

# Mathan Prasanna Kumar S

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## Experience

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### Software Developer (Vision Systems), RobotoAI Technologies

July 2024 – Present

- Led and developed a real-time production monitoring system to track products on the conveyor line, implementing YOLO and ByteTrack to distinctively identify closely stacked items, and logged the product information to a SQLite database and collaborated with the backend team to integrate the updates to a live dashboard
- Integrated visual odometry and IMU from a stereo camera into the navigation stack to enhance localization and navigation of an autonomous mobile robot, and developed multithreaded ROS2 nodes for efficient communication between hardware components
- Collaborated with the navigation team to enable vision-based obstacle avoidance to enhance navigation robustness and safety
- Developed an autonomous docking system using ArUco markers by estimating pose with OpenCV, transforming coordinates to ROS frames, and integrating with the Nav2 docking server for precise alignment
- Implemented a person following feature where optimized detection models using TensorRT for low-latency inference, and developed a motion controller for smooth and responsive movement
- Developed a pressure-based altitude measurement system on MSP430, handling SPI and UART communication, real-time data acquisition, filtering raw data to compute accurate altitude
- Led the development of the Voice command feature, enabling the AMR to understand and execute the spoken instructions, and fine-tuned LLM to generate a custom command sequence for the audio instructions

### Software Developer Intern, RobotoAI Technologies

Sep 2023 – June 2024

- Researched and developed a BLE based localization system for improving the global localization in dynamic environments. Handled data transmission from beacons to gateway through MQTT protocol, analyzed and applied low low-pass filter to the raw RSSI data, and developed a triangulation algorithm to find the gateway position
- Developed an A\* path planning algorithm for the line follower robot to find the shortest trajectory between stations
- Implemented a peer-to-peer video streaming application by using the Gstreamer WebRTC plugin, enabling the user to teleoperate the robot at remote locations
- Developed a chip detection application to distinguish between the threaded and unthreaded chips. Used YOLO model and implemented the training and inference pipeline in Pytorch, and further optimized the model for accelerated inference in TensorRT

## Skills

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**Languages:** C, C++, Python, Javascript

**Frameworks:** Pytorch, OpenCV, ROS2, TensortRT

**Tools:** Docker, Git, CMake

## Projects

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### T5\_Torch

mathanprasannakumar/T5\_Torch

- Implemented the T5 transformer architecture from scratch in PyTorch to deepen the understanding of attention mechanisms and the encoder-decoder structure
- Integrated training, inference, and dataloader pipelines, and loaded pretrained weights from HuggingFace to validate the performance and enable fine-tuning on custom tasks

### Local\_RAG

mathanprasannakumar/Local\_RAG

- Built a Streamlit application that enables users to upload a PDF and ask context-based questions. Used LangChain to process and chunk documents, generate embeddings, and store them in a Chroma vector database, and augmented the query with top-matched chunks to provide grounded responses via an LLM

## Education

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### Bachelor of Engineering in Civil Engineering

April 2022

Government College of Engineering, Salem, TN