





# Udit Singh Parihar

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Bangalore, India

## EDUCATION

<b>International Institute of Information Technology</b> <i>MS By Research Computer Science; GPA: 8.67/10.00</i>	Hyderabad, India 2019 – 2021
<b>Indian Institute of Technology</b> <i>B. Tech Mechanical Engineering; GPA: 7.1/10.0</i>	Jodhpur, India 2014 – 2018

## RESEARCH PUBLICATIONS

- 1. Estimation of Appearance and Occupancy Information in Bird's Eye View from Surround Monocular Images**   
*International Conference on Robotics and Automation (ICRA), Autonomy 2.0, 2022*  
Sarthak Sharma, Unnikrishnan R. Nair, **Udit Singh Parihar**, Midhun Menon S and Srikanth Vidapanakal
- 2. RoRD: Rotation-Robust Descriptors and Orthographic Views for Local Feature Matching**   
*International Conference on Intelligent Robots and Systems (IROS), 2021*  
**Udit Singh Parihar\***, Aniket Gujarathi\*, Kinal Mehta\*, Satyajit Tourani\*, Sourav Garg, Michael Milford and K. Madhava Krishna
- 3. Early Bird: Loop Closures from Opposing Viewpoints for Perceptually-Aliased Indoor Environments**   
*International Conference on Computer Vision Theory and Applications (VISAPP), 2021*  
Satyajit Tourani\*, Dhagash Desai\*, **Udit Singh Parihar\***, Sourav Garg, Ravi Kiran Sarvadevabhatla, Michael Milford and K. Madhava Krishna
- 4. Topological Mapping for Manhattan-like Repetitive Environments**   
*International Conference on Robotics and Automation (ICRA), 2020*  
Sai Shubodh Puligilla\*, Satyajit Tourani\*, Tushar Vaidya\*, **Udit Singh Parihar\***, Ravi Kiran Sarvadevabhatla and K. Madhava Krishna

## WORK EXPERIENCE

<b>OLA Electric</b> <i>Computer Vision and SLAM Research Engineer</i>	Bangalore, India Aug 2021 – Present
<b>Autonomous agent development:</b>	
<ul style="list-style-type: none"><li>Developed an end to end autonomous driving agent using cameras, GPS and IMU sensors</li><li>Ported the agent from Carla simulator to NuScenes Dataset</li><li>Converted the pytorch model to TensorRT and developed a ROS wrapper to run on real Mahindra E2O car achieving final control prediction at 25 HZ, in a zero shot paradigm</li></ul>	
<b>Lidar based mapping and localization:</b>	
<ul style="list-style-type: none"><li>Extended the Lidar based SLAM LeGO-LOAM for the Ouster lidars and ported ROS1 to ROS2 in C++</li><li>Calibrated the Lidar and IMU/GNSS sensors for extrinsic calibration</li></ul>	
<b>Kaggle Image Matching Challenge:</b>	
<ul style="list-style-type: none"><li>Won the silver medal in the Kaggle Image Matching Challenge 2022</li><li>Developed an Ensemble of Deep feature matching algorithm of SuperGlue and LoFTR</li></ul>	
<b>Development of Self Supervised Monocular Depth Estimation Network:</b>	
<ul style="list-style-type: none"><li>Trained PackNet-SfM on indian driving dataset and on Carla simulator dataset</li><li>Converted the pytorch model to TensorRT to achieved 28 FPS and developed a ROS wrapper around the model</li></ul>	

## PROJECTS

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### Feature matching under extreme viewpoint | [Project Page](#)

*Accepted at IROS 2021*

- Proposed rotation invariant deep feature descriptors and matching via orthographic view generation to enhance descriptor quality
- Achieved twice the recall rate in Image Retrieval task and 80 % reduction in Rotation Error compared to state of art

### Place recognition from opposite viewpoint | [Paper Link](#)

*Accepted at VISAPP 2021*

- Developed a Visual Place Recognition algorithm to detect places from 180<sup>0</sup> opposite viewpoints, using a novel idea to localize based on floor signatures
- Incorporated our VPR pipeline into SLAM system to allow map reconstruction from 180<sup>0</sup> opposite robot viewpoint

### SLAM on feature-less environment | [Project Link](#)

*Accepted at ICRA 2020*

- Used semantics understanding for assisting loop closure detection and localization
- Implemented our algorithm using libraries RTAB-Map, PCL, g2o, OpenCV on p3dx bot using RGB-D Sensor, IMU and wheel odometry

### Tutorial on Pose Graph Optimization | [Project Link](#)

*Teaching Assistant in Mobile Robotics course | Sep 2020*

- Created Open source tutorials for 2D pose graph optimization with loop closure and 3D pose graph optimization with landmarks using g2o library
- Obtained more than 50 stars and forks on GitHub for the tutorials

### Development of Robotics Toolbox | [Project Link](#)

*Mobile Robotics Coursework | Aug 2019*

- Implemented Bundle Adjustment from scratch. Compared performance of Gauss Newton and LM algorithm for optimization
- Implemented Extended Kalman Filter algorithm on the standard "Lost in the Woods" dataset

### Development of Parallel Computing Toolbox | [Project Link](#)

*Parallel Scientific Computing Coursework | Jan 2019*

- Implemented PCA algorithms for image compression using C++/Cuda. Compared performance against MATLAB standard PCA implementation
- Implemented parallel Monte Carlo algorithm for calculation of digits of  $\pi$  using OpenMP and MPI

## SKILLS

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**Programming:** C++, Python, C, MATLAB

**Libraries:** PyTorch, Keras, CUDA, ROS1/ROS2, G2O, GTSAM, TensorRT

## RELEVANT COURSEWORK

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**Major coursework:** Computer Vision, Mobile Robotics, Topics in Applied Optimization, Introduction to Parallel Programming, Deep Learning Theory and Practices, Probability and Statistics, Programming and Data Structures