Peter **Breuer**

MASTER'S STUDENT IN ROBOTICS

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"Pleasure in the job puts perfection in the work." - Aristotle

Summary

Master's student in robotics, systems and control at ETH Zurich (graduation in Fall 2024). Experience in legged and aerial robotics (sUAS). Primary interest in GNC software engineering for autonomous UAVs. Knowledge in robotics subdomains including computer vision, kinematics and dynamics, path planning, state estimation, model predictive control, and reinforcement learning (neural control policies).

Work Experience

ETH Zurich *Zurich, Switzerland*

RESEARCH ASSISTANT AT THE ROBOTIC SYSTEMS LAB (RSL) *09.2022 - 12.2023*

- Developed a GUI with RQt for controlling a quadrupedal robot using ROS 2
- Set up a containerized ROS 2 development environment using Docker

RESEARCH ASSISTANT AT THE AUTONOMOUS SYSTEMS LAB (ASL)

- Rapid prototyping of a payload retrieval mechanism for a VTOL UAV using additive manufacturing

Freefly Systems Inc. *Seattle metropolitan area, USA*

ROBOTICS SOFTWARE ENGINEERING INTERN *03.2022 - 07.2022*

- Created a PX4 flight mode for the industrial drone *«Astro»* ↗ enabling precise framing and tracking with a gimbaled camera payload
- Added the possibility to configure a MAVLink-enabled gimbal in the ground control station
- Created an onboard application with pymavlink to request and publish received distance sensor readings via MAVLink messages
- Proof of concept for an app using MAVSDK to shoot hyperlapses with MAVLink-enabled UAVs

ETH Zurich *Zurich, Switzerland*

TEACHING ASSISTANT AT THE ENGINEERING DESIGN AND COMPUTING LABORATORY (EDAC) *09.2019 - 12.2021*

- Course: Technical Drawing and CAD

TEACHING ASSISTANT AT THE INSTITUTE FOR DYNAMIC SYSTEMS AND CONTROL (IDSC)

- Course: Control Systems I and II

Education

ETH Zurich *Zurich, Switzerland*
MSc Robotics, Systems and Control *09/2022 - present*

- Semester project: *Altitude Estimation for UAV Operations Over Water - Integration and Testing of LiDAR and Radar Distance Sensors* under the supervision of Dr. Guillaume Ducard at the Institute for Dynamic Systems and Control (IDSC) group of Prof. Onder. I integrated and tested LiDAR and radar range finders with the goal of achieving reliable altitude measurements for PX4-powered UAVs operating over water. This involved assembling a custom PX4 quadcopter testing platform using FPV drone hardware from scratch, determining optimal radar parameters in ground-based tests, developing a sensor driver for PX4, flight testing over a lake, and analyzing test data using Python.
- Master's thesis (WIP): *Autonomous Tracking of Dynamic Subjects for Aerial Videography with UAVs Using Reinforcement Learning* under the supervision of Jiaxu Xing and Angel Romero at the Robotics and Perception Group (University of Zurich) led by Prof. Davide Scaramuzza

National University of Singapore *Singapore*
MSc Semester Exchange Program *01/2023 - 05/2023*

ETH Zurich *Zurich, Switzerland*
BSc Mechanical Engineering *09/2018 - 08/2022*

- GPA: 5.5/6.0 (approx. top 4% of 207)
- Student project: *Dyana - Dynamic Quadrupedal Animatronic* - A quadrupedal robot developed by an interdisciplinary team of 14 students from multiple Swiss universities. Dyana is capable of dynamic motions and conveys a unique, life-like impression through its feline appearance. The project was hosted by the Robotics System Lab (RSL) led by Prof. Marco Hutter and was supported by several industry sponsors. More info from the roll-out presentation (English subtitles) ⤴.
- Bachelor's thesis: *Low- and High-Level Control for Testing Single Legs of the Quadrupedal Animatronic Dyana* in collaboration with Marco Trentini and under the supervision of Fabian Tischhauser and Marcus Montenegro at the RSL. We developed a ROS 1 (C++) framework for dynamic testing of robotic legs using virtual model- and inverse dynamics control. It allowed us to test the mechanical integrity of the front and hind legs of *Dyana* in a wall-mounted linear guide rail setup and evaluate the commercially available *T-MOTOR AK10-9* actuators used.

Leipzig International School *Leipzig, Germany*
International Baccalaureate (IB) Billingual Diploma *08/2016 - 05/2018*

- Score: 42/45 (top 4.54% worldwide)
- Higher level subjects: Mathematics, Physics, English (B)
- Standard level subjects: Chemistry, Geography, German (A)
- Valedictorian

Leipzig International School *Leipzig, Germany*
International General Certificate of Secondary Education (IGCSE) *08/2014 - 06/2016*

- Top of the year group

Honors & Awards

Awards

06/2018	**Duke of Edinburgh's International Silver Award,** Duke of Edinburgh's Award	*Leipzig, Germany*
10/2016	**Outstanding Cambridge Learner Awards,** Cambridge Assessment International Education	*Leipzig, Germany*

Skills

Languages	German (native), English (C2), Spanish (A2), Chinese (A1)
Programming	Python, C++, C, MATLAB, LaTeX
Robotics	ROS 1, ROS 2
UAVs	PX4 Autopilot, MAVSDK, MAVLink, Betaflight, QGroundControl
Machine Learning	PyTorch, Weights and Biases
Computer Vision	OpenCV
Front-End	Qt for Python
DevOps	Docker, Linux

Hobbies

2021 -	**Freestyle and cinematic First Person View (FPV),** My videos ⤴
2019 -	**Fitness (calisthenics and weight training)**
2018 -	**Backpacking**
2012 -	**Enduro mountain biking**
2010 -	**Photography,** Portfolio ⤴