

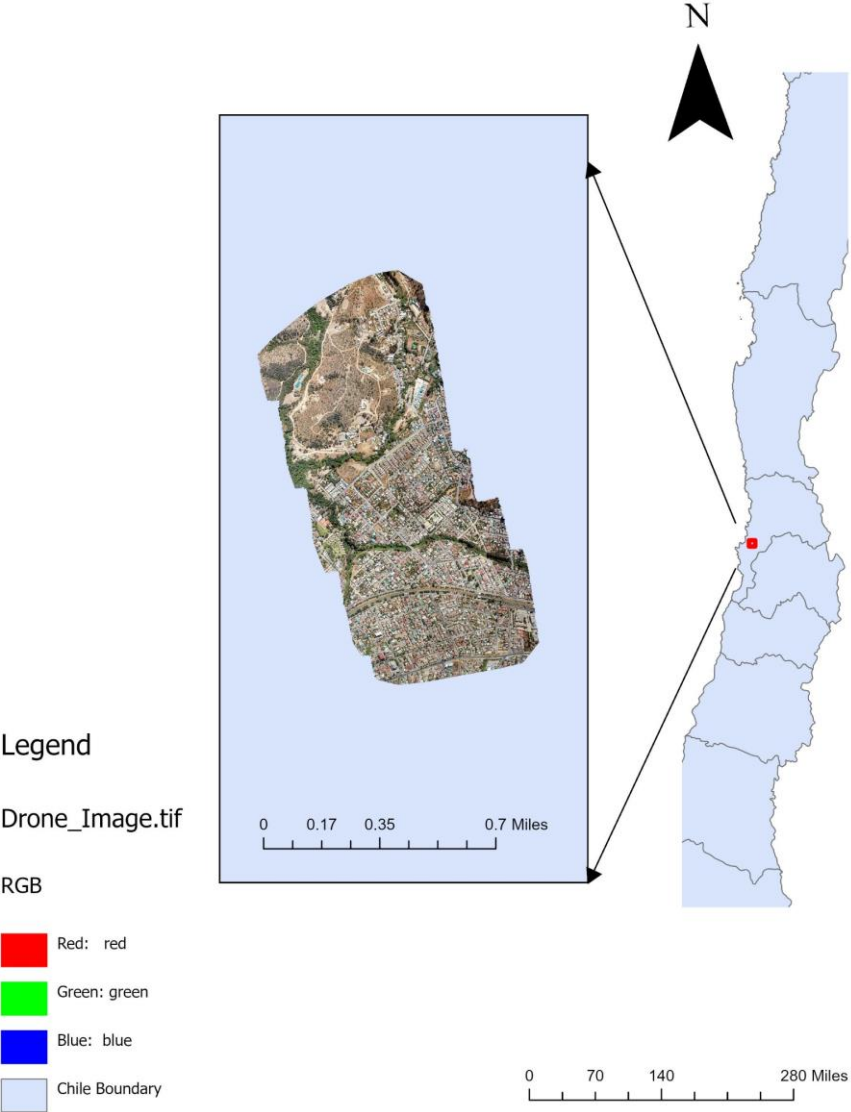
Swimming Pool Detection using Deep Learning

Yeamin Faria Chowdhury

Introduction

- Adding a swimming pool to a property increases the taxes that must be paid to the government.
- Government has to keep track with the recent land use developments, such as the addition of swimming pools to a property and the use of high-resolution drone imagery can be beneficial.
- In order to automate the process of swimming pool identification from drone imagery object identification using deep learning technique can be used.
- Object detection using deep learning is a fast and accurate means of detecting the location of objects in an image.
- Deep learning is a powerful machine learning technique in which object detector learns the required image features for completing the task.
- The objective of my study is to evaluate the automation process of swimming pool detection in drone-based image using the Deep Learning tools in ArcGIS Pro.

Study Site



Data Collection

- I used open-source drone image from 'Open Aerial Map' website. The image is collected on 3rd March, 2023 and has a resolution of 13 cm.
- For pretrained data, I have used USA pool detection dataset from the ArcGIS Living Atlas of the World. It consists 8-bit, 3-band high resolution (5-30 centimeters) imagery and the model used the FasterRCNN model architecture

Creating Training Samples



Creating image chips

✓ **Export Training Data For Deep Learning (Image Analyst Tools)** ✕

Started: Monday, May 1, 2023 at 10:00:50 AM
Completed: Monday, May 1, 2023 at 10:01:22 AM
Elapsed Time: 32 Seconds

Parameters Environments Messages (2)

Classified Raster Or Table	
Image Format	TIFF
Tile Size X	256
Tile Size Y	256
Stride X	128
Stride Y	128
Output No Feature Tiles	ONLY_TILES_WITH_FEATURES
Metadata Format	PASCAL_VOC_rectangles
Start Index	0
Class Value Field	Classvalue
Buffer Radius	0
Input Mask Polygons	
Rotation Angle	0
Reference System	MAP_SPACE

Search (Alt+Q) Yeamin Faria - University of Texas at Dallas

Map Referencing

Locate

Infographics

Coordinate Conversion

Pause

Lock


Convert

Download Map

Inquiry

Labeling

Offline



290.405 m

Selected Features: 0

Image Chips



Training the model

The screenshot displays the Geoprocessing interface with the 'Train Deep Learning Model' tool configured and executed. The tool parameters are as follows:

- Max Epochs:** 20
- Model Parameters:**
 - Model Type:** RetinaNet (Object detection)
 - Batch Size:** 4
 - Model Arguments:**

Name	Value
scales	1, 0.7937005259840
ratios	[1.0,1.0]
chip_size	224
resize_to	
monitor	valid_loss
- Advanced:**
 - Learning Rate:** (empty)
 - Backbone Model:** ResNet-34
 - Pre-trained Model:** (empty)

The 'Run' button is visible at the bottom of the tool configuration panel.

The execution results are shown in the 'Messages (24)' tab:

Train Deep Learning Model (Image Analyst Tools)

Started: Today at 10:44:27 AM
Completed: Today at 11:08:59 AM
Elapsed Time: 24 Minutes 32 Seconds

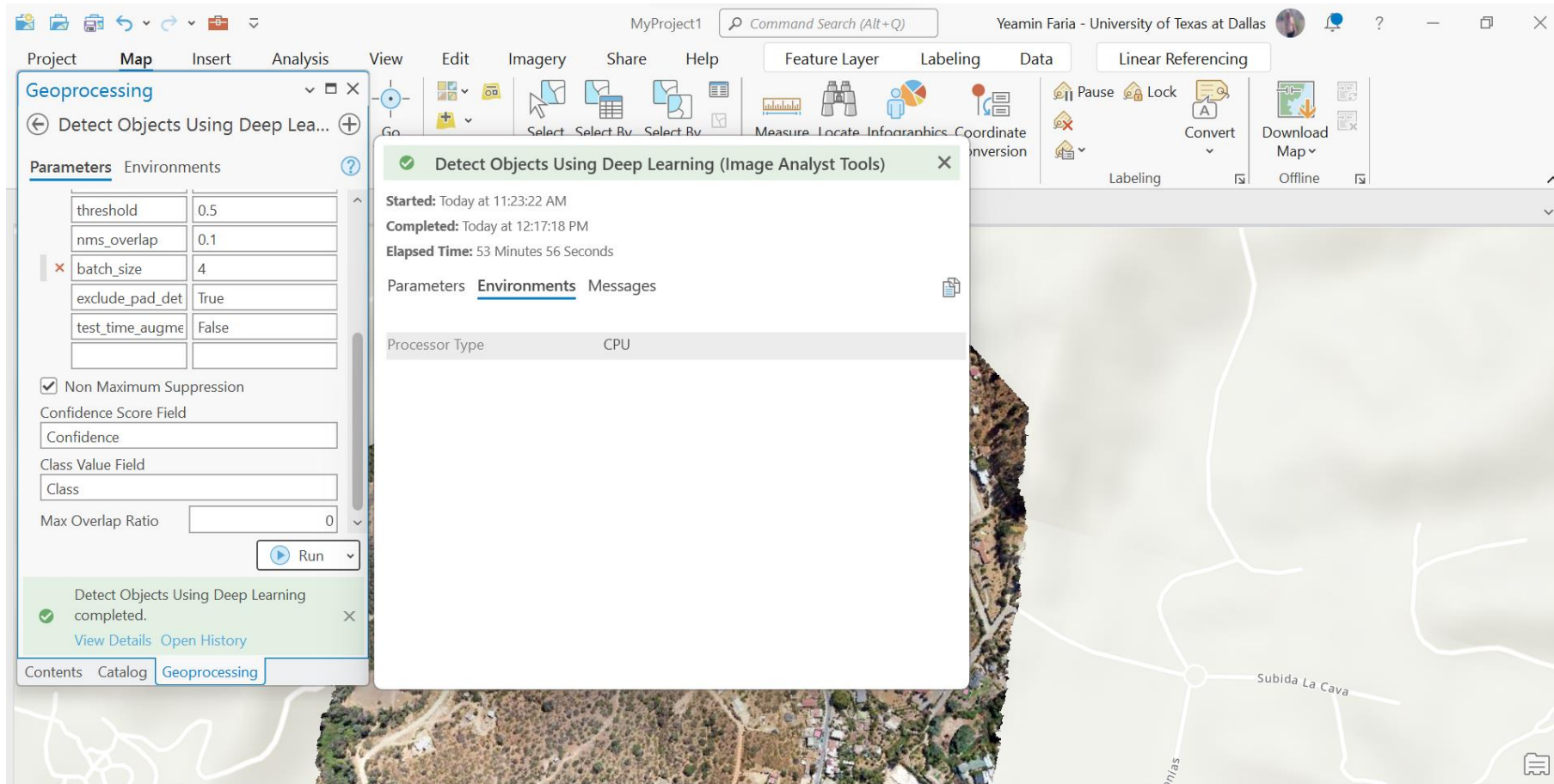
Parameters **Environments** **Messages (24)**

Start Time: Monday, May 1, 2023 10:44:27 AM
Learning Rate - slice(3.981071705534973e-05, 0.0003981071705534973, None)

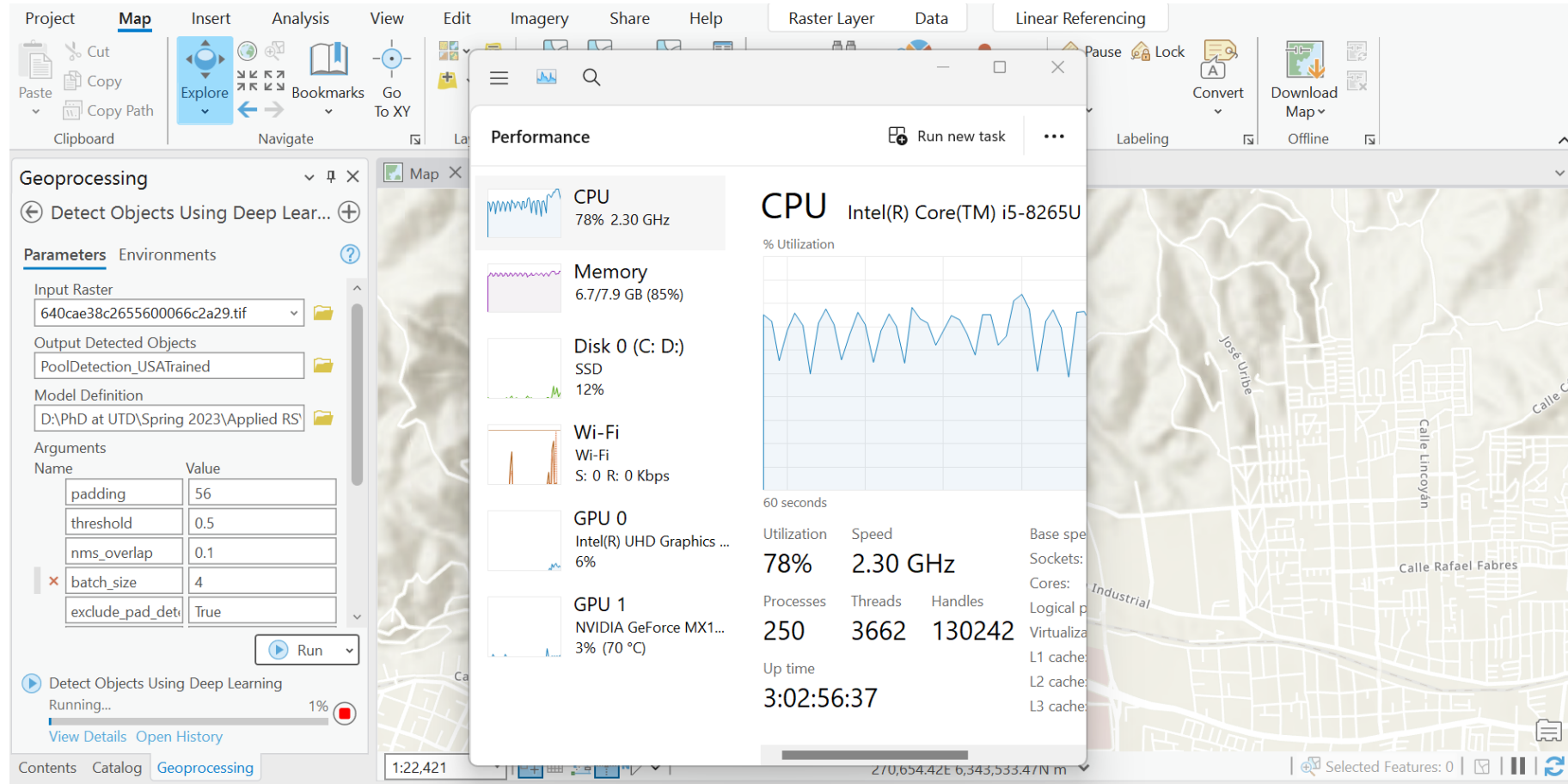
epoch	training loss	validation loss
0	13.511110305786133	12.259966850280762
0.2510066530265309		
1	1.685889482498169	2.123121738433838
0.4818621409016721		
2	1.665110468864441	1.729896903038025
0.5617579937569133		
3	2.04315185546875	1.947136402130127
0.4809279701946012		
4	1.2905863523483276	1.175058126449585
0.5257805971294314		
5	0.9468694925308228	0.9394503235816956
0.6140151553721438		

The background shows an aerial view of a residential area with a house and a car.

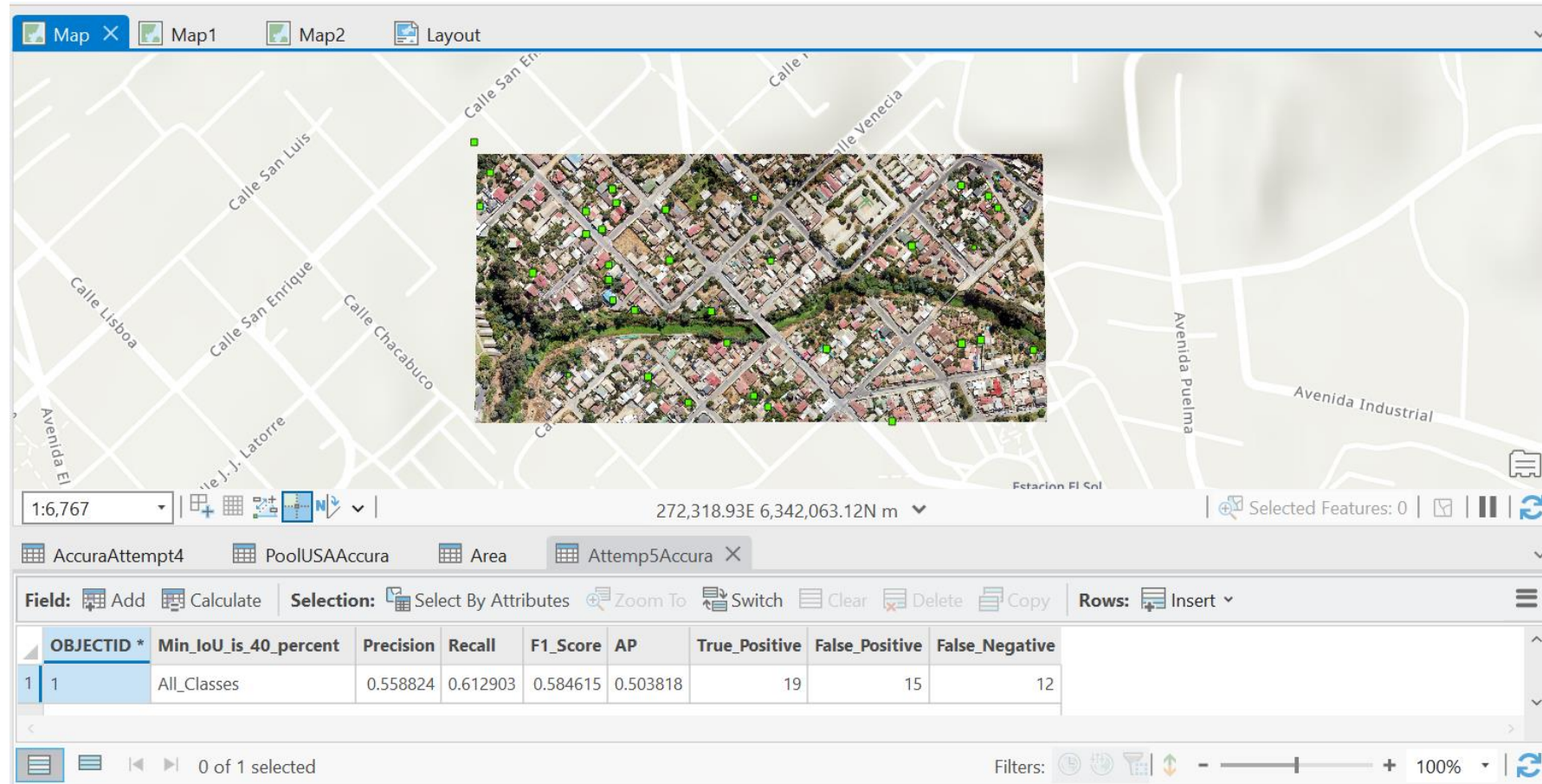
Detect objects



Detect objects with Pretrained Model



Results



Thank you