Using Computer Vision Methods to Predict Building Density Measurements Using Geospatial Image Classification

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Introduction

- Geographic Information Systems
  - Capturing, storing, manipulating, and analyzing spatial or geographic data
- Google Maps, location tracking, etc…

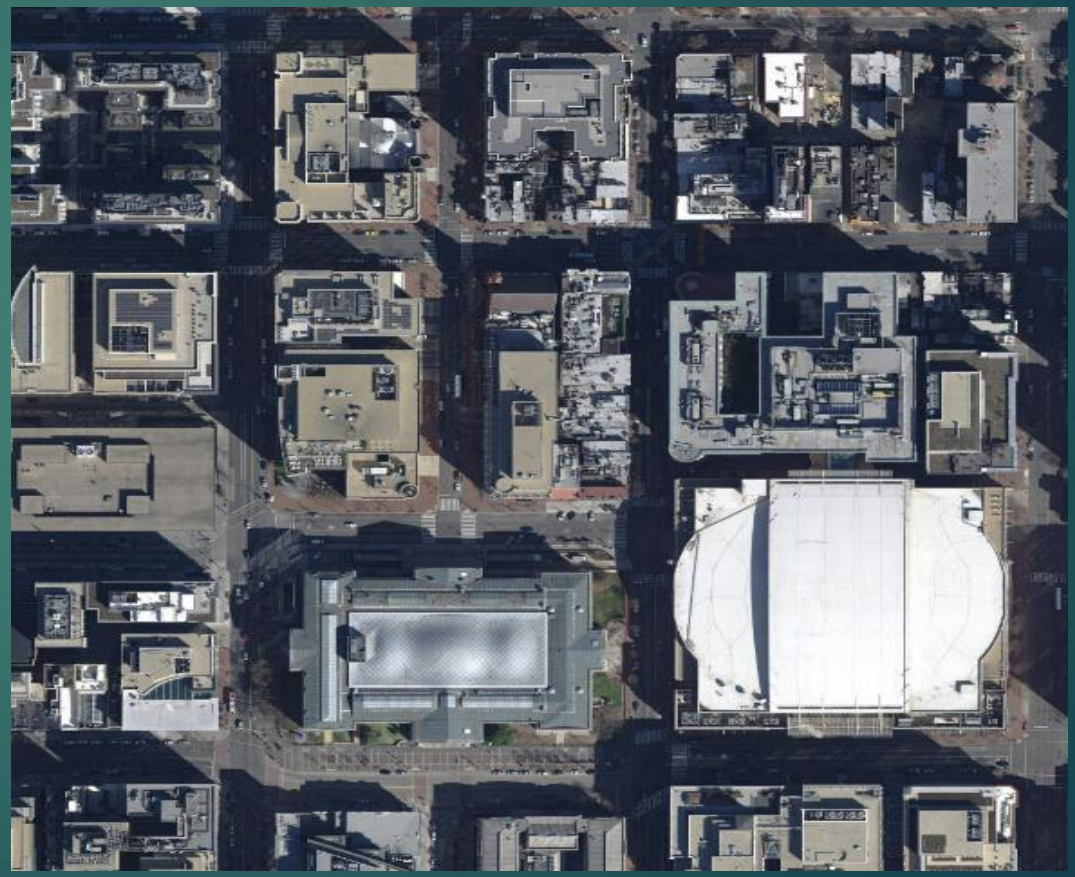
Problem

How would you classify this image?

Given this image and historic images what could you explain?

Can you train a model to differentiate between this urban block and a forested area?

How can we use the building density to accomplish this?

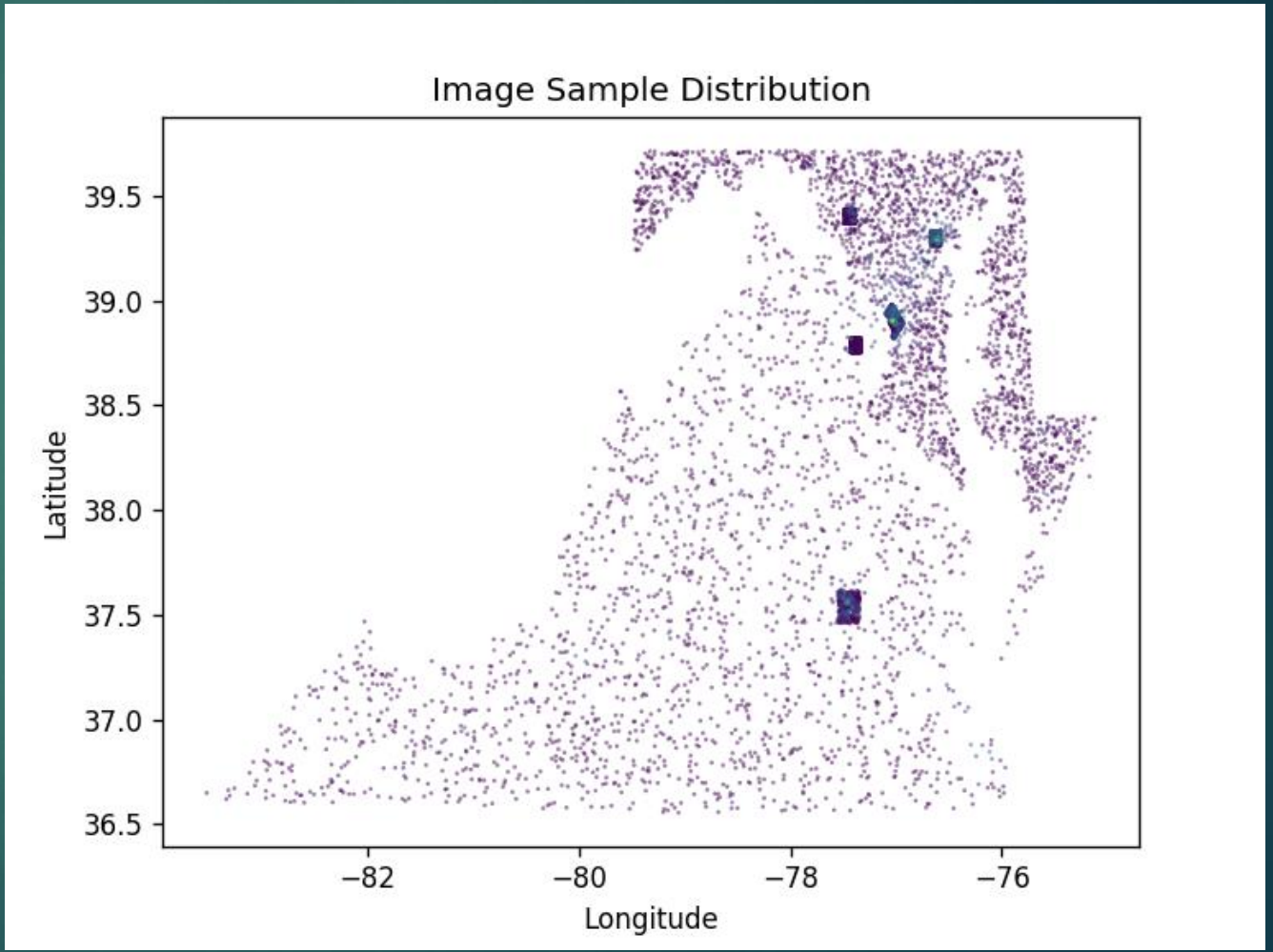


Problem (cont.)

Limited the scope of training/testing area to just Virginia, Maryland, and the District of Columbia

Defined regions split by geographic coordinates in order to ensure train/test set is balanced

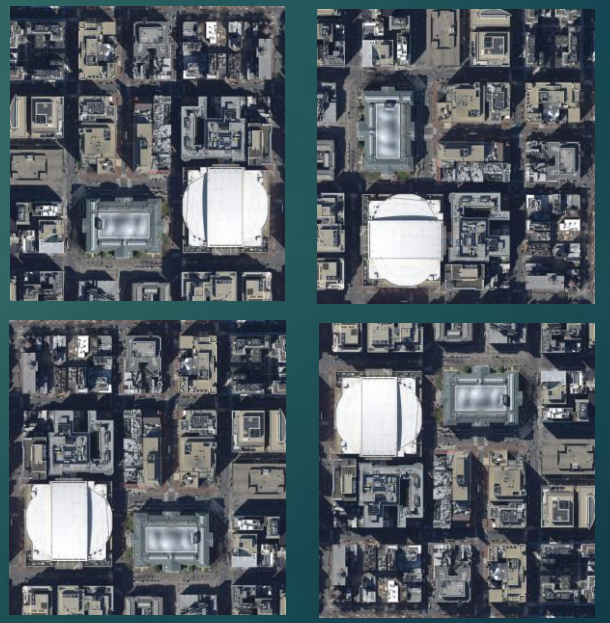
Over sampled urban areas to achieve better distribution of densities



Data Prep

Select, clip and calculate area of building polygons at a random location

Divide by total area to label image with building density



Augment images through flipping and rotation

Resize and add/remove noise depending on model

Methods Selected

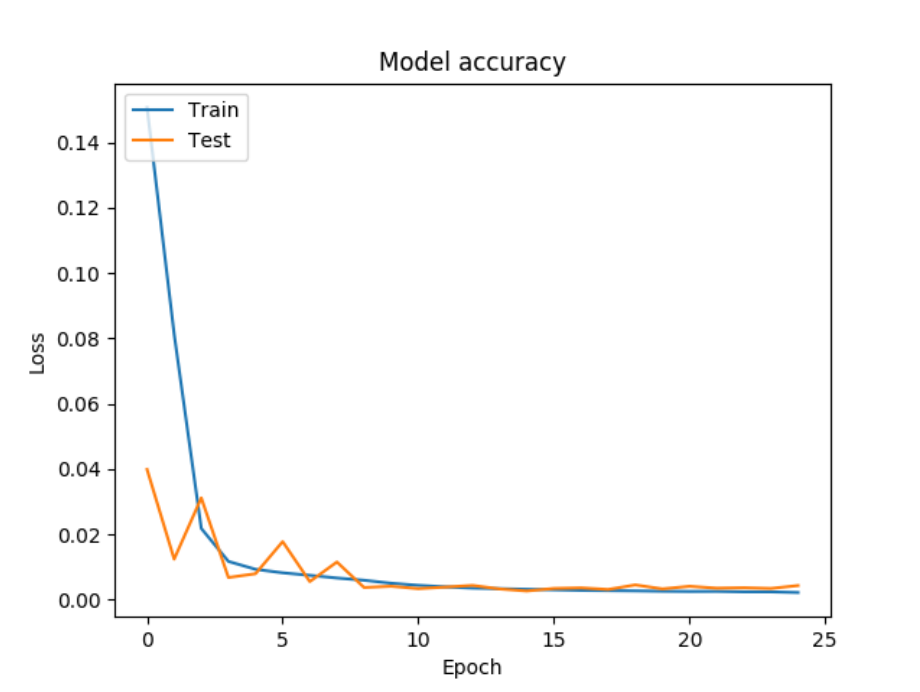
- Multilayer Perceptron
  - Good for classification problems
  - Can easily tweak parameters to have n neurons

- Convolutional Neural Network
  - Can be used for classification problems
  - Good at analyzing images

Methods (Cont.)

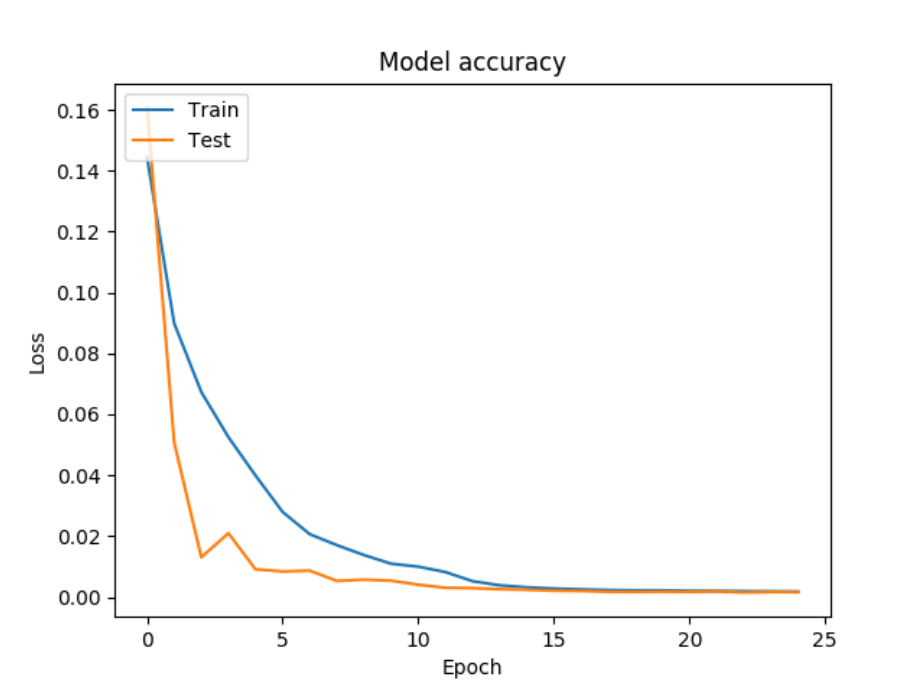
MLP

MSE - 0.00272



CNN

MSE – 0.00147



Application

Density: 0.37309542 (Dense Urban)

Density: 0.0031250431 (Uninhabited)

Applying Algorithm to Examples

WEB APP DEMONSTRATION