Pavan **Kavvuri**

ROBOTICS PERCEPTION ENGINEER ·

Sheffield, United Kingdom

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"Systems that think, pipelines that deliver, performance that lasts."

Summary

Robotics Software Engineer with 4+ years of experience building real-time perception pipelines, and embedded autonomy systems for robotics and autonomous vehicles. Proficient in ROS2, C++, and Python, with hands-on experience in stereo vision, visual odometry, sensor fusion, and embedded deployment. Strong background in designing modular, testable software architectures, with additional experience in developing QA and system validation tools. Currently focused on advancing Visual SLAM and sensor-driven autonomy in simulation and real-world contexts.

Research Interests

Visual SLAM   Focused on learning and applying state-of-the-art Visual SLAM techniques, with interest in modern feature-based, direct, and learning-based approaches for real-world robotics applications.

Neuromorphic AI   Interested in developing AI models tailored for neuromorphic and ultra-low-power hardware, focusing on memory-efficient architectures, quantization strategies, and real-time inference under hardware constraints.

Skills

Math	3D geometry, Linear algebra
Libraries	OpenCV, Eigen, Pandas
SLAM	Visual Odometry
AI	PyTorch, Model Quantization
Programming	C++ and Python
Devops	Git, Docker, ROS2
QA	CI Regression Testing
Project Management	Atlassian Suite (Jira, Confluence), Xray

Work Experience

Opteran Technologies   *Sheffield, United Kingdom*

ROBOTICS SOFTWARE ENGINEER   *Feb. 2023 - Present*

Perception Development:

- **Designed and planned** a modular Visual Odometry pipeline using stereo sequences from the real world datasets, built with ROS2 using both rclcpp (C++) and rclpy (Python) nodes.
- **Implemented** core VO components: stereo rectification, feature detection (ORB), disparity triangulation, and motion estimation via the 8-point algorithm.
- **Applied** P3P with RANSAC for pose refinement and integrated bundle adjustment (Ceres/g2o) for drift correction.
- **Developed** custom ROS2 nodes to process the data and publish visual odometry results (/odom) and 3D landmarks in real-time.
- **Dockerized** the entire pipeline for reproducibility, modular testing, and future deployment on ARM-based embedded platforms

Software QA:

- **Designed and implemented** robust QA pipelines and metric acquisition frameworks in ROS2 - C++ & Python to evaluate the performance and stability of AGVs
- **Led** the development of Spatial and Perception test suites, systematically testing and validating key modules such as Localisation, Optical Flow, Visual Odometry, and Stereo Depth, broadening coverage across core perception modules.
- **Architected and deployed** end-to-end test suites within CI/CD pipelines, enabling automated performance regression tracking and accelerating release cycles.
- **Developed** a custom ROS2 C++ data playback tool to stream rosbags at accelerated rates with reliable and deterministic message delivery, lowering CI runtime, and significantly reducing computational costs.
- **Built** Grafana dashboards for real-time performance monitoring, improving visibility into system behavior and supporting data-driven decision-making.

AI Drivers

London, & Singapore

Robotics Autonomy Engineer

Sep. 2020 - Jan. 2023

- **Led** the development of a navigation test suite for autonomous trucks, validating path planning, control logic, and integration with the cognition system.
- **Utilized digital twin simulations** to verify planning and control behavior against real-world constraints, accelerating testing cycles.
- **Expanded test coverage** using synthetic data from simulation, enabling validation across a wide range of rare and edge-case scenarios.
- **Conducted Site Acceptance Tests** at 10+ seaport terminals in Singapore, ensuring reliable system behavior and data integrity across real-world deployments.
- **Collaborated cross-functionally** with engineers and customers, delivering actionable insights via real-time analytics dashboards to improve system transparency and trust.

Projects

Neuromorphic Audio Classification Under Embedded Constraints

Sheffield, UK

Self-Initiated Project

May. 2025

Developed a resource-constrained RNN-based spoken digit recognizer using the Free Spoken Digit Dataset (FSDD), simulating deployment on low-power neuromorphic hardware—mirroring embedded robotics environments like Jetson Nano.

- **Built** an audio classification pipeline from raw waveform to MFCC spectrograms with an LSTM classifier, optimized for latency and memory efficiency.
- **Reduced model size by 97.5%**, from 807 KB (baseline FP32) to 8.2 KB (quantized), using layer pruning and 8-bit quantization.
- **Maintained strong accuracy:** 91.33% (memory-constrained), 85.83% (quantized), and 83.83% (power-of-2 quantized), compared to 99.00% baseline FP32 model.
- **Simulated integer-only inference** with power-of-2 quantization for shift-based computation on hardware without floating-point support.
- **Demonstrated embedded readiness** by constraining layer size to ≤36KB and optimizing datatype usage under real-time constraints.

Fruit Detection & Ripeness Analysis in Mango Orchards

Bristol, UK

Dissertation Project

Jun. 2020

- **Developed** a real-time object recognition system for agricultural robotics, enabling autonomous fruit detection and ripeness estimation using the ACFR orchard fruit dataset.
- **Achieved** a mean Average Precision (mAP) of 82.38% and F1-Score of 81.13% using YOLOv4 as the best performing model.
- **Gained** hands-on experience in Darknet, TensorFlow, and PyTorch by implementing, optimizing, and comparing models including YOLOv4, YOLOv4-tiny, and YOLOv5.
- **Designed** a ripeness classification system based on Gaussian Mixture Models (GMM) to estimate maturity probability of detected fruits.

Education

University of Bristol

Bristol, United Kingdom

M.S. in Robotics

Sep. 2019 - Sep. 2020

- **Dissertation:** Deep Learning-based Yield Estimation and Ripeness Analysis in Mango Orchards.
- **Grade:** 2:1.
- Co-Researcher for Disability Rights & Robotics Group.

Andhra University

India

B.Eng. in Electronics & Communication

Sep. 2012 - Sep. 2016

- **Dissertation:** CNN based self driving toy car
- **CGPA:** 8.5

Honors & Awards

Awards

| 2020 | **Recipient,** Bristol Plus Award | *Bristol, U.K.* |
| 2020 | **Winner – Best Product Pitch (£200 Prize),** Enterprise and Innovation Funding Competition | *Bristol, U.K.* |

Honors

| 2019 | **Half-Tuition Scholarship,** University of Bristol Master's Scholarship | *Bristol, U.K.* |
| 2012 | **Full-Tuition Scholarship,** Andhra University, Bachelor's Scholarship | *India* |