Statement of purpose

I've always been obsessed about wanting to understand how the brain and mind work. As early as my teenage years, my dream has been to understand the neural circuitry behind our decisions, feelings and perceptions. To fulfill this curiosity, I pursued degrees in the fields of psychology and neuroscience. Obtaining my PhD at MD Anderson UT Health would be ideal as I could learn from leading experts in neuroscience and neuroplasticity.

My first real taste of research was in my third year of undergraduate studies, where I was given the opportunity to be in charge of my own research project. My work afforded me a first-author publication in the Journal of Cognitive Neuroscience titled **"Modulating episodic memory alters risk preference during decision-making"**, where we found that engaging episodic memory processes increased preferences towards risky decisions. I built this project from scratch and did almost everything including writing the ethics proposal, programming the computer task, testing participants, analyzing data and writing the paper. This experience helped me develop more autonomy and made me realize me how fulfilling it is to carry out my own research.

My master's thesis, "**Transient inhibition to light explains stronger V1 responses to dark stimuli"**, aimed to study the mechanisms behind stronger responses to dark than light stimuli in the primary visual cortex. We used machine learning to do system identification of recorded V1 neurons. We discover the stronger dark responses found by previous research (Jin et al., 2008; Shapley et al., 2009) to only occur at early latencies, and to be due to slower intracortical inhibition to dark than light stimuli. During this research project, I greatly improved my machine learning skills, learning how to use Tensorflow to build my own custom, biologically-inspired convolutional neural network. I also developed a solid expertise in both visual neuroscience and electrophysiology, on top of learning how to review and understand the literature to relate my results to it. The preprint of this work is currently available as a BioRxiv, and we are currently working to get it published in a peer-reviewed journal.

During my master's, I published a paper entitled **"Visual perception of texture regularity: conjoint measurements and a wavelet response-distribution model"** where I created the extension to an advanced statistical method to analyze our experimental data. We found the effect of jitter on regularity perception to be strongest at small element spacing and large texture element size, suggesting the visual system uses the edge-to-edge distance between elements as the basis for regularity judgements. This work was published in PL0S Computational Biology, and received compliments from Kennett Knoblauch, who invented MLCM.

I want the next step in my research career to be studying computational models of neuroplasticity. An example project I am interested in would be to use the NMDA-dependent bidirectional plasticity model from Shouval, Bear & Cooper (2002) to study the computational properties of neuroplasticity at the network level. The University of Texas at Houston has some of the best neuroplasticity researchers in the world, giving me the opportunity to become an expert in neuroplasticity. This includes Dr. Harel Shouval, who does outstanding research by modeling neuroplasticity from calcium-dependent mechanisms and Dr. Michael Beierlein, who researches neuroplasticity and the early visual system. I am certain doing research for such supervisors would be both fascinating and propel my research career to the next level.