During my undergraduate years I knew I wanted to specialize in digital signal processing. Once I started to perform undergraduate research at New Mexico State University, I learned to appreciate machine learning and image processing. I was also able to multiple machine learning concepts, such as supervised and unsupervised learning in my research, which was solar flare prediction using support vector machines. Currently, I am getting my Ph.D. at Rice University and while I am considering many different research projects at Rice, one that captivates me is to use deep learning and applying it to object tracking in video.

With the advancements in computer vision, making robots perform autonomous tasks has become very common. Yet, some specific tasks remain difficult for a computer to perform while a human's cognitive ability allows them to perform these tasks relatively fast and easily. One hard task is object tracking, which is still an ill posed problem to automate. For object tracking, there are numerous factors that individuals have to calculate to make sure that the computer can track the said object. Thus, my proposed plan is to try a different perspective to this problem and apply deep learning to investigate the use of recurrent neural networks (RNNs) to perform object tracking.

My proposed research would be to apply RNNs and the Long Short-Term Memory architecture and apply it for object tracking. This framework would be similar to *Caffe*, except the main difference is that *Caffe* assumes the input is time invariant and for object tracking there is time dependency. Hence, *Caffe* would be used as inspiration. In addition, there has been research recently published in the literature that has used RNNs for speech processing. Thus, I will draw inspiration from these previous implementations and establish an effective mouthed for use in video. Overall, my framework will contain a mixture of those two implementations with

new insight that I learned to make this research possible. It is very characteristic of these networks to be massive and complex, because of this I plan on writing my framework to utilize parallel computing architectures to maximize the efficiency of this code.

Rice University is a great fit for this research because Dr. Richard Baraniuk has started a new deep learning project utilizing machine learning and neuroscience. This research stems from *Caffe*, a framework from the University of California at Berkeley, that uses deep convolutional networks for computer vision. These convolutional networks work together Caffe has been used for object detection, so having this preliminary work investigated, he would like to investigate other areas related to deep learning. As a result, I have expressed my interest of this idea of using RNNs for object tracking with Dr. Baraniuk. In addition, Rice has been known to have interdisciplinary research between the departments and this deep learning project is one of the projects that plans to bring fields together.

My fascination and passion of machine learning has led me to pursue this direction in research and can bring significant contributions in the academic world. For instance, evaluating this method requires a substantial amount of video. However, I have not found a massive data set of video and using a small data set has its shortcomings. As a result, I would plan to create this data set and establish it as the standard big data set for all future research in the field, so other researchers can utilize it to validate their methods. With this research being successful, it will open new opportunities, such as creating multiple object trackers or tracking multiple objects in the same instance. Overall, RNNs have shown the potential in other fields, such as speech and music, and with deep learning growing, there is prospect of using this algorithmic approach in object tracking, which can help show why RNNs are useful.