Antun**Skuric**

PhD in physical human-robot interaction

Personal Info

location:
Bordeaux, France

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, hiking, cycling,

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

Research Interests

- Human-centred robotics
- Sustainability in robotics
- Physical human-robot interaction
- Polytope algebra and evaluation algorithms
- Design and control of mechatronic systems
- Optimal control strategies

Education

2020 - 2023 **PhD Thesis** PHYSICAL HUMAN-ROBOT INTERACTION
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.

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

2011 - 2014 **B.Sc. in Electrical Engineering** CONTROL THEORY
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

2021 **IEEE Transactions on Automation Science and Engineering Best Paper Award** IEEE TASE
For the paper: *A Recursive Watermark Method for Hard Real-Time Industrial Control System Cyber-Resilience Enhancement*

2019 **1st at the RoboCup 2019 - Humanoid KidSize Soccer League** RoboCup
I had the opportunity to participate at the RoboCup 2019 held in Sidney, Australia as a part of the team **Rhoban**.

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

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

2015 - 2016 **1st place in PLC+ competition** **SIEMENS** | EESTEC LC Zagreb
- 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:

2021-now **pycapacity:** Real-time capable task-space capacity evaluation python module
INRIA Bordeaux, AUCTUS team
A python package providing a framework for the generic task-space capacity calculation for robotic serial manipulators and human musculoskeletal models. For more info about the theoretic and implementation details check the documentation, paper.

2020 - now **SimpleFOCproject:** Arduino Compatible Open Source Field Oriented Control (FOC) project
Founder & Project Administrator
A Cross-Platform FOC implementation for BLDC and Stepper motors based on the Arduino IDE and PlatformIO.The goal is to support a wide range different motors, position sensors, drivers and microcontrollers. Project has 50+ contributors and 1500+ community members, ranging from amateurs to professionals and researchers. More info on GitHub and Community

2019 **Inverted inertia pendulum:** My first open-source project
Faculty of Electrical Engineering in Zagreb
Development of inertial force based inverted pendulum as a low-cost, testing platform for optimal control algorithms. Currently used for the Mechatronics class 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.

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

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

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

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

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

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

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

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

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

Work Experience

2024 - now **R&D engineer** — Bordeaux, France
POLLEN ROBOTICS
50%: Working on robot control algorithms, dimensional design and development of low-level motion control of the Reachy2 robot.
50%: Exploring sustainable development of robotics solutions

2020 - 2023 **Teaching assistant** — Bordeaux, France
UNIVERSITY OF BORDEAUX | ESNAM | ENSC
Participated in TP and TD exercises for students in ENSC, ENSAM and ASPIC in Bordeaux (about 150h over the course of 3 years).

2020 - 2023 **PhD candidate** — Bordeaux, France
INRA BORDEAUX | AUCTUS TEAM
I was fortunate to be able to do my PhD thesis on human-robot physical interaction at the INRIA institute in Bordeaux, at the AUCTUS team.

2020 **Freelancer**
UPWORK | SELF-EMPLOYED
Fields: Control Engineering, Sensor Fusion for motion tracking and Software development.

2019 **Research Engineer** — Bordeaux, France
AIO | PROJET NUMII®
Human pose estimation algorithms based on RGBd cameras, skeletal fusion algorithms, hardware/software/firmware development.

2018-2019 **Research Associate** — Zagreb, Croatia
FACULTY OF ELECTRICAL ENGINEERING, UNIVERSITY OF ZAGREB
Distributed model predictive control (MPC) for building management systems, control algorithms for a reconfigurable three-wheeled vehicle.

2017-2018 **Graduate Internship - Control Engineering** — Princeton, USA
SIEMENS CT
Maintenance and enhancements of industrial embedded software, development of a novel watermarking algorithm for hard real-time control.

2016-2017 **GuitarFriend - Startup co-founder** — Zagreb, Croatia
STUDENT START-UP INCUBATOR SPOCK, UNIVERSITY OF ZAGREB
GuitarFriend is an innovative device enabling people with hand disabilities to learn and play guitar. The startup was incubated for a year.

2016-2017 **Student Internship and Masters thesis** — Renningen, Germany
ROBERT BOSCH GMBH
Automating of an adaptable fixing device for cyber-physical production systems - Industry 4.0.

Talks and presentations

I had the opportunity to present my research papers at several international conferences: **ICRA2021**, **ICRA2022**, **HFR2022** or **SB2021-23**; and participating in different scientific events like **JNRH2023**, **CoRL2024** or **Robocup 2023**. I was also invited to present my research and open-source projects on several occasions such as

Jun 2023 — **PhD thesis presentation for the R4 network** — Bordeaux, France
Title: Unifying view of physical ability metrics for humans, robots and their collaboration . — Video link

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

Oct 2021 — **SimpleFOC workshop for Arduino LLC**
Invited to host a workshop on Field Oriented Control (FOC) and to introduce the Simple**FOC** project to the Arduino's R&D department — Presentation

Oct 2021 — **Invited Talk at GDR robotique GT1-GT6** — Paris, France
Session "Exosquelettes pour l'assistance physique : quelles solutions optimales ?"
Title: Efficient calculation of human wrench capacity based on human musculoskeletal models. — Presentation

Teaching and Organising events

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

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

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

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

Technical skills

Programming languages

- Python
- C/C++
- Rust (from recently)
- Matlab / Simulink
- Robot operating system (ROS1/2)
- Embedded (Arduino/stm32/esp32...)
- HTML/CSS/JavaScript/SQL/php
- Java
- PLC programming
- Anaconda/Mamba
- Git - collaborative development

Hands-on experience

- Robotics (mostly manipulators)
- Motor/Motion control
- Embedded Systems
- Biomechanical model manipulation
- Control system design
- Mechatronic design
- System identification
- Sensor Fusion
- PCB design
- CAD | 3D printing | CNC
- Industrial Automation (my student days)
- User Applications