

# Alok Raj

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Github Website

Alok Raj  
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## EDUCATION

- Indian Institute of Technology, (IIT ISM) Dhanbad** Dhanbad, India  
Bachelors of Technology in Computer Science and Engineering; CGPA: 8.70 / 10.00 or 3.48 / 4.00 Class of 2026
- BR DAV Public School** Begusarai, India  
High School(12th); Percentage: 97.2% Class of 2022

## RESEARCH EXPERIENCE

- Undergraduate Research Internship** Remote  
Under Prof. G.C. Nandi & Andrew Melnik Dec 2024 - Present
  - Project:** Using state of the art foundation models(VLMs & LLMs) to solve robotic manipulation problems.
    - Working on precise manipulation in indoor environment relying on robot vision.
- Clutterbot Technologies** Bangalore, India  
Machine Learning Intern May 2024 - July 2024
  - Project:** Modernizing Object Detection with Distillation and Curriculum Learning
  - Description:**
    - Self-Training, using Co-DETR, to expand the dataset with unannotated images.
    - Curriculum learning trained DAMO-YOLO-M, distilled to DAMO-YOLO-Tiny for robot deployment.
    - Improved mAP50 from 34% to 42% and evaluated performance with TIDE.
    - Deployed on robot using Nvidia DeepStream and integrated with ROS2.
- NVCTI, IIT(ISM)** Dhanbad, India  
Minor in Product Development Internship Feb 2024 - Jan 2025
  - Project:** Automating the process of road-marking with Computer Vision and Robotics.
  - Description:**
    - Designed a lane detection algorithm to guide the robot on roads.
    - Created with a robot prototype for testing of effective lane following.
    - Incorporated a spraying mechanism for marking roads.
- Robotics and Automation Lab, IIT (ISM) [video]** Dhanbad, India  
Research Intern: Under Prof. Arun Dayal Udai December 2023
  - Project:** Development of in-house Quadrupedal Robot for Mining Application.
  - Work on Quadrupedal Robot:**
    - Developed ROS based framework for a in-house developed Quadrupedal Robot.
    - Reinforcement Learning based control policy.
    - Hardware testing of locomotion controller.

## SELECTED PROJECTS

- Mobile-Swarm-Navigation [video folder] [code]** Nov 2024 - Dec 2024  
Inter-IIT Tech Meet 13.0 - BharatForge
  - Project:** Create a Centralised Intelligence for Dynamic Swarm Navigation.
  - Scalable ROS2 based robot swarm for autonomous exploration and navigation in a dynamic environment.
  - Dynamic semantic environmental mapping with Instance Segmentation and Stereo Depth.
  - Semantic database management system for task allocation for the swarm.
- Autonomous Driving NXP-B3RB Buggy [link]** Aug 2024 - Oct 2024  
NXP-AIM Self Driving Car Design Challenge: Under Prof. Subhrangsu Mandal
  - Developed an autonomous driving system, for a B3RB-buggy, achieving a 1:42 (min:sec) track time.
  - Integrated LiDAR and camera for lane detection, obstacle avoidance, and traffic sign recognition.
  - Trained YOLOv5s, optimized with INT8 quantization for NPU, achieving real-time 7 Hz inference.
  - Utilized a mini computer running ROS2 for onboard processing and control.
- Hologlyph Bots [video] [code]** Aug 2023 - Jan 2024  
E-Yantra 2023
  - Simulated a 3-bot swarm in Gazebo with overhead camera-based arena monitoring.
  - Designed and 3D-printed bots in SolidWorks with three design iterations.
  - Integrated inverse kinematics for a 3-wheeled holonomic drive using servos.
  - Implemented Aruco detection for pen pose tracking in the arena.
  - Developed PID control with camera feedback; used ESP-32 as a ROS2 node via Micro-ROS.

## SKILLS

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- **Programming:** C++, Python, MATLAB, Linux, Git, SQL, SSH
- **Simulation/Visualization:** Isaac Gym, Gazebo, RViz, CoppeliaSim, Mujoco, Sapien
- **Frameworks/Libraries:** ROS/ROS2, RViz, PyTorch, OpenCV, Matplotlib
- **Hardware:** Yashkawa Arm, Nvidia Jetson, Depth Camera, 2D LIDAR, Dynamixel Actuators, RaspberryPi

## RELEVANT COURSEWORK

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- **Mechatronics:** Engineering Mechanics, Analog Interface Electronics
- **Software:** Reinforcement Learning, Self-Supervised Learning, Convolutional Neural Networks, Transformers, Data Structure & Algorithm

## HONORS AND AWARDS

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- 6th Position: InterIIT Tech Meet 13.0 for Rigbettlelabs
- Winner: NXP-AIM Regional Finale
- 3rd Position: Robowars(BattleBots) at TechKriti 2024 (Annual Tech Fest of IIT Kanpur)
- 3rd Position: Robowars(BattleBots) at Concetto 2024 (Annual Tech Fest of IIT Dhanbad)
- Received the Excellent Academic Performance Award (AISSCE 2022).

## EXTRA-CURRICULAR ACTIVITIES

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- **Club Coordinator:** RoboISM - The official Robotics and AI club of IIT ISM Dhanbad.
- **Joint Event Coordinator:** NVCTI - The innovation cell of IIT ISM Dhanbad.
- **Hobbies:** Guitar, Chess, Badminton.