

# Shwetha Ram

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## AREAS OF INTEREST

Computer Vision, Graphics, Image-based Rendering, Image Processing, Image and Video Compression, Machine Learning, Deep Learning, Virtual/ Augmented/ Mixed Reality

## EDUCATION

**University of California Santa Barbara** 2015-17

*M.S, Electrical and Computer Engineering*

- Advisor: Prof. Matthew Turk

**National Institute of Technology Karnataka, Surathkal** 2011-15

*B. Tech in Electrical and Electronics Engineering*

CAMPUS INVOLVEMENT AND AFFILIATIONS: Robotics Club, Executive member of NITK IEEE student chapter, EE committee of the annual technical fest, Volunteer of The Society for Promotion of Indian Classical Music and Culture Amongst Youth and performer at their festival, 'ARADHANA'.

## WORK EXPERIENCE

**Senior Software Dev – Image Tech R&D** Jan 19-Present

*Image Technology Incubation, Advanced Technology Group, Dolby Laboratories Inc.*

**Software Dev – Image Tech R&D** March 17-Dec 18

*Image Technology Incubation, Advanced Technology Group, Dolby Laboratories Inc.*

Algorithm development and prototyping to enable immersive A/V/MR experiences. I'm working on volumetric video capture, format, compression, rendering to achieve the goal of transforming video from a 2D display to a 3D volume in which the user feels present.

- Depth Image Based Rendering, lens un-distortion, lens ghosting correction, stereo rendering, boundary artifact correction
- Light Field Capture from array of cameras. Content generation from Unreal Engine and Blender.
- Volumetric Video format
- Compression and Quality Evaluation: Optimizations to stream large amounts of data within limits of available HW. Conducted rate-distortion experiments with HM-360Lib, FFMPEG and proposed metrics for volumetric video quality, extending current MPEG-I metrics for 360 video to 6 DOF.
- Captained team Eye2Eye (correct perspective video conferencing to enable eye contact) that won Innovation Leadership Award, Field of Dreams Peer Award and a Special Mention from Communications Group at Dolby IdeaQuest 2018.

**Image Processing Intern** June-Dec 16

*Image Technology Incubation, Advanced Technology Group, Dolby Laboratories Inc.*

- Prototyped Depth Image Based Rendering for a Cinematic Virtual Reality Application.
- Resolved several view synthesis artifacts to generate realistic views.

## RESEARCH

### **M.S Project**

2017

*Title: Retargeting Virtual Worlds*

*Committee: Prof. Matthew Turk, Prof. Tobias Hollerer, Prof. Pradeep Sen*

This project addressed the problem of presenting a VR experience to a user in the comfort of the living room by proposing a scheme to ‘retarget’ a virtual world to a given physical environment. Semantic relationships between objects are extracted from the virtual world. The retargeting aims to position the virtual world objects such that these semantic relationships are preserved and the match with the geometry of the physical environment is maximized. This retargeting scheme was successfully applied to retarget different virtual worlds to a real world physical environment.

### **Summer Research Fellowship, Indian Academy of Sciences**

May-July 14

*Computer Vision and Artificial Intelligence Lab, Indian Institute of Science*

*Title: Pro-Cam Display Systems*

Advisor: Prof. K R Ramakrishnan

Implemented a projector-camera display system with hand-held display units. The display content projected by the projector was compensated to fit the display units and suit the view-point of the camera. The system could support dynamic motion of any number of display units, provided they fit within the area of projection.

### **Summer Internship**

May-July 13

*Computer Vision and Artificial Intelligence Lab, Indian Institute of Science*

Advisor: Prof. K R Ramakrishnan

Developed a KINECT-based virtual percussion system to accompany a classical dancer. A Kinect was used to track the foot movements of the Bharatanatyam (a South Indian classical dance) dancer and playback a suitable Mridangam (a percussion instrument) sound.

## PATENTS AND PUBLICATIONS

### **Multi-Resolution Multi-View Video Rendering**

*U.S. Patent Application 62/813,527. Filed March 4, 2019. Patent Pending.*

### **Computer interaction based on voluntary ocular motility for the physically challenged**

*S. Ram and P. Kalwad, 2013 IEEE Global Humanitarian Technology Conference: South Asia Satellite (GHTC-SAS), Trivandrum, 2013, pp. 191-195.*

## ACHIEVEMENTS

- Captained team Eye2Eye that won Innovation Leadership Award, Field of Dreams Peer Award and a Special Mention from Communications Group at Dolby IdeaQuest 2018.
- Winner of technical poster presentation at Grace Hopper Celebration of Women in Computing India 2014. Poster Title: ‘A Visual Cryptography based scheme for Digital Watermarking’
- Selected for the Council for Scientific and Industrial Research Programme on Youth for Leadership in Science.

## OTHER KEY PROJECTS

### **Circuit Reconstruction from EM Images**

*Deep Learning (CS291K) Course Project, taught by Prof. Xifeng Yan*

- Used a Convolutional Neural Network as a pixel classifier to address 2D segmentation of ssTEM image stacks. Segmentation is often the first stage in the process of mapping 3D brain structure and connectivity.
- Successfully trained a CNN to take raw pixel values in a square window centered around each pixel as input and output the probability of that pixel being a non-membrane. The label of each pixel (membrane or non-membrane) was predicted by post-processing the output of our Convolutional Neural Network.

### **Photon Mapping**

*Advanced Image Synthesis (ECE 594Q) Course Project, taught by Prof. Pradeep Sen*

- Implemented Photon Mapping, a two-pass rendering algorithm that approximately solves the rendering equation by tracing light rays from the light source and the camera.
- Presented sample renders to demonstrate that PM can handle caustics and diffuse inter-reflections well.

### **Image Registration**

*Digital Image Processing (ECE 278A) Course Project, taught by Prof. B. S. Manjunath*

- Implemented an algorithm to register images of a scene taken from different viewpoints and stitch them together to form a panorama.
- Used SIFT, RANSAC and Normalized DLT to solve this problem.

## TEACHING

### **PHY 127AL Analog Electronics**

*UC Santa Barbara Department of Physics – Spring 2016*

Supervisor: Prof. Andrea Young

- Teaching Assistant
- Responsibilities included supervising weekly labs, grading lab reports, HWs and exams, debugging circuits and changing fuses when called for.

## MENTORING AND OUTREACH

### **Volunteer, Greene Scholars Program**

Greene Scholars Program (GSP) is focused on increasing STEM engagement for African American youth. I work with them as a volunteer in various capacities that include conducting mock interviews on Career Day, reviewing project proposals and judging the Annual Science Fair.

### **Volunteer Member, San Jose Astronomical Association**

I volunteer for the SJAA Loaner Program, star parties and some solar observing events. This involves loaning out equipment and explaining the operation, setting up telescopes for viewing and interacting with the public.

**Beta Tester, Coursera**

Exploring Coursera courses before they open to the public and providing feedback for improvement.

**Backpack Builder, Family Giving Tree**

Helping fill backpacks with supplies for children from low-income families in Silicon Valley through Dolby Cares.

**Children's Playhouse Builder, Habitat for Humanity Silicon Valley**

Helping build children's playhouses and presenting to a local family onsite through Dolby Cares.

**REFERENCES**

- **Prof. Matthew Turk**  
President, TTIC  
Professor Emeritus  
Department of Computer Science  
Media Arts and Technology Program  
University of California, Santa Barbara
- **Prof. K R Ramakrishnan**  
Retired Professor  
Department of Electrical Engineering  
Indian Institute of Science, Bangalore
- **Prof. Panduranga Vittal K**  
Department of Electrical and Electronics Engineering  
National Institute of Technology Karnataka, Surathkal