Ayush Agrawal

AI Researcher

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Overview

Research Interests

Foundation Models | Computer Vision | Reinforcement Learning | Embodied AI | Graph Neural Networks | HCI

Skills

C/C++ | Python | MATLAB | LaTeX | OpenCV | Git | Pytorch | Tensorflow | ROS

Coursework

Probability & Statistics | Linear Algebra | Image Processing | 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. K Madhava Krishna: *IIIT-H*
Dr. Brojeshwar Bhowmick: *TCS*

Research Experience

May 2022 - Present — **Research Assistant** — Robotics Research Center, IIIT Hyderabad
Tags: Embodied AI, RL, Graph Neural Networks, Foundational Models
Supervisor: Dr. K Madhava Krishna, Dr. Mohan Sridharan, Dr. Krishna Murthy

- Collaborating with TCS Research, Kolkata, India to enhance the performance of embodied agents in object navigation, multi-object navigation, and household tidying-up tasks.
- Proposed Sequence Agnostic Multi-Object Navigation (SAM) task, wherein the agent is neither provided nor forced to compute a global order in which it locates instances of the target objects.
- Proposed a GCN encoder leveraging Foundation Models for generating object-room co-occurrence affinities that align well with Human CommonSense (CLIPGraphs)
- Currently working on a framework, where, an embodied agent must tidy a house by rearranging misplaced objects using scene graphs and CLIPGraphs Affinities

Nov 2021 - May 2022 — **Research Intern** — Bio-Engineering Lab, UNSW Canberra
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 — **Research Intern** — ARMS Lab, IIT Bombay
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, (to be published).

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 (Under Review).

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,** (Patent Pending)

Honors & Awards

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