

# Alok Raj

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 Github  Website

 Alok Raj

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## EDUCATION

- **Indian Institute of Technology (ISM) Dhanbad** Dhanbad, India  
*Bachelors of Technology in Computer Science and Engineering; CGPA: 8.59 / 10.00 or 3.44 / 4.00*  
**BR DAV Public School** Class of 2026  
Begusarai, India  
*High School(12th); Percentage: 97.2%* Class of 2022

## RESEARCH EXPERIENCE

- **Samsung Research** Bangalore, India  
*R&D Intern* May 2025 - Present
  - **Project:** Voice Biometrics on low-compute devices such as smart watches.
  - **Description:**
    - Developing an on-device speaker verification system for low-compute devices, utilizing the **ECAPA-TDNN** architecture.
    - Currently implementing model **quantization** and integrating the system into an **Android application** for efficient on-device authentication.
- **MARMoT Lab, NUS** Remote  
*Research Internship Under Prof. Guillaume A Sartoretti* Feb 2025 - Present
  - **Project:** Embodied Vision-Language Foundation Models for Visual Active Search.
  - **Description:**
    - **CoRL 2025** submission: "**Search-TTA: A Multi-Modal Test-Time Adaptation Framework for Visual Search in the Wild**"; focused on reasoning based geospatial active search using satellite imagery.
    - Adapted VAS/PSVAS frameworks & developed a **novel** Dijkstra-based evaluation method incorporating model predictions & exploration penalties.
    - Implemented & evaluated meta-learning based **Test-Time Adaptation (TTA)**, significantly improving Out-of-Distribution performance.
    - Conducted experiments (iNaturalist dataset, Nvidia RTX 5000) comparing against baselines.
- **Center of Intelligent Robotics, IIIT Allahabad** Remote  
*Research Internship Under Prof. G.C. Nandi & Andrew Melnik* Dec 2023 - Present
  - **Project:** Task-Oriented Grasping using Generative conditioning (GRIM Framework)
  - **Description:**
    - **RSS 2025 CRLH** workshop submission: "**GRIM: Task-Oriented Grasping with Conditioning on Generative Examples**".
    - Developed key components of the **GRIM memory creation pipeline**, involving single-view 3D hand-object reconstruction by prompting foundation models (**VLMs, Genie (Text-to-3D)**).
    - Engineered the **hybrid alignment strategy** for matching retrieved memory instances to scene objects, utilizing **DINOv2 PCA features** for coarse alignment and **ICP** with Chamfer distance for refinement.
    - Enabled robust, training-free task-oriented grasping by transferring grasp poses from aligned, generatively-created 3D examples to novel scene objects.
- **Clutterbot Technologies** Bangalore, India  
*Machine Learning Intern* May 2024 - July 2024
  - **Project:** Addressed challenge of limited labeled data via Self-Training 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 - April 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

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- **Mobile-Swarm-Navigation** [\[video folder\]](#) [\[code\]](#)  
*Inter-IIT Tech Meet 13.0 - BharatForge* *Nov 2024 - Dec 2024*
  - **Project:** Create a Centralised Intelligence for Dynamic Swarm Navigation.
  - Scalable ROS2 based robot swarm for autonomous exploration and navigation in a dynamic environment.
  - Dynamic environmental mapping with Instance Segmentation and Stereo Depth.
  - Database management system for task allocation for the swarm.
  - LLM based interactive search.
- **Autonomous Driving NXP-B3RB Buggy** [\[link\]](#)  
*NXP-AIM Self Driving Car Design Challenge: Under Prof. Subhrangsu Mandal* *Aug 2024 - Oct 2024*
  - 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** [\[video\]](#) [\[code\]](#)  
*E-Yantra 2023* *Aug 2023 - Jan 2024*
  - 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, Open3D
- **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, Mechanical Measurements, Analog Interface Electronics
- **Computer Science:** 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 and Finalist: Grand 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.