

# AntunSkuric

## PhD in Robotics - Human-Robot Interaction



### Personal Info

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#### Online Profiles:



#### Languages:

**Croatian** - native

**English** - proficient

**French** - proficient

**German** - beginner

#### Personal interests:

reading, guitar,

running, cycling,

open-source,

sustainable development

### Summary

Robotician and control engineer with a PhD in human-robot interaction and 7 years of experience working in the industry and academy. I'm passionate about open-source software and hardware as well as working on sustainable and more human-centred future technologies.

### Education

#### PhD Thesis in Robotics - Physical human-robot interaction

2020 - 2023

INRIA Bordeaux, AUCTUS team & University of Bordeaux, France

- Project LiChIE in collaboration with **Airbus DS** (Defense and Space)

- Under supervision of Vincent Padois and David Daney.

#### M.Sc. in Electrical Engineering - Control Theory & Mechatronics

2011 - 2017

University of Zagreb, Faculty of Electrical Engineering and Computing

- Collaboration with **Robert Bosch GmbH**, Stuttgart, Germany

- Under supervision of Jadranko Matusko and Sandor Iles

### Awards and Grants

#### IEEE RAS Sustainability Grant

Aug 2025

- An Open-Source Platform for Sustainability Assessment and Comparison of Collaborative Robots

#### PostDoc offer from MIT Biomimetics Lab (Sangbae Kim)

2024

- Accepted but not pursued due to relocation to Zurich.

#### IEEE Transactions on Automation Science and Engineering Best Paper Award

2021

- *A Recursive Watermark Method for Hard Real-Time Industrial Control System Cyber-Resilience Enhancement*

#### Scholarship grant for Internship in Germany

2016 - 2017

- Awarded by German Academic Exchange Service (DAAD).

### Competitions

#### 1<sup>st</sup> at the RoboCup 2019 - Humanoid KidSize Soccer League

2019

- Participated at the RoboCup 2019 in Sydney, Australia as a part of **Rhoban** team.

#### 1<sup>st</sup> place in competition Elektroboj

2016

- With our project **GuitarFriend** we then participated in the university's startup incubator for 1 year.

#### 1<sup>st</sup> place in PLC+ competition (sponsored by SIEMENS)

2015 - 2016

- Regional competition (Croatia, Slovenia and Serbia) - Winner two years in a row: 2015 and 2016.

### Open-source projects

I am passionate about open-source and really like the community driven development spirit. Here are the projects that I'm particularly proud of:

#### SimpleFOCproject: Arduino Compatible Open Source Field Oriented Control (FOC) project

2020 - now

Founder & Project Administrator

- A cross-platform FOC implementation for BLDC and stepper motors, built on the Arduino IDE and PlatformIO.

- Designed to support a wide range of motors, sensors, drivers, and microcontrollers.

- The project now includes 50+ contributors and a community of over 1500 members — from hobbyists to researchers.

- Find out more at: [GitHub](#), [Community Forum](#).

#### pycapacity: Real-time capable task-space capacity evaluation python module

2021 - now

INRIA Bordeaux, AUCTUS team

- A Python library for evaluating task-space capacity in robotics and biomechanics.

- Developed during my PhD at INRIA, for real-time applications in human-robot interaction and published in JOSS.

- Used in academic research and collaborative projects. See the [documentation](#) and the [paper](#) to get started.

#### Inverted inertia pendulum: Low-cost control systems education platform

2019

Faculty of Electrical Engineering in Zagreb

- An inverted pendulum driven by inertial forces, designed as a cost-effective platform for testing optimal control algorithms.

- Currently used in the Mechatronics course at the University of Zagreb. [GitHub](#) [YouTube](#) [Thingiverse](#)

# Publications

Here is a condensed list of my publications, the full list can be found at Google Scholar.

## Online approach to near time-optimal task-space trajectory planning

Accepted to: IEEE Transactions on Robotics, August 2025

**A Skuric**, N Torres Alberto, L Josph, V Padois, D Daney

2025  
[gitlab](#), [pdf](#), [video](#)

## Simulation Study of the Upper-Limb Isometric Wrench Feasible Set With Glenohumeral Joint Constraints

Journal of Biomechanical Engineering

N Rezzoug, **A Skuric**, V Padois, D Daney

2025  
[paper](#)

## Pycapacity: a real-time task-space capacity calculation package for robotics and biomechanics

Journal of Open-Source Software, 2023

**A Skuric**, V Padois, D Daney

2023  
[github](#) [pdf](#)

## Approximating robot reachable space using convex polytopes

HFR 2022 Best paper finalist

15th International Workshop on Human-Friendly Robotics

**A Skuric**, V Padois, D Daney

2022  
[gitlab](#), [pdf](#)

## On-line feasible wrench polytope evaluation based on human musculoskeletal models: an iterative convex hull method

Accepted to IEEE ICRA 2022 & IEEE RA-L

**A Skuric**, V Padois, N Rezzoug, D Daney

2022  
[gitlab](#), [pdf](#), [video](#)

## SimpleFOC: A Field Oriented Control (FOC) Library for Controlling Brushless Direct Current (BLDC) and Stepper Motors

Journal of Open-Source Software, 2022

**A Skuric**, H Bank, O Williams, R Unger, D Gonzalez

2022  
[github](#), [pdf](#)

## Common wrench capability evaluation of a human-robot collaborative system

46ème Congrès de la Société de Biomécanique

**A Skuric**, N Rezzoug, D Daney, V Padois

2021  
[pdf](#)

## On-line force capability evaluation based on efficient polytope vertex search

IEEE ICRA 2021

**A Skuric**, V Padois, D Daney

2021  
[gitlab](#), [pdf](#), [video](#)

## A Recursive Watermark Method for Hard Real-Time Industrial Control System Cyber-Resilience Enhancement

🏆 IEEE T-ASE Best paper award 2021

IEEE Transactions on Automation Science and Engineering

Z Song, **A Skuric**, K Ji

2020  
[IEEE Best paper award](#), [pdf](#)

# Talks and presentations

I presented my research papers at several international conferences: **ICRA2021**, **ICRA2022**, **HFR2022** or **SB2021-23**; and participated at different scientific events like **JNRH2023**, **CoRL2024** or **Robocup 2023**. Additionally, I presented my research and open-source projects as an invited speaker

## PhD thesis presentation for the R4 network

Bordeaux, France

Title: Unifying view of physical ability metrics for humans, robots and their collaboration

Jun 2023  
[Video link](#)

## Podcast: "Désassemblons le numérique"

Bordeaux, France

A short vulgarisation discussion on human-centered collaborative robotics with G Laisné.

Jun 2023  
[Podcast link](#)

## SimpleFOC workshop for Arduino LLC

Virtual - Arduino HQ

Hosted a workshop on Field Oriented Control (FOC) and introduced the SimpleFOC project to the Arduino's R&D department.

Oct 2021  
[Presentation](#)

## Talk at GDR robotique GT1-GT6 - Session "Exosquelettes pour l'assistance physique : quelles solutions optimales ?"

Virtual - Paris, France

Title: Efficient calculation of human wrench capacity based on human musculoskeletal models.

Oct 2021  
[Presentation](#)

# Teaching and Organising events

## ESNAM Bordeaux

Mathematics and Informatics class - TP and TD exercises (150h), under supervision of Jean-Luc Charles and Eric Ducasse

2020-2023  
Bordeaux, France

## University of Bordeaux, Master ASPIC

Embedded Systems class - TP exercises (16h), under supervision of Gregoire Passault

2022  
Bordeaux, France

## ENSC Bordeaux

Human-robot interfaces class - TD exercises (10h), under supervision of Jean-Marc Salotti

2021  
Bordeaux, France

## Student organisation member at JNRH2023

Organised activities for student participants at the conference with V. Batto.

Jul 2023  
Bordeaux, France

# Work Experience

For the past 8 years, I've worked in robotics, embedded systems, and control across academic research, industry, and open-source.

## Researcher - Freelance

 HUGGING FACE

- Setting up a new research direction on the sustainability and environmental impacts of robotics and AI
- Working on open-source robotics with the Pollen robotics team - [Reachy mini](#)

2025 - now  
Zurich, Switzerland

## R&D engineer - Reachy 2 robot

 POLLEN ROBOTICS

- Low-level firmware development (Rust): Motor control, EtherCAT implementation, Safety features - [github](#)
- Robot dimensional design - optimal shoulder base orientation study, robot payload verification
- Robot motion control - auto-collision avoidance, whole-body gravity compensation implementation - [video](#)

2024 - 2025  
Bordeaux, France

## Founder, Open-Source Initiative SimpleFOC

 PRINCIPAL DEVELOPER | OPEN-SOURCE FOUNDER

- Leading development of the open-source software and hardware stacks. [GitHub](#)
- Designed, produced, and shipped over 1000 SimpleFOC boards worldwide (non-profit model)
- Built and maintained an active community through the [SimpleFOC Forum](#), [YouTube](#)

2020 - now

## PhD candidate

 INRIA BORDEAUX | AUCTUS TEAM

During my PhD thesis my work can be divided in three development and investigation parts:

- Theoretical foundation of expressing human's and robot's physical abilities with the same metrics. - [video](#)
- Efficient algorithms allowing for their real-time use (state-of-the-art sometimes required hours). - [VEPOLI<sup>2</sup>](#), [ICHM](#)
- Robot control and motion planning strategies adapting to the changing physical abilities of robots and humans. - [video](#)
- Given lectures to the students at ENSC, ENSAM and ASPIC in Bordeaux (about 150h over the course of 3 years).

2020 - 2023  
Bordeaux, France

## Freelancer

UPWORK | SELF-EMPLOYED

- Fields: Control Engineering, Sensor Fusion for motion tracking and Software development.
- **Pollen robotics** - working on the inverse kinematics of [Reachy robot](#)

2020

## Research Engineer

 AIO | PROJET NUMII®

- Human pose estimation algorithms based on RGB and Depth cameras, Skeletal fusion algorithms
- Hardware, software and firmware development - prototyping

2019  
Bordeaux, France

## Research Associate

 FACULTY OF ELECTRICAL ENGINEERING, UNIVERSITY OF ZAGREB

- Distributed model predictive control (MPC) for Building management systems
- Advanced control algorithms for a reconfigurable three-wheeled vehicle
- Development of laboratory systems for *Mechatronics* class - [video](#)

2018 - 2019  
Zagreb, Croatia

## Graduate Internship - Control Engineering

 SIEMENS CT

- Maintenance and debugging of industrial embedded software (Siemens PLCs)
- Development of a novel watermarking algorithm for hard real-time control systems Engineering

2017 - 2018  
Princeton, USA

## GuitarFriend - Startup co-founder

STUDENT START-UP INCUBATOR SPOCK, UNIVERSITY OF ZAGREB

- Developed working proof of concept prototype - Mechanics (CAD, 3D print), Electrics (BLDC motors, Encoders), Software (Python, Web)
- Product presented at *IDEA Knockout*, *LEAP summit*, *miPRO* and *TEDx*. [Facebook](#) [Videos](#)

2016 - 2017  
Zagreb, Croatia

## Student Internship and Masters thesis

 ROBERT BOSCH GMBH

- Implemented a full software stack for an IoT device, from low-level firmware and control to the graphical user interface.

2016 - 2017  
Renningen, Germany

# Technical Skills

Here are the technologies and tools I've worked with hands-on, with examples where applicable.

### Programming Languages & Tools

- Python – [github](#)
- C/C++ – [github](#)
- Rust (recent) – [github](#)
- Matlab / Simulink – [github](#)
- Java (a bit rusty) – [github](#)
- Web design – [github](#)
- Robot Operating System (ROS1/2)
- Git, Anaconda/Mamba

### Robotics & Control

- Robot performance evaluation
- Motion control and planning
- Control system design (PID, LQR, QP)
- Mechatronic system design - [github](#)
- System identification
- Sensor fusion (Kalman filter)
- Biomechanical model manipulation
- Motion capture (IMUs, Optitrack)- [gitlab](#)

### Embedded & Hardware Development

- Cross-platform firmware development
- Platforms: Arduino / STM32 / ESP32 ...
- Field Oriented Control
- Real-time applications
- PCB design (Altium, EasyEDA) – [EasyEDA](#)
- CAD, 3D printing – [Thingiverse](#)
- Industrial PLCs (a bit rusty) - Siemens S7