

# SANDER TONKENS

Ph.D. student in Mechanical and Aerospace Engineering · Robotics

La Jolla, California, USA

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## EDUCATION

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### University of California, San Diego

July 2025 (Expected)

*Doctor of Philosophy (Ph.D.) - Mechanical and Aerospace Engineering*

*La Jolla, CA*

Overall GPA: 4.0

### Stanford University

December 2020

*Master of Science (M.S.) - Mechanical Engineering*

*Stanford, CA*

Overall GPA: 4.0

Focus in Numerical Mathematics, Robotics, and Machine Learning.

Relevant Coursework includes Optimal and Learning-Based Control, Convex Optimization I & II, Reinforcement Learning, Principles of Robot Autonomy, Mechatronics I & II, State Estimation, and Medical Robotics.

### École Polytechnique Fédérale de Lausanne (EPFL)

July 2017

*Bachelor of Science (B.Sc.) - Mechanical Engineering*

*Lausanne, Switzerland*

Overall GPA: 5.4 / 6

Focus in Mathematics and Control Theory.

Relevant coursework includes Control Theory, Multivariate Control, Dynamics I & II, and Complex Analysis.

## RESEARCH EXPERIENCE

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### Safe Autonomous Systems Laboratory - UC San Diego

September 2021 - Present

*Graduate Student Researcher - PI: Prof. Sylvia Herbert*

*La Jolla, CA*

- Conducting research on generalization and robustness for learning-based autonomy stacks.
- First Ph.D. student in newly established group, responsible for setting up hardware platforms.

### Control Systems Tech. Group - Eindhoven University of Technology

March 2021 - July 2021

*Research Assistant - PI: Dr. Ir. Mauro Salazar*

*Eindhoven, The Netherlands*

- Conducting research on dynamic programming approach for vaccine allocation optimization.
- Large data-driven system identification for deterministic and stochastic graph-based epidemiology models.
- Developed open-source codebase with the objective of facilitating government policy making.

### Autonomous Systems Laboratory - Stanford University

September 2019 - January 2021

*Research Assistant - PI: Prof. Marco Pavone*

*Stanford, CA*

- Conducting research on efficient constrained optimal control of high-dimensional nonlinear systems.
- Applied research to soft robots modeled using FEM models to devise highly-accurate reduced order models.
- Developed control scheme decoupling output feedback controller from optimization problem, together with reduced order model yielding a state-of-the-art method for complex dynamic tasks, e.g., trajectory tracking.
- Developed open-source codebase for simulation and hardware experiments, interfacing with SOFA framework.

### CHARM Lab - Stanford University

March 2019 - June 2019

*Independent Research Project - PI: Prof. Allison Okamura*

*Stanford, CA*

- Fabricated pneumatically actuated 3-DoF elastomer-based soft wearable haptic devices.
- Developed & implemented inverse dynamics feed-forward adaptive controller with state prediction, P-MRAC, enabling matching soft actuator performance across devices with significantly reduced response latency.
- Validated control design with hardware experiments and received the best grade for a related course project.

## PUBLICATIONS

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**Sander Tonkens**, Paul de Klaver, and Mauro Salazar, “Optimizing Vaccine Allocation Strategies in Pandemic Outbreaks: An Optimal Control Approach”, *Under review*, 2022, <https://arxiv.org/abs/2112.11908>.

**Sander Tonkens**, Joseph Lorenzetti, and Marco Pavone, “Soft Robot Optimal Control Via Reduced Order Finite Element Models”, *IEEE International Conference on Robotics and Automation*, 2021, <https://arxiv.org/abs/2011.02092>.

## TEACHING EXPERIENCE

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**Graduate Course Assistant - Stanford University** March 2020 - July 2020  
*AA203: Optimal and Learning-Based Control* Stanford, CA

- Created new assignments on the topics of reachable sets/tubes, sequential convex programming, comparison of classical and learning-based approaches for control, and reinforcement learning using PyTorch.
- Conducted office hours, graded assignments, and mentored custom class projects focused on optimal control.

**Undergraduate Course Assistant - EPFL** September 2015 - July 2017  
*Physics I, Analysis II, III & IV, Dynamics I* Lausanne, Switzerland

- Taught fundamental and advanced undergraduate Mechanical Engineering courses in English and French.
- Responsibilities included leading tutorial sessions, preparing exam questions, and holding office hours.

## PROFESSIONAL EXPERIENCE

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**Auris Health** June 2019 - September 2019  
*Controls & Robotics Intern* Redwood City, CA

- Developed improved nonlinear dynamics model of next-generation teleoperated flexible endoscope for novel treatments leading to significant improvement in end-effector position control.
- Designed & implemented automated nonlinear system identification procedure and tuning GUI for endoscopes.
- Improved modeling and control aided with the retirement of multiple key endoscope user-responsiveness issues, yielded more intuitive robot, and gave surgeons access to previously inaccessible regions of the target organ.
- Conducted controller performance feedback sessions with clinical engineers during in-vivo lab sessions.

**McKinsey & Company** April 2018 - August 2018  
*Business Analyst Intern* Geneva, Switzerland

- Developed strategy and modeled ROI of generic drug treatment accessibility incentive in Sub-Saharan Africa.
- Co-created & developed IoT use cases for packaging machinery manufacturer and a leading PaaS provider.

**LM Wind Power** September 2017 - April 2018  
*R&D Engineering Intern* Kolding, Denmark

- Prototyped & tested adhesive bonding evaluation tool for 80+ meter wind turbine blades.
- Designed & led field test evaluation of autonomous control system for a novel blade ice mitigation system.

## SKILLS

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<b>Programming</b>	Python, Julia, C/C++, MATLAB, Rust.
<b>Learning &amp; Robotics</b>	ROS, PyTorch, TensorFlow, SOFA, MuJoCo, Box2D.
<b>Design</b>	CATIA, LabVIEW, Simulink, Solidworks.
<b>Languages</b>	Dutch (mother tongue), English, French (Fluent), German, Spanish (Beginner).

## AWARDS & FELLOWSHIPS

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- Netherlands America Foundation Graduate Fellowship, 2018.
- Fulbright Graduate Scholar, 2018.

## SERVICE

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**Reviewing** RA-L (2022), ECC (2022), NeurIPS (2021), IEEE Access (2021).