

MUKUNDAN CHARIAR

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EDUCATION

Carnegie Mellon University

Master of Science in Mechanical Engineering

- Selected Courses: Introduction to Deep Learning, ST - Computer Vision for Engineers.

Pittsburgh, PA

May 2025

Manipal Institute of Technology

Bachelor of Technology in Mechatronics

- Selected Courses: Machine Vision and Image Processing, Machine Learning.

Manipal, India

June 2023

SKILLS

Programming Languages: Python, Java, C, C++, Embedded C, Assembly, SQL, Matlab, Julia.

Libraries: PyTorch, NumPy, Pandas, OpenCV, Jax, MuJoCo.

Application Software: Fusion 360, MakerBot Print, Matlab Simulink.

PROJECTS

CppMjStep: Efficient Differentiable Simulation with MuJoCo and PyTorch

May 2025 - July 2025

Independent: Mini Project

Pittsburgh, PA

- Developed a C++/PyTorch autograd function for fast, differentiable MuJoCo simulation, enabling batch rollouts and native gradient computation for scalable RL and control tasks.
- Achieved significant speedups over Python baselines; released and maintained as an open-source tool adopted by the robotics and machine learning community.

Learning Human Locomotion Reward Functions using Inverse Reinforcement Learning

January 2025 - May 2025

Carnegie Mellon University: Course Project

Pittsburgh, PA

- Developed a Bidirectional GAN framework to infer reward functions for human locomotion trajectories.
- Integrated a VAE-GAN architecture to stabilize discriminator training and extract state-based reward signals for reinforcement learning agents.

Robust Bipedal Locomotion on Uneven Terrain

January 2025 - May 2025

Carnegie Mellon University: Course Project

Pittsburgh, PA

- Trained a 12-DOF bipedal robot in MuJoCo using Proximal Policy Optimization to walk on rough terrain without explicit trajectory planning.
- Benchmarked learned policies against iLQR with trajectory tracking, revealing robustness gaps in model-based control.

Physical-Therapy Assessment with Uncalibrated Cameras and Inertial Sensors

August 2023 - December 2024

Carnegie Mellon University: Research Project

Pittsburgh, PA

- Designed an auto-calibration pipeline to fuse uncalibrated multi-view video and IMU data, enabling markerless 3D pose estimation using a multi-stage SMPL mesh fitting framework.
- Trained machine learning and heuristic-based classifiers for detecting physical therapy movement errors, achieving up to 60.0% F1 score - comparable to inter-clinician agreement - and 93.2% recall using joint angle statistics in data-limited settings.

Machine Learning for Squat Analysis and Correction

January 2023 - June 2023

Manipal Institute of Technology: Research Project

Manipal, India

- Collected a custom dataset of squat exercises from volunteers and applied photogrammetry techniques to reconstruct 3D joint positions from MediaPipe-extracted 2D body keypoints.
 - Designed and trained a neural network to classify squat form correctness, achieving 94.0% classification accuracy.
 - Published paper: 'AI Trainer: Autoencoder Based Approach for Squat Analysis and Correction'. DOI: 10.1109/ACCESS.2023.33160090.
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EXPERIENCE

Rex Engineering and Metal Works

Thane, India

Floor Intern

June 2022 - July 2022

- Studied operations on CNC machines, helped inspect completed jobs, created models, generated g-codes for jobs using Fusion 360, AutoCAD and MasterCam Mill 9.
 - Fabricated a CNC milled tray under supervision of senior engineers.
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LEADERSHIP

Vice President

June 2021 - September 2022

Institution of Engineers, Mechatronics Students' Chapter, Manipal

Manipal, India

- Organized multiple events, coordinated over projects and mini projects, volunteered for collaboration with other student clubs, organized and budgeted funds for the club and projects under the club, held recruitment sessions, etc.
- Managed a board of 8 members and ran weekly meetings to oversee progress in essential parts of the chapter.
- Led chapter of 120+ members to work towards goals that promote community service, academics, and unity.