

Using a Convolutional Neural Network to Classify Vegetation in Northern Siberia

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Introduction

As the world is forced to adapt to the effects of climate change, the Arctic is likely to carry the brunt of it. We've already seen an increase in ice melt in the area, and tracking vegetation trends is the next step in seeing the impact climate change has had. The area is also important to look at because accurate land cover data is rarer to find in areas so close to the arctic, specifically ones that differentiate trees and shrub. Using Cold War era Keyhole (KH-9) satellite imagery and a classification neural network, we classified the land cover of the Kolyma region from 1974. This method has been used on black-and-white imagery before, including by Mboga, et al. (2020).

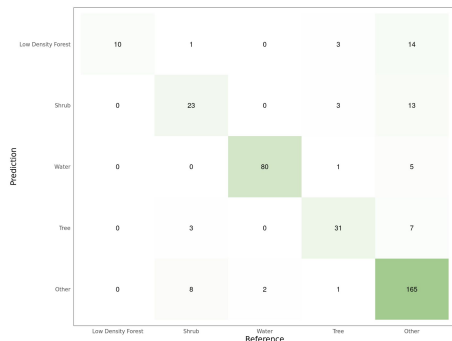
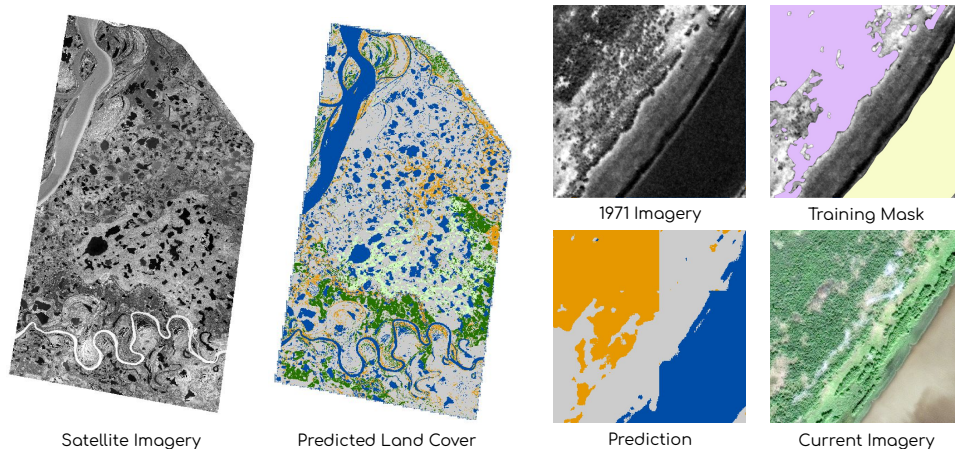
Methods

Overview

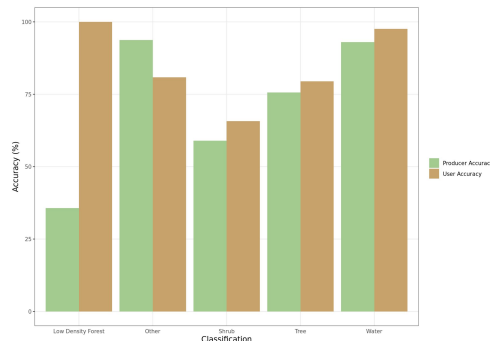
- ArcGIS Pro was used to view the satellite imagery
- The model containing the neural network algorithm was created by Keras

Procedure

1. Satellite image of area was randomly tiled into 400 training images
2. We classified each image, drawing polygons around the pixels that fell into our four classes: trees, water, shrubs, or low-density forest
3. The training images were exported and rasterized to then be used to train the model
4. The model then predicted the entire extent of images, which were then mosaiced together to create our final prediction



Confusion Matrix



Accuracy

Considerations

At many points, low-density forest (LDF) was incorrectly classified as trees or shrub (or vice versa). Interestingly, it often classified LDF as areas around shrub or trees and then classified the individual trees or shrub as themselves. More training data will be needed to increase accuracy, but it is an interesting classification.

Future Use

The next step in this project will be to conduct the same procedure for more recent data and to then track the trend. This will allow us to see if there has been an increase in tall vegetation in the arctic or any other potential climate impacts.

Acknowledgements

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