Karnik Ram

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EDUCATION	**Technical University of Munich**	2023 -

ELLIS PhD
Supervised by Prof. Daniel Cremers and Prof. Max Welling (UvA)

International Institute of Information Technology, Hyderabad (IIIT-H)   2018 - 2021
M.S. by Research in Computer Science & Engineering
Supervised by Prof. K. Madhava Krishna
Thesis: Robust plane-based visual-inertial odometry for dynamic environments
Ritesh Tiwari Outstanding MS Thesis Award, IIIT-H
GPA: 9.50/10

Anna University, SSN College of Engineering, Chennai   2013 - 2017
B.Eng. in Electronics & Communication Engineering
Best Senior Year Project Award, ECE Dept.
GPA: 7.20/10

PUBLICATIONS

RP-VIO: Robust Plane-based Visual-Inertial Odometry for Dynamic Environments ⚭
Karnik Ram, Chaitanya Kharyal, Sudarshan S. Harithas, K. Madhava Krishna
International Conference on Intelligent Robots and Systems (IROS), 2021

From Variance to Veracity: Unbundling and Mitigating Gradient Variance in Differentiable Bundle Adjustment Layers
Swaminathan Gurumurthy, **Karnik Ram**, Bingqing Chen, Zachary Manchester, J Zico Kolter
IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2024

Robot Safety Monitoring using Programmable Light Curtains ⚭
Karnik Ram, Shobhit Aggarwal, Robert Tamburo, Siddharth Ancha, Srinivasa Narasimhan
In submission (IROS '24)

Learnable Spatio-Temporal Map Embeddings for Deep Inertial Localization ⚭
Dennis Melamed, **Karnik Ram**, Vivek Roy, Kris Kitani
International Conference on Intelligent Robots and Systems (IROS), 2022

CalibNet: Geometrically-Supervised LiDAR-Camera Extrinsic Calibration using 3D Spatial Transformer Networks ⚭
Ganesh Iyer, **Karnik Ram**, J. Krishna Murthy, K. Madhava Krishna
International Conference on Intelligent Robots and Systems (IROS), 2018

INFER: Intermediate Representations for Future Prediction ⚭
Shashank Srikanth, Junaid Ahmed Ansari, **Karnik Ram**, Sarthak Sharma, J. Krishna Murthy, K. Madhava Krishna
International Conference on Intelligent Robots and Systems (IROS), 2019

PathFinder: Designing a Map-less Navigation Robot for Blind People in Unfamiliar Buildings ⚭
Masaki Kuribayashi, Tatsuya Ishihara, Daisuke Sato, Jayakorn Vongkulbhisal, **Karnik Ram**, Seita Kayukawa, Hironobu Takagi, Shigeo Morishima, Chieko Asakawa
CHI Conference on Human Factors in Computing Systems, 2023

WORK
EXPERIENCE

Carnegie Mellon University   Oct 2022 - Aug 2023
Research Associate, Robotics Institute
Advisor: Prof. Srinivasa Narasimhan
- Worked with programmable light curtains (PLC), a novel controllable depth sensor. ⚭
- Worked on using PLC for building a safety monitoring system, and for active robot perception.

Carnegie Mellon University   Aug 2021 - Oct 2022
Research Associate, Robotics Institute
Advisor: Prof. Kris Kitani
  - Worked on a low-drift inertial odometry algorithm using map prior information (IROS '22).
  - Implemented a camera-less localization algorithm on a smartphone for indoor navigation.
  - Worked on a map-less navigation robot for assisting the visually impaired (CHI '23).

International Institute of Information Technology, Hyderabad   Aug 2018 - Aug 2021
Graduate Research Student, Robotics Research Center
Advisor: Prof. K. Madhava Krishna
  - Developed a plane-based monocular visual-inertial odometry algorithm and a dataset for dynamic environments (IROS '21).
  - Worked on trajectory prediction using intermediate semantic representations (IROS '19).

Google Summer of Code ⚲
Student Developer, Mobile Robot Programming Toolkit   Summer 2018
  - Developed a self-contained GUI app for the extrinsic calibration of depth sensors.
  - Implemented extrinsic calibration algorithms based on plane and line matching.

International Institute of Information Technology, Hyderabad
Research Intern, Robotics Research Center   May 2017 - April 2018
Advisor: Prof. K. Madhava Krishna, J. Krishna Murthy
  - Worked on a deep network with geometric supervision for target-less LiDAR-camera extrinsic calibration (IROS '18).
  - Implemented a target-based LiDAR-camera extrinsic calibration algorithm.

SYSTEMS PROJECTS	Smartphone-based Indoor Navigation

Smartphone-based Indoor Navigation
  - Implemented a real-time deep IMU and BLE based localization system on a smartphone.
Janitorial Mobile Robot
  - Implemented indoor navigation on a mobile robot for pick-and-place janitorial tasks.
Automated Stock-counting Quadcopter
  - Implemented on-board navigation on a custom-built drone using optical-flow based odometry.

AWARDS
  - **Ritesh Tiwari Outstanding MS Thesis Award**, IIIT Hyderabad ⚲   2021
  - **Best Senior Year Project Award**, ECE Department, SSN-CE   2017
  - **Top 3** out of 136 teams in the ARTPARK Robotics Challenge, IISc ⚲   2022
  - **First place**, inter-college image processing based robotics event, Anna University   2016
  - **Top 10** out of 144 teams in the "Apps for Chennai Challenge"   2015

RELEVANT COURSEWORK
Graduate: Mobile Robotics, Computer Vision, Machine Learning, Topics in Applied Optimization.
Undergraduate: Robotics & Automation, Digital Image Processing, OOP & Data Structures, Computer Architecture, Probability & Random Processes, Embedded & Real Time Systems

ADDITIONAL COURSES
ETH Robotics Summer School, ETH Zürich ⚲   July 2019
2-week summer school on autonomous ground robot navigation with talks, hands-on lectures and exercises, and a competition. 53 selected participants from 15 countries. Awarded full travel grant.
Committee: Cesar Cadena, Marco Hutter

TEACHING EXPERIENCE
CSE 483 Mobile Robotics ⚲   Fall 2019
International Intitute of Information Technology, Hyderabad
Designed five new assignments and exams along with regular responsibilities as head teaching assistant with Prof. K. Madhava Krishna.

3D Computer Vision Workshop ⚲ Feb 2020

International Institute of Information Technology, Hyderabad

Instructor for the multiple view geometry hands-on session for a large professional audience.

SERVICES
- Served as a reviewer in the SLAM track for IROS 2021, 2022
- Served as a co-chair for the VI-SLAM session at IROS 2021
- **Lab systems administrator** for the compute cluster at RRC, IIIT Hyderabad 2020-21
- Conceived, developed, and maintained **The SSN App**, the official Android app of SSN-CE 2014-17

TECHNICAL
SKILLS

Tools & Libraries: OpenCV, ROS, PyTorch, Ceres Solver, Eigen, Git | Familiar: iOS, Qt, Android

Programming Languages: C++, Python | Familiar: Swift, Java