

# LYSEA HAGGIE

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**Date of Birth:** 23/10/1993

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**Citizenship:** New Zealand and USA

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## EDUCATION

2019 - Present

### **Doctor of Philosophy in Bioengineering**

Auckland Bioengineering Institute, University of Auckland

*Thesis: Neural Circuitry in Motion - Computational Modelling of Motor Cortical Dynamics to Understand Human Movement*

2017 - 2018

### **Post Graduate Diploma in Teaching (Secondary, Field based)**

Faculty of Education, University of Auckland

*Participant in the Ako Mātātupu: Teach First NZ leadership programme*

2012 - 2016

### **Bachelor of Engineering (Honours) / Bachelor of Science Conjoint**

University of Auckland

*Major in Biomedical Engineering*

*Major in Psychology and Sport & Exercise Science*

## RESEARCH EXPERIENCE

### **PhD Research in Bioengineering (submitted, preparing for defense)**

April 2019 – Current

- Built Spiking Neural Network model of brain dynamics involved in the generation of movement
- Developed a multi-scale framework for creating interdisciplinary models of human movement
- Implementation in digital agents in collaboration with New Zealand company, [Soul Machines](#)

### **Honours Research in Bioengineering**

February 2015 – November 2015

- Finite element modelling of the tibia to predict stresses and strains for injury risk in runners
- Developed a workflow to create subject-specific models using segmentation of MR images

### **Research Intern – Sport Performance Research Institute of New Zealand**

November 2014 – February 2015

- Data collection and processing of EMG and motion capture data with top athletes in various sports including swimming, netball, triathlon and running
- Developed MATLAB code which was used to process and analyse accelerometer data

### **Research Intern – University of Auckland, Department of Sport & Exercise Sciences**

November 2013 – February 2014

- Used 3D optical motion capture system to simulate and analyse movement in hockey players
- Recruitment of participants, data collection and processing as well as simulation and kinematic analysis with OpenSim models

## OTHER WORK EXPERIENCE

### **Research Intern - Office of the Prime Minister's Chief Science Advisor**

October 2023 - Current

- Looking into adoption and potential areas of impact from artificial intelligence technology in education
- Engaging with policy makers, researchers and businesses to discuss opportunities and risks

### **Outreach Coordinator - Women in Engineering**

November 2019 - November 2021

- Working with student committee and volunteers to run engineering workshops and academic support programs, expanded across New Zealand High Schools
- Carried out recruitment, training, event coordination, resource management, logistics and planning as well as report writing, feedback and data analysis of program effectiveness
- Forming partnerships and relationships with other groups (Kiwibots, Shore Junction, SPIES, TEC, etc.) and building online engagement and website development during the COVID-19 pandemic

### **Maths Teacher - Tamaki College**

January 2017 - December 2018

- Teaching classes of Year 9, 10 & 12 students in a digital setting (1:1 devices)
- Set up a Google site for student access to past resources and class work, as well as systems for tracking student progress and building engagement
- Started up a robotics club for students, participated in Kiwibots competitions using VEX robotics, implemented program in junior technology curriculum

## SKILLS & EXPERIENCE

### **Programming & Computer Skills**

- Python Experience - 3 Years (Packages: Brian2, Pandas, Seaborn, NetworkX, Numpy, PyTorch, Matplotlib)
- Completed Interactive Neuromatch Academy Courses in Computational Neuroscience and Deep Learning
- Motion Capture and Simulation software – VICON workstation, FEBIO, Abaqus and OpenSim
- Basic MATLAB, C, Computer aided design software – CREO and Solidworks, Adobe Skills

### **Leadership, Communication & Teamwork**

- Finalist at Falling Walls Lab Wellington innovation pitch competition
- Keynote speaker at Enginuity Day: Engineering Open Day for Female High School students
- Organiser of National Biomechanics Day for the University of Auckland
- Workshop presenter at Auckland Maths Teachers Association Conference
- Founding committee member of student club: Robogals (Auckland Chapter) - Partnerships Manager

## AWARDS

Auckland Bioengineering Institute 3 Minute Thesis Winner  
– Finalist in University of Auckland 3MT

*April 2022*

Callaghan Innovation R&D Fellowship Grant

*April 2019*

Education Sector Winner in the Velocity Innovation Challenge

*May 2018*

360 Auckland Abroad Exchange Travel Award

*January 2016*

– Student Exchange to University College London

Auckland Bioengineering Institute Research Forum Poster Winner  
First in Course Award for BIOMENG 772  
– Musculoskeletal and Orthopaedic Biomechanics  
WorelyParsons Grant for dedicated Robogals Members

November 2015

November 2015

July 2015

## JOURNAL PUBLICATIONS

Haggie, L., Besier, T. and McMorland, A. (2023). Circuits in the Primary Motor Cortex Explain Spinal Responses to TMS, *Network Neuroscience* (*accepted for publication September 2023*)

Haggie, L., Schmid, L., Röhrle, O., Besier, T., McMorland, A. and Saini, H. (2023). Linking cortex and contraction—Integrating models along the corticomuscular pathway, *Frontiers in Physiology: Computational Physiology and Medicine*, 14. DOI: 10.3389/fphys.2023.1095260

Haggie, L., Besier, T., and McMorland, A.J.C. (2023). Modelling Spontaneous Firing Activity of the Motor Cortex in a Spiking Neural Network with Random and Local Connectivity. *Neurons, Behavior, Data Analysis, and Theory*, June, 1–22. DOI: 10.51628/001c.82127.

## CONFERENCE PRESENTATIONS

Haggie, L., Schmid, L., Röhrle, O., Besier, T., McMorland, A. and Saini, H. (2023). Computational modelling of the corticomuscular pathway. Progress in Motor Control XIV. Rome, Italy (Poster presentation)

Haggie, L., Besier, T. and McMorland, A. (2022). A Spiking Neural Network Model of Motor Cortex Activity. Australasian Winter Conference on Brain Research. Queenstown, New Zealand (Poster presentation)

Haggie, L., Besier, T. and McMorland, A. (2020). A Neural Network Model of the Motor Cortex. Neuromatch Conference 3.0, Online Conference (Oral presentation)

## REFERENCES

### **Professor Thor Besier**

Professor - Auckland Bioengineering Institute, Department of Engineering Science  
University of Auckland, New Zealand  
Email: [t.besier@auckland.ac.nz](mailto:t.besier@auckland.ac.nz)

### **Dr. Angus McMorland**

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University of Auckland, New Zealand  
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