

# Ayush Agrawal

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## Education






May 2022 Aug 2018	<b>Birla Institute of Technology and Science (BITS) Pilani</b> B.E. Electronics & Instrumentation	Pilani, India
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## Experience

<b>Present</b> June 2023	<b>National University Of Singapore (NUS)</b> Research Intern / Advisors: <a href="#">Dr. Dianbo Liu</a> , <a href="#">Dr. Anirudh Goyal</a> Leveraging LLMs and VLMs to equip Embodied Agents with human physical commonsense reasoning	Remote / Singapore
June 2023 May 2022	<b>International Institute Of Information Technology (IIIT)   Robotics Research Center</b> Research Assistant / Advisors: <a href="#">Dr. K. Madhava Krishna</a> , <a href="#">Dr. Mohan Sridharan</a> , <a href="#">Dr. Krishna Murthy</a> Developed computational methods inspired by human cognition to enhance performance of embodied agents in object navigation, multi object navigation and household tidying up tasks	Hyderabad
May 2022 Nov 2021	<b>University of New South Wales (UNSW)   Bio-Engineering Lab</b> Research Intern (Bachelor Thesis) / Advisor: <a href="#">Dr. Sridhar Ravi</a> Designed and implemented a Deep Learning model inspired by Honey Bee Vision to achieve effective obstacle avoidance for drones	Remote / Canberra, Australia
Aug 2021 June 2021	<b>Indian Institute Of Technology (IIT)   ARMS Lab</b> Summer Intern / Advisor: <a href="#">Dr. Arpita Sinha</a> Developed a Decentralized Multi-Drone Terrain Exploration algorithm using PX4 drones on ROS and Gazebo.	Remote/ Mumbai, India

## Publications

S=In Submission, C=Conference

- [S.1] **Embodied Physical CommonSense Affordance**  
[Ayush Agrawal](#), Raghav Prabhakar, Anirudh Goyal, Dianbo Liu  
[In Submission]
- [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 retrieval 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](#)]

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

<b>Languages</b>	Python, C++, MATLAB
<b>Frameworks</b>	Pytorch, Tensorflow
<b>Tools</b>	Git, Visual Studio
<b>Simulators</b>	Habitat, AI2Thor, Virtual Home, Gibson, Gazebo
<b>Relevant Coursework</b>	Pattern Recognition, Probability & Statistics , Linear Algebra, Discrete Maths Neural Networks & Fuzzy Logic, Object Oriented Programming
<b>MOOC</b>	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 [🌐]