J P K VARMA POTHURI

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SUMMARY

Aspiring Robotics/AI Software Engineer and master's student with two years of software development and two years of hands-on robotics research and development experience. I've worked on projects involving autonomous UAVs and ground robots, mostly designing and implementing computer vision and reinforcement learning techniques. With expertise in Python, C++, and ROS/ROS2, I'm driven to apply my experience and research skills to develop groundbreaking robotics solutions that solve real-world challenges with innovation.

EDUCATION

UNIVERSITY AT BUFFALO Buffalo, NY
MS in Robotics Expected May 2025
Cumulative GPA: 4.0/4.0
Relevant Course Work: Robotic Algorithms, Learning for Autonomous Systems, Optimization in Engineering Design, Machine Learning, Deep Learning, Probability, Computer Vision and Image Processing, Control Systems.

WORK EXPERIENCE

ADAMS Lab, University at Buffalo Buffalo, NY
Research Assistant Jun 2023 – Present
- Created and deployed a hybrid aerial object tracking and pursuit system on Crazyflie using AI and Flow decks.
- Designed Pixhawk-based quadcopters with PX4/ArduPilot firmware, integrated Jetson Nano, Orin Nano, Raspberry Pi, and Intel Real Sense Depth Camera for real-time autonomous navigation.
- Implemented multi-UAV coordination algorithms (task allocation, coverage path planning) on custom and Parrot Anafi quadcopters.
- Worked with TurtleBots to implement and test SLAM algorithms.
- Validated algorithms using ROS/ROS2 with Gazebo, Airsim, and other simulation platforms, fine-tuned for real-world deployment.
- Supervised and trained 4 undergraduate students in UAV development, covering drone assembly, programming, and control techniques.

TATA CONSULTANCY SERVICES Hyderabad, INDIA
Software Engineer Nov 2020 – Dec 2022
- Developed a natural language processing based recommendation system for support ticket resolution, improving efficiency by 35% and enhancing customer satisfaction through automation.
- Created a 30-day ticket forecasting model using time series analysis to optimize resource allocation and workload prediction.
- Managed the integration of Single Sign-On (SSO) for 500+ enterprise applications using OAuth 2.0 and SAML 2.0 protocols.
- Awarded Employee of the Month (3x) and Best Team Awards for delivering high-impact solutions.

SKILLS

Programming Languages: Python, C++, R, MATLAB, C, Java.
Technologies and Frameworks: ROS/ROS2, PyTorch, TensorFlow, Scikit-learn, OpenCV, Gazebo, AirSim, Numpy, Pandas, Azure, Linux, Git, Simulink, LATEX
Hardware: NVIDIA Jetson, Intel Depth Cameras, Pixhawk, ESP32, Raspberry PI, Arduino, Crazyflie

PUBLICATIONS

Scalable and Load-Balanced Coverage Path Planning for Multiple Unmanned Aerial Vehicles Jointly Surveying Non-Convex Areas Paper

Open-Source Hardware/Software Architecture and Supporting Simulation Environment to Perform Human FPV Flight Demonstrations for UAV Autonomy Paper

PROJECTS

Intelligent UAV Tracking and Pursuit using Reinforcement Learning (Thesis) May 2024 - Present
- Designed a hybrid active tracking system using YOLO for object detection, KCF for fast tracking, and Kalman Filters for better target position estimation under occlusions and appearance changes.
- Trained a physics-constrained RL model in AirSim by integrating with Gymnasium and Stable Baselines3.
- Deployed on different hardware platforms such as custom-built UAV (using Jetson Nano, Intel D435i, Pixhawk 6C, X500v2 frame) and Crazyflie with AI and flow decks.
- Successfully tracked the target in over 90% of frames and significantly improved pursuit stability.

Scalable and Load-Balanced Coverage Path Planning (SCoPP) Jan 2024 – Sept 2024
- Implemented a Scalable Coverage Path Planning (SCoPP) algorithm for multi-UAV teams, optimizing area coverage in non-convex and large-scale environments.
- Designed variations of SCoPP such as SCoP3 and SCoPE for effective handling of priority-based and time-sensitive mission constraints.
- Achieved better workload balancing among UAVs using iterative clustering, Voronoi partitioning, and auction-based methods.
- Improved mission efficiency by integrating KD-tree-based nearest-neighbor path planning.
- Conducted extensive simulations for teams of up to 150 UAVs, achieving planning times under a few minutes.
- Successfully demonstrated the algorithm in a netted outdoor facility (SOAR) using three heterogeneous UAV platforms, achieving over 95% of desired area coverage in real-world conditions.

Physical-Digital Twins for Coordinated Multi-UAV Systems May 2024 – Jul 2024
- Designed a framework for developing multi-UAV algorithm in both simulation and real-time, bridging the gap between virtual and real-world applications.
- Simulated UAV operations in a netted outdoor facility using AirSim and Unreal Engine, ensuring seamless integration with real-world UAVs equipped with PX4, ArduPilot, and Parrot Anafi firmware.
- Implemented coverage path planning (SCoPP) and MRTA algorithms to thoroughly validate the framework.
- Integrated Parrot Anafi and Ardupilot-based UAVs with Python-based software architecture and achieved over 95% mission efficiency in field experiments.

Object Detection and Depth Estimation for Autonomous Systems Feb 2023 – May 2023
- Developed a low-cost perception framework for autonomous systems by combining YOLOv5 object detection with a custom MLP for distance estimation of detected objects.
- Trained on the KITTI dataset and a preprocessed, augmented dataset with added noise and blur to simulate challenging conditions, such as fog and low light.
- Achieved real-time performance with this single-camera system, enabling robust object detection and depth estimation, eliminating the need for expensive LiDAR sensors.

Stereo Visual Odometry for Autonomous Vehicles Feb 2023 – May 2023
- Built a SVO pipeline for real-time camera motion estimation for autonomous vehicles using ROS, Python, and OpenCV.
- Utilized ORB features for reliable feature detection and matching and then Lucas-Kanade optical flow to track feature points across successive frames.
- Eliminated mismatched correspondences for accurate motion estimation and for outlier rejection, used RANSAC.
- Enabled 3D reconstruction and trajectory estimation through triangulation and relative pose calculation between stereo frames.

EXTRA-CURRICULAR ACTIVITIES

- Led the Robotics Club during undergraduate studies, successfully organizing over 10 inter-collegiate competitions.
- Organized workshops for 200+ students, introducing them to foundational robotics concepts.

CERTIFICATIONS

Deep Learning Specialization deeplearning.ai
Natural Language Processing Specialization deeplearning.ai
Machine Learning by Andrew Ng Coursera