Chaitanya Chawla

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Education

Technical University of Munich — Munich, Germany
B.Sc. in Electrical and Computer Engineering — ***GPA 1.60*** † — *Oct. 2020 – March 2024*
Minor in Robotics — ***GPA 1.20*** †

Coursework - Control Systems, Introduction to Robotic Control, Human Machine Communication 1, Numerical Analysis, Fundamentals of AI, Python for Machine Learning

Thesiswork -

Research Experience

Robotics Institute, Carnegie Mellon University — Jul 2023 – Present
Visiting Research Scholar, Bot Intelligence Group | ***Prof. Jean Oh*** — *Pittsburgh, Pennsylvania*
Learning Abstract Representations of Agent-Environment Interactions

- **Co-advised by Prof. Sandra Hirche (TU Munich)**
- Worked on a project to extract pivotal skills from day-to-day tasks and learn an abstract representation of the agent-environment pair
- Generated real-world Datasets with object- and manipulator-state data from a teleoperated Lite6 Arm as well as from human demonstrations for 10 different tasks
- Finetuned a preexisting model to train on the new Real-World Datasets
- Achieved a semantic label accuracy of 39.5% with over 17 individual skills
- Successfully implemented new tasks by combinatorial composition of skills, where only the individual skills were seen by the model during training

Technical University of Munich — Mar 2023 – Present
Undergraduate Research Assistant, Vision and Perception Group | ***Prof. Darius Burschka*** — *Munich, Germany*
Robot-Agnostic Framework for Intrinsic Feature Extraction

- Proposed a method for segmentation of human demonstration trajectories based on Via-Points that are detected by grouping PointClouds in an Octree structure
- Developed a pipeline to detect motions, such as wiping/rubbing, by computing surface normals, surface limits, and through Object-Surface proximity through PointCloud Data
- Using a single visual demonstration, extracted velocity-based constraints such as speed, orientation, and acceleration of the manipulated object, and modeled them into the trajectory representation
- Learning a graph representation for the relevant action-state pairs for a task

Technical University of Munich — Jan 2022 – Oct 2022
Undergraduate Research Assistant, Human-Centred Robotics Lab | ***Prof. Dongheui Lee*** — *Munich, Germany*
Visual Teleoperation using Learning from Demonstration

- Built a pipeline for capturing 3D hand trajectories of a user through stereoscopic conversion of 2D Pose Detection
- Proposed use of Dynamic Motion Primitives for obtaining a regressed, learned trajectory
- Implemented control of Frank Panda on Gazebo as well SIM2Real using learned trajectory

Professional Experience

Roboverse Reply GmBH — Jul 2022 – Apr 2023
Research Internship (Part-time) — *Munich, Germany*

- Created a pipeline for transferring live PointCloud data from Boston Dynamics' SPOT mounted BLKArc LIDAR sensor to Oculus VR Headset, so that a distant user could see SPOT's immediate environment in real time
- Developed one of the first Voice Control systems for SPOT and integrated it with the company's web framework
- Built an autonomous system with a 6-layered CNN model to detect and open door knobs using SPOT's inbuilt Cameras and SPOT Arm
- Presented the company's ongoing projects at various fairs, showcasing the new products and future prospects

†NOTE — German GPA ranges from 1.00 to 5.00, where 1.00 is the highest

Projects

Face Recognition using Autoencoders and PCA June 2020 – Present

- Designed a 7 layered CNN Model for Face Recognition on our own custom-processed Dataset
- Studied the effects of different preprocessing methods, like Autoencoders and PCA

Miniature Factory Model May 2018 – May 2020

- As part of the practical course: Control and Automation (EI06631), came up with implementations of topics like PID Controller (Balancing Cube), Petri Nets (Factory model), Neural Networks, PLC Controls and Path Planning
- Using a SCARA Robot, implemented concepts such as Transformation matrices, Forward Inverse Kinematics, Resolved Rate Control, Force- and Impedance- Controller, and Trajectory Planning

Main Controller Unit for Electric Car May 2018 – May 2020

- As part of TU Fast Eco Team, designed the main controller unit of our car for Shell Eco-Marathon 2021
- Controls the following subsystems of the car: light controller, clutch controller, horn and wiper

Publications

T. Shankar, **C. Chaitanya**, J. Oh. **Learning Abstract Representations of Agent Environment Interactions**
In Submission to International Conference on Robotics and Automation 2024 (ICRA 2024)

Awards and Fellowships

2023	**Heinrich and Lotte Mühlfenzl Scholarship:** Merit based Scholarship for research to top 1%	*Mühlfenzl Foundation*
2023	**TUM Promos:** Received funding of €3,000 for research stay-abroad	*TU Munich*
2021/22/23	**German National Scholarship:** Based on Merit and Extracurricular Activities	*German Federal Government*
2021/22/23	**Dean's List:** Awarded by the University for showing excellence in academics	*TU Munich*
2021	**Max Weber Program and TU Munich Junge Akademie:** Nominated for these programs for being in top 5% of students	*TU Munich*

Teaching

Robotics Control Laboratory (EI06931) Nov 2023 – Present

- Conducted lab sessions for implementing different control methods on a KUKA KR 470 and a SCARA robot using MATLAB

Advanced Mathematics (MA9411) Apr 2022 - Sept 2022

- Was selected as a Tutor for one of the toughest undergrad courses, with over 40% students failing each year
- Led weekly recitation sections for a class of 40 students, discussing assignments designed by the Professor and me

Physics for Electrical Engineers (PH9009) Oct 2021 - Feb 2022

Bridge Course for Mathematics (MA9001) Sept 2021 - Oct 2021

Service and Leadership

Vice-President: Electrical Engineering Students' Association (EESTEC) Nov 2021 - Oct 2022

- Invited researchers and Leaders from the field of Robotics and AI for talks at the University
- Led a team of 15 to organize a university-wide Career Fair, with firms like BMW, Texas Instruments, & Infineon

Technical Skills

Programming Languages: Python, C/C++, MATLAB, HTML
Libraries: PyTorch, PCL, Scikit-Learn, Pandas, OpenAI Gym, Rviz, Gazebo
Frameworks: ROS, Azure, AWS, WandB, Node.js, Flask, Docker