AMAN CHULAWALA

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EDUCATION

Carnegie Mellon University **Aug 2022 – May 2024**

Master of Science in Mechanical Engineering| Research – Robotics and Controls *GPA: 4.0/4.0*

Relevant Coursework: Robot Learning, Computer Vision, Planning and Decision Making for Robots, Control Theory

University of Mumbai **Aug 2018 – May 2022**

Bachelor of Engineering in Mechanical Engineering *GPA: 9.81/10.0*

RESEARCH

Carnegie Mellon University *Pittsburgh, PA*

Advisor: Dr. Kenji Shimada

- Developed **an analytical inverse kinematics solver based on OpenRAVE's IKFast** for kinematically redundant systems to address singularity limitations of the existing approach.
- Engineered a **robotic framework** involving a UR5e and added kinematic redundancy **to perform surface inspection and reconstruction of parts** manufactured by powder based additive processes for high-stakes applications.
- Innovated **a reprojection-based metric** to quantify and compare dense cloud registration quality across various algorithms, presenting findings in a research poster.
- Developed a **reinforcement learning based approach** to create **a generalized solution to coverage viewpoint problem** for different objects, achieving an **average of 90% coverage in 4 seconds** on the ABC dataset.

University of Mumbai *Mumbai, India*

Advisor: Dr. K.N Vijaya Kumar and Dr. Vinit Katira

- Engineered a **Composite Anti Intrusion Plate** for use in Formula Student Vehicles. (Patent: 379355-001)
- Designed a **Square Frustrum Impact Attenuator** for use in Formula Student Vehicles. (Patent: 381642-001)
- Developed a method to use **fiducial markers to track chassis deviations** during torsional stiffness test of a vehicle.

Advisor: Prof. Prasad Shirodkar (Bachelor's Degree Project)

- Engineered a **real-time respiratory monitoring and control system** for a modular ventilation platform.

Advisor: Dr. Frank Crasta

- Documented and published **strategies for selection and usage of carbon fibre composites** for structural applications.

SELECTED PROJECTS

Autonomous Driving in Adverse Conditions **Feb 2024 – May 2024**

Advisor: Dr. Ding Zhao| Trustworthy AI Autonomy | Link

- Developed a **Soft Actor Critic** based policy for Autonomous Vehicles and tested in the **CARLA Simulator**.
- Tested policy robustness by **designing adversarial attacks** aimed at imparting incorrect environment information.

Mobile Platform for Environment Mapping and Survey **Oct 2023 – Mar 2024**

Advisor: Dr. Michael Kaess | Simultaneous Localization and Mapping | Link

- Deployed a mobile platform for LiDAR based environment mapping using **ROS2 SLAM toolbox and Navigation stack**.
- Created a map survey routine using **Adaptive Monte Carlo Localisation** for structured environments.
- Implemented a **visual servo-based object tracking** routine for object tracking in the environment.

Assistive Robot for Operations on Cargo Ships **Jan 2023 – May 2023**

Advisor: Dr. Cameron Riviere and Dr. Zeynep Temel | Mechatronics Design | Link

- Developed **eye-in-hand visual servo solution** for the manipulator to finetune task localization and execution.
- Deployed a **perception model based on YOLOv8 and Hough Transforms** for locating and analysing task state.
- Wrote a **ROS Control and Planning package** to allow autonomous task tracking and operation in the environment.

WORK EXPERIENCE

Research Assistant **Oct 2022 – Present**

Carnegie Mellon University | *PI: Dr. Kenji Shimada* *Pittsburgh, PA*

- Engineered a **cross-platform teleoperation package** enabling **remote robot control via velocity or pose** commands, leveraging WebXR for seamless integration with Android devices and Meta Quest.
- Led a team of graduate students in developing **a robotic inspection pipeline meant to identify delamination and crater** defects in window sealants.
- Collaborated on **optimizing a GPU-accelerated ray casting kernel**, reducing process time to an average of **4 ms**.
- Pioneered the **CoverageEnv** family, a suite of OpenAI Gym compatible environments for training reinforcement learning agents in coverage viewpoint planning.
- Co-developed a **view quality metric for surface inspection confidence**, increasing measurement reliability and optimizing inspection coverage while minimizing redundant scans.

Robotic Systems Engineer **May 2023 – Aug 2023**

Neocis | *R&D Team (System Integration Group)* | *Internship* *Miami, FL*

- Designed a testing station to **verify torque-current relation of actuators up to 50 N-m** using inline torque sensors.
- Wrote a testing pipeline to validate actuator performance under load with **maximum error of 15 arcseconds**.
- Created a torque loading station which could **simulate torques up to 80 N-m** to replace a dynamometer.
- Supported development of an **end effector camera subsystem for self-calibration** procedures and guided motions.

Product Design Engineer **Aug 2021 – Oct 2021**

RoboSlog | *R&D Team (Product Development)* | *Internship* *New Delhi, India*

- Orchestrated the **product development pipeline** as the first intern for the start-up targeting automated home devices.
- Architected an **IoT communication package** which served as the foundation for three products currently in the market.
- Designed **a control loop and part model for the auto-lock mechanism** used in initial product demonstrations.

SKILLS

Software Frameworks: ROS 1&2, DrakeSim, SolidWorks, Nvidia Isaac Sim, Gazebo, PyBullet, Blender, MATLAB, ANSYS
Programming: Advanced – C++, Python | Intermediate – Rust, C#, Java
Tools: Unity, CUDA, Linux CLI, Git, Docker, Nvidia Jetson, Arduino, PSoC, Nvidia Omniverse
Libraries: Boost, Eigen, cuDNN, cuBLAS, PCL, OpenCV, Open3D, OpenAI Gym, Stable-Baselines-3, PyTorch, NumPy
Networking: WebRTC, ZeroMQ, EtherCAT, Protobuf, CAN Bus
Robots: Universal Robots (UR5e and UR10e), Denso VS series, KUKA iiwa, HEBI actuated arms, Schunk Powerball

TEACHING

Teaching Assistant **Jan 2023 – May 2025**

Carnegie Mellon University *Pittsburgh, PA*

- Numerical Methods in Engineering (Spring 2023) – Dr. Jessica Zhang
- Mechatronics (Fall 2023) – Dr. Victoria Webster-Wood
- DIY: Design and Fabrication (Spring 2024 and Spring 2025) – Dr. Kenji Shimada

VOLUNTEERING

Organising Staff, International Symposium on Academic Makerspaces *2023*
Mentor, CMU Mentorship Program *2023*
Mentor, Business Plan Team (DJS Racing) *2022 – Present*
Instructor, DJS Racing - SolidWorks workshop *2021*
Reviewer, International Conference on Intelligent Manufacturing and Automation *2021*