Alok Raj

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Education

Indian Institute of Technology (Indian School of Mines) Dhanbad Expected May 2026
Bachelor of Technology in Computer Science and Engineering (CGPA: 8.82 / 10.00) *Dhanbad, Jharkhand*

- **Relevant Coursework:** DSA (C++), DBMS (SQL), Operating System (C++), OOPS (C++/Python), Linear Algebra.

Experience

Active Growth Partners Aug 2024 – Present
Data Science and Software Developer *Remote*

- Built a scalable dental disease detection system, addressing data leaks, class imbalances, and labeling inconsistencies.
- Set up AWS EC2 and S3 to deploy a real-time Flask API for secure data processing and storage.
- Used Supervisely to improve annotation efficiency and data consistency.
- Collaborated with the web-dev team to improve model metrics across 31 disease classes, achieving mAP50 of 31%

Clutterbot May 2024 – July 2024
ML Intern *Bangalore, Karnataka*

- Collaborated with the Perception team to identify improvements in model pipelines used on the robot.
- Integrated Boundary Loss to baseline Semantic Segmentation pipeline, increasing segmentation border precision.
- Conducted cloud-based model training experiments on pseudo-labelling, knowledge distillation, and curriculum learning pipelines.
- Optimized the training pipeline of the baseline Object Detection model, enhancing mAP50 from 34% to 42%.

Projects

Autonomous Driving NXP-B3RB-buggy | *ROS2, PyTorch, Gazebo, Cognipilot, Remote-SSH* Project Link

- Developed an autonomous driving system in ROS2 with Gazebo for the B3RB buggy, achieving a 1:42 (min:sec) track time.
- Implemented LIDAR and camera for lane detection, obstacle avoidance, and traffic sign recognition with Ackermann-steering control.
- Trained YOLOv5s and optimized with INT8 quantization for NPU, achieving real-time inference at 7 Hz.
- Employed a mini computer running ROS2 on Ubuntu 22 for onboard processing and control tasks.

Embedded Toy Detection for Robots | *Nvidia DeepStream, Pytorch, Git, ROS2*

- Trained the state-of-the-art Co-DETR model for pseudo-labelling unannotated images to expand the dataset.
- Trained a large object detection model (DAMO-YOLO-M) using curriculum learning; applied knowledge distillation to train a smaller model (DAMO-YOLO-Tiny) for deployment on robots.
- Increased mAP50 from 34% to 42%; utilized TIDE for model evaluation.
- Deployed the model on the robot using Nvidia DeepStream and integrated it with ROS2.

Hologlyph Bots | *OpenCV, ROS2, Gazebo, Micro-ROS, SolidWorks* Project Link

- Simulated the bot in Gazebo with an integrated overhead camera for arena monitoring.
- Designed and 3D-printed the bot in SolidWorks; iterated design three times.
- Integrated inverse kinematics for a 3-wheeled holonomic drive with continuous rotation servos.
- Implemented Aruco detection to track pen pose relative to the arena.
- Developed a PID control loop with camera feedback; converted ESP-32 into a ROS2 node via Micro-ROS for servo-based pen movement.

Technical Skills

Languages: Python, C/C++, MATLAB, SQL, Java
Technologies: RunPod, ROS2, SolidWorks, Git/GitHub, AWS EC2 S3, Linux, TensorFlow, PyTorch, Isaac Gym
Concepts: Data Structures and Algorithms, Machine Learning, Operating Systems, Database Management Systems, Object-Oriented Programming, Computer Vision, Mechatronics, Control Systems, SSH.

Achievements

- Achieved 2nd Runner-Up position at TechKriti'24 RoboWar, IIT Kanpur.
- Achieved 2nd Runner-Up position at Concetto'24 RoboWar, IIT Dhanbad.
- NXP-AIM'24 finalist. Achieved top 16 placement in India, won the regional final and received hardware components valued at 1.77 Lakhs for physical deployment of the autonomous system.
- Ranked among the top 50 teams in the E-yantra Robotics Competition 2023-2024 at IIT Bombay.
- Received the Excellent Academic Performance Award (AISSCE 2022).

Social Engagements

Club Coordinator : RoboISM - Robotronics club of IIT Dhanbad.
Hobbies: Guitar, Chess, Gaming.