**Team DJCH Capstone Memo 10/31**

1. Completed to Date
   1. Reviewed the data set(s) by visualizing images in a jupyter notebook.
   2. Tested various methods of image normalization between on cell’s images and sets of cells images.
   3. Created a baseline similarity comparison between the low-level intensity images using non-local means image processing algorithm with the high intensity cell images.
   4. Designated specific train, test, and validation sets.
   5. Began review of UNET implementation as first iteration of model performance.
2. Next Steps
   1. Use CARE algorithm (<http://csbdeep.bioimagecomputing.com/>) as baseline for model performance.
   2. Implement initial UNET implementation and compare to baseline performance (CARE).
   3. Error review of initial model implementation.
   4. Test additional methods for improvement in model.
      1. Probabilistic U-Nets in image segmentation:  <https://arxiv.org/pdf/1806.05034.pdf>.  This specific technique is somewhat of a stretch goal, but what we plan to do is look at all the permutations of U-Nets they're testing it against.  Specifically, the three suggestions are:
         1. Add dropout (easiest/was going to do anyway)
         2. Ensembles of U-nets (not bad code-wise, may take awhile to tune/train)
         3. This paper (<https://arxiv.org/pdf/1711.11586.pdf>). Essentially, it accounts for the one-to-many nature of our problem by using ideas from GANs to generate distributions of images, and specifically uses a U-net as the generator.
3. Issues/Roadblocks Encountered
   1. New data is continuously being gathered and in slightly different ways.  Initial dataset contained images taken by humans in the lab. Subsequent datasets contained images taken by a program.  Additionally, there are variations in the format of the images stored, the number of cells photographed, and number of z-planes designated.
      1. Note: As a result, data review and preparation took longer than anticipated.
   2. We are working on NYU Langone’s skynet cluster.
      1. Note: Anytime we need additional packages installed for python, we need to reach out to the admins for installation.  This isn’t a huge inconvenience, but it does take some time.