

Rishab Balasubramanian

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EDUCATION

- **Oregon State University** Corvallis, OR
M.S in Artificial Intelligence Sep 2021 - Present
- **National Institute of Technology** Trichy, India
B.Tech in Instrumentation And Control Engineering Aug 2016 - May 2020

PUBLICATIONS AND PREPRINTS

- **Balasubramanian, Rishab**, Jiawei Li, Prasad Tadepalli, Huazheng Wang, Qingyun Wu, and Haoyu Zhao. Adversarial attacks on combinatorial multi-armed bandits. *under review at NeurIPS*, 2023:
- Zichen Wang, **Balasubramanian, Rishab**, Hui Yuan, Chenyu Song, Mengdi Wang, and Huazheng Wang. Adversarial attacks on online learning to rank with stochastic click models. *under review at NeurIPS*, 2023:
- **Balasubramanian, Rishab** and Kunal Rathore. Contrastive learning for object detection. *arXiv preprint arXiv:2208.06412*, 2022:
- **Balasubramanian, Rishab**, Rupashree Dey, and Kunal Rathore. Contrastive learning for ood in object detection. *arXiv preprint arXiv:2208.06083*, 2022:
- **Balasubramanian, Rishab**, Lifeng Zhou, Pratap Tokekar, and PB Sujit. Risk-aware submodular optimization for stochastic travelling salesperson problem. In *2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 4720–4725. IEEE:
- **Balasubramanian, Rishab** and Sujit PB. A cooperative framework for autonomous landings of quadrotors using vision on a moving ugv. In *AIAA Scitech 2021 Forum*, page 1880, 2021:

SKILLS SUMMARY

- **Languages:** Embedded C, C, C++, Python, MATLAB, HTML, Assembly Language, SQL, L^AT_EX, Scratch, Shell Programming
- **Tools:** ROS, Gazebo, OpenCV, Keras, PyTorch, Arduino, Tina, Pygame, MATLAB & Simulink, Ardupilot, PyTorch, PyTorch3D

RESEARCH EXPERIENCE

- **Adversarial Attacks on Combinatorial Multi-Armed Bandits (code)** Oregon
Research with Dr. Huazheng Wang (OSU) March 2022 - Present
 - Created a theoretically provable attack on combinatorial multi-armed bandits.
 - Verified effectiveness on cascade bandits and maximum coverage problems for multiple algorithms
 - Currently extending the attacks to an online influence maximization setting
- **Block-wise Trainable Neural Networks (code)** Remote
Research with Dr. Beidi Chen (Meta) August 2022 - December 2022
 - Designing neural networks that are trainable in blocks to reduce training time and computation
 - Applied contrastive learning to enforce better representation learning
 - Enforced gradient blocking and data pruning to improve training time
 - Tested on a variety of networks including Transformers, ResNets and VGG models
- **Contrastive Learning for Object Detection and OOD Detection (code)** Oregon
Course project with Prof. Stefan Lee (OSU) April 2022 - June 2022
 - Enforced ranking to incorporate human knowledge into contrastive learning framework
 - Verified on Object Classification, detection, and OOD detection tasks
 - Performed evaluations using mAP, accuracy and training time, and described possible improvements
- **Explainable 3D Object Reconstruction from Multi-View Images (code)** Oregon
Research with Dr. Prasad Tadepalli (OSU) January 2022 - March 2022
 - Implemented [3D-R2N2](#) for voxel-based shape generation.
 - Used the weights of the RNN to rank input images based on importance
 - Compared against [SoftRas](#), a mesh-based generation method.

- 3D Reconstruction from Endoscopy Images** India
 Research at [EndovisionAI](#) January 2021 - April 2021
 - Created an API for 3D reconstruction of digestive track using endoscope images.
 - Developed a model for unsupervised learning of depth from RGB endoscopy images inspired by [Depth From Cameras in The Wild](#).
 - Produced 3D point clouds from RGB images using Shape-from-Shading methods.
- Risk Averse Travelling Salesman Problem ([code](#))** India
 Research with **Dr. Sujit** (IISER Bhopal) and **Dr. Tokekar** (University of Maryland) June 2020 - November 2020
 - Developed a risk aware greedy algorithm to maximize the Conditional Value at Risk (CVaR) using a submodular function over a matroidal constrained system.
 - Proved the algorithm has polynomial runtime and approximation factor is proportional to the optimal solution.
 - Showed the suboptimality gap of the solutions is bound by a constant factor.
- Autonomous Mapping And Safe Footfall Planning For Hexapods ([code](#))** Remote
 Research **Dr. Guillaume Sartoretti** (National University of Singapore) June 2020 - January 2021
 - Generated global map using RTABMap and teleoperated control
 - Calculated an elevation map from input images, by fusing localization data with an octomap.
 - Computed gradients and safe foot positions by applying a sobel filter to the input pointcloud data.
 - Worked on closed loop footstep planning using a Central Pattern Generator.
- Domain Decomposition for Multi-Agent Search ([code](#))** Remote
 Research **Dr. Guillaume Sartoretti** (National University of Singapore) June 2020 - January 2021
 - Used Asynchronous Actor Critic (A3C) to learn the optimal generator placements, and create a Voronoi diagram using these to decompose the map.
 - Analyzed the effect of communication restrictions and uncertainty of sensors on the efficiency of the search.
 - Integrated the decomposition with search algorithms to verify the performance.
- Cooperative Autonomous Landings of Quadrotors ([code](#))** India
 Summer Research Internship with **Dr. P.B.Sujit** (IIIT-Delhi) May 2019 - May 2020
 - Tuned an SDRE controller for the UAV
 - Applied homographic transformations and Kalman Filtering on the visual data to estimate the target's position and velocity
 - Proved robustness and stability of proposed controller and developed strategies for multi-agent coordinated landing for high-speed targets.

PROJECTS

- Snake-like Robot
- Geometric Pursuit Evasion Algorithms
- Ball Balancing Robot
- Collision Avoidance for multi-agent systems
- American Sign Language to Text Conversion

TEACHING EXPERIENCE

- Mentor for freshmen in the last two years of undergraduate
- TA for ENGR 201: Electrical Fundamentals I at Oregon State with Dr. Pallavi Dhagat (Fall 2021)
- TA for CS 325: Analysis of Algorithms at Oregon State with Prof. Umma Reddy (Winter 2022)
- Created teaching material for CS 514: Algorithms at Oregon State with Prof. Samina Ehsan (Spring 2022)
- TA for AI 534: Machine Learning at Oregon State with Dr. Xiaoli Fern (Fall 2023)

ACHIEVEMENTS AND EXTRA-CURRICULAR ACTIVITIES

- Was among the top 1% in JEE amongst the students graduating from high school in 2016
- Selected twice for regional **AMTI (Association of Maths Teachers of India)** examination
- Participant in the **National Service Schemes (NSS)**