

# PatathKartik

ROBOTICS RESEARCH ENGINEER · AI/ML SPECIALIST

San Francisco Bay Area, CA

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*"Robotics Research Engineer with 4 years applying perception for autonomous vehicles, specializing Localization, SLAM, and production-ready robotics frameworks"*

## Field(s) of Interest

Perception, Localization and Mapping, Deep Learning, Robotic systems engineering

## Education

**Worcester Polytechnic Institute (WPI)**

MA, USA

Masters of Science in Robotics Engineering CGPA - 4/4

August 2019 - May 2021

## Core Technical Skills

<b>Programming Languages</b>	Python (Prototype/Production), C++ (Real-time Systems)
<b>ML/AI Frameworks</b>	TensorFlow, PyTorch, Transformers
<b>Robotics &amp; Perception</b>	ROS, SLAM, Computer Vision, Sensor Fusion
<b>Production &amp; Deployment</b>	Git, Docker, GCP, AWS, Large-scale Data Processing pipelines, CI/CD
<b>Computer Vision &amp; SLAM</b>	GTSAM, ORB-SLAM, Visual Odometry, 3D Reconstruction

## Professional Experience

**Woven by Toyota, U.S, Inc.**

Palo Alto, CA

Localization and Mapping Engineer

June. 2022 - present

- **Mapping Systems for Autonomous Driving:** Designed and deployed large-scale localization frameworks for real-world autonomous vehicle fleets, processing thousands of data files in parallel using Python and C++ based production systems.
- **Offline Perception Pipelines:** Designed the localization algorithm for the change detection pipeline using GTSAM factorgraph optimization with GPS and visual-inertial odometry, for robust localization.
- **Cross-functional Research Collaboration:** Led technical integration across perception, mapping, and ML teams, translating research concepts from PoCs into production-ready systems deployed on vehicle fleets.

**Velodyne Lidar**

San Jose, CA

Computer Vision Engineer

Aug. 2021 - March 2022

- **ML-Driven 3D Perception Systems:** Contributed to development of 3D object tracking and prediction modules with deep learning-based occupancy estimation for the Vella Development Kit, deployed in commercial ADAS applications.
- **Real-world Robotics Deployment:** Contributed in automating training and validation of end-to-end ML pipelines for LiDAR perception in autonomous vehicles.

**Honda Research Institute, USA**

San Jose, CA

Robotics Research Intern

Feb. 2021 - May 2021

- **Path Planning for Robotics:** Researched and implemented curiosity-driven exploration algorithms for autonomous navigation in unknown environments, combining reinforcement learning with traditional robotics approaches.

**NASA JPL, Team COSTAR**

Pasadena, CA

JVSRP Research Intern

Aug. 2020 - Jan. 2021

- **Multi-modal Sensor Fusion for Robotics:** Developed advanced artifact localization methods using camera and LiDAR fusion for subterranean robotic exploration, deployed in the DARPA SubT competition final stage.

**Worcester Polytechnic Institute**

Worcester, MA

Research Assistant

Sep. 2019 - Aug. 2020

- **Semantic SLAM Research:** Developed end-to-end semantic SLAM systems integrating deep learning-based object detection with traditional SLAM, enabling semantic understanding for autonomous robotic navigation.
- **Production-ready Robotics Frameworks:** Implemented robust data association and loop closure detection algorithms using semantic objects, creating reusable frameworks for semantic robotics applications.

- **Real-time Robotics Visualization:** Developed dynamic texture mapping systems for real-time stiffness visualization, creating production-quality RViz plugins with texture mapping and projective geometry for surgical robotics applications.
- **Multi-modal Robotic Perception:** Implemented comprehensive vision systems combining Intel RealSense and Hokuyo LiDAR for 6-legged robots, integrating RGBD and monocular SLAM with person tracking and 3D mapping capabilities.

## Selected Research Projects

### Research Project

Oct 2019 - Dec 2019

#### Curiosity-Driven Exploration for Autonomous Navigation

- Implemented Intrinsic Curiosity Module and Random Network Distillation for autonomous navigation in unknown environments, demonstrating novel applications of curiosity-driven learning to real-world robotics challenges in the MineRL Navigation Challenge.

### ML Research Project

Jan 2020 - April 2020

#### Motion Forecasting using Transformer-based Models

- Developed trajectory prediction models for autonomous vehicles using LSTM Encoder-Decoder architectures and Social GAN approaches on the Argoverse dataset, achieving state-of-the-art performance in multi-agent motion forecasting for robotics applications.

### Computer Vision Research

Sept. 2017 - May 2018

#### Multi-focal Image Fusion using Deep Neural Networks

- Designed CNN-based image fusion approach using Siamese network architecture to compute optimal fusion masks for multi-focal image pairs, demonstrating advanced deep learning techniques for enhanced robotic perception and computer vision applications.

## Publications

- Qian Zhentian, **Kartik Patath**, Fu, Jie and Xiao Jing, "Semantic SLAM with Autonomous Object-Level Data Association", research paper in IEEE International Conference on Robotics and Automation, ICRA 2021.(accepted)
- **Kartik Patath**, R. Arun Srivatsan, Nicolas Zevallos and Howie Choset, "Dynamic Texture Mapping of 3D models for Stiffness Map Visualization", poster presentation in the workshop on Medical Imaging at the IEEE/RSJ International Conference on Intelligent Robots and Systems, IROS 2017.
- **Kartik Patath**, Hadi Salman and Howie Choset, "Visual system for a Modular 6-Legged robot", research paper and poster in vol.5, pages 138-141, Robotics Institute Summer Scholars Journal 2017.
- Nicolas Zevallos, R Arun Srivatsan, Hadi Salman, Lu Li, Jianing Qian, Saumya Saxena, Mengyun Xu, **Kartik Patath** and Howie Choset, "A surgical system for automatic registration, stiffness mapping and dynamic image overlay", The International Symposium on Medical Robotics, ISMR 2018.
- N. Zevallos, R. A. Srivatsan, H. Salman, L. Li, J. Qian, S. Saxena, M. Xu, **K. Patath** and H. Choset, "A Real-time Augmented Reality Surgical System for Overlaying Stiffness Information", in proceedings of Robotics: Science and Systems, RSS 2018.

## Patents

31 Jan, 2024	<b>Systems and Methods for Estimating a Gap Between Positioning and Odometry Signals</b> , Application Number 18/428,329	USA
05 May, 2017	<b>Humanoid Robot</b> , Application Number 201721015920	India
22 Dec, 2016	<b>Robotic Cleaning System</b> , Application Number 201621043891	India

## Achievements & Awards

2017	<b>Summer Scholar</b> , Robotics Institute Summer Scholars Program	Pittsburgh, PA
2017	<b>Scholarship</b> , Federation of Indian Chambers of Commerce and Industry (FICCI)	Pittsburgh, PA