# MATTHEW LOCK

FOURTH YEAR STUDENT

## PERSONAL PROFILE

I am a versatile fourth student with an inquisitive sense, studying towards a Bachelor of Science in Computer and Electrical Engineering. Always having been filled with curiosity, my innate sense to explore and understand the world around me has aided in developing one of my key strengths, namely problem solving and logical thinking. My fascination with computers lead me to an early start with python programming, and furthermore to my current field of study. I have acquired a passion for embedded systems engineering, thoroughly enjoy my fair share of software developments, and boast an aptitude for technological tinkering. Indeed I have also embarked on my journey of Artificial Neural Networks and machine learning. Aside from that I have a drive to stay up to date with scientific and technological forefronts, with a keen interest in physics. I also take great pride in maintaining a healthy lifestyle and fitness level relating to physique training and bouldering.

## CONTACT INFORMATION

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## EMPLOYMENT HISTORY

### Electrical Engineering Internship

**Tellumat (December 2017)**

Completed a vacation work period of 4 weeks in December of 2017 at Tellumat which is a leading company in electronic technology in the telecommunications, defence, transport and energy industries. Responsibilities included :
- PCB design using Ultium for system testing
- Familiarising myself with UART communication protocol

### Software Development Work Experience Program

**SOLIDitech (January 2019)**

Completed a work experience program of 3 weeks in January 2019 at SOLIDitech. The company serves to automate and manage the needs of ISPs, dealing with automatic billing, sales support, product management, and much more. Major takeaways from this experience include:
- Understanding of the Scrum process
- Importance of well written code to be used by others
- Familiarization with Apache Tomcat

### Java Application Development

**Nozari (2019-2020)**

Helped to develop an Android application for a UCT based startup called Nozari. Their primary aim is to provide a solution to text book translation using Computer Vision where English is not a first language. My role involved general application design and the implementation of an SQLite database to store, dynamically display and track pages of translated textbooks.

## EDUCATIONAL HISTORY

### Westerford High School

**January 2012 - November 2016, Rondebosch**

Completed the National Senior Certificate qualification with seven distinctions and an 85% aggregate with subjects including, but not limited to, Information Technology, Physical Science, Life Science, Accounting

### Cape Peninsula University of Technology

**15 November 2018 - 28 November 2018 , Bellville**

Practical Training Programme. Some of the skills I learnt include welding, turning and pneumatic system design

### University of Cape Town

**March 2017 - Present , Rondebosch**

Current Studies : BSc in Electrical & Computer Engineering

## SKILLS & ACHIEVEMENTS

- Strong programming skills with the ability to apply understanding of the fundamentals across various languages.
- Proficiency in C/C++, Java, Python
- Well rounded ability with Verilog, Matlab, Julia, Android Development SQL, HTML, JavaScript
- Placed on Dean's list for academic achievement : 2017, 2018, 2019
- Dedication award from Engineers Without Borders UCT (EWB-UCT) 2019

## 2D SONAR IMAGING SYSTEM

This project was completed for the 2019 UCT Electrical and Computer Engineering Design course. The aim of this project was to design and build an imaging sonar operating at 40 kHz in air. This was achieved by using a Teensy 3.6 Microcontroller coded for in Julia and C, and implementing a simple 2-element design that enabled direction finding and object detection up to distance of 10 meters. Found below are two screenshots from the report showing the results of the project, with multiple colours showing the inherent uncertainty in the measurement and potential locations of detected objects. Source code for this project can be found at https://github.com/Lawrence-Godfrey/Sonar-Design
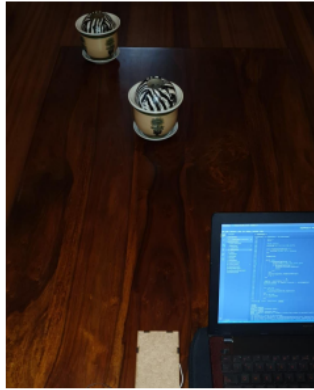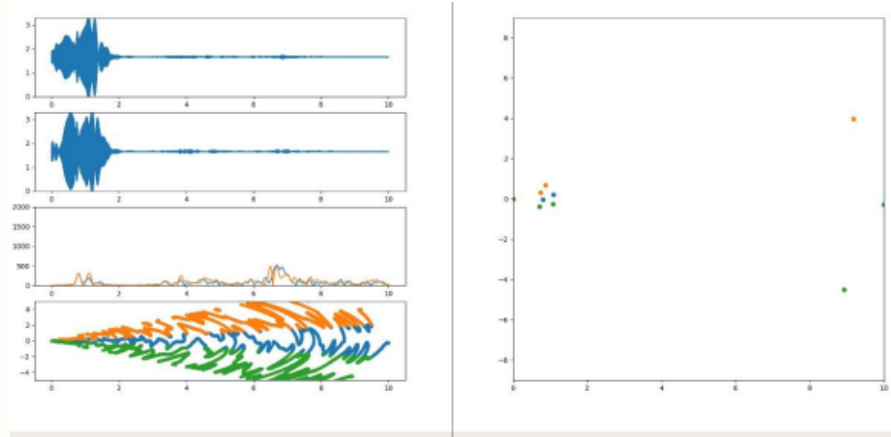


Figure 9.6: Setup of Test 3- Two objects

Figure 9.7: Results of Test 3- Two objects

## UNSUPERVISED IMAGE CLUSTERING

This project was completed for the 2020 UCT C++ and Machine Learning course. This project uses C++ to implement the K-Means ++ Algorithm to cluster a set of images. The program allows the user to select between a variety of input features and cluster iterations in order to optimize the results. The program was tested on a set of 10 images per digit in the range 0-9 and achieved an accuracy of more than 85 % when using the HSV image space. Source code for this project can be found at https://github.com/matthew-william-lock/Unsuperised-Image-Clustering

## REMOTE ENVIRONMENTAL MONITORING

This project was completed for the 2019 UCT Embedded Systems II course. The aim of this project was to create a system that could monitor environmental conditions including temperature, light intensity, and simulated humidity levels of a greenhouse and remotely monitor and log these results. This project was implemented using a Raspberry Pi 3B and used the Blynk IoT platform for remote monitoring and control. Source code for this project can be found at :
https://github.com/matthew-william-lock/environmental-logger/tree/master/blynk_application/linux

## SIMPLE ARTIFICIAL NEURAL NETWORK

This project was completed for the 2020 UCT C++ and Machine Learning course. The aim of this project was to create a simple Artificial Neural Network (ANN) that could be trained using the perceptron learning rule. This was achieved by using C++ to create a simple framework for a perceptron, from which an ANN could be created. The program was trained and successfully tested to implement a simple XOR Gate but could be used to implement more complex ANN structures and functions. Source code for this project is currently unavailable as it is still in the process of getting marked.

## IMAGING MASKING ACCELERATOR

This project is currently underway and is being for completed the 2020 UCT High Performance Embedded Systems course. The aim of this project is to implement an image masking solution on the Nexys A7 100T FPGA in order to produce an image masker that is able to complete image masking and overlay much faster and more efficiently than a C++ golden measure implementation. Current working components implemented on the FPGA include a VGA adapter module, a BRAM module, and simple memory control unit. Source code for this project can be found at https://github.com/matthew-william-lock/Image-Masking-Accelerator

## MORE PROJECTS

A further list of personal and university projects are listed below, where some related source code can found at **https://github.com/matthew-william-lock.**
- Net energy intake diary application for Android (Java)
- Rudimentary data transmission between Arduino Uno and STM32F0 Development Board (Arduino and C++)
- Simple reactive website made for the Zaio Becoming Elite Challange ( HTML, CSS, JavaScript)
- Falling Word Game implementing a parallel programming paradigm (Java)
- Value Iteration Algorithm (C++)