

Window Histogram for Characterizing Basins

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INTRODUCTION

In this research, our goal is to identify the relationship between vegetation density and low-lying areas. We use a window-based approach to preprocess the data within Fair Mount area. The distribution of NDVI and near-infrared data inside each window will be summarized using histograms. Each column inside a histogram will then be treated as a separate attribute. Using the preprocessed data set, we build a decision tree classifier that has a sensitivity of 67% and a specificity of 81%.

OBJECTIVES

- Use window-based approach to preprocess NDVI and near-infrared data within Fair Mount area.
- Build a decision tree model to classify the preprocessed data sets.
 1. The whole map was cut into two parts. The larger upper part is used as training data set and the smaller lower part is used as testing data set. The basins of the whole map were identified and their coordinates were given by Dr. Xuefeng Chu, NDSU.
 2. The text files are processed into window-based data sets using the algorithm in a particular format to be classified using the classifier.
 3. The attributes are the summarized NDVI and near-infrared data. Each observation includes the above data inside a single window.
- Identify the relationship between low-lying areas and the attributes based on the built model.

METHODS

Process:

1. Read the input text files, which contain the ndvi and near infrared information, to gather needed data for identifying features.
2. Distribute the data into different windows and make histogram-based data format for each window.
3. Build a decision tree using the data sets that are produced in Step 2.
4. Print out the decision tree model and the information gain for each attribute while building the model.
5. Reduce size of the tree by selecting 50% of the attributes that has the highest information gain. Build a new model based on these attributes.

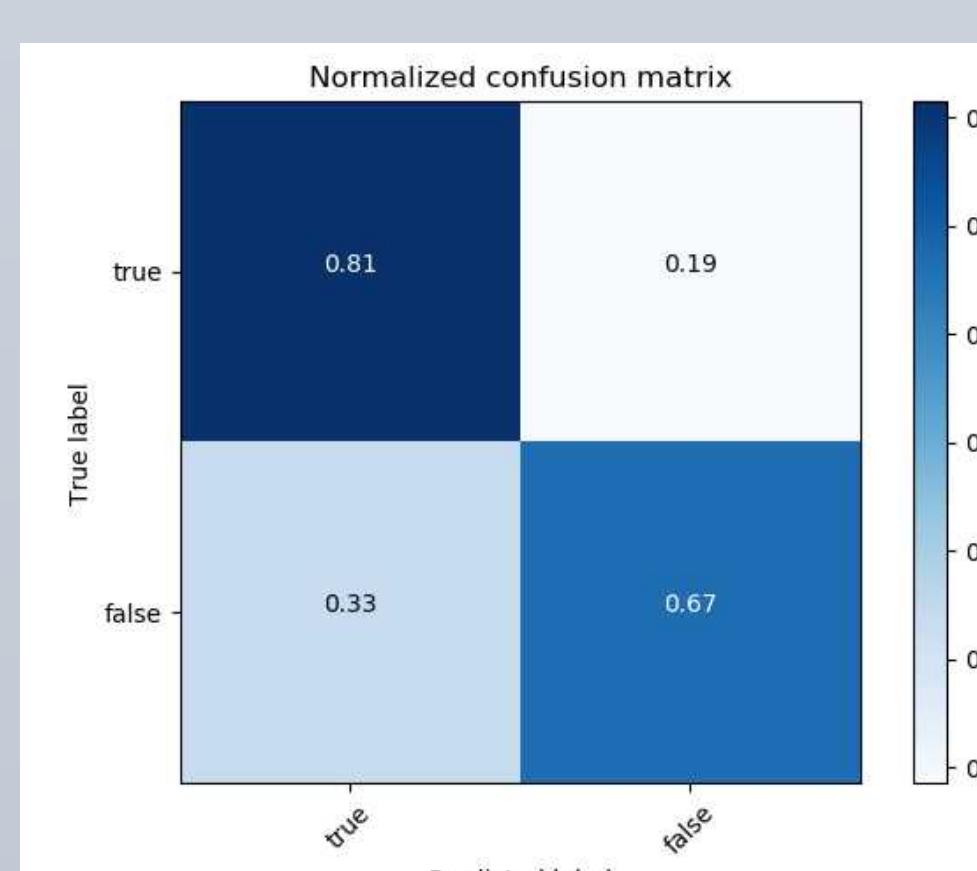
Part of text based raw data:

```
X,Y,Z  
682455, 5099765, -0.0415536501  
682465, 5099765, -0.0233036236  
682475, 5099765, -0.0237412546  
682485, 5099765, -0.0360228941  
682495, 5099765, -0.0211235955  
682505, 5099765, -0.027578475  
682515, 5099765, -0.018413945  
682525, 5099765, -0.0364997648  
682535, 5099765, -0.0334884785  
682545, 5099765, -0.0120817842  
682555, 5099765, -0.039311931  
682565, 5099765, -0.056440935  
682575, 5099765, -0.0510603002  
682585, 5099765, -0.0317279175  
682595, 5099765, -0.0263861436  
682605, 5099765, -0.0134630613  
682615, 5099765, -0.0183150191
```

NDVI and Near-Infrared histograms after preprocessing:



Classification result using decision tree:



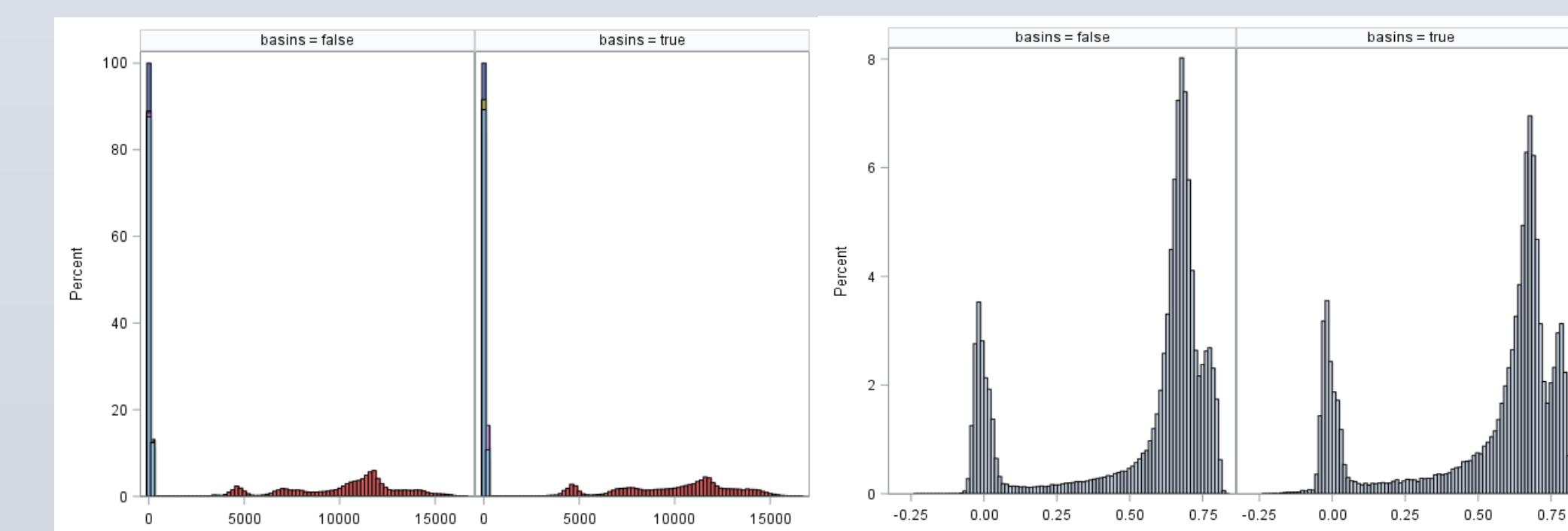
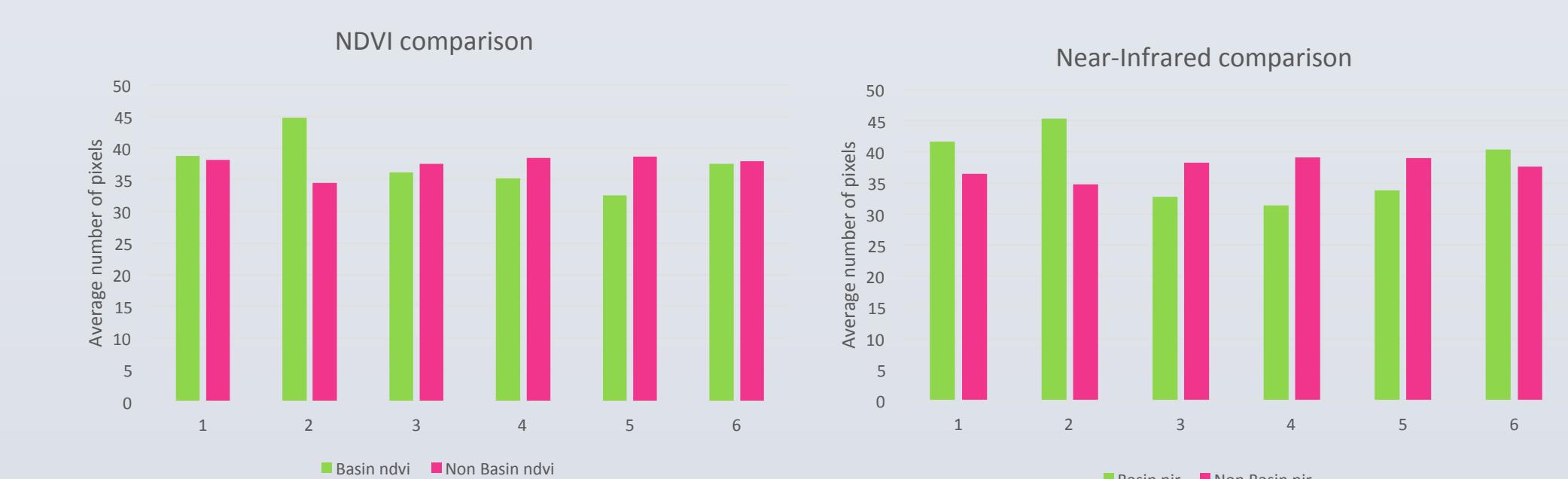
RESULTS

Training dataset: Upper section of Fairmount site

Testing dataset: Lower section of Fairmount site

Window Size: 15 * 15

From the comparison based on NDVI and Near-Infrared data from training data sets in the pictures below we can see that the area that contains basins has less vegetation density. Although the difference is not significant, both data support this theory.



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