

# Arion Zimmermann

Electrical Engineer EPFL



arion@innovazion.ch



arion-zimmermann



+41 787957766

## Work experience

### Associate Research Engineer

Caltech, United States, 2024

Design, implementation and validation of robust perception and motion planning algorithms for an autonomous race car.

### Electrical Engineer Intern

SpeQtral, Singapore, 2023

FPGA development and PCB design for a Quantum Key Distribution LEO satellite.

### Research & Teaching Assistant

EPFL, Switzerland, 2020-2023

Research on ultra-wideband angle-of-arrival localization strategies and experimental testing under supervision of Pr Andreas Burg.

TA for *Physics III: Electrodynamics* under supervision of Pr Dirk Grundler.

TA for *Embedded Systems* under supervision of Dr Alexandre Schmid.

TA for *Electronics II: Analog amplifiers* under supervision of Dr Adil Koukab.

## Education

### MSc Electrical Engineering

EPFL, Switzerland, 2018-2024

MSc Thesis: Pose estimation of unknown tumbling bodies under supervision of Pr Soon-Jo Chung, Caltech, USA

Minor in Space Technologies.

Research focus on advanced system localization strategies and redundant switched-mode power supplies for space missions.

## Volunteering

### EPFL Xplore

EPFL, Switzerland, 2020-2023

"EPFL Xplore is the largest robotics student association in Switzerland. Hundreds of students gather every year to develop rovers, drones, and legged robots to participate in the ERC robotics worldwide competition."

Co-founder (2020)

Rover Systems Engineer (2020-2021)

Project Manager & Vice-President (2021-2022)

Drone Systems Engineer (2022-2023)

### EPFL Rocket Team

EPFL, Switzerland, 2019-2021

"The EPFL Rocket Team (ERT) is a student-led rocketry association designing, manufacturing and operating sounding rockets. The ERT participates every year in the EuRoC international competition in Portugal."

Avionics Engineer (2019-2020)

Avionics Team Leader (2020-2021)

## Skills

**Electronics:** Altium Designer, KiCad, LTSpice, LTPowerCAD, Xilinx Vivado, Intel Quartus, VHDL, Verilog, Cadence EDA, ModelSim, Verilator, SDR, GNU radio.

**Software:** C, C++, FreeRTOS, ZephyrRTOS, Python, MATLAB, Swift, Java, React, Javascript, HTML, CSS, Node.js, SQL, PHP, Git, CI.

**Robotics:** ROS, ROS2, PCL, Perception, CNN, GNN, Factor Graphs, SLAM, Gazebo, Fusion 360, Capella, Kalman Filtering, MPC.

**Languages:** English C2, German fluent, French native.

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## Achievements

### ERC Robotics Competition

Kielce, Poland, September 2023

3<sup>rd</sup> place at the ERC world finals with the special prize for the best autonomous robotic arm design and operation.

### Startup Weekend Hackathon

Lausanne, Switzerland, May 2023

2<sup>nd</sup> place at the startup week-end Lausanne hackathon. Development of a business plan to automatize digital marketing through LLM GPT AI.

### Lauzhack Hackathon

Lausanne, Switzerland, November 2022

Participation at the Lauzhack international hackathon. Development of a decentralized music content sharing platform (DDS and blockchain).

### ERC Robotics Competition

Kielce, Poland, September 2022

2<sup>nd</sup> place at the ERC world finals with the special prize for the best autonomous navigation software.

### EuRoC Rocketry Competition

Ponte de Sor, Portugal, October 2021

1<sup>st</sup> place at the EuRoC international rocketry competition. Design and launch of a student-researched-and-developed hybrid rocket.

### ERC Robotics Competition

Kielce, Poland, September 2021

3<sup>rd</sup> place at the ERC world finals with the special prize for the best scientific plan and its execution.

### Helvetic Coding Contest

Lausanne, April 2018

National computer programming and problem-solving contest. Ranked 19<sup>th</sup> in the University undergraduate/graduate category.

### Athena Program Scholarship

Lausanne, March 2018

\$10k scholarship awarded by the University of Geneva for the highest grade in Electrodynamics undergraduate course.

### Piano Competition

Lausanne, February 2018

1<sup>st</sup> prize *cum laude* at the Schubert piano competition organized by the Geneva Music Conservatory.

### Special Prize

Lausanne, November 2017

Prize *Coup de Cœur* of \$500 awarded by the high-school's parents' council APEC for the design and development of a campus mobile application.

### MIT Primes

Lausanne, July 2017

MIT Primes-Switzerland program in mathematics. Knot theory lectures jointly organized by the MIT and SwissMAP.

### Helvetic Coding Contest

Lausanne, March 2017

National computer programming and problem-solving contest. Ranked 37<sup>th</sup> in the University undergraduate/graduate category.



## Robotics projects

### Rover

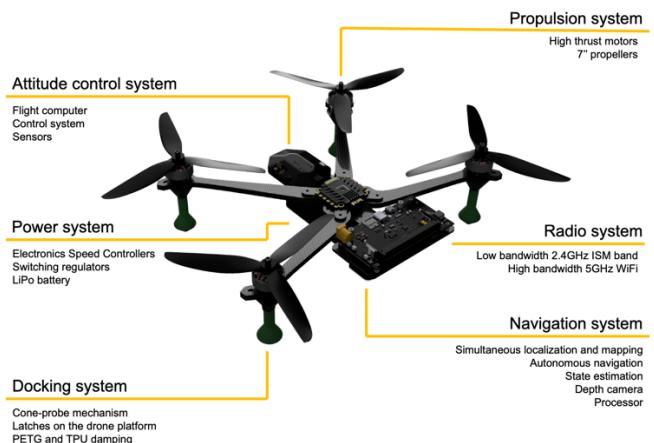
EPFL Xplore is an EPFL student association which develops robotic systems to participate every year in the ERC robotics competition. I oversaw the systems engineering and project management aspects of the Rover project. During the first year, my duties consisted in defining the concept of operations, writing the requirements, defining a software/electrical system architecture, and creating an assembly, integration, and testing plan. For the second year though, I was promoted to the project manager role, where I had the responsibility of maintaining the project's budget and timeline. Implicitly, this role taught me many soft skills, such as quick decision-making, stress management and conflicts management.



*"Astra" rover, 2<sup>nd</sup> at the ERC 2022 world finals with the best autonomous navigation*

### Drone

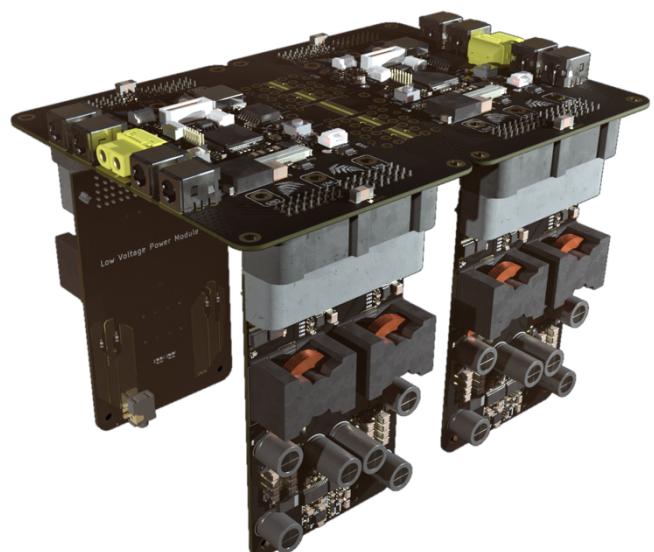
In February 2023, the ERC robotics competition committee decided to include the design and development of a drone that had to take-off from and land on the rover. An agile team of 4 students was formed to address the need of designing a drone in less than 6 months. I mainly worked on the system architecture and the autonomous navigation software. At ERC 2023, the drone we developed flew successfully, and thus provided useful scientific data to the team.



*"Brokkoly" autonomous drone, providing aerial imagery at the ERC 2023 world finals*

### Power system

Between 2020 and 2023, I was also in charge of designing, manufacturing, and testing the rover's power system, which provides and monitors the energy delivered to all electronic parts of the robot. After many years of iterations, the design converged to a high-power fully redundant and programmable power system.



*"Pollux III" motherboard and its power modules, powering the 2023 "Kerby" rover*

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## Electronics projects

### Rocket avionics

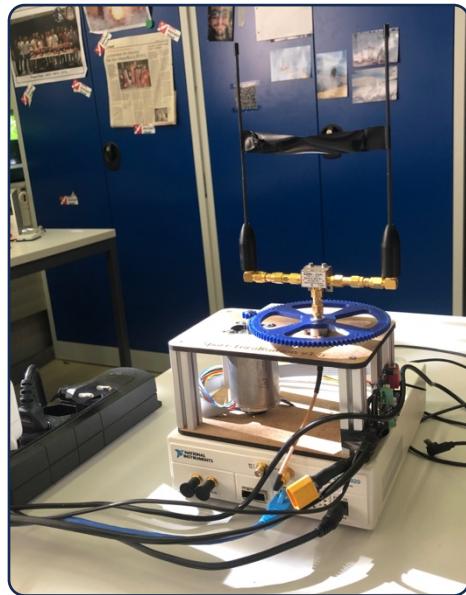
Since 2017, the EPFL Rocket Team designs rockets and participates in rocketry competitions, such as the Spaceport America Cup in Utah and EuRoC in Portugal. In 2020, I was the team leader of the Avionics subsystem, which developed all the electronic components related to the ignition, telemetry, state estimation and thrust control of the hybrid rocket.



*Successful launch of the “BellaLui II” hybrid rocket at the EuRoC 2021 competition*

### UWB AoA localization system

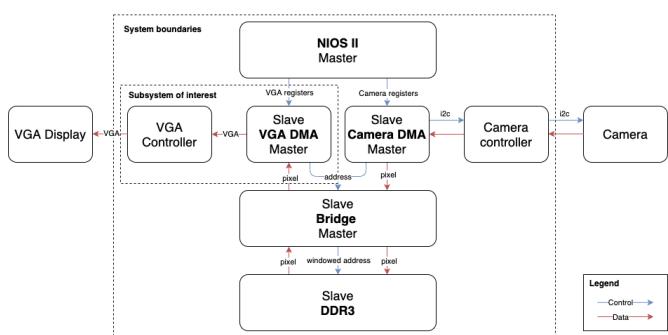
During my graduate studies, I undertook a semester project at the Telecommunications Circuits Laboratory at EPFL. There, I proved that by broadcasting a rotating high bandwidth signal, one could retrieve the signal's direction-of-arrival through a phase-based processing of the Doppler shift due to the signal's rotation. This localization strategy could theoretically outperform standard radar localization technologies in terms of angular resolution and multipath error.



*Test-setup of the UWB AoA localization system using a USRP software-defined radio.*

### FPGA camera and display drivers

As part of the embedded systems course at EPFL, I had to develop a pipeline to acquire data from a camera and display it on a VGA screen. The complexity of the project was that the system's clock was limited to 25MHz, whereas it had to handle a data bandwidth of at least 25MHz. Since the timings of the VGA specification are strict, the handling of the data through the internal memory had to be done with care. The use of DDR memory accesses, along with large FIFO buffers and DMA burst transfers allowed the FPGA to properly display the images captured by the camera.



*System block diagram*

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## Software projects

### Autonomous racecar algorithms

In 2024, I oversee the perception subsystem of the Caltech Racer autonomous racecar participating in the Indie Autonomous Challenge. The perception task consists in detecting the opponent racecars robustly and consistently using the LiDAR and stereo camera data.



### Communication protocol

The RoCo Rover Communication protocol was developed in 2020 and was the first piece of software developed for EPFL Xplore. It allowed embedded systems with very few resources to communicate with one another through a common protocol.

The advantage of this communication system was its lightness, as it only used static memory allocation but still implemented a publisher-subscriber model, similar to the more complex Robotic Operating System (ROS).

In addition, this very low latency protocol reduced the reception delay to no more than  $100\mu\text{s}$  between any pair of endpoints. This proved to be particularly useful for drones, as a delay in the sensor acquisition pipeline could result in a dangerous instability in the drone's control system.

Until today, the RoCo protocol is used in all of EPFL Xplore's robots.

### Language learning application

During my high-school studies, I developed a passion for ancient languages, such as Latin and ancient Greek, which I chose as language options for my curriculum.

In 2019, I developed the *Lexis* language learning application. Common flashcard apps are indeed unsuited for ancient languages because there is only the need to translate from ancient languages to modern languages and not vice-versa.

*Lexis* focused on teaching ancient language vocabulary (Latin and ancient Greek) by using machine learning to predict how well a given word was memorized and displaying it accordingly.

