responsibilities

- Apr'16-Apr'17 **Web Manager**, *Student Technical Activities Body*, IIT Bombay.
○ Developed and Managed the Website of STAB IIT Bombay with other web applications.
○ Helped in development of OKSP (Online Knowledge Sharing Platform).
- June'15-Apr'16 **Convener Robotics Club**, *Student Technical Activities Body*, IIT Bombay.
Conducted sessions on robotics and talks on Augmented and Virtual Reality
- June'14-Apr'15 **Volunteer**, *National Service Scheme*, IIT Bombay.
Taught under privileged children in the Phulenagar Slum (3 hours per week).

Extra-curricular Activities

- Aug'15-Apr'16 **Course in Japanese Language**, *IIT Bombay*.
Learnt how to read and write Katakana, Hiragana and basic Kanji and helped in organization of Japanese events.
- May'15-Jun'15 **Android App Workshop**, *IIT Bombay*.
Attended 6 lectures on developing an android app from scratch.
- May'15-Jun'15 **Entrepreneurship Bootcamp**, *IIT Bombay*.
Attended 6 lectures from distinguished entrepreneurs on how to build a successful startup.