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Project proposal

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Modeling the Secondary visual cortex

The ability to see and perceive is a result of a complex decoding system performed by the human brain. Once presented with stimuli, information travels to the visual cortex through a network of neurons, and its interpreted by electrical synapses so we can make sense of the world around us. The visual cortex is divided in a hierarchy of cortical levels, meaning that different areas process different complexities of space that together decode the specific object and its surroundings. Much is known about the primary visual cortex (V1), an area highly responsible for the most basic kind of information processing, such as spatial location and pattern recognition. Computationally speaking, V1  has a well defined map of spatial processing, and many advances have evidences how the brain works in that area

The secondary visual cortex, is at a higher cortical level and is the second largest area of the visual cortex. It remains uncertain, however, which differentiations are made in this cortex. This project seeks to propose a computational and mathematical model that encompasses the functionality of the secondary visual cortex. After understanding computationally how information travels to the brain and begins to be processed by neurons, and how it can be represented using deep convolutional neural networks and machine learning. I will use previous data gathered from Dr. Schwartz’s lab, along with additional research, tol infer approaches for a computational model of the secondary visual cortex, as well as its functionality. The goal would be to obtain a functional model that encompasses the processing of information of V2. One of the importances of this approach is that by understanding how the brain acts on its healthy state, we are able to compare it to the abnormal, enlightening the way for novel methods of curing diseases linked to that area of the brain. Besides that, the brain is in many ways a super computer, designed with many complex networks of neurons intertwined. The pathway and approach that the brain takes to process visual information can lead to insights on how to better model the pattern artificially, opening the way to new technological approaches. The faculty advising me in this project is Dr. Odelia Schwartz.