Axel Jacobsen

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PROGRAMMING Advanced in Python, experienced in C, Java, Javascript, learning Julia, Lisp, Rust
ELECTROMECHANICAL Experience with robotics, PCB design, mechanical prototyping and Onshape/Solidworks

RELEVANT EXPERIENCE

CHAN-ZUCKERBERG BIOHUB | R&D Engineering Intern | Jun 2020 - Dec 2020, Jul 2021 - Present

- Owner of the Biohub's reprogramming project of the Opentrons OT-2, an open-source pipetting robot
- Wrote code base with a focus on simplicity, reliability, and speed
- Doubled the speed of certain frequent operations (e.g. picking up / dropping pipette tips), with a reduction of the codebase size by ~75%
- Designed and implemented architecture so any software-controlled instrument can be used during protocols (e.g. cameras, GPUs, thermocyclers)
- Designed and implemented tests to measure the accuracy of the OT-2 using cross-correlation techniques, accurate to the μm range over the robot's movement range of ~1 meter

WILDLIFE COMPUTERS | Engineering Intern | May 2019 – Aug 2019

- Designed an isolator PCB to isolate digital lines from sensitive measurement devices, allowing low-noise and accurate voltage measurements
- Wrote C++ to test PCBs that arrive from fabrication - autonomously verifies PCB component placement to increase production throughput

CONTROL MOBILE | Data Science Co-op | Jan 2018 – Apr 2018

- Wrote Python scripts to analyze and rank order over 300 individual SQL queries by their runtime to optimize the SQL database; reduced the runtime to fetch and display customer data by 65%
- Worked with the backend team to fix existing bugs, write new code, and refactor current code

PROJECTS

DEEP LEARNING

- Asynchronous Advantage Actor-Critic Model written in Pytorch, optimized for multicore CPUs via multiprocessing
- LSTM-based Deep Q-Network, trained on Denmark Technical University's High-Performance Computing Cluster
- Feed-forward neural network written from scratch, implementing the math behind deep learning
- Currently writing a basic autograd library in Julia, in order to understand fundamentals of Pytorch

ENGINEERING PHYSICS AUTONOMOUS ROBOT COMPETITION

- Designed and created an autonomous robot from scratch in 8 weeks, capable of navigating complex and dynamic course
- Implemented signal processing software to detect specific IR frequencies with sub-millisecond detection time
- Designed and created circuits to control the mechanical subsystems (robotic arm / claw, basket)
- Wrote (in C) driver software for the robotic arm / claw, as well as software for high-level control loops

EDUCATION

UNIVERSITY OF BRITISH COLUMBIA | Expected May 2022

B.ASc Engineering Physics
Coursework includes Lagrangian Mechanics, Computational Modelling, Digital Systems and Microcomputers, Signals and Systems, Applied Quantum Mechanics, Linear Algebra, Honours Multivariable and Vector Calculus, Complex Analysis, Optics, Statistical Mechanics

DENMARK TECHNICAL UNIVERSITY | Winter 2019

Exchange Semester
Coursework includes Operating Systems, Deep Learning, Robotics, Computationally Hard Problems.
Won DTU OS Course Competition for writing the fastest reverse hash server in C