I’ve always been curious about trying to understand how the brain works. Through my bachelor’s degree in honors psychology at McGill University, it became clear to me that I wanted to pursue a career in research. In my last year of undergraduate studies, I was fortunate enough to be able to work on my own research project, entitled “**Modulating episodic memory alters risk preference during decision-making**”. In this project, we found that probing episodic memory in human participants reduced their aversion towards risky decisions. I’ve published this work as the first-author in the Journal of Cognitive Neuroscience.

This project gave me a taste of what research is really like, and made me realize that I would be much more fulfilled in computational neuroscience where I can understand what brain circuits do in more details. For this reason, I then pursued my Master’s degree in visual neuroscience under the supervision of Dr. Curtis Baker at McGill University. In my research, entitled “**Model-Based Approach Shows ON Pathway Afferents Elicit a Transient Decrease of V1 Responses**”, I built a custom machine learning algorithm to analyze how recorded V1 neurons respond differently to light and dark patches within natural images. Using these methods, we showed the reason why V1 neurons respond more strongly to dark than light stimuli is because there is stronger transient inhibition from the ON than OFF pathway. I’ve published this work as the first-author in the Journal of Neuroscience.

During my Master’s degree, I’ve also worked on a psychophysics project entitled “**Visual perception of texture regularity: Conjoint measurements and a wavelet response-distribution model**”. As the statistical expert within the team, my role within this project was to create an extension to an advanced statistical method to analyze our experimental data. We published this work in PL0S Computational Biology, with me being the second-author.

I am excited to now start my PhD at Duke University under the supervision of Dr. John Pearson, collaborating with Dr. Greg Field at UCLA. For my PhD, I want to use information theory to understand why the visual system is built the way it is. Information theory has already succeeded at explaining a variety of experimental phenomena, such as why V1 neurons have Gabor-like receptive fields (Olshausen & Field, 1996), why there are more retinal neurons encoding dark (OFF) than light (ON) stimuli (Karklin & Simoncelli, 2011), and why retinal ganglion cells form anti-aligned ON/OFF mosaics (Jun, Field & Pearson, 2021). My current project uses information theory models (Jun, Field & Pearson, 2021) to replicate experimental findings about how retinal ganglion cells encoding different color-opponency form distinct yet complementary mosaics (Brainard, 2019). In the future, I would also like to use information theory to understand why it is optimal for neurons to be separated into excitatory and inhibitory subclasses (Dale’s principle; Osborne, 1979), a prominent feature of neuronal circuitry information theory has yet to explain. With my strong background in both visual and computational neuroscience, I believe I am in an excellent position to utilize information theory to shed light on why the early visual system is wired the way it is.