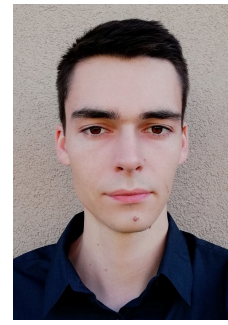# Hugo Grall Lucas

24 years old | Swiss | French | Portuguese
Rue des Prés 15B, 2017 Boudry (Neuchâtel, Switzerland)

☐ +41 (0) 79 239 55 18 | in hugoGrallLucas
✉ gralllucashugo@gmail.com | ⬡ grallH

OBJECTIVE

I have recently obtained my Master's degree at the EPFL within the Microengineering section, specialising in robotics. During the course of my studies, I have developed a strong interest for control theory and how it is applied to robotics and to multi-robot systems.

▶ **Key strengths:** software development, control theory, autonomy, curiosity

EDUCATION

MASTER OF SCIENCE: Microengineering + Specialisation in Robotics ⧉
Ecole Polytechnique Fédérale de Lausanne, EPFL

Lausanne, Switzerland
Sep. 2017 - Jul. 2020

Main Courses	Advanced Control Theory, Distributed Intelligent Systems (DIS), Aerial/Mobile Robotics, Computational Motor Control (CMC), Model Predictive Control (MPC)
Other Courses	Machine/Deep Learning, Image Processing, Optical Detectors

BACHELOR OF SCIENCE: Microengineering ⧉
Ecole Polytechnique Fédérale de Lausanne, EPFL

Lausanne, Switzerland
Sep. 2014 - Jul. 2017

Main Courses	Control Theory, Signal Processing, Microinformatics, Sensors, Electronics, Conception and Design of Mechanisms

HIGH SCHOOL DIPLOMA: Physics and Applied Mathematics ⧉
Lycée Denis-de-Rougemont, LDDR

Neuchâtel, Switzerland
Sep. 2011 - Jul. 2014

- ▶ Diploma Dissertation (Travail de Maturité) :
  Prime numbers: Properties, Characteristics and Application.
- ▶ Graduate with Honours (Mention Bien)

WORK EXPERIENCE

INTERNSHIP
ROVENSO, Agile robots for security and safety monitoring of industrial sites ⧉

Villaz-St-Pierre, Switzerland
Sep. 2019 - Feb. 2020

- ▶ Realization of a web server composed of a database, a VPN server and a web interface used for monitoring the robot ROVéo (video live stream, live access to sensor values and management of the logs). The project focuses first on the backend, from the realization of an embedded server running on the robot to the web hosted application server (running within docker containers ⧉). Then, the frontend is realized using both Grafana ⧉ and NodeJs. I have also taken part to the development of the software of a Pan Tilt Zoom (PTZ) camera module, mainly for tuning the two PID of the motors and to transform USB cam into IP cam server used for the video live stream.

TEACHING ASSISTANT
Service de Promotion des Sciences (SPS), EPFL

Lausanne, Switzerland
Feb. 2019 - Today

- ▶ Teaching children of eleven to thirteen years old about the basis of robotic programming through various activities and coding challenges. The robot used during these courses was the LEGO MINDSTORMS Education EV3 ⧉. Now, we are currently working on a online version of the course with several videos.

TEACHING ASSISTANT
Ecole Polytechnique Fédérale de Lausanne, EPFL

Lausanne, Switzerland
Oct. 2018 - Dec. 2018

- ▶ Assist mechanical and microengineering students in first year Bachelor's degree during their electronic laboratories.

TRAINING PROGRAM
Ecole Technique - Ecole des Métiers de Lausanne, ETML

Lausanne, Switzerland
3 weeks in August 2016

- ▶ Use of drilling, turning and milling machines to create various components. A personal project was also realized : Chess pieces and the board ⧉.

ACADEMIC PROJECTS

MASTER PROJECT

Performance and Comparison Analysis of Linear Model Predictive Control on Reference Tracking Quadrotors ↗

Full Time

DISTRIBUTED INTELLIGENT SYSTEMS AND ALGORITHMS LABORATORY, DISAL (EPFL)

Feb. 2020 - Jul. 2020

High performance trajectory tracking is a challenging and crucial task for the quadrotor position control. The proposed algorithms are tested and evaluated in two different simulated environments, i.e. MATLAB and Webots. A comparative study is performed between Linear and a Nonlinear Model Predictive Control (MPC) and computational time assessment is realized on the real hardware (Raspberry Pi 4) while the physics is computed on Webots. Summary ↗

▶ **Key Words:** Quadrotors, MATLAB & Simulink, Webots ↗ , C/C++

SEMESTER PROJECT II

Simulations on Webots of a SLAM algorithm designed for the Khepera IV ↗

10 hours
per week

DISTRIBUTED INTELLIGENT SYSTEMS AND ALGORITHMS LABORATORY, DISAL (EPFL)

Feb. 2019 - Jun. 2019

The purpose of this work was to search and then to implement a SLAM algorithm suitable for a specific multi-robots system. The robot used in this study was the Kheperah IV whose computational capacities are limited. An approach exploiting with the five ultrasonic sensors carried by the robot and with its wheels encoders has been tested in simulation on Webots. The final results were compared with those obtained using a standard LIDAR.

▶ **Key Words:** Mobile Robotics, SLAM, Localization, Navigation, Simulation, Webots ↗, Khepera IV ↗, C/C++

COURSE PROJECT

Multi-robot navigation in cluttered and dynamic environments ↗

2 hours
per week

COURSE : DISTRIBUTED INTELLIGENT SYSTEMS (DIS) ↗ (EPFL)

Sep. 2018 - Dec. 2018

This project aimed to implement a navigation strategy for a multi-robot system formed by a group of e-pucks moving throughout an environment. This environment was composed of an enclosed arena with static obstacles. Each group of robots had to be able 1) to avoid obstacles within the arena while retaining the collective aggregation, and 2) to maintain collective aggregation while two different groups of robots cross each other moving in opposite directions. This project was carried out by group of four students. Video : [1], [2]

▶ **Key Words:** Multi-robots, e-pucks ↗, Webots ↗, Flocking, C/C++, IR-Communication

SEMESTER PROJECT I

Simulations of upper body movements using MATLAB and OpenSim API ↗
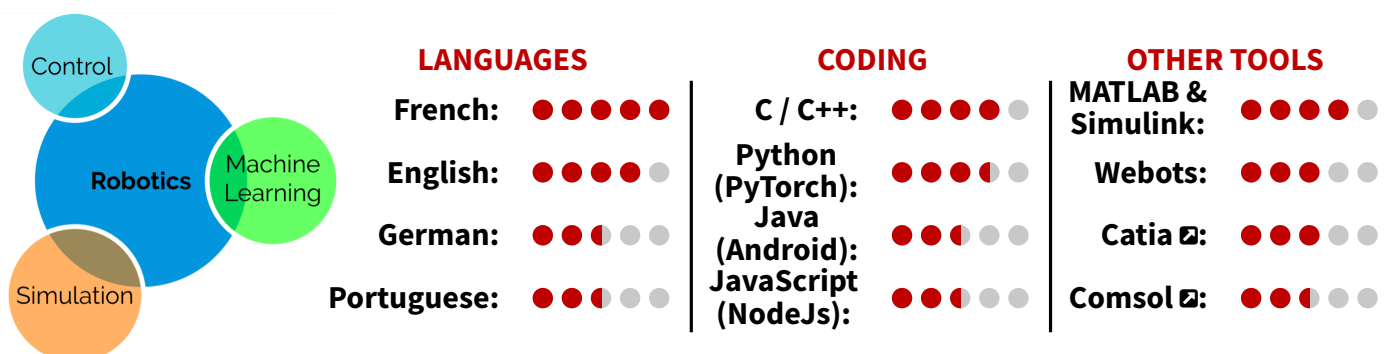
10 hours
per week

BIOROBOTICS LABORATORY, BIOROB (EPFL)

Feb. 2018 - Jun. 2018

This work belong to the FlyJacket ↗ project. The goal was to create a numerical simulation close to the test bed used in reality. The purpose of the experiment was to identify the dynamic models of the human upper body movements caused by the specific forces of the FlyJacket. During the experimentation phase, the torso is moved by a set of cables bounded on motors. The simulation mixed the OpenSim capabilities to model the muscles dynamic and the versatility offered by MATLAB & Simulink to mimic the specific forces generated by the motors through the cables.

▶ **Key Words:** Dynamic Models, Simulation, OpenSim ↗, MATLAB & Simulink

SKILLS

LANGUAGES

French: ●●●●●
English: ●●●●○
German: ●●●◐○○
Portuguese: ●●●◐○○

CODING

C / C++: ●●●●○
Python (PyTorch): ●●●●◐
Java (Android): ●●●◐○○
JavaScript (NodeJs): ●●●◐○○

OTHER TOOLS

MATLAB & Simulink: ●●●●○
Webots: ●●●○○
Catia ↗: ●●●○○
Comsol ↗: ●●●◐○○

EXTRACURRICULAR ACTIVITIES

SPORT: Gym La Coudre (NE) ↗

Active Member	2003-2014
Gym Instructor for kids of 10 to 13 years old	2012-2014
Gymnastic Judge Kids categories (C1-C4)	2014-2017

MUSIC: Showband Les Armourins (NE) ↗

Active Member	2004-2014
Percussion Instructor for kids of 12 to 13 years old	2013-2014