Abhyudit Singh Manhas

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EDUCATION

Stanford University — GPA: **4.14/4.00**
Master of Science in Mechanical Engineering — *Expected June 2024*
Depth: Robotics, Automatic Controls and Dynamics
Coursework: Principles of Robot Autonomy, Control Design Techniques, Linear Algebra, Collaborative Robotics, Advanced Dynamics, Experimental Robotics, Decision Making under Uncertainty

Indian Institute of Technology, Madras — CGPA: **9.63/10**
Bachelor of Technology with Honors in Mechanical Engineering — *July 2018 - June 2022*
Achievements: Top 1% of Students in the Class of 2022, Department Rank 2, Merit Scholarship holder

TECHNICAL SKILLS

Languages: Python, C/C++, Julia, MATLAB, LaTeX   **Software:** ROS, ROS2, Mathematica, Abaqus
Libraries: NumPy, PyTorch, TensorFlow, OpenCV   **CAD:** Fusion 360, AutoCAD, Creo Parametric

EXPERIENCE

Stanford GSB & The Hi-Tech Robotic Systemz Ltd — *July 2023 - Sept. 2023*
SEED Intern. Domains: Machine Learning, Natural Language Processing, Computer Vision
- Implemented end-to-end pipelines for pre-training and fine-tuning a LLM and video classification model (movinet).
- Pre-trained the LLM on a large corpus of data with self-supervised learning objectives and fine-tuned it for question answering tasks.
- Fine-tuned movinets on videos from YouTube and proprietary fleet driver footage for streaming action recognition.

Interactive Perception & Robot Learning Lab, Stanford University — *March 2023 - June 2023*
Graduate Research Assistant. Domains: Robotics, Controls
- Developed a whole-body control solution for a 7 DOF Kinova Gen3 arm mounted on a powered-caster based platform.
- Integrated the OCS2 toolbox with the robot, reformulated the optimization problem to account for arm joint velocity and acceleration limits, and implemented no-slip and no-slide constraints for the platform wheels. GitHub

TTK Center for Rehabilitation Research & Device Development, IIT Madras — *Jan. 2022 - June 2022*
Undergraduate Thesis. Domains: Multi-Body Dynamics, Biomechanics, Robotics
- Project Title: Inverse Dynamics Analysis of Human Walking. GitHub
- Performed inverse dynamics analyses to determine joint forces and moments for human walking.
- Developed a novel formulation to estimate ground reaction forces from just gait data, reducing equipment costs by 5%.

Acoustics and Dynamics Laboratory, The Ohio State University — *June 2021 - Aug. 2021*
Summer Research Internship. Domains: Non-Linear Dynamics, Vibration Isolation
- Project Title: Smooth Stopper Engagement for QZS mount design. Project sponsored by the Ford Motor Company.
- Designed a stopper mechanism that ensured smooth engagement with the QZS mount through simulations in Abaqus.
- The mechanism developed reduced impulsive loads in the system, without compromising on motion control. Link.

COURSE PROJECTS

SmartTidyBot — *Sept. 2023 - Dec. 2023*
- Extended the functionality of TidyBot by integrating an advanced decision-making system into its cleaning strategy.
- Implemented offline and online solution methods to compute an optimal cleaning strategy.
- This revised strategy results in substantial time and operational cost savings, particularly in navigating through excessively cluttered environments, allowing SmartTidyBot to accomplish the same tasks faster than TidyBot. Github

Robusser: A Dish Washing Robot — *March 2023 - June 2023*
- Developed a robot that could ease the process of retrieving and washing dishes in a restaurant setting, and used a Franka Panda 7 DOF arm mounted on a 3 DOF mobile base for the purpose. GitHub
- Built the entire world from scratch by developing models in Onshape, and used the SAI-2 simulation software alongwith Redis to interface different components of the system.
- Implemented various controllers to guide the robot through tasks necessary to complete the entire dishwashing procedure.

Collaborative Resource Gathering — *Jan. 2023 - March 2023*
- Implemented algorithms for a locobot to perform collaborative tasks with other locobots in an unknown environment.
- Leveraging RGB and depth camera data, the locobot builds an occupancy grid to track observed objects in the environment, and determines the highest priority block move (block color, pick-up location and drop-off station).
- It then moves to the location, picks up the block and delivers it to the station, using A* for path planning. GitHub Website

Autonomous Exploration & Rescue Mission using TurtleBot — *Sept. 2022 - Dec. 2022*
- Developed the simulation in Gazebo by implementing path planning, control and computer vision algorithms using ROS.
- The bot detects animals (using a pre-trained MobileNet) during navigation in a mock and unexplored environment, and then rescues them after the exploration phase, utilizing RRT* for path planning. GitHub

POSITIONS OF RESPONSIBILITY

Teaching Assistant: For *Principles of Robot Autonomy I*, *Principles of Robot Autonomy II* at Stanford University;
For *Functions of Several Variables* (MA1101) and *Differential Equations* (MA2020) at IIT Madras.
Strategist: For the MEA (Mechanical Engineering Association) at IIT Madras.