In total, approximately 70% of these labeled image tiles contained the plant species of interest. To prepare for training, the tiles and corresponding labels was split into a train (80%) and test (20%) set. These data were then oriented into a converted to a numpy array for input into a tensorflow model. To segment the areas containing P. australis, a U-Net CNN architecture was leveraged [1]. This model is made up of an encoder and decoder network capable of “highlighting” areas of interest in a high dimensional space before mapping those points to a segmentation map. This map is highly detailed as the pixel density is a one to one match between input and output. Tensorboard was used to do a simple hyperparameter search on the dropout rate, optimization algorithm and kernel initializer. Initially the model was highly hyper fitting the training data. In an attempt to mitigate this issue, L2 regularization was added to several of the convolutional layers and normalization was performed on the input image data.

With these changes, we were able to achieve an approximate accuracy of 89% on the training data and 86% on the testing data. With more tuning and more data, this accuracy may be boosted. Finally, adaptations were made so the network could process large images of original size (630x6792x5). In this configuration, the image is broken down into 32x32x5 images which are processed by the network. Zero-padding is used on border images to ensure dimensions are equal throughout network processing. A segmentation mask is created by piecing the tiles together and cropping off the padded zeros. In total, it returns a mask of the Phragmites australis locating the position and area!

[1]: <https://arxiv.org/abs/1505.04597>)

The Phragmites australis classifer is currently limited in the accuracy of its predictions and the inability to adapt to differing input data shapes. Currently the accuracy on the test set of images is approximately 86%. With more data, the accuracy is bound to improve. To increase the size of the training data, alterations such as rotation, cropping and stretching should be leveraged to synthesize “new” data. With time and resources, additional images might be segmented by hand as well.

Currently the classifier is capable of only processing images of dimension 630x6792x5. Unfortunately the images taken are not of square format when imaged. Preprocessing of the network should be improved so images of any size can be processed and segmented with high accuracy. Overall, this is a fantastic version one though, as it classifies the images with reasonable accuracy!