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 Sim, Webots)
Languages: German, English, Hindi

Internship Experience

Boardwalk Robotics Inc.   Pensacola, FL
AI Intern   June 2024- August 2024
- Designed reinforcement learning pipeline for autonomous bi-manipulation tasks for upper body of humanoid robot
- Conducted simulation testing in Isaac Sim to explore and optimize control strategies for manipulation
- Analyzed and interpreted simulation data to refine machine learning models for robust performance

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)
- 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 in group of 3
- 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

Design of Reaction Time Game
- Designed reaction time game using STM32 where system tries to hit user's hand to test reaction speed   Fall 2023
- Tasks: Sensor circuit design using KiCAD and communication + DC motor control using STM32

Design of Color Sensor Circuit   Fall 2023
- Designed and implemented circuit on KiCAD using npn phototransistor amplifier circuit and shift register
- Communicated with circuit using STM32

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
- Tasks: Map generation, collision detection

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)
- Tasks: robot modelling, sensor communication via SPI, sensor data fusion, designed flatness based controller for trajectory following, designed interrupts for special cases

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
- Tasks: Modelling of buck-boost converter, simulation and design of modulator and noise filter circuit in LT Spice

Research Experience

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)