Kaustabh Paul

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Education

Carnegie Mellon University — Pittsburgh, PA
Master's of Science in Electrical and Computer Engineering (Advanced Study) — May 2025

Technical University Munich — Munich, Germany
Bachelor's of Science in Electrical Engineering and Information Technology — May 2023

Skills

Programming Languages: MATLAB, C/C++(ROS, embedded), Python (PyTorch, Tensorflow, Keras, Jax), Julia
Software: Simulink, LT-Spice, SolidWorks, MSC Adams, KiCad, SolidEdge, Linux, Git,
Hardware: ATmega5, STM32, Raspberry Pi, BeagleBoard
Controls: Linear (PID, LQR), Optimal (MPC, H∞), Nonlinear (Feedback Lin., Backstepping), Data-Driven (DMD, ERA, OKID)
AI: Machine Learning (VAE, Diffusion Models, Transformers), Reinforcement Learning
Robotics: Hybrid and Contact Dynamics, Computer Vision, SLAM, Simulation (ROS ,MuJoCo, Isaac Gym, Webots)
Languages: German, English, Hindi

Internship Experience

Siemens Healthineers — Forchheim, Germany
R&D Intern in Department: Diagnostic Imaging (DI) X-Ray Products (XP) — September 2021-October 2021, March 2022
Research and Development Hardware (HW) Mechatronics (MEC)

- Collaborated with senior engineers to analyze new components regarding safety aspects and functionality
- Analyzed damage on electromechanical components (e.g. footswitch for mammography system, Display Control Boards) through automated testing procedures
- Programmed hardware controller on BeagleBoneBlack microPC for automated testing of prototype

Projects

Carnegie Mellon University — Pittsburgh, PA

Sketch to Image Latent Diffusion Model — Spring 2024
- Designed text conditioned latent diffusion model framework using DDIM with PyTorch
- Tasks: dataloader implementation, architecture design and hyperparameter tuning

Implementation of Decision Transformer for Existing RL Environment — Spring 2024
- Added online decision transformer to RL simulation environment of humanoid robot unitree H1
- Tasks: Incorporated decision transformer into TDMPC2 algorithm of framework

Autonomous Vehicle Controller Design — Fall 2023
- Implemented PID and LQR controller with EKF SLAM and A* planning for autonomous vehicle in Webots

Technical University Munich — Munich, Germany

Sound-Source Localization and SLAM — Fall 2022
- Simulated search and rescue mission in ROS2 on unknown map in group of 3
- Car attempts to reach signal source points while creating map of the environment and avoiding collisions
- Tasks: Map generation, collision detection

Tour into the Picture (Computer vision project) — Summer 2022
- Implemented MATLAB application based on research paper "Tour into the Picture" in group of 5
- Application: Transformation of 2D image into 3D for different viewing positions
- Tasks: Team leader, Image segmentation and warping, 3D reconstruction + wall in/out blending

Self-balancing and Trajectory Following Robot — Spring 2022
- Implemented digital controller on ATmega8 microcontroller for balancing and trajectory following
- Utilized various sensors and components (e.g. accelerometer, gyroscope, ADC, encoder)

Design of Controller for Buck-Boost Converter — Winter 2021
- Designed digital and analog controller for buck-boost converter with various loads
- Analog controller implemented as OpAmp circuit, digital controller on microcontroller

Research Experience

Carnegie Mellon University, Robomechanics Lab — Pittsburgh, PA
- Ongoing research on locomanipulation project with quadruped (Ghost Robotics Spirit V6) — March 2024-ongoing

Technical University Munich, Chair of Information-oriented Control (ITR) — Munich, Germany
Bachelor thesis: *Grasp Optimization from Learning-Based Initial Guess* — September 2022-April 2023
- Developed optimization algorithms for robotic grasp based on initial guess from reinforcement learning framework in simulation environment MuJoCo
- Divided into contact position optimization (via force and moment residual control) and force optimization (minimizing grasping wrench while satisfying friction cone and external force constraints)