Mayank Bansal

Worcester MA
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EDUCATION:

Worcester Polytechnic Institute (WPI), Worcester, MA
Master of Science in Robotics, GPA 4.0/4.0 May 2024
Relevant Courses: Hands-on UAV, Motion Planning, Robot Control, Reinforcement Learning, Robot Dynamics, Legged Robotics

Manipal Institute of Technology, **(MIT),** Manipal, India
Bachelors of Technology in Mechatronics, GPA 8.71/10.0 June 2022

SKILLS:

Programming Languages/ Operating System: Python, C++, C, C#, Java, Embedded C, Linux
Applications/ Software: ROS2, MoveIt, PyTorch, OpenCV, Open3D, Blender, Gazebo, Unity, AirSim, MATLAB, SimScape
Hardware Tools: NVIDIA Jetson, DJI Tello Edu drone, Arduino, Raspberry Pi, PLC
Languages: English, Hindi, German

EXPERIENCE:

Graduate Researcher, Prof. Ziming Zhang, VIS Lab August 2023 – December 2023
- Refined **VRCNet** for robust **point cloud completion**, utilizing advanced optimizers and adaptive learning rates.
- Developed a **PointNet** classifier to categorize shapes with an accuracy of over **85%** from the **ShapeNet** dataset.

Planning and Controls Intern, Orangewood Labs, San Francisco, California, USA June 2023 – August 2023
- Orchestrated a joint trajectory controller for the OWL robotic arm simulation, utilizing **ROS, Gazebo,** and **MoveIt**.
- Designed **MoveIt** configuration files for precise OWL robotic arm **pick and place** operation.

Computer Vision Intern, Wastefull Insights, Vadodara, Gujarat, India January 2022 – May 2022
- Trained object detection and classification models to segregate wastes on a conveyor belt.
- Deployed **YOLOv5** and **ResNet**-based color classification model on Jetson Xavier using **TensorRT** and **CUDA**.
- Developed the dataset and used **AWS S3** services to manage and control the flow of data in the pipeline.
- Evaluated and improved the performance of the models to obtain an accuracy of above **90%** on both tasks.

PROJECTS:

Fly Through Unknown Gap November 2023
- Engineered a perception and control stack to fly DJI Tello drone through a gap of unknown shape and size.
- Applied **SPyNet** for optical flow analysis to identify navigable gaps using **Python** and **Pytorch**.
- Achieved **100%** success in drone gap navigation across various environments.

Mini Drone Race October 2023 – November 2023
- Developed an autonomous flight system for a **DJI Tello drone** to navigate through sequentially placed gates.
- Created a **Blender** dataset with **Gaussian Splatting** and trained **YOLOv8** for gate segmentation and corner detection.
- Applied the **PnP** algorithm to deduce drone's pose, ensuring **accurate** and **smooth** passage through each gate.

Motion Planning for DJI Tello Drone September 2023 – October 2023
- Developed motion planning pipeline for DJI Tello drone using **RRT*** and **minimum snap** trajectories in Blender.
- Fine-tuned **PID** controllers to ensure precise tracking of generated trajectories in the simulation.
- Accomplished trajectory following on the real drone using **velocity** and **position controller** in real-world maps.

Quaternion-based Attitude Estimation of quadrotor August 2023 - September 2023
- Utilized **Complementary, Madgwick,** and **UKF** filters for precise quadrotor attitude estimation in quaternions.
- Conducted benchmarking against **Vicon Motion Capture System** ground-truth attitudes to ensure accuracy.

DQN-based Autonomous Vehicle control March 2023 – April 2023
- Developed a **DQN** based controller for an autonomous vehicle in a simulated environment using **AirSim** simulator.
- Preprocessed sensor data, trained the DQN model, and controlled the vehicle using **Python, PyTorch,** and **OpenCV**.
- Achieved an average speed of **5 mph** and successfully navigated a neighborhood environment avoiding collisions.