

Peter Ralph Desir

MSc Mechanical Engineering - BioMechanical Design, TU Delft

Specializing in physical human-robot interaction (pHRI): thesis on contact-force regulation in pHRI (defense Oct 2026), with a first-author systematic-review preprint. Applied-physics BSc who builds hands-on robotics: ROS2, embedded control (ESP32/Arduino), multibody and musculoskeletal simulation, CAD and 3D printing, and a quick, coachable learner. **Portfolio website:** ralphdesir.com

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Dutch citizen (EU/EFTA), No work permit sponsorship required

Available from November 2026, relocation to Switzerland at own expense

Languages: English (native) · Papiamentu (native) · Dutch (C2) · Spanish (B2) · Haitian Creole (B1) · French (B1) · German (learning)



TECHNICAL SKILLS

Controls & Haptics: force/impedance/admittance control, haptics, PID & state-feedback, signal conditioning & data acquisition

Software & Simulation: Python (SymPy, NumPy), MATLAB/Simulink, OpenSim, SCONE, AnyLogic, SolidWorks, Git, TypeScript, SQL

Robotics & Embedded: ROS2, Arduino, ESP32, GRBL (CNC), 3D printing, PWM/pneumatic actuation, sensor-actuator integration

EDUCATION

MSc Mechanical Engineering - BioMechanical Design, TU Delft

Sep 2024 – Oct 2026 (expected)

Thesis (BodyHaptics group, Dr. Arno Stienen): contact-force regulation for assistive robotic tools in industrial work, continuation of the Bilfinger/Shell field study. Defense: Oct 2026.

Relevant courses: Control System Design, Human Robot Interaction, Bio Inspired Design, Neuromechanics & Motor Control, System Analysis & Simulation, Multibody Dynamics, Non-Linear Mechanics, Musculoskeletal Modeling & Simulation

BSc Applied Physics, TU Delft

Sep 2020 – Jun 2024

Thesis: Investigating the Human Environment with Custom Built Heartbeat Pump and Arteries

Relevant courses: Quantum Mechanics I-III, Electrodynamics, Classical Mechanics, Statistical Physics, Experimental Physics, Computational Science, Systems & Signals, Solid-State Physics

Extra: Pre-Master Bridge Applied Physics to Mechanical Engineering, TU Delft, incl. Advanced Mechanics, Systems & Control, Material Science (Sep 2023 – Jun 2024)

Minor Science, Business and Innovation, Leiden University

Sep 2022 – Jan 2023

Relevant courses: AI for Business using Python

PUBLICATIONS

Desir, P.R. & Stienen, A. (2026). Systematic review of contact-force regulation in physical human-robot interaction (preprint). engrXiv. DOI: [10.31224/7827](https://doi.org/10.31224/7827)

TECHNICAL WORK AND PROJECT EXPERIENCE

Full project write-ups and video demonstrations: page 2.

Bilfinger/Shell R&D Engineer Intern

Sep 2025 – Nov 2025

Field study on robotization of industrial work: collected measurements, e.g. posture and task-load data during on-site observations to establish design parameters for assistive robotic tools targeting chronic posture correction. Dataset and problem definition carried forward into MSc thesis (Body Haptics group, TU Delft).

StratosDynamics Founding Team Member

Nov 2025 – May 2026

Early-stage venture development of stratospheric balloon-glider aircraft including the EUDIS hackathon and ESA BIC Noordwijk pre-start programme; stepped back in May 2026 to focus on thesis research; venture subsequently won the TU Delft Impact Contest Advanced Award (€7,500) and won a €5,000 Arnold & Siedsma discount through the Ready to Startup (Roland Berger).

Euro Pool System Fault-Tree Analysis for Dashboard Data Reliability

Feb 2025 – Jun 2025

Improved dashboard data reliability through qualitative and quantitative fault-tree analysis, mapping minimal cut-sets across organizational and technical failure paths.

Picnic E-commerce Warehouse AMR Implementation

Feb 2025 – Jun 2025

Co-developed an AnyLogic discrete-event AMR-vs-forklift model on real warehouse data: ~20% lower kWh per pallet transported, ~40% faster inbound cycle time.

Multibody Systems Dynamics & Predictive Simulations

Sep 2024 – Jun 2025

- SymPy (with Prof. Jason Moore): symbolically derived DCM/Euler kinematics and DAE-based equations of motion for holonomic and nonholonomic multibody systems; numerical integration of planar and spatial linkages.
- OpenSim & MATLAB: inverse kinematics/dynamics and static optimization comparing post-TKR vs. healthy gait; tuned SCONE reflex controllers with Hill-type muscle models to quantify sensory-noise effects on neuromuscular control.

ROS2 Robot Arm (Hugging Face SO101): 3D-printed arm with ROS2 control stack; SolidWorks design

2025 – Present

ESP32 Pneumatic Heartbeat Simulator: PWM solenoid control, PDMS arterial phantoms

Feb 2024 – Jun 2024

Compact 3D-Printed CNC Lathe: Arduino/GRBL, NEMA17 microstepping; 0.0025 mm resolution

Sep 2023 – Nov 2023

Bio-Inspired Tie-Wrap Wound-Closure Patch: TPU/PU CAD; 64% peak-stress reduction, <\$4 unit

Sep 2024 – Feb 2025

Personalized Platform Dev for Aruban Companies: Python, PostgreSQL, TypeScript; eg: mitoocarrental.com

2024 – 2025

Additional: Content creation (social media) · 3D printing & CAD design

Project Portfolio

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PROJECTS & VIDEO DEMONSTRATIONS

ROS2 Robot Arm (Hugging Face S0101)

2025 – Present

3D-printed and assembled the Hugging Face S0101 robot arm and brought it up on a ROS2 control stack; mechanical design and fixturing in SolidWorks. Ongoing work on teleoperation and imitation-learning demonstrations.

Video: [\[YouTube link to be added\]](#)

Systematic Review: Contact-Force Regulation in pHRI

2025 – 2026

First-author systematic review of contact-force regulation in physical human-robot interaction, with Dr. Arno Stienen (TU Delft). Published as an engrXiv preprint, DOI: [10.31224/7827](https://doi.org/10.31224/7827). Video: walkthrough of the literature map and key findings.

Video: [\[YouTube link to be added\]](#)

Compact 3D-Printed CNC Lathe

Sep 2023 – Nov 2023

Using an Arduino Uno running GRBL on a CNC shield with 17HS4401 NEMA17 steppers at 1/16 microstepping driving 8 mm lead screws, I co-engineered from scratch a compact desktop CNC lathe that delivers 0.0025 mm microstep resolution (0.04 mm per full step) for precise aluminium bar turning.

Video: [\[YouTube link to be added\]](#)

ESP32-Driven Pneumatic Heartbeat Simulator

Feb 2024 – Jun 2024

Using an ESP32-WROOM-32 DevKit to drive solenoid valves in a PWM-controlled pneumatic loop and custom PDMS arterial phantoms (ID 1.6 mm), I built from scratch a custom pulsatile flow simulator that replicates physiological systolic peaks (1.25 bar) and achieves 2.5 mL/s peak flow.

Video: [\[YouTube link to be added\]](#)

Multibody Dynamics & Musculoskeletal Simulation

Sep 2024 – Jun 2025

- Using Python's SymPy with Prof. Jason Moore, I symbolically derived DCMs and Euler/Tait-Bryan kinematics, formulated and solved the DAE-based equations of motion for holonomic and nonholonomic multibody systems, and implemented numerical integration schemes to simulate planar and spatial linkages such as bicycle wheels and articulated desk lamps.
- Using OpenSim and MATLAB, I co-engineered inverse kinematics, inverse dynamics, and static optimization on subject-specific musculoskeletal models to compare post-TKR vs healthy gait, revealing reduced knee flexion and compensatory muscle force redistribution.
- Using SCONE's Lua-based reflex controllers with Hill-type musculotendon models and MATLAB's optimization and FRF toolboxes, I ran forward dynamic simulations and inverse optimizations to tune proprioceptive gains and neural delays, and quantified the effects of sensory noise on neuromuscular control across gait, reaching, and postural stability tasks.

Video: [\[YouTube link to be added\]](#)

Bio-Inspired Tie-Wrap Zipper Wound-Closure Patch

Sep 2024 – Feb 2025

Using skin adhesive, tie-wraps and CAD-driven TPU zipper integration on custom PU patches, I co-engineered a bio-inspired wound-closure device that secures 5-15 cm lacerations in under 2 min, employing Gaussian stress-distribution modeling to cut peak point stresses by 64%, and holds unit cost under \$4.

Video: [\[YouTube link to be added\]](#)

Personalized Platform Dev for Aruban Companies

2024 – 2025

Building fully responsive websites for Aruban companies featuring RESTful data management, secure payment processing, and admin dashboards using Python, PostgreSQL, TypeScript, and API integrations.

Live site: mitoocarrental.com

StratosDynamics: Stratospheric Balloon-Glider Venture

Nov 2025 – May 2026

Founding team member of an early-stage aerospace venture developing stratospheric balloon-glider aircraft. Took part in the EUDIS hackathon and the ESA BIC Noordwijk pre-start programme; the venture won the TU Delft Impact Contest Advanced Award (€7,500) and a €5,000 Arnold & Siedsma discount through Ready to Startup (Roland Berger). Stepped back in May 2026 to focus on thesis research.

Website: stratosdynamics.net