Surya Lakshmi Subba Rao Pilla

linkedin.com/in/pslsubbarao

Email : slpilla@ucsd.edu

Mobile : +1-959-999-0403

EXPERIENCE

University of California San Diego - Laboratory Experience — San Diego, CA

Existensial Robotics Laboratory (ERL) — Sep. 2023 - Present

- Designing a pipeline to employ optimal scene graph planning using a large language model(LLM) to generate linear temporal logic and use anytime multi-resolution multi-heuristic A* algorithm for planning
- Developed indoor localization and mapping for ERL robot powered by Nvidia Jetson mounted with Hokuyo 2D lidar using ROS, utilized Gazebo simulation and RViz for visualization of indoor navigation
- Implemented Gmapping technique to generate 2D occupancy grid map using laser scans from lidar

Summer Research Intern at Computational Imaging Systems Lab — Jul. 2023 - Sep. 2023

- Integrated learnable lens parameters into the loss function of end-to-end computational imaging system model using pytorch to enable the deep optics model to prevent human face identity from cyber attack
- Designed a DBSCAN clustering pipeline for processing event data captured by a dynamic vision sensor to differentiate fire signature from rest of the dynamic moving objects
- Developed a self-supervised learning pipeline utilizing SuperPoint keypoint descriptor extraction from privacy-preserving lens images for Visual Inertial Simultaneous Localization and Mapping (VI SLAM)

Graduate Student Researcher — Jan. 2023 - Jun. 2023

- Extracted HoG features and trained SVM supervised model to correct slippage of eyeglass-mounted cameras and accurately calibrate gaze estimation, reducing gaze mapping error of real-world frame by 20%

Honeywell - Industrial Experience — Bangalore, India

Embedded Engineer — Jul. 2019 - Jul. 2022

- Modeled supervised Machine Learning (ML) algorithm with 98 % flame detection accuracy utilizing existing dataset, and deployed it into legacy 3IR flame detector compliant with EN54 (European certification), saving 10 months of development cycle and 10+ human resources for data collection
- Designed Machine Learning (ML) framework utilizing Python scientific libraries, compatible with existing dataset, for Triple IR sensor-based flame detection, saving 150 man-hours of data collection
- Trained and deployed state-of-the-art object detection model (YOLOv4) in Nvidia Jetson Nano for autonomous maritime search-and-rescue purposes for a New Product Introduction (NPI)
- Collaborated with a 3-membered team, analyzed IR flame signature data to design and deploy ML algorithm into legacy hardware (98 % flame detection accuracy using Python, MATLAB, and IAR)
- Prototyped a novel visible + thermal camera-based flame detection for annual innovation challenge (quantized the model weights for edge deployment), contributing towards high value Intellectual Property
- Mentored 3 interns with technical tasks in ML/Computer Vision (CV), and professional efficiency

Visteon - Industrial Experience — Chennai, India

Image Processing Intern — May. 2018 - Jul. 2018

- Developed image processing algorithm, utilizing XCode (C++) and OpenCV, 3x time faster than traditional algorithm in computing degree of rotation of analog fuel indicator in a car

EDUCATION

University of California San Diego — San Diego, CA

Master of Science in Electrical and Computer Engineering - Robotics — Sep. 2022 - Mar. 2024

Relevant Courses: Sensing and estimation for robotics, Planning and learning in robotics, Digital image processing, Statistical learning (Bayesian probability), Visual learning (Computer vision/ Deep learning), Low power VLSI for ML, Deep learning for 3D data

Indian Institute of Technology — Tirupati, India

Bachelor of Technology in Electrical Engineering — Aug. 2015 - Aug. 2019

TECHNICAL SKILLS

- Programming Languages: Python, C++, Verilog
- Frameworks: PyTorch, TensorFlow, Keras, OpenCV, TinyML, JAX, Open3D, Trimesh
- Software/ Tools: MATLAB, Gazebo, RViz, Minitab, ROS, Git, Docker, AWS Sagemaker
- Computing Platforms: Linux, Windows, Nvidia Jetson, STM32/ TI micro-controller, ESP32 MCU

RELEVANT ACADEMIC PROJECTS

- **Particle Filter SLAM:** Modeled Particle Filter for indoor localization and mapping of differential-drive robot using LiDAR to generate probabilistic occupancy grid of unknown environment
- **6D pose estimation:** Utilized PyTorch to implement the PointNet deep learning architecture, achieving 85% accuracy in estimating object pose from RGBD data and point clouds within given scenario
- **Quantization of convolution layers:** Applied Post Quantization Training and Quantization Aware Training to quantize conv layers of VGG16 and ResNet20 models to 2 bit and 4 bit correspondingly, minimizing classification accuracy reduction to under 2% on CIFAR-10 data
- **Pruning of VGG16 network:** Achieved 95% model accuracy restoration post-application of unstructured pruning with 80% weight sparsity across conv layers of VGG16, orchestrated structured pruning for conv layer hardware mapping onto a 2D systolic array to achieve a 30x reduction in model size
- **Image Segmentation:** Developed UNet + attention model for semantic segmentation with 90% accuracy and conducted a comparative analysis against Deeplabv3 using for road object detection
- **Visual Inertial SLAM:** Implemented VI SLAM by designing Kalman Filter for localization and landmark mapping to track 3D pose of robot by fusing gyroscope, accelerometer, and camera measurements
- **Autonomous Navigation:** Executed dynamic programming algorithm for deterministic shortest path problem to minimize value function, optimize control actions to find shortest path by avoiding obstacles
- **Trajectory Tracking:** Optimized non-linear objective function using python CasADi solver to get optimal control policy for accurate trajectory tracking using Generalized Policy Iteration (GPI)
- **Motion Planning:** Engineered a compelling comparison between search-based (A*) and sampling-based (RRT) algorithms, unveiling their distinct performances in a dynamic continuous 3D environment
- **Trajectory Tracking:** Optimized non-linear objective function using python CasADi solver to get optimal control policy for accurate trajectory tracking, compared Receding-Horizon Certainty Equivalent Control and Generalized Policy Iteration

PATENTS, AWARDS AND CERTIFICATIONS

- Patent No. 20240021059, published on 01/18/2024, in the United States Patent and Trademark Office
- Patent No. 20230408476, published on 12/21/2023, in the United States Patent and Trademark Office
- 8 IP awards: 2 U.S. patents (20240021059, 20230408476) and 6 trade secrets
- Diamond award: Awarded with 2nd position out of 276 ideas presented at annual innovation competition
- Silver award: Recognized for developing new Fire Path for flame detector.
- Certification: Certified with Six Sigma Green Belt for DFSS Hardware, MicroMBA from Rady School of Business University of California San Diego

LEADERSHIP, EXTRACURRICULAR ACTIVITIES AND COMMUNITY SERVICES

- Hosted 5 networking events for 2023 MicroMBA program at the Rady School of Management, June 2023
- Volunteered for a Corporate Social Responsibility (CSR) visit to Agastya foundation at Honeywell, 2019
- Participated in the AIESEC exchange program Egypt as a Global Entrepreneur volunteer to address the IX Sustainable Development goals set by U.N, 2018
- Represented student community in the senate meeting as a *Student General Secretary* of IIT Tirupati
- Coordinated National Social Scheme (NSS) team and was instrumental in conducting a feasibility study at 3 out of 5 villages adopted by IIT Tirupati for Rural Development program, 2017
- Organized funding for *Abhayakshetram*(Orphanage) and educational campaigns for *Navajeevan* blind cchool
- Collaborated with XLr8AP, a technology business accelerator, to secure summer internships for IIT Tirupati sophomore class, April 2017
- Convened ANFANG (the first Tech-Fest) of IIT Tirupati, with 10 plus events and a turnover of Rupees. 3.5 Lakhs, March 2017
- Participated in 1500 meters race, inter IIT sports meet, 2016 and 2017