Christopher Mailer

Email: christophermailer@icloud.com | **Cell**: +27 71 562 5218 | **Website**: chrismailer.github.io

Education

Master of Science in Electrical Engineering — June 2023

University of Cape Town

- Independent research project on the design and control of a novel planar legged robot which combines proprioceptive and pneumatic actuators for agile manoeuvres.
- Awarded three prestigious merit-based scholarships and fellowships.
- Due to present results at a top robotics research conference (*See [1] in publications*)

Bachelor of Science in Mechanical and Mechatronic Engineering — July 2021

University of Cape Town

- Top of class (Graduated with First Class Honours)
- Awarded Class Medal, SASOL Product Design Prize, and Dean's Merit List
- **Capstone Project**: Online Gait Adaptation of the Robotic Agents Hexapod Robot
  - Published and presented work at an international research conference (*See [2] in publications*)

Relevant Coursework: System Design, Measurement & Control, Mechatronics Design, Fundamentals of Control Systems

Relevant Experience

You can read more about the projects on my personal website https://chrismailer.github.io/projects

Legged Robotics Researcher — Feb 2021 – Present

University of Cape Town – Robotics Lab

- Responsible for the full development of three custom planar legged robots
- Translating high-level system specifications into successful designs, and taking the projects through CAD design, fabrication, testing & debugging, controller development, and documentation stages.
- Led project largely independently with bimonthly meetings with Lab director and graduate researcher.
- Presented demos of the robots to key stakeholders, attracting significant interest and funding from MathWorks.
- Designed test rigs to characterize actuators, and implemented multi-sensor fusion in C++ for robot state estimation.
- Generated dynamic whole-body motions with trajectory optimisation in Python and performed extensive controller testing and refinement in a custom Simscape Multibody simulation before deployment on hardware.
- Conducted experiments with researchers and performed data analysis and visualisation in MATLAB and Python.
- Developed balance and motion controllers in Simulink for real-time execution on a Speedgoat Target Machine, working with EtherCAT and CAN communication protocols on both sensors and actuators.
- Wrote and maintained documentation to facilitate other researchers' use of the robotic platforms.

Mechatronics Internship — Nov 2019 – Dec 2019

University of Cape Town – Robotics Lab

- Designed and manufactured a 2kg dynamically balanced hopping robot for a PhD researcher in a 6-week timeframe.
- Utilized CNC machining, laser cutting, bending, and electrical discharge machining to produce components.
- Implemented precise motion control with a BLDC FOC controller and high-resolution optical encoders.
- Conducted FEA stress analysis on robot legs to meet mass and strength specifications.

Practical Training Course — Nov 2018 – Dec 2018

Cape Peninsula University of Technology

- Training in CNC programming & machining, precision metrology and measurement, electrical automation/robotics, pneumatics, welding, fitting, and turning in an 8-week course.

Software Internship — Nov 2017 – Dec 2017

Prescient Investment Management

- Developed a program in R to provide a daily inflation estimate by analysing around 80 thousand online prices.
- Presented project results to senior fund managers and demonstrated the program's utility in improving the quality of investment decisions.

Publications

[1] **C. Mailer**, S. Shield, R. Govender, and A. Patel, "Getting air: Modelling and control of a hybrid pneumatic-electric legged robot", in *IEEE International Conference on Robotics and Automation* (ICRA), London, UK, in press.

[2] **C. Mailer**, G. Nitschke, and L. Raw, "Evolving gaits for damage control in a hexapod robot", in *Proceedings of the Genetic and Evolutionary Computation Conference* (GECCO), ser. GECCO '21, Lille, France: Association for Computing Machinery, 2021, pp. 146–153.

Skills

Application Software: SolidWorks, MATLAB, Simulink
Programming Languages: Advanced - MATLAB, Python; Intermediate - C/C++
Languages: English (Native), Afrikaans (Elementary Proficiency)

Honours & Awards

- Vice-Chancellor Research Scholarship **July 2021**
- Harry Crossley Research Fellowship **Dec 2020**
- National Research Foundation Postgraduate Scholarship **Dec 2020**
- Class Medal - *awarded to top student in graduating class* **Dec 2020**
- SASOL Product Design Award - *for top student in final year design class* **Dec 2020**
- Dean's Merit List **2017, 2018, 2019**

Leadership

Honours Project Mentor, in Computer Science Department under A/Prof Geoff Nitschke **2022**
Honours Project Mentor (x2), in Electrical Engineering Department under A/Prof Amir Patel **2021, 2022**

University Projects

Ice Claw Design and Prototype **Dec 2018 – Feb 2020**

University of Cape Town – Polar Arctic Research Group

- Collaborated in a team of 4 undergraduate mechanical engineering students performing detailed design of a crane attachment for picking up 5m ice floes onto the Agulhas II research vessel.
- Performed FEA buckling analysis to determine required material thickness while minimising mass.
- Wrote technical documentation of design process, calculations, and decisions and presented to stakeholders.
- Assisted with building and testing of a scale prototype.

Volunteering

Instructor **Sep 2021 – Dec 2021**

High School Arduino Educational Outreach

- Co-facilitated an 8-week workshop introducing Portlands High School students to programming, electronics, soldering and additive manufacturing.
- Taught and assisted students in building a heart rate sensor, a motion alarm, and a sweet colour sorter.