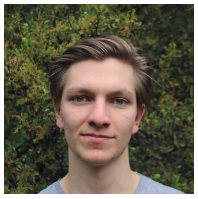
Alexander Knemeyer



Mechatronics Engineer
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Website: alknemeyer.github.io GitHub: github.com/alknemeyer
Location: Berlin, Germany Last updated: April 5, 2021

ABOUT ME

I am an enthusiastic, hard working engineer, looking for interesting engineering problems I can learn from. Working in teams is great, but I can handle projects from home without assistance. I have enjoyed working in the fields of robotics, state estimation, embedded systems and machine learning, but am always open to new things.

EDUCATION

- **MSc. Eng. Robotics**
  University of Cape Town
  Over the course of my research master's, I built a trajectory optimisation library which runs more than 10x faster for complex models. I used it to achieve start of the art optimal control results on a complex model of a quadruped that I developed.
  2019–2020, 2 years

- **BSc. Eng. Mechatronics**
  University of Cape Town
  GPA: 84%; awarded class medal for first year electrical engineering course; on the Dean's Merit list every year; received awards for my honours project.
  2015–2018, 4 years

SKILLS

- **Programming Languages**
  Experienced: Python, Julia, C.
  Familiar: C++, Rust, Clojure(Script), Matlab, Simulink, JavaScript, TypeScript, Common Lisp, Verilog.

- **Other Technology**
  Programming, Linux, Windows, LaTeX, MS Word, Git, ODrive, Python science ecosystem, robotics, computer vision, machine learning, embedded systems.

- **Spoken Languages**

English	C2 level (native)
German	B1 level (additional)
Afrikaans	B1 level (additional)

EXPERIENCE

- **R&D Engineer**
  Mechatronics lab, Cape Town, South Africa
  I'm currently building a DGNSS/MEMS-IMU based whole-body tracking system using C, Matlab, Julia, kinematic modelling, GNSS, and Kalman filtering.
  Jan 2021–

- **Mechatronics Engineer (Contractor)**
  TFASA Flight School, South Africa
  I'm implementing a flight tracking system using Python, TrigNet, WiFi and u-blox GPS modules.
  Feb 2021–

- **Robotics Engineer**
  Mechatronics lab, Cape Town, South Africa
  I built a hopping robot platform for research into foot design for legged robots. I designed and manufactured a frame and boom, wrote comms code to interface with sensors (force, IMU, LIDAR, encoders), and implemented a controller (Teensy, ODrive).
  Dec 2019–Dec 2020, 12 months

- **Machine Learning Consultant**
  Cape Town, South Africa
  A local startup hired me to develop a machine learning product, which helps professional squash players train more safely. Sensors strapped to players' bodies were used to gather data, which I analysed using Python (Jupyter, Keras and Pandas).
  Jan–July 2019, 7 months

- **Vac Work Student**
  Peralex, Cape Town, South Africa
  I updated a C++ TDoA library to use Armadillo, extended a C++ program to convert recorded antenna data from a local format into an HDF5 file, and used Octave/Matlab to decode text in the RDS portion of an FM signal using the raw recorded data.
  Dec 2017–Jan 2018, 5 weeks

OPEN SOURCE PROJECTS

- `physical_education`: a library for trajectory optimisation of legged robots and animals. *Python*
- `foot-design-project`: code and electronics for a monoped robot hopper being developed at the UCT Mechatronics Lab, for research into foot designs for robots. *C++, Python*
- `optoforce`: a library to interact with the OptoForce sensor. *Python*
- `sensor-logger`: an open source example of an embedded sensor system, used in the foot design project. *C++*
- `typesieve`: a library which contains type hints for matplotlib, odrive, pyomo and sympy. Similar to typeshed. *Python*
- `uct-mechatronics-boat`: vacation work contributions to an autonomous boat platform, including PCB design and other embedded engineering. *C, Arduino, Python*

PUBLICATIONS

- Lead author on *Minor Change, Major Gains: The Effect of Orientation Formulation on Solving Time for Multi-Body Trajectory Optimisation*. Published in RA-L, one of the top robotics journals, and presented at IROS.
- Author on *Cheetah tail behavior during pursuit*, presented at the Society for Integrative and Comparative Biology.

COMMUNITY SERVICE

- **Student mentor**
  Mentored multiple fourth year students for their honour's projects, as well as first year engineering students while they adjust to university life.
  2016–2020
- **Volunteer Tutor, Society Chairperson**
  Golden Future Project
  Volunteered for the Golden Future Project, a student run tutoring and mentorship organisation which helps disadvantaged high school children. I was chairperson of the society from Aug 2017 to Aug 2018, during which time we doubled the number of students being tutored.
  Feb 2015–Oct 2018, 3 1/2 years
- **Blood donor**
  I have donated over 23 units of blood (≈10L).

KNOWLEDGE

Robotics, trajectory optimisation, nonlinear optimisation and control, simulation, system modelling, rigid body dynamics, high performance computing, numerical computing, compilers, machine learning, computer vision, digital signal processing, electronics and embedded systems.

TEACHING

- **Teaching Assistant**
  University of Cape Town
  Teaching assistant for three third and fourth year courses in the Electrical Engineering department, with responsibilities including tutoring, designing projects, running tutorials and answering conceptual questions.
  Feb 2019–Nov 2020, 3 courses
- **Blog posts**
  alknemeyer.github.io/archive
  I write tutorials for my personal blog. Feedback from undergraduate students who have used the information for projects has been favourable. For example, I have written about Communicating with embedded systems using Python, Knowing your tools and A workflow for remote development.
  Aug 2020–
- **Intro to control using Matlab and Simulink**
  alknemeyer/Intro-to-control-using-MATLAB
  A relatively fast-paced introduction to MATLAB, including the basics, plotting, control-related functions and Simulink. I wrote it as a tutor for students taking a third year control course. It was very well received.
  Sep 2018, 1 week

ONLINE LEARNING

Underactuated Robotics · The Fast.ai deep learning course · Clojure for the Brave and True · Rust by Example · Parallel computing with Julia · Practical Common Lisp · Kalman and Bayesian Filters in Python

ADDITIONAL DETAILS

Citizenship	South African
Passports	German, South African
Marital status	Single

Can move for work on short notice.