Aditya Rauniyar

Active Perception • Robot Planning • Multi-Agent Systems

https://adityarauniyar.com

Education

Carnegie Mellon University, School of Computer Science, Pittsburgh **Aug 2022 – Aug 2024**

Master of Science in Robotics (MSR) *GPA: 3.89*/4*

Coursework: Visual Learning, Robot Learning, Multi-Robot Coordination & Planning, Computer Vision.

SRM Institute of Science and Technology, Chennai **Jan 2020**

B.Tech - Mechanical Engineering *GPA: 90.95%*

Coursework: Virtual Reality, Path Planning, Robotics Engineering, Mechatronics

Technical Skills

Concepts: Algorithm Design, Software Design, Multi-Agent Systems, Machine Learning, Computer Vision, Robot Planning
Languages/Database: C++, Python (Numpy, PyTorch), CUDA, WanDB, Docker, Ansible, ROS, ROS2, DDS, Linux.
Software & Tools: Isaac Sim, Rviz, Gazebo, Blender, Unreal Engine, Simulink, Solidworks.

Research Experience

AART Lab, CMU **Aug 2023 – Present(5m)**

*Graduate Researcher under **Prof. Katia Sycara*** *CMU, Pittsburgh*

- Developed **simulation environment** with UAVs, Ships, and Debris, towards a collaborative AI solution.
- Developed **Active Vision** using uncertainty estimation for UAVs to navigate in unknown, outdoor environments with prior understanding of scene.

Air Lab, CMU **Aug 2022 – Present(17m)**

*Graduate Researcher under **Prof. Sebastian Scherer*** *CMU, Pittsburgh*

- Part of a larger collaborative project with PIs: Prof. Scherer, Prof. Kris Kitani, Prof. Isher, Prof. Hyun Soo Park
- Developed conflict resolution strategies that achieves **46% reduction of inter-robot collisions**, and single agent view search that is **72x computationally superior**
- Developed multi-drone tracking and view planning for reconstructing multiple moving targets, achieving upto **25% better occlusion-aware perception of robots** than state-of-the-art methods that **leverages GPUs vs CPUs**
- **System Engineered 3 Drones geometrically tracking 3 moving targets in-the-wild.**
- **Field Test Coordination:** Organized and executed weekly experiments involving multiple collaborators, showcasing effective teamwork and dedication to translating ideas into real-world applications.
- Research funded by **ONR, DARPA, NSF Grant**. Presentations to NSF Foundational Research in Robotics (FRR).

IIT Madras **Dec 2018**

*Research Assistant under **Prof. Krishnan Balasubramanian*** *Chennai, India*

- Generated a fault map of toxic pipelines and provide analytics for required metrics (cracks and bends) using a non-destructive testing robotic system.

Bhabha Atomic Research Centre. **May 2018 - Nov 2018(7m)**

*Research Assistant under **Prof. Debanik Roy*** *Chennai, India*

- Developed a novel test setup of **multi-link Flexible Robotic Systems (FRS)** for bedridden patient assistance.
- Presented the accepted paper at the 2018 IEEE ICCIC, which received the track's **best paper award**

Honors & Awards

Best Project Award: Active Vision for Next Best View Planning in 16824 VLR Course at CMU.
Best Project Award: Collaborative MeWBots from batch of 2019 within the Department, SRM IST
Best Paper Award : Track No. 3 at IEEE ICCIC 2018 for the publication mentioned above
(UG) Full-Ride Scholarship : Recipient of USD40,000 full-ride scholarship to pursue undergraduate degree.
COMPEX Scholarship Test : Rank 1 out of 12,000 applicants for merit-based scholarship towards B.tech.

Industry Experience

Vimana (Venture funded startup) HQ: Berkeley, California **April 2020 – July 2022(29m)**

Software Engineer (Teams: Edge Computing, Cloud Computing) *Remote*

- **98% improved CPU usage** for OS apps through thread optimization and efficient nested hash implementation.
- Developed library that made **36% reduction of code repeateablily and 75% better trafic management**.
- Featured **informative talks on edge computing**, enhancing cross-functional team performance.
- Skills: Operating Systems, Computer Networks, Cloud Computing, DS&Algo, Software design, Test Driven Dev (TDD)

Publications

Active vision for view gathering in large scenes. **March 2024 (In Preparation)**

- Authors: **Rauniyar*, Aditya** and Alama*, Omar and Sycara, Katia and Scherer, Sebastian
- European Conference on Computer Vision (ECCV) 2024

Coordinated Capture with multi-drone operations **Dec 2023 (In Preparation)**

- Authors: **Rauniyar, Aditya** and Suresh, Krishna and Hou, Yuechuan and Corah, Micah and Scherer, Sebastian
- IEEE Robotics and Automation Letters (RA-L)

Greedy Perspectives: Multi-Drone View Planning for Collaborative Coverage. | *Link* **2024 (Submitted)**

- Authors: Suresh, Krishna and **Rauniyar, Aditya** and Corah, Micah and Scherer, Sebastian
- Under Review at Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)
- Short version presented at IROS 2023 Workshop on *IPPC*

Enhancing Multi-Drone Coordination for Filming Group Behaviours in Dynamic Environments **Oct 2023**

- Authors: **Rauniyar, Aditya** and Li, Jiaoyang and Scherer, Sebastian
- Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) Workshop on Multi-Agent Learning

MeWBots: Decentralized Collaborative Manipulation in a Clustered Space. | *Publication link* **March 2021**

- Authors: **Aditya Rauniyar**, Hem Chandra Upreti, Aman Mishra, Dr. S. Prabhu.
- Springer: Journal of Intelligent & Robotic Systems volume 102, Article number: 3 (2021)

Design Model for the Test Set-Up of a Novel Flexible Robotic System. | *Publication link* **Aug 2019**

- Authors: **Aditya Rauniyar**, Dr. Debanik Roy, Pankaj Pandit, Vinod Atpadkar.
- 2018 IEEE International Conference on Computational Intelligence and Computing research (ICCIC)

Projects

Informative Multi-Drone View Planning for Collaborative Coverage | C++, CUDA **June 2023 – present**

- Developed methods for submodular maximization to optimize camera views across teams of aerial robots for large-scale filming of dynamic groups of people in complex environments.
- Addressing inter-robot collision and environment view occlusions, and developed a dynamic-multi-target view planner.

Active Vision for Next Best View Planning | Python, Torch **June 2023 – present**

- Developing uncertainty driven view planning approach that uses prior experiences of navigating outdoor scenes
- Developed a novel training approach called, "cutscene augmentation" that reduces dataset size by 30% and increase pred accuracy by 20%

Dynamic Multi-Agent Multi-target Task Assignment and Planning | Python, *Git* **Jan 2023 – May 2023**

- Conflict-Based Multi-Agent Path Finding (MAPF) algorithm for collision-free paths in multi-camera filming scenarios.
- Extension for actor-specific requirements. Demonstrated effectiveness through experiments in simulated environments.

Unified Graph Algorithms | *C++, Git* **June 2021 – July 2021**

- Implemented and rigorously tested graph-related algorithms, including Kruskal, Prim, Floyd Warshall, BFS, DFS, negative cycle detection, Dijkstra, A*, and more.
- Ensured comprehensive problem statement documentation for each algorithm, specifying input parameters, constraints, and output types, while actively encouraging bug reporting for continuous refinement.

Collaborative MeWBots in obstacle-clustered Environment | C **July 2018 – Jan 2020**

- Led a 3-member team in developing Collaborative MeWBots for obstacle-clustered environments, overseeing full-stack engineering from design to testing.
- Implemented coordination algorithm enabling multi-robot collaboration in transporting objects.

Online Courses

Data Structures and Algorithms Specialization: University of California San Diego (Coursera)
Robotics Specialization: University of Pennsylvania (Coursera)
Front End Development: The Hong Kong University of Science and Technology (Coursera)

Mentorships

Krishna Suresh: Robotics Institute of Summer Scholar(RISS) 2023 Intern. Worked together towards **ICRA** publication over summer 2023.
Hannah Noh: Undergraduate Student conducting independent research study in Spring 2024.
Angie Bu: Undergraduate student preparing towards part 107 pilot license.

Services

Reviewer: IEEE International Conference on Robotics and Automation (ICRA) 2023 - Present
Flight trainer Actively training new members towards their first drone piloting at Air Lab.
Workshop Host: 2nd International Conference on Advances in Mechanical Engineering at SRM IST
Relief Volunteer: Earthquake relief volunteering in Nepal

Entrepreneurship Experience

Pixel AI (Stage: Ideation) **Aug 2023 – Present**
Founder *Swartz Center for Entrepreneurship, CMU*

- Revolutionizing construction industry with robotics and AI towards seamless integration of various subdomains.
- Conducted Market Survey to find value proposition under common platform for Contractors/Architects/Construction Manager to realtime building status with digital twin representation.
- Selected for Project Olympus Customer Discovery kick-start program

Leadership and Competitions

World Robot Olympiad(WRO) **2018 and 2019**
S.T.A.R. Robotics *at SRM IST* *Chennai, India*

- **Co-founded** the team S.T.A.R Robotics to take part in WRO 2018. Total team size of 14 members
- **Led** the Design, Simulation and Testing of the fully autonomous Two-link Articulated Arm Mobile Delta Robot in '18
- Secured **Bronze Medal** Nationally(India) in WRO'18.

Asia-Pacific Robot Contest (ABU Robocon) **2017 and 2018**
SRM Team Robocon *at SRM IST* *Chennai, India*

- **Led** the Design, Control, and Testing of a Frisbee launching mobile robot with controlled landing of Frisbee in 2017
- **Top 15 finish out of 150+ teams** from all over the country in ABU Robocon 2017.
- **Led** 4 member sub team towards Mathworks Robocon Simulation Competition in 2018.

Licences

FAA Part 107 Certified Pilot **Jan 2023**
Federal Aviation Administration
CPR/AED **Jul 2023 - Jul 2025**
American Heart Association *Credential ID 236028626830*

Extracurricular Activities

Mountain Treks: Trekked Himalaya Annapurna Base Camp in May 2023. Duration: 7d. Altitude: 4300m
Soccer: Graduate-Sudent Assembly CMU Soccer league champions 2023, Team's top scorer, Position: Striker.
Cycling: Intermediate on Mountain and Road Biking, Participant of BikePGH 40miles.
Cricket Represented Home Country(Nepal) Internationally in U19 leagues. Played w/ India(L) and Kuwait(W)
Other: Poker, table tennis, 8 ball pool, bouldering.