Nicolas Pfitzer

MSc Robotics, Systems and Control | Bachelor of Microengineering

Swiss & US Citizen

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Profile

Robotics and ML engineer

Reinforcement Learning

Computer Vision

Micro-systems and Electronics

Technical Skills

Programming Languages

C++, Python, MATLAB

Machine Learning

PyTorch, TensorFlow

Reinforcement Learning

IsaacLab, TorchRL, VMAS

Robotics , CAD & Electronics

ROS2, Catia, Cadence

Tools

Git, Docker, Linux

Languages

French ●●●●

English ●●●●

German ●●●○

Personal Interests

Exploring autonomous decision-making and embodied intelligence. Connecting perception, reasoning, and control to create innovative real-world systems.

Last updated: September, 2025.

Education

2023 – Present. **Master's Degree in Robotics, Systems and Control**

ETH Zurich – Zurich, Switzerland

Jan. 2025 – Present. Master Thesis, University of Cambridge – Cambridge, United Kingdom

2020 – 2023. **Bachelor in Microengineering**

2020 – 2022. **EPFL, Swiss Federal Institute of Technology of Lausanne** – Lausanne, Switzerland

2022 – 2023. University of New South Wales – Sydney, Australia

Grade: 5.42/6 (Top 5%)

2017 – 2020. **Swiss Matura (French-German Bilingual)**

Ecole Moser, Geneva – Switzerland

Specialization: Physics and Applied Mathematics

Completed with honours, Grade: 5.7/6 (Top 5%)

Experience

Feb. 2025 – Sept. 2025 **Researcher @ ProrokLab - University of Cambridge**

Multi-Agent Reinforcement Learning - Collaborative and Language Driven Multi-Agent Teams.

Sept. 2024 – Jan. 2025 **Student Researcher @ Robotic Systems Lab - ETH Zurich**

Multi-Task Reinforcement Learning for Material Handling - Partnered with Liebherr

Feb. 2024 – Aug. 2024 **Computer Vision Engineer Intern @ Shape Labs Inc. - San Francisco**

Developed high-impact software solutions at the intersection of computer vision, machine learning, and 3D graphics. YCombinator Pioneer Internship Program.

Aug. 2021 – Jul. 2022. **Power System Engineer @ EPFL Spacecraft Team - Lausanne**

Student Aerospace organization at EPFL building CubeSats. Orbital simulations, Designed and optimized solar-panel deployment.

Publications

Nicolas Pfitzer, et al. *Prompting Robot Teams with Natural Language and Automata*. Submitted to IEEE International Conference on Robotics and Automation (ICRA), 2026.

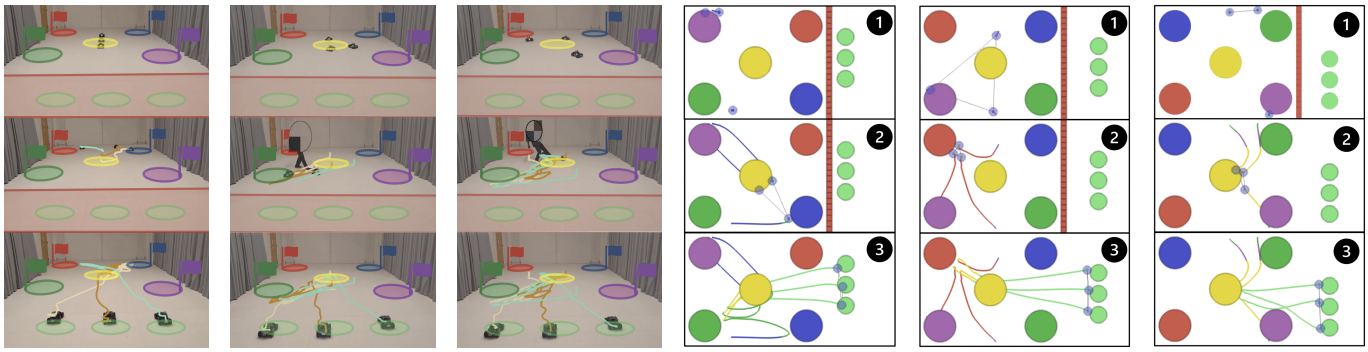
Nicolas Pfitzer*, et al. *MR.NAVI: Mixed-Reality Navigation Assistant for the Visually Impaired*. Accepted at the CV4MR Workshop, CVPR 2025. (co-first author)

Projects Portfolio

Feb. 2025 – Present **Multi-robot Coordination and Reasoning through Natural Language**

ProrokLab - University of Cambridge - Master Thesis

- Investigating how Large Language Models (LLMs), RNNs and Automaton theory can enable intuitive human-robot collaboration by interpreting and executing natural language instructions in multi-robot tasks.
- Work submitted to the IEEE International Conference on Robotics and Automation (ICRA 2026)



(a) "Search for the blue flag, then the switch, then head to the goal room." (b) "First search for the green flag, then the actuator, then proceed to goal." (c) Same as (b), with major disruptions. (d) "Head for the blue flag, then the green flag, and finish at the target." (e) "Locate the purple flag, then the red flag, and proceed to the goal." (f) "Find the green flag, identify the purple one, then reach the goal."

Figure 1: Examples of zero-shot multi-robot deployments in a retrieve-the-flag scenario, on physical robots (**a-c**) and in simulations (**d-f**). Each task requires the team to locate the specified flag, and then 'bring' it to the switch (yellow) which opens a virtual gate separating their goal region. The team can handle a variety of natural-language expressions, objectives and even unmodeled disturbances (a person interferes with the team in (b) and (c), middle panel). Simulated examples add more complexity: instead of locating a single flag, the agents must find and retrieve a series of flags in a given sequence.

Sept. 2024 – Jan. 2025 **MR.NAVI: Mixed-Reality Navigation Assistant for the Visually Impaired**

ETH Zurich - Course Project (Team of 4)

- Developed a Mixed-Reality application to support visually impaired individuals in navigating unfamiliar environments. Demo video!
- Work resulted in a paper accepted to the **CV4MR Workshop at CVPR 2025**.

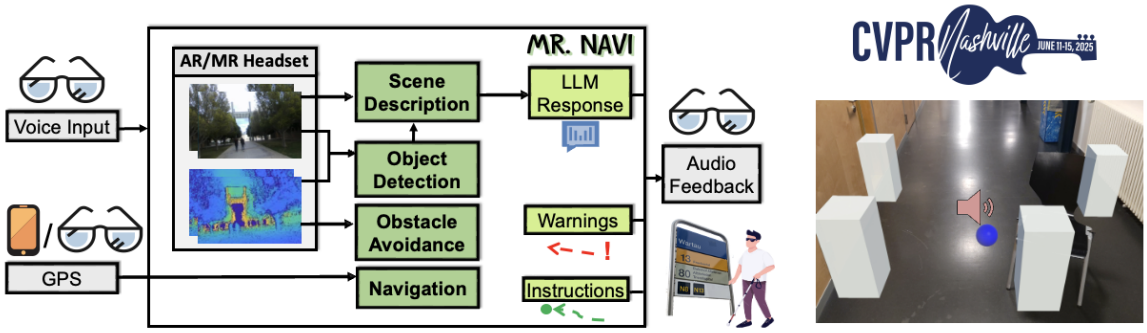


Figure 2: Application Pipeline

Sept. 2024 – Jan. 2025 **Multi-task Reinforcement Learning for Material Handling**

Robotic Systems Lab - ETH Zurich - Semester Project

- In this project, we explored a multitask reinforcement learning (MTRL) framework aimed at learning control strategies for material handling equipment, specifically the Liebherr LH 40.
- We trained a single MTRL policy to efficiently learn and execute three key tasks in a material handler's workflow: point-to-point navigation, waypoint tracking, and dynamic throwing.

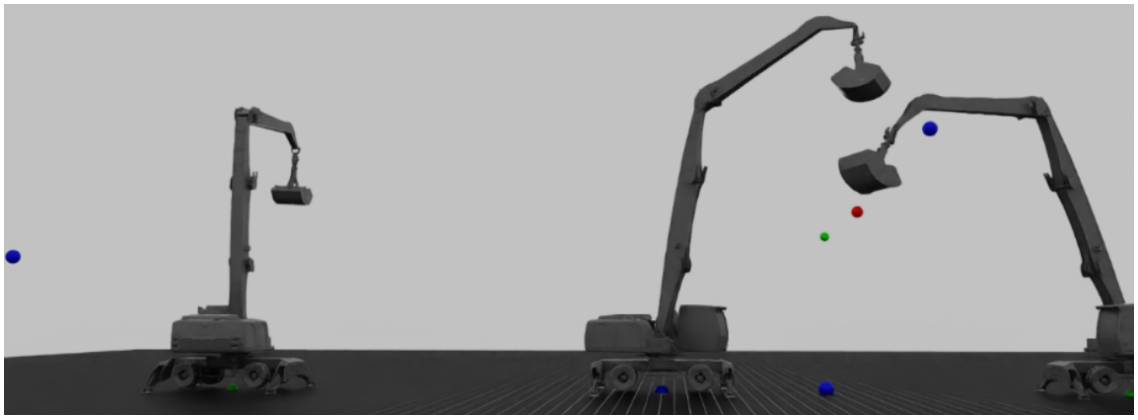


Figure 3: Simulated roll-out of a multi-task material handling policy.

Sept. 2023 – Dec. 2023 **A Dexterous Low-Cost Tendon-Driven Biomimetic Robotic Hand with Novel Snap-fit Pin Joints**

ETH Zurich - Course Project (Team of 5)

- Developed a tendon-driven robotic hand featuring a unique snap-fit pin joint design for simplified assembly and maintenance.
- This robotic hand includes 11 actuated degrees of freedom and leverages a tendon-driven mechanism.
- Key aspects of the project included teleoperation using an optimization-based hand-tracking and re-targeting algorithm, along with the implementation of reinforcement learning policies for executing complex ball rolling tasks, demonstrating its practical functionality in real-world applications.

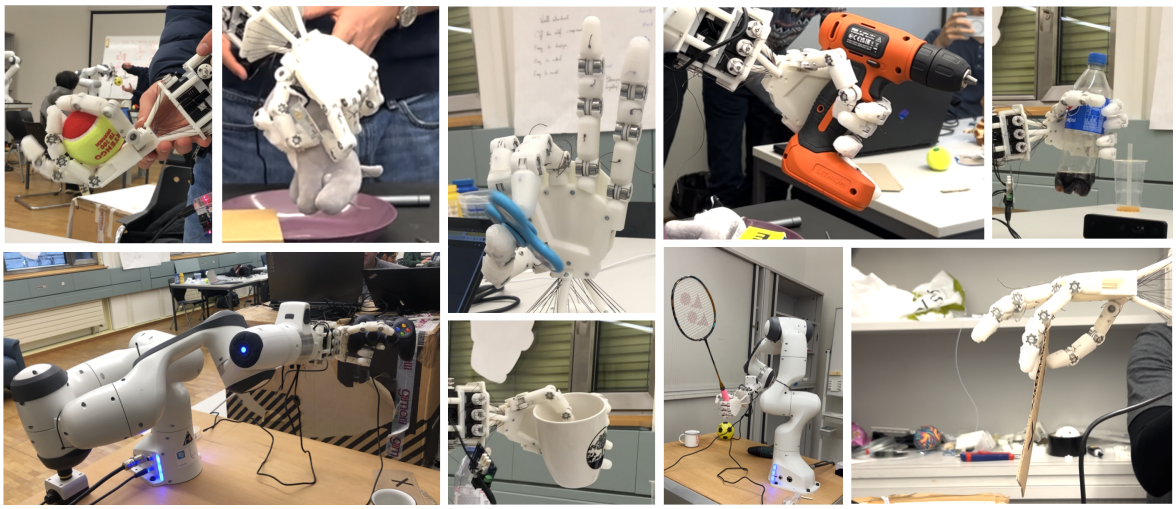


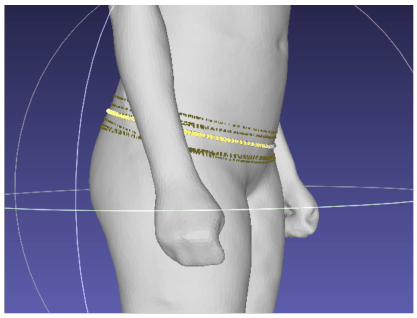
Figure 4: The hand in action.

Feb. 2024 – Aug. 2024 **Computer Vision Projects at Shape**

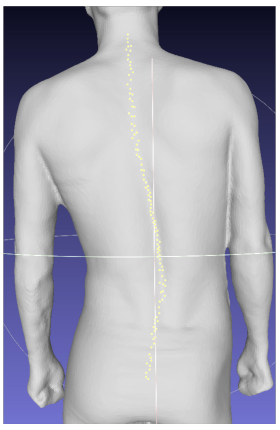
Shape is a health tech startup backed by Ycombinator and based in San Francisco, California, which has developed a state-of-the-art 3D body scanner allowing users to monitor their overall fitness, body-composition, and much more. Working at Shape, I independently led the development of 3 new Computer Vision pipelines:

- Posture Analysis

  The project aimed to develop a comprehensive postural analysis framework using whole-body 3D scans to diagnose and manage musculoskeletal disorders. These measurements are performed by analyzing muscle definition, body symmetry, and common physiological markers, all supported by medical literature.



Visualization of Anterior Pelvic Tilt measurement



Visualization of the Spine Mapping

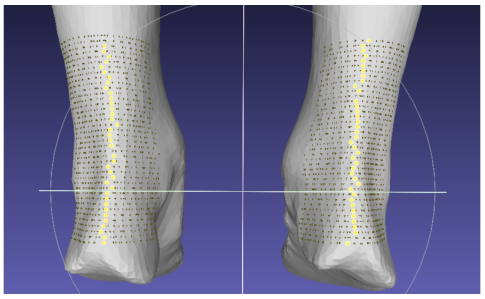


Figure illustrating pronation & supination measurements

- Rigging 3D Body scans for Animation

  I led the development of a novel C++ pipeline to automatically rig and animate any given textured 3D PLY mesh of a human. This pipeline re-targets joint positions from either open-source (ex. Mixamo) or custom animations in gLTF format, ensuring seamless and dynamic animations. The final objective of the project was to create an IOS Demo where the user could seamlessly transition between a variety of different animations fitted onto their own 3D scans.

Figure 5: Snapshots of a Capuera animation 60fps

- Residual Networks for Clothing detection

  To guarantee the effectiveness of the Shapescale measurements, users are requested to wear tight-fitting clothing or no clothing during the scanning process. However, customer-data showed that users do not always comply, resulting in erroneous measurements. My approach was to train a deep learning model (ResNet50) to automatically detect when a user was wearing clothing that could

destabilize the scanning process. Trained on over 60'000 publicly available images, the ResNet50 network achieved an accuracy of over 98.5%.

Sept. 2023 – Dec. 2023 **Bi-directional Rapidly-Exploring Random Trees (B-RRT*) for Enhanced Path Planning in Obstructed Environments**

ETH Zurich - Course Project (Team of 2)

- Developed a high-performance simulation for obstacle navigation using a two-wheeled robot in a dynamic 2D environment.
- Tasked with finding an optimal paths without prior knowledge of other robots, I opted for a Bidirectional Rapidly Exploring Random Tree approach, which proved highly effective in navigating complex scenarios.

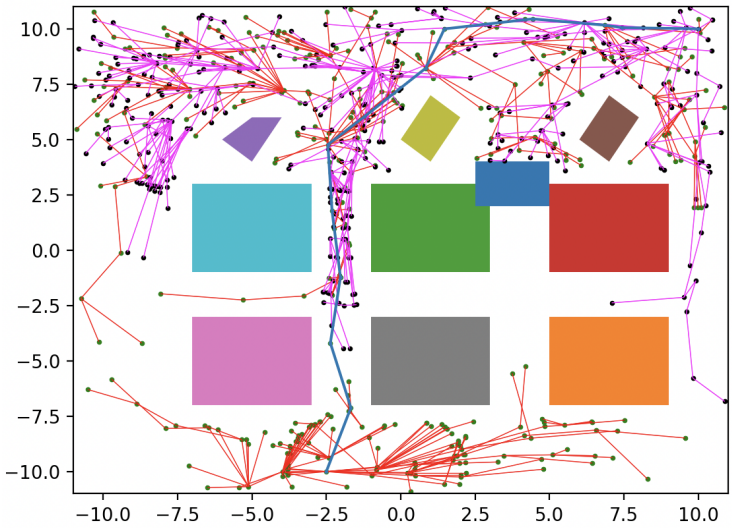


Figure 6: (B-RRT* path planning in a highly obstructed environment optimized for ultra-fast convergence.

Feb. 2022 – Jul. 2022 **High-Efficiency Mechanical Clock with Flexible Mechanics**

EPFL - Course Project (Team of 5)

- Developed a high-performance mechanical clock, achieving a theoretical 50% increase in energy efficiency compared to traditional mechanical clocks.
- This innovative timepiece designed with a titanium body and tungsten counter-weights features a unique, flexible-guidance oscillator that replaces the traditional ticking system, significantly reducing energy loss.