I read chapter four from the MATLAB book. This chapter discusses code organization for easier maintenance and building up bigger projects. It includes topics such as naming the variables sensibly and providing comments appropriately. Organizing code is important throughout all programming projects and we have talked about similar principles as introduced in this chapter in my other computer science classes. So, I am fairly familiar with this topic. The projects I am working on over the summer actually reminded me the importance of documenting the data and code in a clear and easy to understand fashion. When we were extracting information from data collected two years ago, we realized that if we had better column descriptions and timing information, we would have an easier time to reconstruct the previous analysis and provide new insights of the data with our memory model. When we were trying to use different analysis technique to the data we collected last month, we found that we could not distinguish which conditions each file fit in based on the non-descriptive file names. Proper documenting with helpful but not superfluous information will be an ongoing learning objective for me throughout the research experience.

Chapter four from the *Theoretical Neuroscience* book talked about using information theory techniques to quantitatively measure how much information does the neural response tell us about a stimulus. It introduced entropy and mutual information for discreet as well as continuous variables. The application of entropy and information maximization theory to explain the visual receptive fields, where the receptive fields aimed to maximize the amount of information conveyed by associated neural responses about a natural visual scene in the presence of noise, is very interesting. I am surprised to see entropy, a physics term I learned, being used in a neuroscience context. Entropy is also used as a measure with a stochastic variable. I have limited knowledge to stochastic variables or modeling, but it is mentioned frequently in the book and a couple times in the lab meeting about model development. Luckily, I will take an independent study class on stochastic modeling next semester and hopefully I will have a better grasp of this idea next semester. Meanwhile, this book will give me some good ideas about possible projects that I could do in the class next semester.

The detailed formula derivations in the *Theoretical Neuroscience* book are still challenging to me. But I think this book provided a big picture of how computer science, mathematics, physics and neuroscience are related and reassured me that all the seemingly random classes I took could be connected and applied to the field.

This week I tested the fit of the current memory model design to the three data sets. I found a mistake in the time stamp we used in the first two data sets. By using the correct but different time for post nap memory retrieval test for the three data sets, the model produced quite different results. The Targeted Memory Reactivation effect in memory boost in the paired special task (data set 3) is much smaller than the first two. So I spent some time finding the differences in the three data’s experimental protocol, learning criterion, training procedure and testing strategies. After a short discussion on Wednesday during lab meetings, we have not reached a conclusion about why the results looked so different. However, the current model only has two parameters, which could not be enough to capture all the differences in the experiments and the changes in human memory. The first step to improve the model is to integrate more accurate timing information. We have the detailed timing information for the practice session and EEG recording of the first two data sets. Next week I will work on incorporating these information into the model and testing how does the accurate time changes the model fitting. To assist the lab’s biweekly DARPAR progress report, Dr. Reber suggested me to calculate a single memory decay parameter estimation and TMR effect value across all the data set we have. I helped carry out the calculation and produced several graphs with different memory decay parameter for the progress report meeting.

Last Friday, we had a discussion in the lab about the funding and progress check of scientific projects in academic labs. Dr. Reber mentioned the point that it was always hard to tell if a project failed because people tried really hard but it was just impossible to accomplish or because people just took the money and did no work. This conversation made me realize the challenges in doing research in addition to the fact that getting scientific breakthrough is always arduous. The importance of integrity and courage to commit to research struck me. I feel it would be very easy to become sluggish and unproductive when no one is checking the progress regularly. Also, I think it is hard to start a project facing the possibility that the project might be unavailing even after a long time and hard work.