

Ayush Agrawal

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Education

Birla Institute of Technology and Sciences, Pilani

B.E. in Electronics And Instrumentation Engineering | CGPA: 7.66/10

Teaching Assistant: Microprocessor & Interfacing Lab

Pilani, India

August. 2018 - August 2022

New Green Field Public Academy, Indore

CGPA - 10 (X Standard) ; Percentage - 89.9 (XII Standard)

Indore, India

2016 - 2018

Publications

Sequence Agnostic Multi-Object Navigation 📄 | 📺

IEEE INTERNATIONAL CONFERENCE ON ROBOTICS AND AUTOMATION

Ayush Agrawal*, Ahana Datta*, Nandiraju Gireesh*, Snehasis Banerjee, Mohan Sridharan, Brojeshwar Bhowmick, Madhava Krishna

ICRA 2023

Accepted

CLIPGraphs: Multimodal Graph Networks to Infer Object-Room Affinities 📄 | 🌐 | 📺

IEEE INTERNATIONAL CONFERENCE ON ROBOT AND HUMAN INTERACTIVE COMMUNICATION

Ayush Agrawal*, Raghav Arora*, Ahana Datta, Snehasis Banerjee, Brojeshwar Bhowmick, Krishna Murthy Jatavallabhula, Mohan Sridharan, Madhava Krishna

RO-MAN 2023

Accepted

Research Experience

Robotics Research Center, IIIT Hyderabad

RESEARCH ASSISTANT, [GUIDE](#): Dr. Madhav Krishna , Dr. Krishna Murthy , Dr. Mohan Sridharan

Hyderabad, India

June. 2022- Present

- 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]

University of New South Wales, Canberra

UNDERGRADUATE THESIS, [SUPERVISOR](#) : Dr. Sridhar Ravi [RESULTS](#): [Thesis Link](#) , [Conference PPT](#)

Canberra, Australia

November 2021- May 2022

- 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.

Indian Institute of Technology, Bombay

REMOTE RESEARCH INTERN, [GUIDE](#): Dr. Arpita Sinha [RESULTS](#): [GitHub](#)

Bombay, India

June. 2021- August 2021

- 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
- Tools Used: Python, ROS, Gazebo, MATLAB

References

Dr. K Madhava Krishna, [E-Mail](#) | [Webpage](#) | Full Professor at IIIT-H

Dr. Mohan Sridharan, [E-Mail](#) | [Webpage](#) | Reader at University of Birmingham

Dr. Krishna Murthy Jatavallabhula, [E-Mail](#) | [Webpage](#) | Post Doc at MIT

Dr. Brojeshwar Bhowmick, [E-Mail](#) | [Webpage](#) | Principal Scientist, TCS Research Kolkata, India

Patents

May 2023 **Method And System For Multi-Object Tracking And Navigation Without Pre-Sequencing**,

Patent Pending

Projects

Image Denoising for UAV Imagery

BITS Pilani

SUPERVISOR : [Dr. Meetha Shenoy](#) **RESULTS :** [Github Link](#) | [Project Report](#)

Jan 2021 - May 2021

- Reviewed various denoising, deblurring, super-resolution, marker detection methods using GANS and CNN's.
- Created a new dataset by adding commonly occurring UAV noises, to judge the level of denoising, Metrics chosen : PSNR, SSIM
- Tools Used: TensorFlow, Keras, PIL, Wand

Bio-inspired Source Localization Drone

Pilani, India

CO-SUPERVISOR : [Dr. Sujan Yenuganti](#), [Dr. Puneet Mishra](#) **RESULTS :** [Project Report](#)

September 2021- May 2022

- Worked on making a Bio-inspired Odor/Light Source Localization Drone
- Interfaced Gas/LDR Sensors with a Micro-Controller attached to a DJI Tello to publish the signals in real time to a ROS topic
- Developed a ROS Program to process these signals and guide the DJI Tello to reach the odor/light source
- Fully Sponsored by AUGSD BITS Pilani

Crop Advisory System using Novel Nitrogen Sensor and IoF Framework

BITS Pilani, India

GUIDE : [Dr. Puneet Mishra](#) **RESULTS :** [Project PPT](#)

August 2021 - January 2022

- Developed an architecture for soil sensing and visualization using ESP32 and AWS
- Researched about micro-controllers, types of sensors, whole system architecture and interfaced it all together to send data at regular intervals to AWS Database
- This was a [Department Of Biotechnology, Government Of India](#) Sponsored Project

Competitions

E-Yantra Robotics Competition

IIT Bombay, India

FINISHED IN TOP 30 OUT OF 500 TEAMS | [Final Submission Video](#)

Sept 2020 - April 2021

- Designed and Simulated a parcel distribution drone with Discrete PID Controller
- Successfully Executed Marker Detection, QR code-based scanning, path planning, obstacle avoidance, scheduling of delivery/pickup to maximize the revenue
- Tools Used: Python, ROS, Gazebo, Plotjuggler, OpenCV

University Physics Competition 2021

BRONZE MEDAL | [Certificate](#)

November 2021

- Researched about Asteroid's minimum mass to cause a substantial damage to a 1000 Km away coastal city
- Presented our findings in form of a Research Paper in a span of 48 Hours.

IRDC(International Rover Design Challenge)

The Mars Society

[Team Website](#) | [Certificate](#)

July 2021- September 2021

- Part of a 65 Member Team.
- Contributed in researching various low light imaging techniques using Deep Learning & Standard Image Processing

Relevant Coursework

David Silver RL | Linear Algebra | Probability And Statistics | Pattern Recognition | Image Processing | Neural Network And Fuzzy Logic | Deep Learning Specialization (Online) | Discrete Mathematics | Object Oriented Programming

Technical Skills

- **Languages :** [Python](#), C/C++
- **Developer Tools:** [Git](#), VS Code, Google Colab
- **Libraries:** [Pandas](#), NumPy, Matplotlib, Wand, PIL, OpenCV
- **Softwares:** [MATLAB](#), SIMULINK, Gazebo, ROS
- **Frameworks:** [TensorFlow](#), Keras, PyTorch

Honors & Awards

2018 [96.07 percentile out of 0.15 million applicants, IIT Joint Entrance Examination Advanced, 2018](#)

2021 [Awarded INR 50,000 as UG Project Funding for Autonomous Odor Drone, AUGSD BITS PIALNI](#)

BITS Pilani