CS 585 : P1 - Project Proposal

**Computer Vision to Support Neuroscience Research**

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For our project, we will apply Computer Vision concepts to an ongoing neuroscience research project at Boston University. The current researcher records neural activity in the brain of mice and rats while they forage for food. We hope to provide extra analysis to the study through Computer Vision. The final goal of this project is to track the animal head and body regions in a video while the animal is moving through the experimental space.

First, we will collect images and videos of the subjects in the neuro lab. The images could provide preliminary testing for our segmentation algorithm. We can develop an understanding of key features that should be in the videos we capture. We may find that different angles and lighting conditions work better than others. Since we hope to gather a large dataset, this will be a collaborative effort between all three teammates.

Next, one teammate, Jiangshan Luo, will design and implement a segmentation algorithm to detect the mice and rats in each video frame. The main body of the subject can be distinguished from the background using color detection. The head of the animal can be identified using the ears. Once we found the all the subjects in each frame, another teammate, Shijie Zhao, will apply a Kalman filter. Therefore, we will predict where the rat/mouse is going to be in the next frame. This information will be fed into a data association algorithm, implemented by Jamie Nelson. This step associates predicted points and found objects in the next frame, thus tracking the animal from frame to frame. Our last portion of the project will be visualizing the results in an informative way. We will consult with the researcher to insure our results are comprehensive and relevant to his/her study. At this stage, we can tweak any issues to best match the research.

If we have time at the end of our project, we hope to apply our program to a different dataset and observe the outcome. There is another research group at Harvard University that is working on mice and rat behavior. We will use videos provided to us from these researchers, instead of ones we captured ourselves, to determine if the program we designed provides an optimal outcome. This will challenge our program to determine if it is applicable in the general setting, a general mice and rats tracking algorithm. This is only if time allows and would be an extension of the main goal of our project.