VICTORIA UNIVERSITY OF WELLINGTON
Te Whare Wananga o te Upoko o te Ika a Maui

School of Engineering and Computer Science
Te Kura Mātai Pūkaha, Pūrorohiko

PO Box 600
Wellington
New Zealand

Tel: +64 4 463 5341
Fax: +64 4 463 5045
Internet: office@ecs.vuw.ac.nz

Work Experience Reflective Report

Daniel Eisen

Supervisor: Dr Fiona Stevens McFadden

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Summary

Over the summer of 2019/2020, I worked as an engineering research intern at the Robinson Research Institute developing and testing different signal processing techniques for future deployment in power grid monitoring. My work aligned well with my degree and I was able to practically apply my accumulated knowledge as well as develop my confidence and key skill in a professional work environment under the supporting guidance of the staff.

Robinson is a research and development institute with a cross-disciplinary makeup focusing on the commercialisation of cutting edge technology. There are approximately 40 permanent employees that cover that whole gambit of fields of engineering and applied science with a high level of international engagement.

In my time there I was placed within an existing team working on a project aiming to develop new technology and systems for monitoring power grid failures, it was a highly collaborative endeavour between the institute, researchers in Canterbury and Transpower.

Acknowledgments

I would like to thank both the Robinson Research Institute, Dr Fiona Stevens McFadden for the opportunity I was given and the great support I had throughout. I would also like to thank my fellow interns and peers that I had to the great pleasure of working alongside during the summer.

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1. Introduction

This report reflects upon my time working at the Robinson Research Institute. Being an Electronics Engineering student at Victoria, this was my first industry-relevant job at the work and the environment was representative of where I want to take my career in the future. The work I did and the opportunity to operate as a part of a greater team helped me to quickly build on my knowledge gained in education, develop new skills and connections that will be vital going forth.

Robinson Research Institute is an internationally recognised team of multi-disciplinary scientists and engineers that develop and commercialise cutting edge technology. They are particularly well known from their work in high-temperature superconductors (HTS) for a variety of applications.

2. Providing Context

2.1. Robinson Research Institute

Their approach is the melding of innovative engineering and applied physics to build advanced technologies and for a new venture, 2014, they have already made a large and recognised impact on not only their primary venture (HTS) also have established wide connections and relationships and many awards recognising their research and innovations. There are approximately 40 permanent employees and up to 15 interns/research assistants but also a large amount of collaboration/interaction with the other institutes on site.

They occupy a facility on the Callaghan Innovation campus in Gracefield, Lower Hutt. It's a mix of multi-disciplinary laboratories, offices and stand-alone buildings for other experiments. I, and the other interns, worked out of a larger open office, central in the building and had the freedom to rearrange and change the environment to suit our needs. We had to access the provided computers, labs, and compute servers if the work necessitated it

Socialisation was a large part of the culture, especially between interns (not only of the same institute), but also across the whole hierarchy and I would often spend lunch breaks chatting with senior engineers about what we were working on. Everyone was encouraged to attend events, guest talks, and presentations held on-site and these, I felt, really fostered a curiosity and learning focus culture.
Picking back up on the mention of other interns, the interns from Robinson, MSL and Callaghan had formed a habit of kicking back and playing table tennis for our lunch break.

2.2. Overhead Lines Project

The work-model was based around project teams made up of supervising engineers, primary researchers, research assistants, and interns.

I was a part of the 'Overhead Line Project', which was a research team focused on developing a low-cost solution to distribution, remote power grid monitoring. The primary stakeholder was The Science for Technological Innovation National Science Challenge (SfTI) who provided primary funding towards the project and where project milestones and reports were sent/provided to, but primary management of the project was undertaken by Dr McFadden on site.

The team met as a whole (there were around seven of us) once a week to report individual summaries, solve any issues, plan for the next week, and make sure long term plans were on track. I was expected to either prepare a summary document showing my research or demonstrate the result of that week's work/development.

The project involved very diverse work; high power grid fault experiments/simulations, embedded electronics design, advanced signal processing, neural network classification, and literature sourcing and review. With each section being taken on by usually two people. I was tasked primarily with the signal processing and some literature reviewing but roles were flexible and I often helped and contributed across the project.

2.3. My Role

My work/research predominantly involved the implementation and investigation of various signal processing techniques for use in [neural network] feature extraction. These features were used as inputs for a deep learning algorithm for the detection and characterization of High Impedance Faults (HIF) in overhead power lines, which is distinct from conventional [low impedance] fault detection due to the low current and non-linear characteristics of the HIF.

The implementations then had their efficacy evaluated based on the performance and of these various techniques, primarily computational and storage cost, as well as the quality of output characteristics, and tuning trade-offs of note.

Day to day this involved reading research publications describing a process or definition of a particular technique, then either writing a review/report outlining findings and procedure or developing our version/implementation that was compatible and unusable with the scope of the project. This development was done with MatLab or Python using various processing frameworks to produce the desired features for classification.

3. Reflecting on the experience

3.1. What I experienced while working

Almost all of what I experienced while working at Robinson was new to me, as previously I had only either done tutoring or labour/retail. Though I was able to bring my learned work ethic and time management skill to the job I still needed time to experience and adjust to working in the professional research and development space.

Due to the nature of projects at Robinson, methods and work needed to be well documented and in my case be justified by solid research. So there was a focus on leaving good documentation for others to pick up in future when and if the author is no longer present.

My experience with the management style was that it was quite hands-off. They were available for questions, guidance and direction, as well as progressing the project tasks but I was allowed to define my work style as long I was meeting my responsibilities, reporting and documenting progress and staying on track within the greater project.

Feedback on my work was rich and fast. There was very little wait time between demonstrating my work and having a conversation about it. For example, a person on the team I was working directly with/under would come into the office almost every day to see the current status, ask questions about how previous work functioned etc. There was little uncertainty about where I was at.

Outside of my experience specific to my work, I found Robinson to be quite a dynamic work environment. I had opportunities to participate and experience other interns projects, helping or just observing. Another example was the construction of a brand new plasma sputtering lab facilities being set up and we were practically allowed large sections of a workday to help with the setup, ask questions and get insight from more senior staff that we wouldn't normally encounter. Alongside this, there were also constant offers of tours around our facility and even others on site, ie MSL, as Robinson saw our internships not just as temporary work but as opportunities to provide us greater education.

3.2. Reflection on my experiences

Looking back on my time at Robinson, I can appreciate that it as much and benefit to me and my learning and growth in preparation for my entrance into the industry as I was a useful contributor to the work being done there.

Primarily, the attitudes of senior staff towards interns focused on encouragement and providing a supportive atmosphere of learning. I was made to feel immediately part of the whole. An example was in the first few days before even most of the other interns had started, Rod (the Deputy Director) pokes his head into the office space I was working in and invited me out to the green where the institute was having some official photography done. While this may seem small, even though I was only a temporary employee this showed that they did not make that distinction in practice. It was an immediate and effective confidence boost and driver as well as an easy path into making introductions/networking around people I would have otherwise not encountered.

My project was the first time I had the opportunity to work in a larger team and I feel this really pushed me to work in different ways. Not only the previously discussed focus of good documentation and conversation but I found that not being alone really fostered my creativity. Brainstorming ideas during our weekly meetings, or when just collaborating really helped to prevent “stale” views and plans that would have taken me off course and the combined effort but into the planning stages combined and created unique solutions/perspectives that we were able to test/implement and build on. For example, when I had one of my signal processing algorithms completed, Fiona, Sifat (another team member) and worked on a better way of splitting the output data into a more generalised and useful segment for labelling and feeding into the network. We met in Sifats office, goals were established and we went about discussing approaches and ideas of how to tackle them. I was able to express how I’d approach it, receive immediate feedback and by the end of the meeting we had an outline on a whiteboard and were able to immediately begin with prototyping it. This sort of collaboration on a project created an enthusiasm for learning that I found working alone lacked. Being able to share discoveries with the rest of your team was exiting and build on my knowledge and confidence.

Over the summer there were numerous opportunities to attend industry events hosted by the institute, from internal presentations about larger expos and event to larger hosted networking events. These larger events gave me the opportunity to learn about industry practice, job opportunities and a great chance to network as usually industry people from without the institute were in attendance. I am very grateful for these as I learned so much on these days and met a huge diversity of people.

Majorly what I learned in my time and experience over the summer was that always seize the opportunity to expand my knowledge base, even if that opportunity may not seem immediately relevant and to also seek out feedback and collaboration in my work and projects. I never regretted it, and in every situation, it improved either my viewpoint or directly the work itself.

3.3. The relevance of my Major

The work I primarily did was directly related to the courses I had done, particularly ECEN 220. I was able to directly apply the skills and knowledge of signal processing to my

work/research and additionally lend my electronics knowledge and several other ECEN courses skills to our and other projects. These were expected, as in even my interview 220 was directly brought up as a reference point for the type of work I'd be theoretically undertaking, but what was not expected is how relevant ENGR201 was to my work. The skills I developed in sourcing legitimate and relevant research, the ability to concisely and efficiently extract information and form it into a coherent paper that was fit for my final report, as well as my weekly summaries, documentation and final presentation.
Also, the experience I gained from our oral argument/debating served to give me great preparation for the non-technical aspects/challenges I encountered, such as working within a team, expressing my feedback and needs to supervisors and in the preparation and especially the delivery of my final presentation to the institute.

Having the opportunity to work as an ECEN student directly in such a relevant industry environment brought with it quite a level of encouragement and contributed to my drive. I was able to utilise and build on what I was taught. It enabled me to observe and strengthen the interconnections and crossover between what had previously been a more separate area of my knowledge (in the context of academia). And in turn, the soft skills learnt from working within a team, giving presentations, managing time, deadlines and tasks and general professional interaction are priceless and highly transferable to not just future employment but within the completion of my degree with VUW.

4. Conclusions

My main takeaways from we summer at the Institute were:

- I am valued not only for what I can provide but how I can grow
- Being able to prepare and deliver an oral presentation, to not only convey technical details but also deliverable value, importance to stakeholders, and being descriptive and concise is incredibly important when working in a collaborative environment.
- Building solid time management skills, not only focusing directly on work but also developing a work-life balance to prevent burn out.
- I can if given the support, quickly build and develop my skill to above what was provided to me in my education.
- Feedback and is the most important part of working in this kind of environment. Do not think of yourself high enough that you can comprehend the entire direction of a project.
- This is the field and work I want to continue to do, and think I can make a real impact.