

MAHTAB SANDHU

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SUMMARY

- Interdisciplinary engineer with skills and practice in Computer Vision, Robotics and Machine Learning
- Worked in and led collaborative projects, resulting in 4 peer-reviewed publications.
- Deep understanding and experience of Perception Stack for Autonomous driving.
- Self-motivated, problem-solving and collaborative with excellent communication skills
- Looking to contribute to Advanced driver-assistance systems (ADAS) projects

RESEARCH EXPERIENCE

Siemens PLM

Engineer

Aug 2019 to present

- Sensor Calibration: Automating the Calibration process for Lidar and cameras
- Improving Learned Dense depth by leveraging sparse ground truth depth
- Improving 3d object detection by using Pseudo Lidar depths
- Using Graph Convolution Networks for Optimal Ride Sharing
- Working on ADAS Perception tool Chain
- Handling customer queries and requests

Robotics Research Center

Research assistant

IIIT-Hyderabad

Aug 2016 to July 2019

- Primarily involved with the perception team working on the autonomous car effort.
- Developing a deeper understating of road scenes using a graph convolution network.
- High speed Motion Model model segmentation using Spectral Clustering.
- Developed a light weight Object detection method.
- Mentored students
- These projects led to 4 publications

EDUCATION

- B.Tech and MS by Research in Electronics and Communications Engineering, IIIT-Hyderabad

PUBLICATIONS

- **Understanding Dynamic Scenes Using Graph Convolution Networks**

Published in International Conference on Intelligent Robots and Systems (IROS 2020)

Mahtab Sandhu, Sravan Mylavarapu*, Priyesh Vijayan, K Madhava Krishna, Balaraman Ravindran, Anoop Namboodiri*

- **Towards Accurate Vehicle Behaviour Classification With Multi-Relational Graph Convolutional Networks**

Published in 2020 IEEE Intelligent Vehicles Symposium (IV'20)

Sravan Mylavarapu, Mahtab Sandhu, Priyesh Vijayan, K Madhava Krishna, Balaraman Ravindran, Anoop Namboodiri

- **Fast Multi Model Motion Segmentation on Road Scenes**

Published in 2018 IEEE Intelligent Vehicles Symposium (IV'18)

Mahtab Sandhu, Nazrul Haque, Avinash Sharma, K Madhava Krishna and Shanti Medasani

- **Motion Segmentation Using Spectral Clustering on Indian Road Scenes**

Accepted in Workshop On Autonomous Navigation in Unconstrained Environments (AutoNue, ECCV 2018)

Mahtab Sandhu, Sarthak Upadhyay, Prof Madhav Krishna and Shanti Medasani

TECHNICAL SKILLS

- **Programming:** ◦ C ◦ C++ ◦ Python ◦ Bash ◦ Latex
- **technologies:** ◦ Pytorch ◦ Tensorflow ◦ ROS ◦ MATLAB ◦ PCL ◦ OpenCV ◦ GIT ◦ Docker

SELECTED PROJECTS

- **Graph Convolution Networks for Optimal Ride Sharing** | Siemens 2020 -current
Constructing graphs for Localized Spatio-temporal information of Ride sharing demand and predicting the next time step using a Spatio temporal GCN.
- **Dense Depth Prediction and correction** | Siemens 2020 - current
Correcting Learned Dense Depth from deep learning based methods by using Lidar data as anchor points.
- **Joint Sensor calibration** | Siemens 2020
End-to-End Automated Camera(s) and Lidar(s) Calibration followed by pair wise optimization the calibration for improved accuracies.

- **ROS based perception pipeline** | Siemens 2020
Integrating current SOTA for object detection, tracking and SLAM in one single ROS based deploy able pipeline.
- **Developing deeper understanding of Road Scenes Using Graph Convolutions Networks** | Research project
Generating Spatio-temporal Scene graphs from monocular video sequences for classifying vehicle's on road Behaviour .
- **Unsupervised Motion Segmentation** | Research project
Explored the possibility of using re-projection loss as an unsupervised method for Monocular motion segmentation
- **Real time Obstacle Detection** | Research Project Mar 2017 – May 2017
Detecting possible obstacles using stereo cameras in real time for an autonomous car.
- **Motion Planning Algorithm On a Turtlebot** | Intro to Robotics, Spring 2017
Implemented A star, RRT and Dijkstra for motion planning of a turtle bot in ROS .
- **Non-holonomic Trajectory Planning** | Mobile Robotics, Monsoon 2016
Generate a kinematically feasible smooth trajectory for a differential drive robot using the Bernstein basis.
- **EKF Localization** | Mobile Robotics, Monsoon 2016
Implemented Extended Kalman Filter (EKF) SLAM in Matlab.
Pixel level foreground and background segmentation Spring 2017 Pixel level Segmentation using Convolutional Neural Networks to get a foreground mask.
- **Multiple exposures and merging photographs - HDR** | Monsoon 2016
With a known response function and dynamic range, we find the exposures that would result in a set of images that when combined would emulate an effective camera with a desired dynamic range and a desired response function.

TEACHING AND MENTORING EXPERIENCE

- July 2018 - Dec 2018, Head Teaching Assistant
Digital Signal and Microprocessors, IIIT-Hyderabad, India.
- May 2018 - July 2018, Teaching Assistant
Computer Vision and Deep Learning, Robotics Research Center, IIIT-Hyderabad, India
- Mentored and Introduced students to research in Computer Vision and Robotics

AWARDS AND ACHIEVEMENTS

- Qualified for the 2015 ACM-ICPC Amritapuri Onsite Regionals
- Dean's List Awardee for Undergrad Research

SELECTED COURSES

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| ◦ Computer Vision | ◦ Mobile Robotics |
| ◦ Statistical Methods in A.I | ◦ Linear ◦ Algebra |
| ◦ Data Structures | ◦ Algorithms and OS |
| ◦ Intro to Robotics: Mechanics and Control | ◦ Probability and Random Process |
| ◦ Digital Image processing | ◦ Information Theory and coding |
| ◦ Signal and systems | ◦ Computer System Organization |
| ◦ Embedded Hardware Design | |