



Education

Indian Institute of Technology Madras, Chennai
Dual Degree B.Tech.(Honors) & M.Tech. in Electrical Engineering
Minor in Robotics

CGPA : 9.32/10
2013–2018

Navrachana School, Vadodara
Class XII CBSE

95.6%
2013

Coursework

Computer Science & Signal Processing: Image Signal Processing¹, Deep Learning¹, 3D Computer Vision^{1 2}, Machine Learning for Computer Vision¹, Data Structures and Algorithms, Convex Optimization^{1 3}, Computer Organization, DSP Architectures for Embedded Systems¹, Microprocessor Laboratory, Digital Signal Processing

Photonics and Optics: Optical Signal Processing¹, Electronic and Photonic Nanoscale devices¹, Introduction to Photonics¹

Robotics and Control: Introduction to Robotics, Non Linear Control Systems¹, Flight Control Systems^{1 2}, Control Engineering

Mathematics: Probability, Statistics and Stochastic Processes, Linear Algebra and Numerical Analysis, Functions of one Variable, Functions of several variables, Game Theory^{1 3}, Mathematical Finance

Skills

Languages: C, C++, Python, MATLAB, Lua, Verilog

Libraries & Tools: TensorFlow, Torch, PyTorch, SciLab, OpenCV, PIL, OpenNI, Kinect SDK, Unity 3D, L^AT_EX

Hardware: Raspberry Pi, Arduino, Microsoft Kinect, Xilinx Spartan-3E

Academic Research and Course Projects

Blurred Image to Video Generation

Jun'17-Present

Guide : Prof. A.N. Rajagopalan

IIT Madras

- Developed an approach to extract a temporally consistent sequence of clean frames from a single motion blurred image and set a baseline for the novel task
- Extensively studied areas of deblurring, future frame prediction, optical flow estimation and experimented with Generative Adversarial Networks, Spatial Transformer Networks and Recurrent Neural Networks
- Proposed a novel approach to train a Video AutoEncoder using a modified version of Convolutional LSTMs and trained a blurred image encoder to match feature generated by video encoder
- Trained the network on GoPro dataset which has both camera motion and independent object motion. Tested the network on standard deblurring datasets and blurred images obtained from the internet
- Manuscript to be submitted to European Conference on Computer Vision ECCV 2018

Unconstrained rectification of Rolling Shutter effect in Videos

Dec'17-Present

Guide : Prof. A.N. Rajagopalan

IIT Madras

- Designed a novel network to perform rectification of rolling shutter effect on realistic videos
- Created a realistic dataset for scenes with rolling shutter effect to enable training of deep networks.
- Achieved state-of-the-art performance on rectification of videos with camera motion and show results on rectification of dynamic scenes for the first time in literature
- Manuscript to be submitted to European Conference on Computer Vision ECCV 2018

Defocus Map Generation

Jul'17

Guide : Prof. A.N. Rajagopalan

IIT Madras

- Addressed the problem of obtaining an optical blur based binary segmentation map of a 3D scene
- Trained a patch-level and an image-level CNN to classify blur. MRF and matting used to refine the map
- Manuscript submitted to ICIP 2018

3D Reconstruction System

Oct'16-Jan'17

Guide : Prof. Radim Šára

Czech Technical University in Prague

- Developed a system to reconstruct 3D scenes using images captured from an internally calibrated camera
- Estimated the Essential Matrix for each pair of images using the five point algorithm and refined it by minimizing Sampson

¹Graduate Level Course

²Done at Czech Technical University in Prague, Czech Republic

³Ongoing course

- reprojection error ; The optimal matrix was obtained using RANSAC
- Performed stepwise gluing to obtain camera positions and obtained the point cloud

🔗 **Enhanced Scaling free CORDIC**

Apr'17-May'17

Guide : Prof. K. Sridharan

IIT Madras

- Did literature survey on Coordinate Rotation Digital Computer (CORDIC) which is used to implement rotations and vector operations for graphics and signal processing applications and implemented a variant on an FPGA
- Simulated an approach which used radix-4 Booth Recoding with domain folding and adaptive iterations to avoid scale compensation; Obtained a 30% decrease in number of occupied slices

🔗 **All Optical Digital to Analog Convertor**

Oct'17-Nov'17

Guide : Prof. Deepa Venkitesh

IIT Madras

- Simulated a 2-bit and 3-bit all optical digital to analog converter using non linear optical loop mirrors (NOLM)

Industrial Research Experience

Virtual Cognitive Mirror

May'16-Jul'16

IBM Research Lab, India

- Developed innovative algorithms using machine learning and image processing techniques to detect neck feature points in a face image and overlay a necklace image accurately without use of expensive depth sensors
- Project was part of a product to give suggestions and improvise the jewellery buying experience. Was named a co-inventor in a patent filed at US PTO

Surveillance Camera Video Enhancement

May'15-Jul'15

Matrix ComSec R&D, India

- Extensively studied various image enhancement techniques like edge enhancement, gamma correction, lens distortion correction and implemented algorithms on the TI DM38x media processor for security camera video enhancement
- Obtained quality enhancement on 3MP stream, improved the motion detection functionality and implemented a TripWire functionality to detect intruders

Projects at Centre for Innovation, IIT Madras

Robot Navigation using Kinect

May'14-Jun'14

Centre for Innovation

IIT Madras

- Developed a system to locate a robot in an area using trilateration and control it autonomously using Kinect Sensor
- Used RGB-D information to identify markers, plan trajectory and actuate via an Arduino Microcontroller

Kinect Meets DJ

Aug'14-Jan'15

Centre for Innovation

IIT Madras

- Developed an intuitive user centric system where music is generated using gestures captured using a Kinect Sensor
- Programmed a 3D character using Unity3D to replicate movements, play music and dance in tune with gestures
- Showcased it in front of 2500+ people during Envisage 3.0, India's largest student-run techno-entertainment show

Teaching Experience

Project Mentor

Jan'18-Present

EE5121 : Image Signal Processing

IIT Madras

- Assisted professor in coming up with new assignments, conducting viva and evaluation.

Teaching Assistant

Jun'17-Nov'17

PH1010 : Physics I

IIT Madras

- Assisted professor in conducting classes, tutorials and examinations on topics in non-relativistic mechanics

Academic and Extra Curricular Achievements

- **Department Topper 2015-16** : Awarded the Kolluri Memorial Prize for best Academic record in Electrical Engineering in 3rd Year with a GPA of 9.75
- **Semester Abroad** : Among 8 selected from IIT Madras for a semester exchange at Czech Technical University in Prague from Sep'16 to Jan'17
- **IIT - Joint Entrance Examination Advanced 2013** : Ranked 1074 among more than 150,000 candidates
- **Robotics Competitions** : Part of a team that won in many technical events in the campus like , 1st in Autonomous Robotics (TechSoc'15), 1st in RoboCup (Wavez'15), 2nd in Manual Robotics (Shaastra'14)
- **Hindustani Classical Music** : Completed Madhyama Purna (Diploma) level in Hindustani Classical Vocals in 2009