Ayush **Agrawal**

ayush8120.github.io | ay.agrawal812@gmail.com | github.com/Ayush8120 | Google Scholar

Education

May 2022 | **Birla Institute of Technology and Science (BITS) Pilani** — **Pilani, India**
Aug 2018 | B.E. Electronics & Instrumentation

Experience

Present / **June 2023** | **National University Of Singapore (NUS)** — **Remote / Singapore**
Research Intern | Advisors: Dr. Dianbo Liu, Dr. Anirudh Goyal
Leveraging LLMs and VLMs to equip Embodied Agents with human physical commonsense reasoning

June 2023 / **May 2022** | **International Institute Of Information Technology (IIIT) | Robotics Research Center** — **Hyderabad**
Research Assistant | Advisors: 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

May 2022 / **Nov 2021** | **University of New South Wales (UNSW) | Bio-Engineering Lab** — **Remote / Canberra, Australia**
Research Intern (Bachelor Thesis) | Advisor: Dr. Sridhar Ravi
Designed and implemented a Deep Learning model inspired by Honey Bee Vision to achieve effective obstacle avoidance for drones

Aug 2021 / **June 2021** | **Indian Institute Of Technology (IIT) | ARMS Lab** — **Remote/ Mumbai, India**
Summer Intern | Advisor: Dr. Arpita Sinha
Developed a Decentralized Multi-Drone Terrain Exploration algorithm using PX4 drones on ROS and Gazebo.

Publications

S=In Submission, C=Conference

[S.1] **Physical Reasoning and Object Planning for Household Embodied Agents** [🔗][🌐]
Ayush Agrawal, Raghav Prabhakar, Anirudh Goyal, Dianbo Liu
[In Submission] **[TMLR]**

[C.1] **Sequence Agnostic Multi-Object Navigation** [🔗][📹]
Nandiraju Gireesh*, Ayush Agrawal*, Ahana Datta*, Snehasis Banerjee, Mohan Sridharan, Brojeshwar Bhowmick, Madhava Krishna (* = Equal Contribution)
IEEE International Conference On Robotics And Automation **[ICRA 2023]**

[C.2] **CLIPGraphs: Multimodal Graph Networks to Infer Object-Room Affinities** [🔗] [🌐] [📹]
Ayush Agrawal*, Raghav Arora*, Ahana Datta, Snehasis Banerjee, Brojeshwar Bhowmick, Krishna Murthy Jatavallabhula, Mohan Sridharan, Madhava Krishna (* = Equal Contribution)
IEEE International Conference On Robot And Human Interactive Communication **[RO-MAN 2023]**

Select Research Projects

Physical Common Sense Reasoning June'23 - Present
Advisors: Dr. Dianbo Liu, Dr. Anirudh Goyal

- Formulated a 3 step architecture for demystifying the Human CommonSense Reasoning involved in decision making when making object selection for Task Completion
- Created human preference datasets and analysed abstract commonsense reasoning capabilities of LLMs when posed the same questions [In Submission]

Embodied Multi Object Navigation May'22 - June'23
Advisors: Dr. K Madhava Krishna, Dr. Mohan Sridharan, Dr. Krishna Murthy

- Developed Commonsense oriented heuristics to optimize the task of search and retreival of multiple objects by framing the problem as a Contextual TSP.
- For static objects, developed a modular framework with an RL policy based on semantic inputs to output effective long term goals thus enabling the robot to locate the list of objects in a optimized sequence agnostic manner[**ICRA'23**][Blog]
- For dynamic objects, developed a Graph Neural Network by processing Human Preference Dataset and CLIP Features to give better human commonsense aligned Object-Room Affinities and latent embeddings.[**RO-MAN'23**][Intuition]

Bio-Inspired Robotics Sept'21 - May'22

Advisors: Dr. Sridhar Ravi, Dr. Puneet Mishra, Dr. Sujan Yenuganti

- Developed and Tested Honey Bee vision inspired obstacle avoidance algorithm on simulated tunnels with varying number of obstacles. [Report]
- Explored smell sensing in insects, and got institute funding for an autonomous source localization drone. [Report]

Patents

Method And System For Multi-Object Tracking And Navigation Without Pre-Sequencing, 2023 | Patent Pending

Talks

"Bio-Mimicry"

- A Honey Bee's Attempt at Obstacle Avoidance [🔗] December 2021 (BITS Pilani)

Honours and Awards

BITS Pilani Undergraduate Project Funding, 2021 [🌐] For working on Autonomous Odor Localization Drone

Bronze Medal, Univeristy Physics Competition 2021 [🌐] For presenting our solution as a white paper in 48 hours

Academic Service

Reviewer IROS 2023

Skills

Languages	Python, C++, MATLAB
Frameworks	Pytorch, Tensorflow
Tools	Git, Visual Studio
Simulators	Habitat, AI2Thor, Virtual Home, Gibson, Gazebo
Relevant Coursework	Pattern Recognition, Probability & Statistics , Linear Algebra, Discrete Maths Neural Networks & Fuzzy Logic, Object Oriented Programming
MOOC	RL by David Silver, Deep Learning Specialization by Andrew Ng

References

- Dr. Dianbo Liu ..... *Assistant Professor, NUS, Singapore* [🌐]
- Dr. K Madhava Krishna ..... *Professor, IIIT Hyderabad, India* [🌐]
- Dr. Mohan Sridharan ..... *Reader, University of Birmingham, UK* [🌐]
- Dr. Krishna Murthy Jatavallabhula ..... *PostDoc, MIT* [🌐]