Srikanth Popuri

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LinkedIn |GitHub|Portfolio

Education

University of Colorado Boulder, Boulder, CO — Aug 2023 – Present
– Master of Science in Mechanical Engineering, — GPA- **3.8/4.0**
SASTRA University, Thanjavur, Tamil Nadu, India — Aug 2018 – Jun 2021
– Bachelor of Technology in Mechanical Engineering, — GPA- **3.4/4.0**

Summary

Robotics-focused software engineer with a background in **mechanical engineering**, specializing in **perception, motion planning, and state estimation** using ROS 2, PyTorch, and custom sensor pipelines. Experienced in **sensor fusion**, **embedded systems development**, and real-time robotics software on platforms like **Raspberry Pi** and **Arduino**.

Technical Skills

- **Programming Languages & Tools:** Python, C++, MATLAB
- **Tools and Frameworks:** ROS-2, Pytorch, Simulink, SolidWorks, Abaqus, Opencv2,GitHub
- **Expertise:** Computer Aided Design,FEA, Depth Estimation(traditional **stereo Depth estimation** , **deep learning** based approach), Mechatronics, PCB Design, Optical Flow

Work Experience

Teaching Assistant – University of Colorado Boulder — Aug 2024 – Dec 2024

- Facilitated student understanding of advanced mathematical concepts such as differential equations, matrices, **Least square**, and **singular value decomposition** (SVD).
- Conducted office hours and evaluated assignments, providing personalized support in applied mathematical techniques for engineering.

Research Assistant - University of Colorado Boulder — Jan 2024 - May 2024

- Contributed to a **ROS**-based solution enabling a **Franka Emika Panda** robot to perform manipulation tasks despite locked multi-joint failures.
- Implemented **ROS nodes** for robot control and sensor data processing,
- Assisted in developing a ROS package for **kinodynamic** map generation, representing the robot's action space under failure constraints.
- Co-authored a publication, **"Exploring How Non-Prehensile Manipulation Expands Capability in Robots Experiencing Multi-Joint Failure,"** in **IROS**.

Junior Software Engineer - Cognizant — Nov 2021 – Jun 2023

- Contributed to the development of **IoT-enabled applications** with backend services designed for data exchange between **cloud platforms** and edge devices using **Java** and Spring Boot.
- Implemented **RESTful APIs** for seamless integration of sensor data streams and device control, supporting real-time monitoring and actuation in distributed systems.
- Containerized services using **Docker** to enable scalable deployment across IoT gateways and edge nodes, simulating industrial automation and robotics use cases.

Projects

Structure from Motion (SfM) – 3D Scene Reconstruction

- Reconstructed a 3D street scene from 2D images using feature matching and multi-view geometry.
- Applied **RANSAC** for robust correspondence filtering and outlier rejection.
- Estimated camera poses via essential matrix decomposition and **triangulation.**
- Refined 3D Point Cloud using **Non linear Optimization** to minimize reprojection error.

Design and Implementation of an Autonomous Combat Robot

- Integrated ultrasonic, IR, and PixyCam sensors with **Raspberry Pi** and **Arduino via I2C** and **SPI** for real-time data acquisition and processing.
- Developed motor control logic for omnidirectional movement using **PWM**-based drivers.
- Implemented a dual-weapon system: a slider-crank lance mechanism and a high-speed disk shooter for balloon-popping tasks.

Depth Estimation and Multi-Angle View Synthesis using Generative AI

- Developed a pipeline to synthesize novel viewpoints from a single RGB image by reconstructing 3D point clouds and shifting camera poses.
- Utilized RAFT-Stereo for high-fidelity depth estimation and accurate spatial reconstruction.
- Applied generative inpainting (LaMa) to resolve occlusions and enhance visual consistency.
- Enabled realistic multi-view scene synthesis for data augmentation in vision-based learning tasks.

Monocular Depth Extimation From Coded Images

- Developed a deep learning pipeline for depth estimation using coded image simulation and monocular RGB images, with datasets such as NYUv2 and UMDCodedVO.
- Simulated coded images by applying a phase mask's **Point Spread Function (PSF)** to RGB and depth data, enabling depth-aware convolution and realistic depth blur effects.
- Designed and trained a **U-Net** model for depth prediction, achieving strong performance on depth accuracy metrics**(Rel-Abs Error and RMSE).**

Sensor Fusion for Real-Time Localization

- Developed an optical flow-based tracking system using Raspberry Pi, IMU, and optical flow sensors over **SPI** for real-time motion estimation.
- Implemented an **Extended Kalman Filter (EKF)** to fuse IMU and optical flow data, enhancing localization accuracy in dynamic environments.
- Built custom **Linux**-based drivers for the ICM-20948 IMU to access its Digital Motion Processor (DMP), enabling efficient **FIFO** data retrieval and **interrupt-driven** sampling for synchronized **sensor fusion**.

Autonomous Driving and Robotics (ADR) – LIDAR-Based Localization and Navigation

- Designed and implemented a **LiDAR-based SLAM** system, utilizing an **Extended Kalman Filter (EKF)** for localization and Iterative Closest Point (ICP) for scan matching, ensuring accurate map alignment and vehicle pose estimation.
- Developed a **feedback control** system with proportional controllers for precise position and orientation corrections
- Addressed challenges like noisy sensor data, model uncertainties, and covariance growth in EKF, ensuring robust and reliable **autonomous** operation in dynamic environments.

Ball Screw Drive system

- Designed a precision ball screw linear actuator with minimal backlash, including detailed load calculations, natural frequency analysis, and **GD&T**-compliant **CAD** documentation
- Provided insights to optimize actuator design for precision and reliability in high-performance applications