AntunSkuric

Roboticist, Control Engineer & Open-Source Enthusiast

Personal Info

location:
Zurich, Switzerland

e-mail:
antun.skuric@outlook.com

mobile:
(FR) +33 6 18990823

website:
askuric.github.io

Online Profiles:

Languages:
Croatian - native
English - proficient
French - proficient

Personal interests:
playing guitar, reading, running, cycling, hiking,

I feel passionate about:
hands-on learning, open-source, sustainability in technology

Summary

Roboticist and control engineer with a PhD in human-robot interaction and 7+ years of experience in embedded systems, motion control, and robotics. I'm passionate about building accessible, open-source tools that turn complex theoretical concepts into practical, hands-on solutions.

Education

PhD Thesis 2020 - 2023
INRIA Bordeaux, AUCTUS team & University of Bordeaux, France
THESIS: A COUPLED VIEW OF THE PHYSICAL ABILITIES OF HUMAN-ROBOT DYAD FOR THE ONLINE QUANTITATIVE EVALUATION OF ASSISTANCE NEEDS
- Exploration of physical capabilities for physical-human robot interaction
- Project LiChIE in collaboration with **Airbus DS** (Defense and Space)
- Under supervision of Vincent Padois and David Daney.

M.Sc. in Electrical Engineering 2014 - 2017
University of Zagreb, Faculty of Electrical Engineering and Computing
- Collaboration with **Robrt Bosch GmbH**, Stuttgart, Germany
- Under supervision of Jadranko Matusko and Sandor Iles

B.Sc. in Electrical Engineering 2011 - 2014
University of Zagreb, Faculty of Electrical Engineering and Computing
- GPA: 4.0/5.0 - ranked among the top 10% of my generation

Honors and Awards

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*

1st at the RoboCup 2019 - Humanoid KidSize Soccer League 2019
- Participated at the RoboCup 2019 in Sidney, Australia as a part of the team **Rhoban**.

Scholarship for Internship in Germany 2016 - 2017
- Awarded by German Academic Exchange Service (DAAD).

1st place in competition Elektroboj 2016
- Innovation competition founded by international student organisation eStudent.
- First place prize 1000€ and 1 year incubation for **GuitarFriend** project.

1st place in PLC+ competition 2015 - 2016
- Regional competition (Croatia, Slovenia and Serbia), organized by Eestec LC Zagreb, sponsored by **SIEMENS**.
- Winner two years in a row: 2015 and 2016.

Open-source projects

I am quite passionate about open-source and enjoy sharing with the community. Here are the projects that I'm particularly proud of:

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.

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.

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

Work Experience

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

Founder, Open-Source Initiative SimpleFOC 2020 - now

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

R&D engineer - Reachy 2 robot 2024 - 2025

POLLEN ROBOTICS Bordeaux, France

- 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

Teaching assistant 2020 - 2023

UNIVERSITY OF BORDEAUX | ESNAM | ENSC Bordeaux, France

- Given lectures to the students at ENSC, ENSAM and ASPIC in Bordeaux (about 150h over the course of 3 years).

PhD candidate 2020 - 2023

INRA BORDEAUX | AUCTUS TEAM Bordeaux, France

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^2, ICHM
- Robot control and motion planning strategies adapting to the changing physical abilities of robots and humans. - video

Freelancer 2020

UPWORK | SELF-EMPLOYED

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

Research Engineer 2019

AIO | PROJET NUMII® Bordeaux, France

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

Research Associate 2018 - 2019

FACULTY OF ELECTRICAL ENGINEERING, UNIVERSITY OF ZAGREB Zagreb, Croatia

- 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

Graduate Internship - Control Engineering 2017 - 2018

SIEMENS CT Princeton, USA

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

GuitarFriend - Startup co-founder 2016 - 2017

STUDENT START-UP INCUBATOR SPOCK, UNIVERSITY OF ZAGREB Zagreb, Croatia

GuitarFriend is an innovative device enabling people with hand disabilities to learn and play guitar. The startup was incubated for a year.

- 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

Student Internship and Masters thesis 2016 - 2017

ROBERT BOSCH GMBH Renningen, Germany

- Implemented the complete control software stack as well as the user interface following the industry 4.0 paradigm.

Technical Skills

Here are key 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

Publications

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

Simulation Study of the Upper-Limb Isometric Wrench Feasible Set With Glenohumeral Joint Constraints 2025
Journal of Biomechanical Engineering paper
N Rezzoug, **A Skuric**, V Padois, D Daney

Online approach to near time-optimal task-space trajectory planning 2024
In submission to: IEEE Transactions on Robotics, May 2024 gitlab, pdf, video
A Skuric, N Torres Alberto, L Josph, V Padois, D Daney

Pycapacity: a real-time task-space capacity calculation package for robotics and biomechanics 2023
Journal of Open-Source Software, 2023 github pdf
A Skuric, V Padois, D Daney

Approximating robot reachanble space using convex polytopes
HFR 2022 Best paper finalist 2022
15th International Workshop on Human-Friendly Robotics gitlab, pdf
A Skuric, V Padois, D Daney

On-line feasible wrench polytope evaluation based on human musculoskeletal models: an iterative convex hull method 2022
Accepted to IEEE ICRA 2022 & IEEE RA-L gitlab, pdf, video
A Skuric, V Padois, N Rezzoug, D Daney

SimpleFOC: A Field Oriented Control (FOC) Library for Controlling Brushless Direct Current (BLDC) and Stepper Motors 2022
Journal of Open-Source Software, 2022 github, pdf
A Skuric, H Bank, O Williams, R Unger, D Gonzalez

Common wrench capability evaluation of a human-robot collaborative system 2021
46ème Congrès de la Société de Biomécanique pdf
A Skuric, N Rezzoug, D Daney, V Padois

On-line force capability evaluation based on efficient polytope vertex search 2021
IEEE ICRA 2021 gitlab, pdf, video
A Skuric, V Padois, D Daney

A Recursive Watermark Method for Hard Real-Time Industrial Control System Cyber-Resilience Enhancement
🏆 **IEEE T-ASE Best paper award 2021** 2020
IEEE Transactions on Automation Science and Engineering IEEE Best paper award , pdf
Z Song, **A Skuric**, K Ji

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 Jun 2023
Bordeaux, France Video link
Title: Unifying view of physical ability metrics for humans, robots and their collaboration

Podcast: "Désassemblons le numérique" Jun 2023
Bordeaux, France Podcast link
A short vulgarisation discussion on human-centered collaborative robotics with G Laisné.

SimpleFOC workshop for Arduino LLC Oct 2021
Virtual - Arduino HQ Presentation
Hosted a workshop on Field Oriented Control (FOC) and introduced the SimpleFOC project to the Arduino's R&D department.

Talk at GDR robotique GT1-GT6 - Session "Exosquelettes pour l'assistance physique : quelles solutions optimales ?" Oct 2021
Virtual - Arduino HQ Presentation
Title: Efficient calculation of human wrench capacity based on human musculoskeletal models.

Teaching and Organising events

ESNAM Bordeaux 2020-2023
Matematics and Informatics class - TP and TD exercises (150h), under supervision of Jean-Luc Charles and Eric Ducasse Bordeaux, France

University of Bordeaux, Master ASPIC 2022
Embedded Systems class - TP exercises (16h), under supervision of Gregoire Passault Bordeaux, France

ENSC Bordeaux 2021
Human-robot interfaces class - TD exercises (10h), under supervision of Jean-Marc Salotti Bordeaux, France

Student organisation member at JNRH2023 Jul 2023
Organised activities for student participants at the conference with V. Batto. Bordeaux, France