

Jagadeswara Pavan Kumar Varma Pothuri

ipkvarmapothuri@gmail.com | buffalo.edu/~jagadesw | github.com/ipkvarma | linkedin.com/in/ipkvpothuri

Buffalo, NY (open to relocate) | +1 7162473865

SUMMARY

AI/ML & Robotics Engineer with 4+ years of experience in deep learning, computer vision, and autonomous systems. Specialized in visual perception, object detection, tracking, SLAM, and reinforcement learning for UAVs and mobile robots. Experienced in building transformer-based models and LLMs from scratch, deploying scalable AI pipelines, and delivering end-to-end mobile robotics systems from design to real-world deployment.

TECHNICAL SKILLS

Programming Languages: Python, C++, C, MATLAB, Bash

Machine Learning & Deep Learning: Supervised & Unsupervised Learning, Reinforcement Learning (Model-Free & Model-Based), Transfer Learning, Multi-Task Learning, Behavioral Cloning, Reward Modeling, Diffusion Models, Transformers, Vision Transformers, Ablation Studies, Simulation-to-Real Transfer, Domain Randomization, Inference Optimization, Edge Deployment, Large-Scale Model Training & Evaluation

Computer Vision & Perception: Object Detection & Tracking, Semantic & Instance Segmentation, Depth Estimation, Optical Flow, Stereo Vision, Camera Calibration, SLAM, Sensor Fusion, Multi-View Geometry, 3D Reconstruction, Bundle Adjustment, Generative Models, Vision-Language Models, Vision-Language-Action Models

Libraries & Frameworks: PyTorch, TensorFlow, JAX, Keras, Hugging Face Transformers, OpenCV, Scikit-learn, MLflow, NumPy, SciPy, Pandas, Matplotlib, Plotly

Planning & Control: A*, RRT, Dijkstra, Lloyd's Algorithm, Coverage Path Planning, Multi-Robot Task Allocation (MRTA), Trajectory Optimization, MPC, PID, Imitation Learning

Simulation & Robotics Tools: AirSim, Gazebo, Isaac Sim, NVIDIA Omniverse, PyBullet, Webots, Unreal Engine, ROS, ROS2, PX4, MAVROS, ArduPilot

DevOps & Tools: Docker, Git, GitHub, Bazel, Kubernetes, CI/CD Pipelines, VS Code, Linux

Hardware: NVIDIA Jetson Nano/Orin, Pixhawk, Crazyflie, Raspberry Pi, Arduino, Intel RealSense, LiDAR, IMUs, GPS Modules

Other Expertise: Multi-Agent Coordination, Robotic Manipulation, Real-Time Systems, Optimization Techniques, Perception-Control Integration, Applied Mathematics

EXPERIENCE

ADAMS Lab, University at Buffalo

Buffalo, NY

Research Assistant

Jun 2023 – Present

- * Designed and built autonomous UAV platforms using Pixhawk flight controllers with PX4/ArduPilot firmware, integrating Jetson Nano/Orin, Raspberry Pi, Intel RealSense camera for real-time vision-based navigation.
- * Developed and deployed a hybrid aerial object tracking system combining YOLO-based detection, KCF tracking, and physics-informed and APCE based reinitialization, deployed on lightweight Crazyflie drones for high-speed pursuit tasks.
- * Implemented behavioral models trained via reinforcement learning for real-time aerial tracking, applying offline RL and domain randomization for robust sim-to-real transfer.
- * Deployed multi-UAV coordination strategies including Multi-Robot Task Allocation (MRTA) and Scalable Coverage Path Planning (SCoPP), validated in both simulation and field tests.
- * Evaluated SLAM and sensor fusion algorithms on TurtleBot platforms using RGB-D data for localization and mapping in unstructured indoor environments.
- * Led mentoring and collaboration efforts, supervising undergraduate researchers in UAV assembly, design, perception pipeline development, and testing.

TATA CONSULTANCY SERVICES

Hyderabad, INDIA

Software Engineer

Nov 2020 – Dec 2022

- * Designed an intelligent recommendation system that suggested ticket resolutions in real time by combining TF-IDF-based retrieval, Machine learning models, and a clean Django, Angular interface, reducing average resolution time by 35%.
- * Built a robust forecasting tool to predict daily support ticket volumes across 500+ applications, using LSTM-based time series modeling, achieving 92% accuracy and significantly improving team planning and resource allocation.
- * Led the end-to-end data pipeline, from cleaning and preprocessing 3 years of organizational ticket data to engineering NLP features for scalable model training and deployment.
- * Consistently recognized for impact and leadership, awarded "Best Employee of the Month" three times and received the "Best Team Award" for a critical support automation project.

EDUCATION

UNIVERSITY AT BUFFALO

Jan 2023 - May 2025

M. Sc., Robotics and Machine Learning

CGPA: 4.0/4.0

Relevant Course Work: Robotic Algorithms, Learning for Autonomous Systems, Optimization in Engineering Design, Intro to Machine Learning, Deep Learning, Probability, Computer Vision and Image Processing, Control Systems.

Jawaharlal Nehru Technological University (JNTU), Kakinada, India

Jun 2016 – Sept 2020

B.Tech. in Electronics & Communication Engineering

CGPA: 9.05/10.0

PUBLICATIONS

- * **Pothuri, J.**, Bhatt, A., KrishnaKumar, P., Oddiraju, M., & Chowdhury, S. (2025). A physics-constrained learning approach for active tracking of dynamic objects from an unmanned aerial vehicle. University at Buffalo. (Accepted)
- * KrishnaKumar, P., Witter, J., Collins L., **Varma P.**, Ghassemi, P., Dantu, K., Esfahani, E.T. and Chowdhury, S., Scalable and Load-Balanced Coverage Path Planning for Multi-Robot Teams Surveying Non-Convex Areas, Robotics and Autonomous Systems (Under Review)
- * Xiao, H., KrishnaKumar, P., **Pothuri, J.**, Soni, P., Butcher, E., Chowdhury, S., [An Open-source Hardware/ Software Architecture and Supporting Simulation Environment to Perform Human FPV Flight Demonstrations for Unmanned Aerial Vehicle Autonomy](#), AIAA Aviation 2024, Las Vegas, August 2024.

PROJECTS

Autonomous Vision-Based UAV Tracking ([Github](#))

- * Developed a UAV tracking system using YOLOv11 for detection, KCF for local tracking, and PPO-based reinforcement learning for control. Integrated Kalman filter and physics constraints for robust state estimation and trajectory planning.
- * Technologies: PX4, Jetson Nano, ROS 2, YOLOv11, PPO, Kalman Filter, AirSim

Scalable and Load-Balanced Coverage Path Planning ([Github](#))

- * Deployed the SCoPP algorithm for multi-UAV coordination across non-convex environments. Achieved scalable and balanced area coverage with up to 150 UAVs, validated in field trials using Pixhawk drones.
- * Technologies: PX4, MAVROS, PyMavlink, Olympe, Parrot Anafi, Ardupilot

LLM from Scratch ([Github](#))

- * Developed a custom GPT model using PyTorch Lightning with self-attention, BPE tokenization, and positional encoding. Trained on Harry Potter corpus for character-level text generation.
- * Technologies: PyTorch, Python, Transformers, GPT Architecture

ViT-Based Object detection ([Github](#))

- * Designed a ViT-based object detector fine-tuned for aerial scenarios. Leveraged self-attention mechanisms for improved performance under occlusion and appearance variation.
- * Technologies: Python, ViT, PyTorch, Transformers

Image Captioning with Vision-Language Models ([Github](#))

- * Trained vision-language models on Flickr8k to generate real-time scene captions from drone footage. Enabled descriptive perception for autonomous missions.
- * Technologies: BERT, CNN, Transformers, Flickr8k, Vision-Language Models

Object Detection and Depth Estimation for Autonomous Vehicles ([Github](#))

- * Integrated YOLOv5 with a custom MLP model to estimate object distances using single-camera bounding boxes. Enabled lightweight, real-time depth estimation on edge devices without LiDAR.
- * Technologies: YOLOv5, MLP, KITTI, monocular depth estimation

Stereo Visual Odometry ([Github](#))

- * Built a stereo VO pipeline using the KITTI dataset. Extracted features from stereo images, computed disparity maps, triangulated 3D points, and estimated pose using PnP with Kalman filtering.
- * Technologies: C++, OpenCV, KITTI, ORB features, triangulation, pose estimation

Path Planning Algorithms Implementation ([Github](#))

- * Implemented A*, Dijkstra, and RRT* algorithms for UAV motion planning in 2D grid-based environments. Evaluated each algorithm's trade-off between optimality and computational cost.
- * Technologies: C++, Python, A*, Dijkstra, RRT*

Structure from Motion ([Github](#))

- * Developed a full SfM pipeline to reconstruct 3D scenes from 2D image sequences. Included feature extraction, triangulation, camera pose recovery, and bundle adjustment.
- * Technologies: Python, C++, OpenCV, feature matching, 3D reconstruction

Classical Machine Learning & Deep Learning Projects

- * Completed diverse projects involving regression, classification, clustering, and time-series forecasting using CNNs, RNNs, ensemble methods (bagging, boosting), and unsupervised algorithms. Developed as part of coursework and personal exploration, covering both structured and unstructured data.