

# Ayush Agrawal

AI Researcher



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Ayush8120

## Overview

### Research Interests

Cognitive Science

Embodied AI

Reinforcement Learning

### Skills

C/C++

Python

MATLAB

LaTeX

OpenCV

Git

Pytorch

Tensorflow

ROS

### Coursework

Probability & Statistics

Linear Algebra

Discrete Mathematics

Neural Networks & Fuzzy Logic

Object Oriented Programming

### Online Courses:

RL-By David Silver

Deep Learning Specialization

## Education

**BE Electronics & Instrumentation Engineering**

BITS Pilani

2018 - 2022 | Pilani, India

## References

**Dr. Krishna Murthy:** MIT

**Dr. Mohan Sridharan:** UoBirmingham

**Dr. Brojeshwar Bhowmick:** TCS

## Research Experience

May 2022 - Present

**Robotics Research Center, IIIT Hyderabad** - Research Assistant

**Tags:** CommonSense Reasoning, Embodied AI, RL, GNNs

**Supervisor:** Dr. K Madhava Krishna, Dr. Mohan Sridharan, Dr. Krishna Murthy

- Developed computational methods inspired by human cognition to enhance performance of embodied agents in object navigation, multi-object navigation, and household tidying-up tasks.
- Proposed Sequence Agnostic Multi-Object Navigation (SAM) task, and proposed a RL based approach to leverage the learned semantic relations between rooms and static objects, to navigate to an unordered list of goal objects. [SAM, ICRA 2023]
- Further proposed a GCN encoder with Foundation Models as a backbone to generate utility based objects-room co-occurrence affinities that align well with Human CommonSense. [CLIPGraphs, RO-MAN 2023]

Nov 2021 - May 2022

**Bio-Engineering Lab, UNSW Canberra**

Research Intern

**Tags:** Bio-Inspired DL, Sequential Modelling

**Supervisor:** Dr. Sridhar Ravi

- Worked on my undergraduate thesis on the topic : Obstacle Avoidance in drones Using Bee Vision inspired Algorithms
- Implemented Deep Learning techniques to model the relationship between Geometric Optic Flow and Obstacle Avoidance in Bees, curated real honeybee trajectory dataset, and proposed an LSTM+CNNs model achieving 75% accuracy.
- Successfully tested the model in custom tunnels with multiple obstacles, resulting in avoiding obstacles each time.

June 2021 - August 2021

**ARMS Lab, IIT Bombay**

Research Intern

**Tags:** Decentralized Algorithms

**Supervisor:** Dr. Arpita Sinha

- Successfully implemented a Decentralized Multi-Drone Terrain Exploration algorithm on ROS and Gazebo using PX4 drones, ensuring complete exploration in a limited number of steps
- Utilized an incidence matrix as a mode of communication between robots and vertex, eliminating the need for inter-robot communication.

## Publications

A. Agrawal, A. Datta, N. Gireesh, S. Banerjee, M. Sridharan, B. Bhowmick, and M. Krishna, **Sequence-Agnostic Multi-Object Navigation** in IEEE International Conference on Robotics and Automation(ICRA), 2023, [arXiv](#) | [YouTube](#).

A. Agrawal, R. Arora, A. Datta, S. Banerjee, B. Bhowmick, J.K. Murthy, M. Sridharan, and M. Krishna, **CLIPGraphs: Multimodal Graph Networks to Infer Object-Room Affinities** in IEEE International Conference On Robot And Human Interactive Communication(RO-MAN), 2023. [arXiv](#) | [GitHub](#) | [YouTube](#)

## Patents

A. Agrawal, A. Datta, N. Gireesh, S. Banerjee, M. Sridharan, B. Bhowmick, and M. Krishna, **Method And System For Multi-Object Tracking And Navigation Without Pre-Sequencing**, Indian Patent Application No. 202321030491 , 27-Apr-2023 (Patent Pending)

## Honors & Awards

- Awarded a **INR 50,000** grant by **AUGSD BITS Pilani** to implement Autonomous Odor Drone