Manan Arora

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Education

BITS Pilani KK Birla Goa Campus **2020 – 2024(expected)**
Bachelors of Engineering in Electronics and Communications *Goa, India*

Relevant Coursework

Probability and Statistics, Linear Algebra, Computer Programming, Data Structures and Algorithms, Control Systems,Non-Linear Dynamics and Chaos, Modern Control Systems, Machine Learning, Reinforcement Learing

Experience

Swaayatt Robots **June 2023 – September 2023**
Research Intern *Bhopal, India*

- Advised by Mr Sanjeev Sharma(Founder and CEO, Swaayatt Robots)
- Research in **Motion Planning for Autonomous Vehicles in Highly Stochastic Environments using Deep Reinforcement Learning**.
- Implemented Reinforcement Learning environments and Reinforcement Learning algorithms for training agents to navigate through dynamic and static obstacles.
- Tech Stack: Python, Pytorch, C++, Numpy, Gazebo

MARMot Lab, National University of Singapore **February 2023 – June 2023**
Research Intern *Remote*

- Advised by Dr Guillaume Sartoretti
- Research in **Foothold Planning using Reinforcement Learning**
- Implemented control algorithms using Central Pattern Generators for six-legged robot Yuna and Reinforcement Learning algorithms for learning legged locomotion
- Tech Stack: Python, Pytorch, Pybullet, IsaacGym, C++, Numpy

BITS Pilani Goa Campus **September 2022 – Present**
Undergraduate Researcher *Goa, India*

- Advised by Dr Sarang Dhongdi
- Research in **Flyinng Adhoc Network Simulator**
- Working on a bridge framework to co-simulate the coverage planning of disaster-deployed UAV swarms and the communication network between them.
- Tech Stack: Python, C++, PX4 SITL, ROS, Gazebo, NS3

CSIR-CEERI | **Code** | **Paper** **June 2022 – September 2022**
Research Intern *Rajasthan, India*

- Advised by Dr Kaushal Kishore.
- Research on **UAV Landing on a Moving Platform without any Markers**
- Implemented control algorithms to follow and land on the moving platform and perception algorithms for detection of the unmarked platform using 3D Lidar and a USB camera
- Tech Stack: Python, C++, PX4 SITL, ROS, Gazebo, OpenCV, RViz
- Work done was published in the paper titled **UAV Landing on General Moving Platforms Without Markers** at IMSD-ACMD at IIT Delhi

Projects

Proximal Policy Optimisation | *Python, Pytorch* **Github Link**

- Implemented clipped objective Proximal Policy Optimisation Algorithm from scratch using Pytorch and reproduced the results in LunarLander and BipedalWalker OpenAI gym environment.
- Included modifications like Generalised Advantage Estimate, Entropy Regularisation etc. in order to match the performance offered by StableBaseline3's PPO

Obstacle avoidance using RL | *Python, Pytorch, Pygame* **Github Link**

- Implemented Reinforcement Learning environment and agent from scratch to learn to reach the goal pose while avoiding obstacles.
- Implemented clipped objective Proximal Policy Optimisation algorithm from scratch to train the agent

TrotBot | *Python, ROS, Arduino, C/C++, PyTorch* **Github Link**

- TrotBot is an autonomous omni wheel based delivery bot developed by ERC. Implemented path planning algorithms and Kalman Filter to get a reliable odometry from sensors
- Worked on Semantic Segmentation i.e categorizing various objects in the image captured by the onboard camera.

Octobounce | *Python, ROS, Arduino, C/C++, OpenCV* **Github Link**

- OctoBounce is a Stewart based platform for controlling the bounce of a table tennis ball.
- Implemented computer vision based ball detection algorithm.

Maze Solving Robot | *Python, ROS, Arduino, C/C++, OpenCV* **Github Link**

- Developed a control and navigation stack for an omni wheel robot to solve a maze autonomously.
- Implemented a closed loop PID controller and a modified version of RRT for path planning.

Technical Skills

Languages: Python, C/C++, MATLAB
Tools and Frameworks: ROS, Gazebo, PyBullet, Gym, Isaac Gym, Simulink, rViz, NS3, Logisim, Autocad
Deep Learning: PyTorch, Tensorflow, NumPy, Pandas, scikit-learn
Technologies/Frameworks: Linux, Git/Github

Extracurricular

Robotics Hackathon 2022 **July 2022 – August 2022**
Hackathon Mentor *BITS Pilani KK Birla Goa Campus*

- Designed a robotics hackathon for 100+ undergraduate students, with the objective of developing an autonomous cleaning robot. Helped students by clearing their doubts and troubleshooting on various subjects like ROS, Path Planning, Control Theory etc.

Quark Summer Technical Project 2022 **July 2022 – August 2022**
Mentor *BITS Pilani KK Birla Goa Campus*

- Designed and mentored a summer robotics course for 100+ undergraduate students, involving development of an maze solving robot.