

AUTOMATED FEATURE DETECTION

(from PDF, PNG, TIFF, JPG)

An AI/ML Application [for Engineers]

Mark Stefanchuk, Phocaz Inc.
CTO, VP Development



GDOT Original Use Case

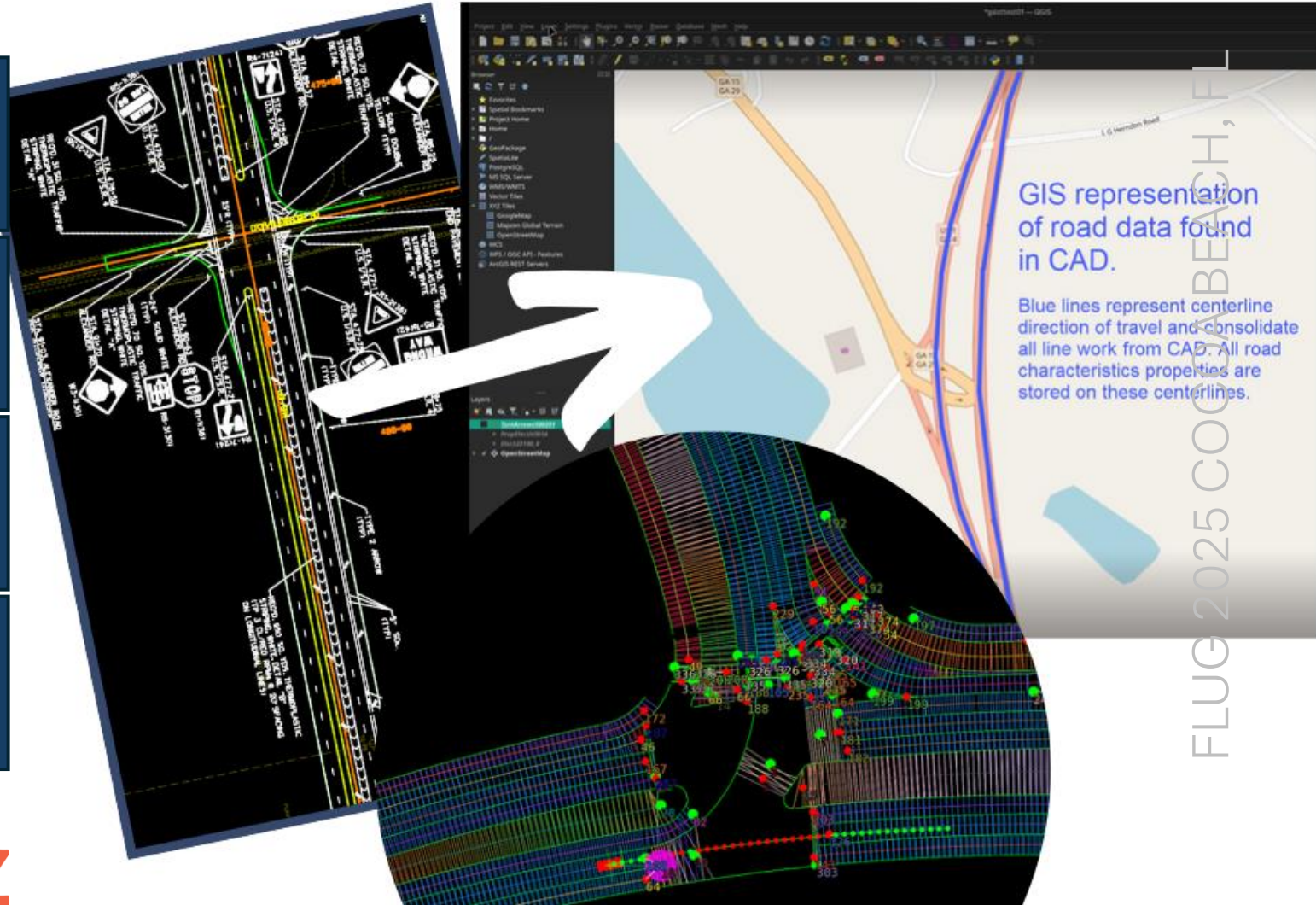
AI/ML | GIS | LRS

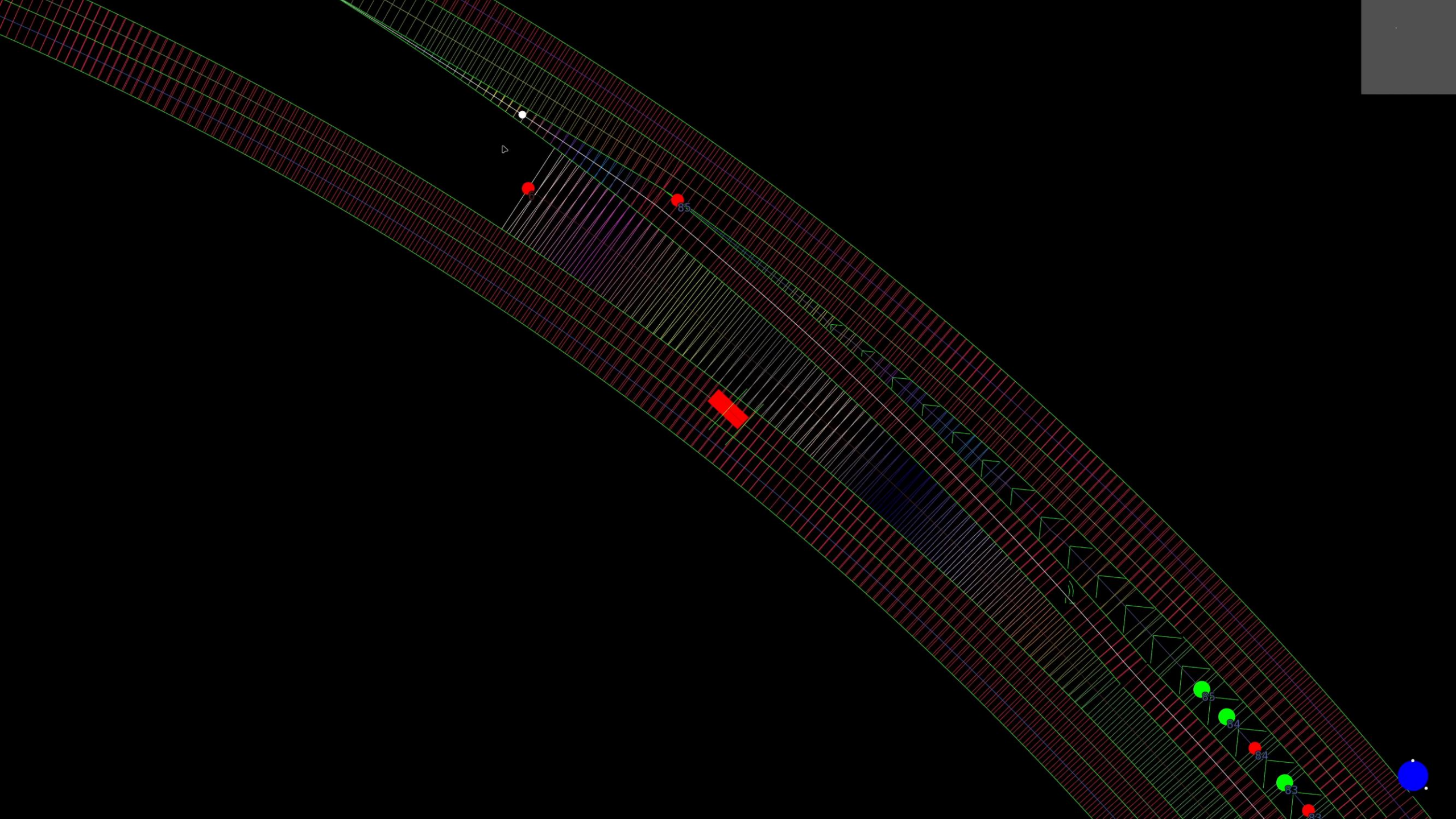
LEGACY CAD

DIGITAL TWIN

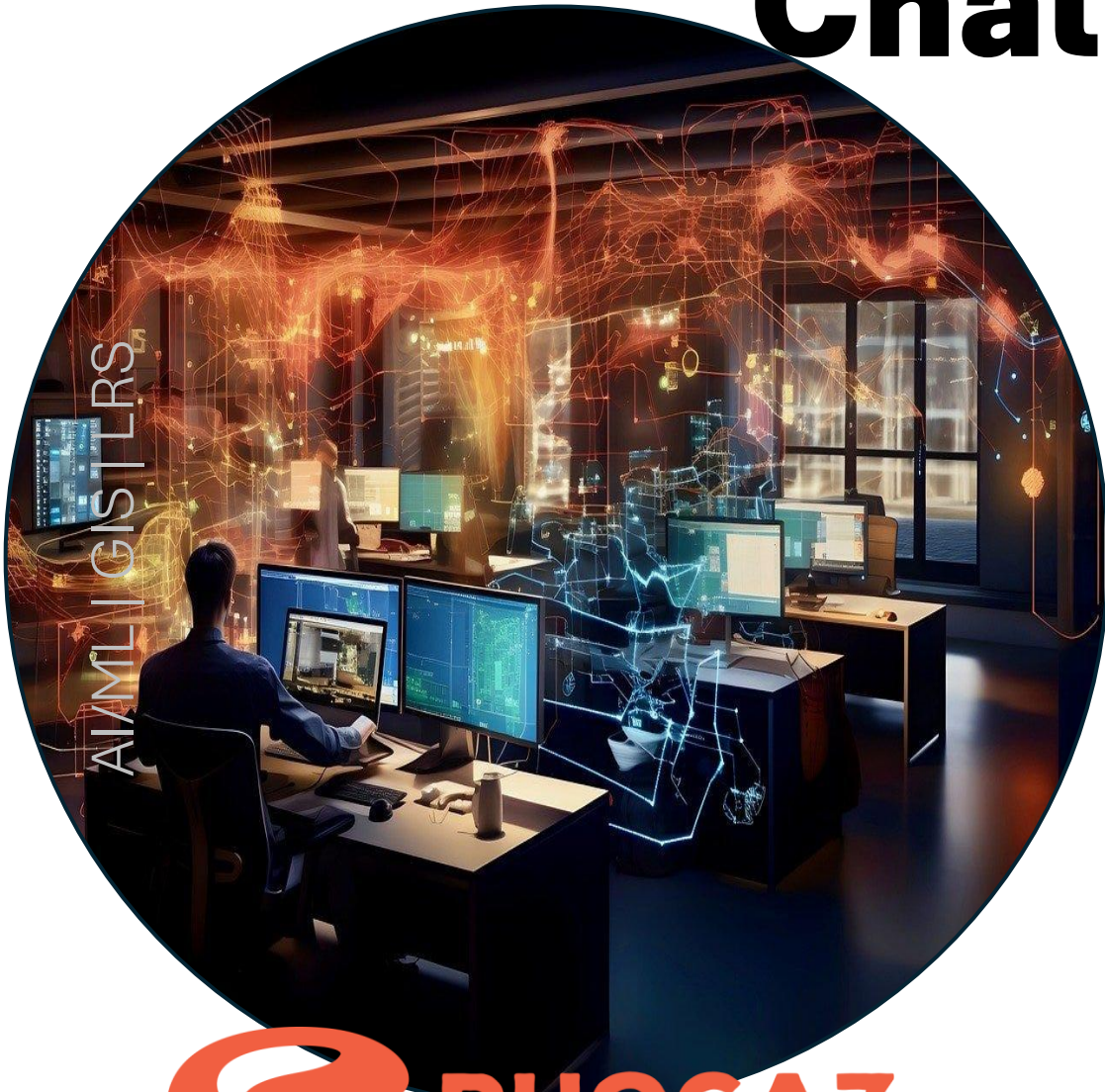
AI/ML

GEOJSON





Challenges



- Not as-built
- Not final submission
- Duplicate data (outside border)
- Missing coordinate systems
- CAD Knowledge



PDFs . PNG . TIFF . JPG

- More likely PDF submission
- Archive project drawings
- Legacy drawings as scanned imagery



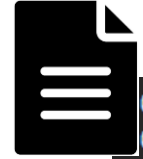
Fine Tuning

- In AI/ML, we can do this thing called fine tuning. It allows us to tell the model how to find things that we are interested in that the model doesn't already know about. Like, find the hound in this picture. You might have used phone apps that do something like this. What is that bug, flower, etc.
- To fine tune, we feed examples of the thing we want to identify to the existing model so it can learn.



Not Easy

- The dog could be facing away, standing up, turned around, be a different type of dog. I need a lot of photos.
- Need thousands and often hundreds of thousands of **annotated** examples.
- Takes time and lots of money.
- I might be able to afford to train a model to detect defects in concrete, but if I have a different material, I need a new model.



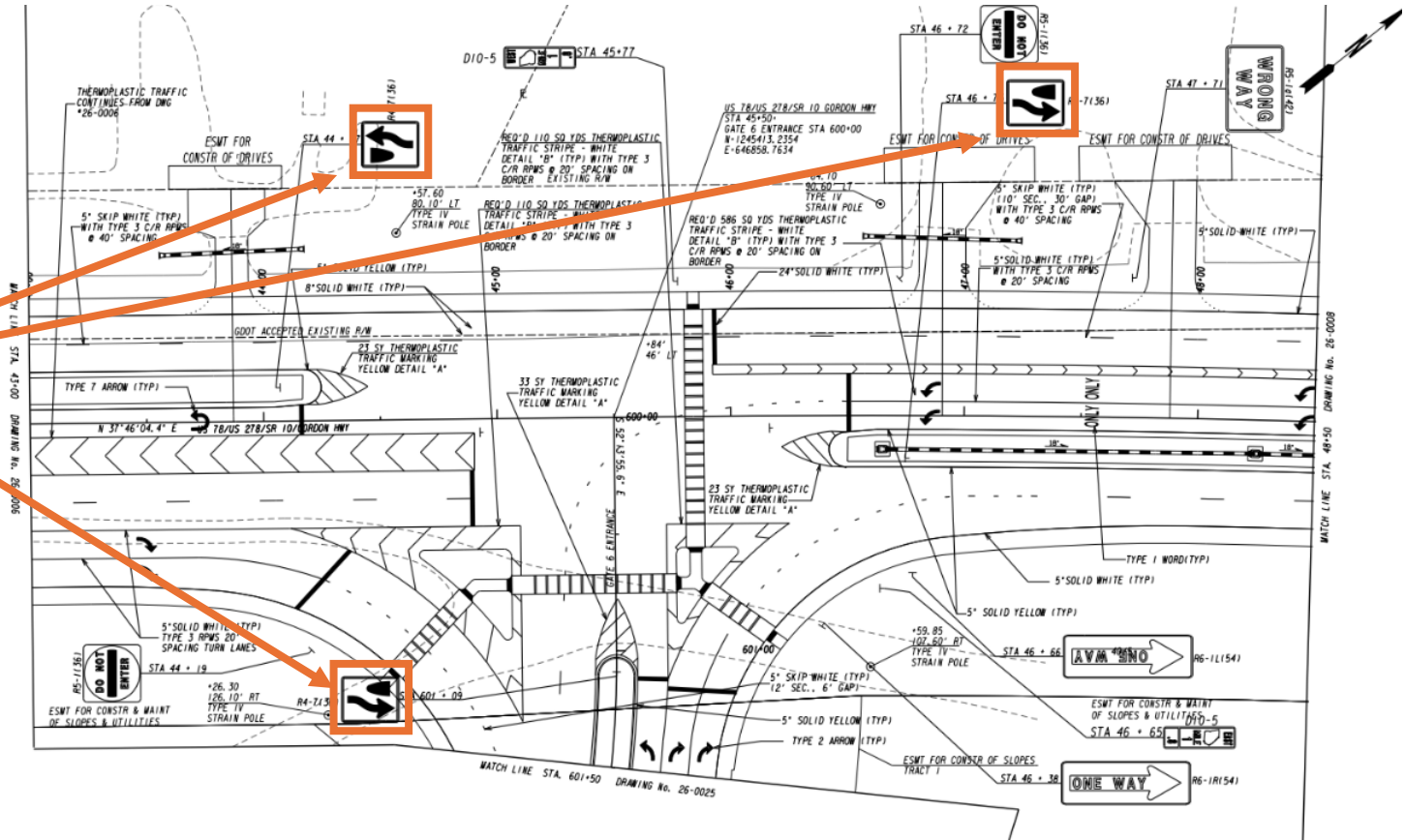
```
0 0.8571514 0.4051099 0.1647768 0.16338104
0 0.21096386 0.28835836 0.29839116 0.30327684
0 0.4807025 0.76869714 0.2774703 0.2665006
0 0.07896864 0.8482356 0.16265024 0.15664917
0 0.87400305 0.1166475 0.14253736 0.14345124
0 0.8956551 0.785221 0.11972046 0.12692088
0 0.6670902 0.20544234 0.19708073 0.19708075
```



Same Thing for Drawings

- Engineering – find the keep right signs in this drawing package...

AI/ML | GIS | LRS

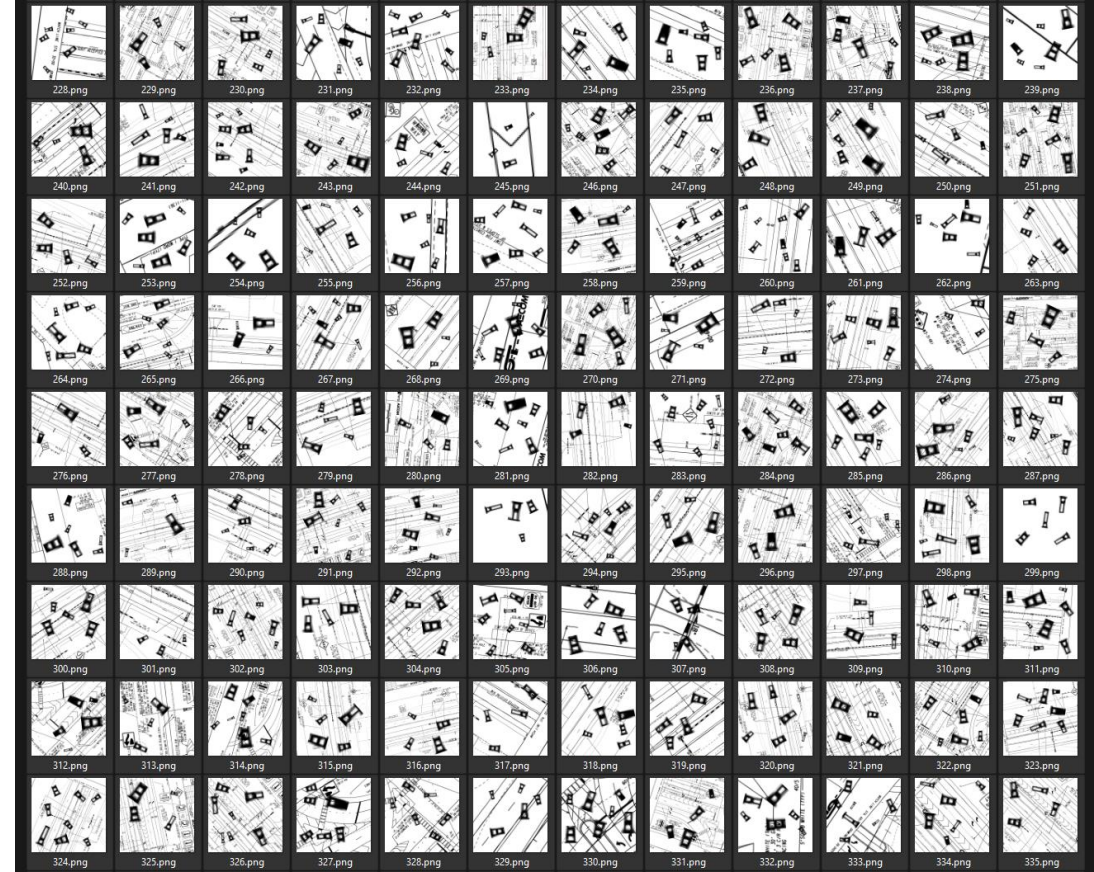


FLUG 2025 COCOA BEACH, FL



I don't have facebook money

- I don't have the people needed to collect and annotate every feature I want to detect.
- Good news!



Synthetic Imagery

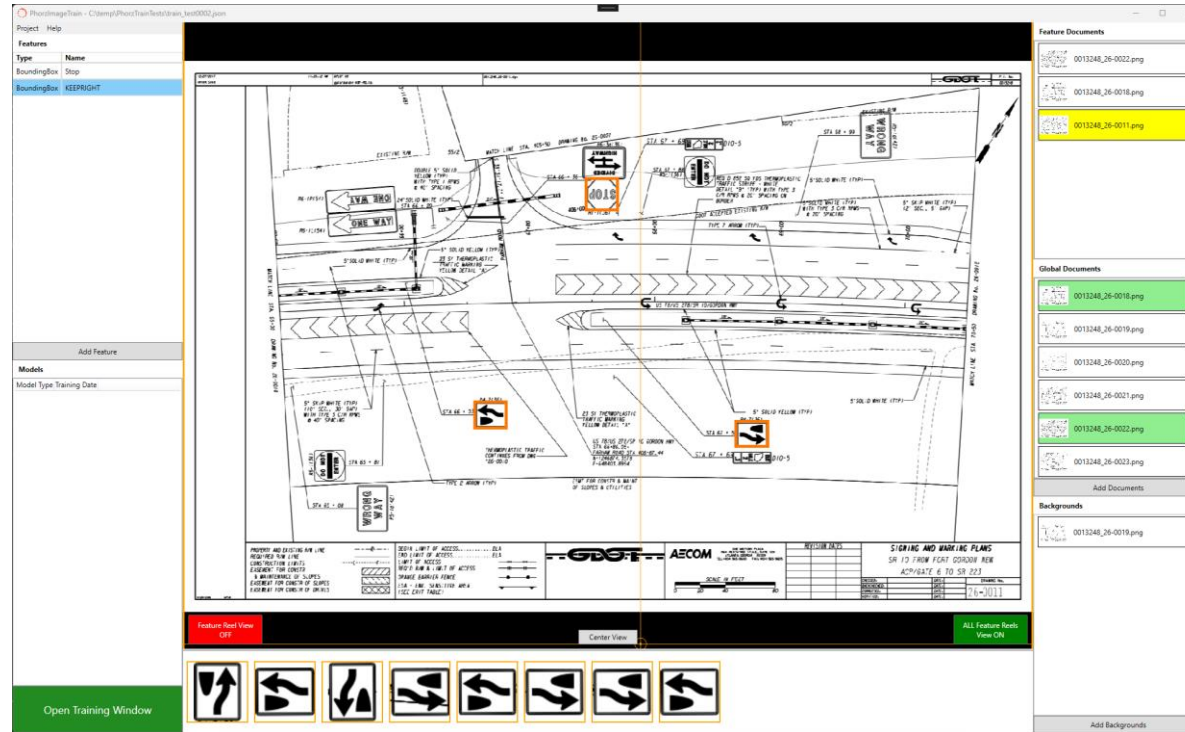
- Turns out we can build the training data without lots of people.
- We programmatically apply rotation, position, and scale
- And we can automatically build annotation for each example.
- So, we don't have to collect a lot of data for the thing we want to find.



AI Training; How-to:

Let's build our own model.

AI/ML | GIS | LRS



FLUG 2025 COCOA BEACH, FL



PDF EXAMPLE

PhorzImageTrain - C:\temp\PhorzTrainTests\pdf_example0002.json

Project Help

Features

Type	Name
BoundingBox	Spillway

Add Feature

Models

Model Type	Training Date
------------	---------------

Select a Document

Feature Documents

Global Documents

Add Documents

Backgrounds

Feature Reel View OFF

Center View

ALL Feature Reels View OFF

Deselect Crop

Add Crop Background

Add Backgrounds

Open Training Window

KEEP RIGHT EXAMPLE

PhorzImageTrain - C:\temp\PhorzTrainTests\KeepRight0001.json

Project Help

Features

Name

Add Feature

Models

Model Type Training Date

Select a Feature

Feature Reel View OFF

Center View

ALL Feature Reels View OFF

Deselect Crop

Add Crop Settings

Add Backgrounds

Feature Documents

Global Documents

Add Documents

Backgrounds

Add Backgrounds

Open Training Window

Features

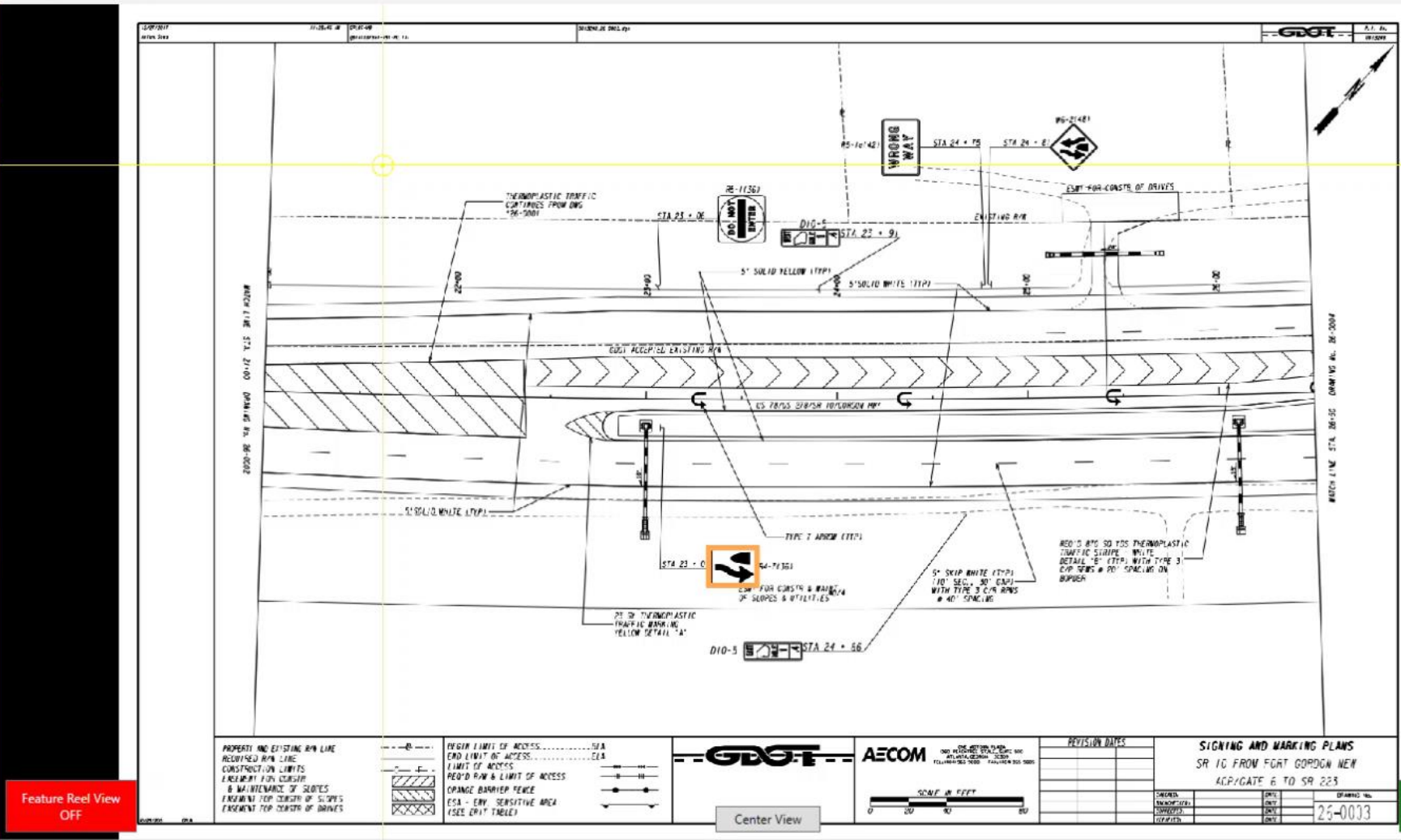
Name

BoundingBox KeepRight

Add Feature

Models

Model Type Training Date



Feature Reel View OFF

ALL Feature Reels View ON



Deselect Crop

Open Training Window

Reset Crop Selection

Feature Documents

- 0013248_26-0003.png
- 0013248_26-0007.png

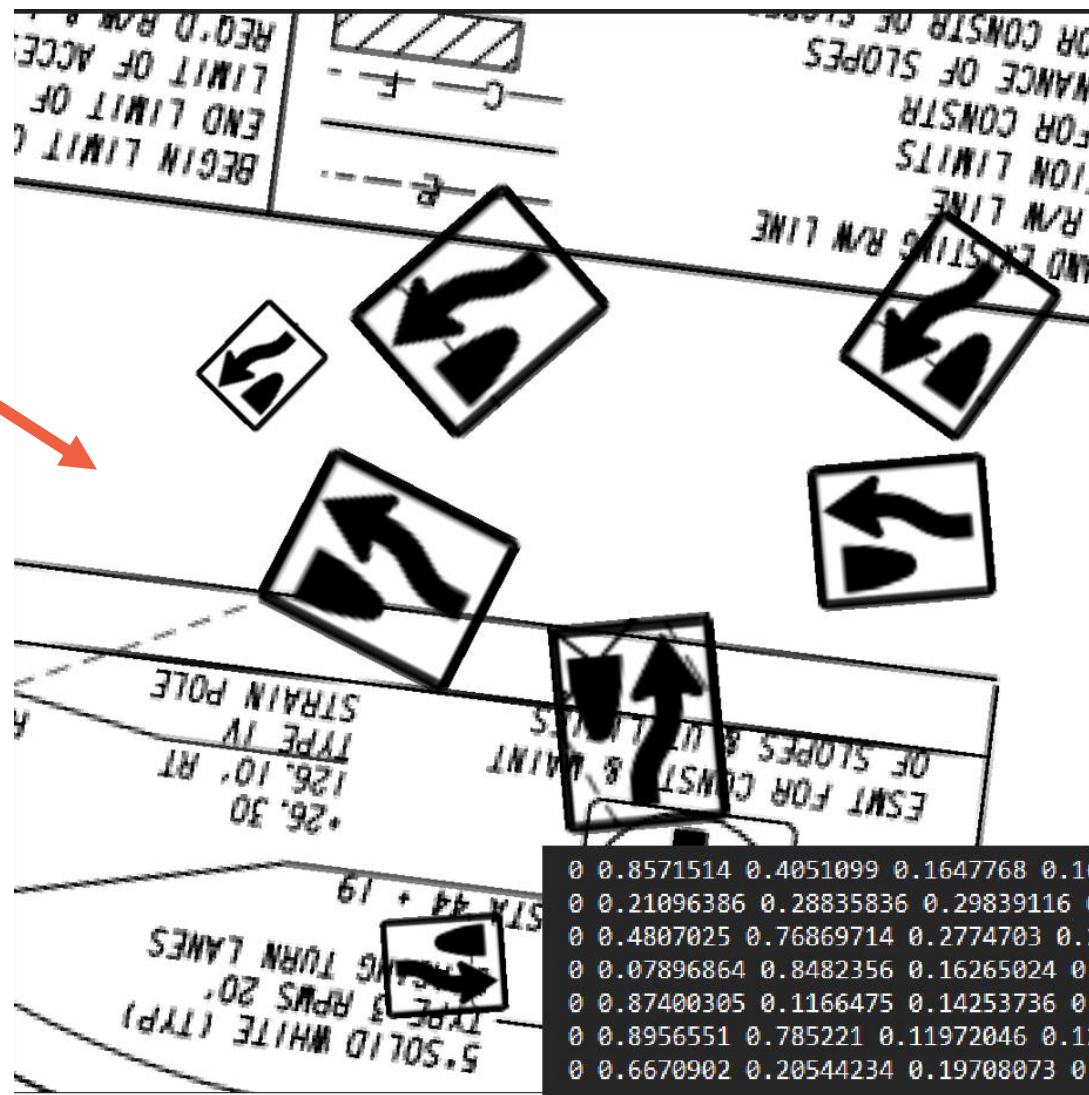
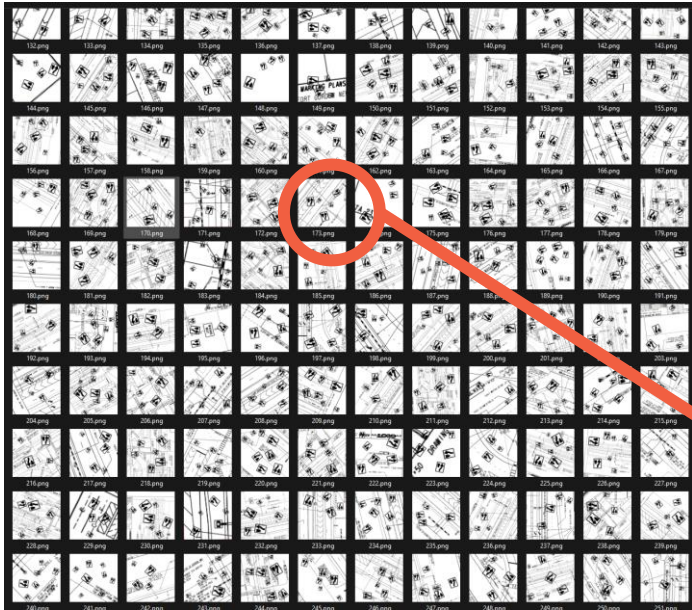
Global Documents

- 0013248_26-0006.png
- 0013248_26-0007.png
- 0013248_26-0008.png
- 0013248_26-0009.png
- 0013248_26-0010.png

Add Documents

Backgrounds

Add Backgrounds



0	0.8571514	0.4051099	0.1647768	0.16338104
0	0.21096386	0.28835836	0.29839116	0.30327684
0	0.4807025	0.76869714	0.2774703	0.2665006
0	0.07896864	0.8482356	0.16265024	0.15664917
0	0.87400305	0.1166475	0.14253736	0.14345124
0	0.89565551	0.785221	0.11972046	0.12692088
0	0.6670902	0.20544234	0.19708073	0.19708075

AI DETECTION

AI/ML | GIS | LRS

Phorz Image Plus - C:\temp\PhorzTrainTest\detect17.pon

Image Viewer

Signs

Conf: 0.7

File Viewer

Light Theme

0013248_26-001.png

0013248_26-002.png

0013248_26-003.png

0013248_26-004.png

0013248_26-005.png

0013248_26-006.png

0013248_26-007.png

0013248_26-008.png

0013248_26-009.png

0013248_26-010.png

0013248_26-011.png

Properties

Stop

Category

RegulatoryName

State

Install

Reflectivity

1.0

PayItem

Alignment

Station

0 1 2 3 4 5 6 7

Results

Results Map

Image File	Category Index	Category Name	X	Y	Width	Height	Latitude	Longitude	ModelType	Confidence	Index
0013248_26-0022.png	16	KeepRight	0.35005	0.50113	0.03035	0.05789	0.0000000	0.0000000	Signs	0.97	0
0013248_26-0022.png	15	DoNotEnter	0.22177	0.68357	0.05287	0.08224	0.0000000	0.0000000	Signs	0.97	1
0013248_26-0022.png	16	KeepRight	0.28979	0.83994	0.03026	0.05916	0.0000000	0.0000000	Signs	0.97	2
0013248_26-0022.png	22	OneWayR62	0.73178	0.60091	0.02876	0.05658	0.0000000	0.0000000	Signs	0.97	3
0013248_26-0022.png	9	WrongWay	0.91157	0.10401	0.03778	0.08568	0.0000000	0.0000000	Signs	0.96	4
0013248_26-0022.png	16	KeepRight	0.74871	0.68309	0.03731	0.04024	0.0000000	0.0000000	Signs	0.96	5
0013248_26-0022.png	16	KeepRight	0.29527	0.59004	0.03733	0.04020	0.0000000	0.0000000	Signs	0.96	6
0013248_26-0022.png	18	Stop	0.78826	0.14863	0.03835	0.05940	0.0000000	0.0000000	Signs	0.96	7

PROPERTY AND EXISTING ROW LINE
PROPOSED ROW LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONCRETE
& MAINTENANCE OF SLOPES
EASEMENT FOR CONCRETE OF SLOPES
EASEMENT FOR CONCRETE OF SLOPES

BEGIN LIMIT OF ACCESS
LINE LIMIT OF ACCESS
LIMIT OF ACCESS
EASEMENT FOR CONCRETE
EASEMENT FOR CONCRETE
EASEMENT FOR CONCRETE

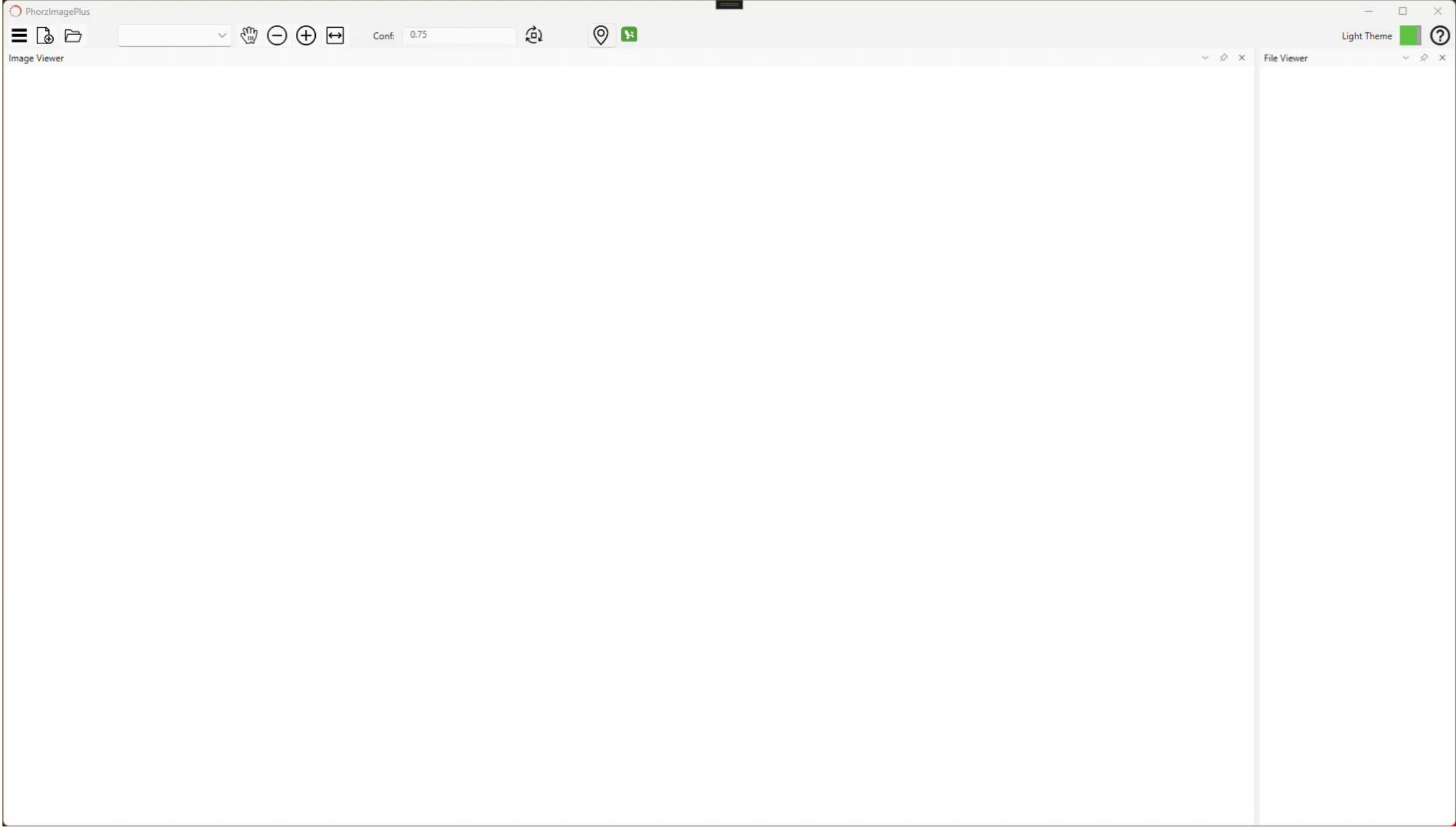
SCALE IN FEET
0 20 40 80

SIGNING AND MARKING PLANS
SR 10 FROM FORT GORDON NEW
ADP/GATE 6 TO SR 223
DATE: 06-0022

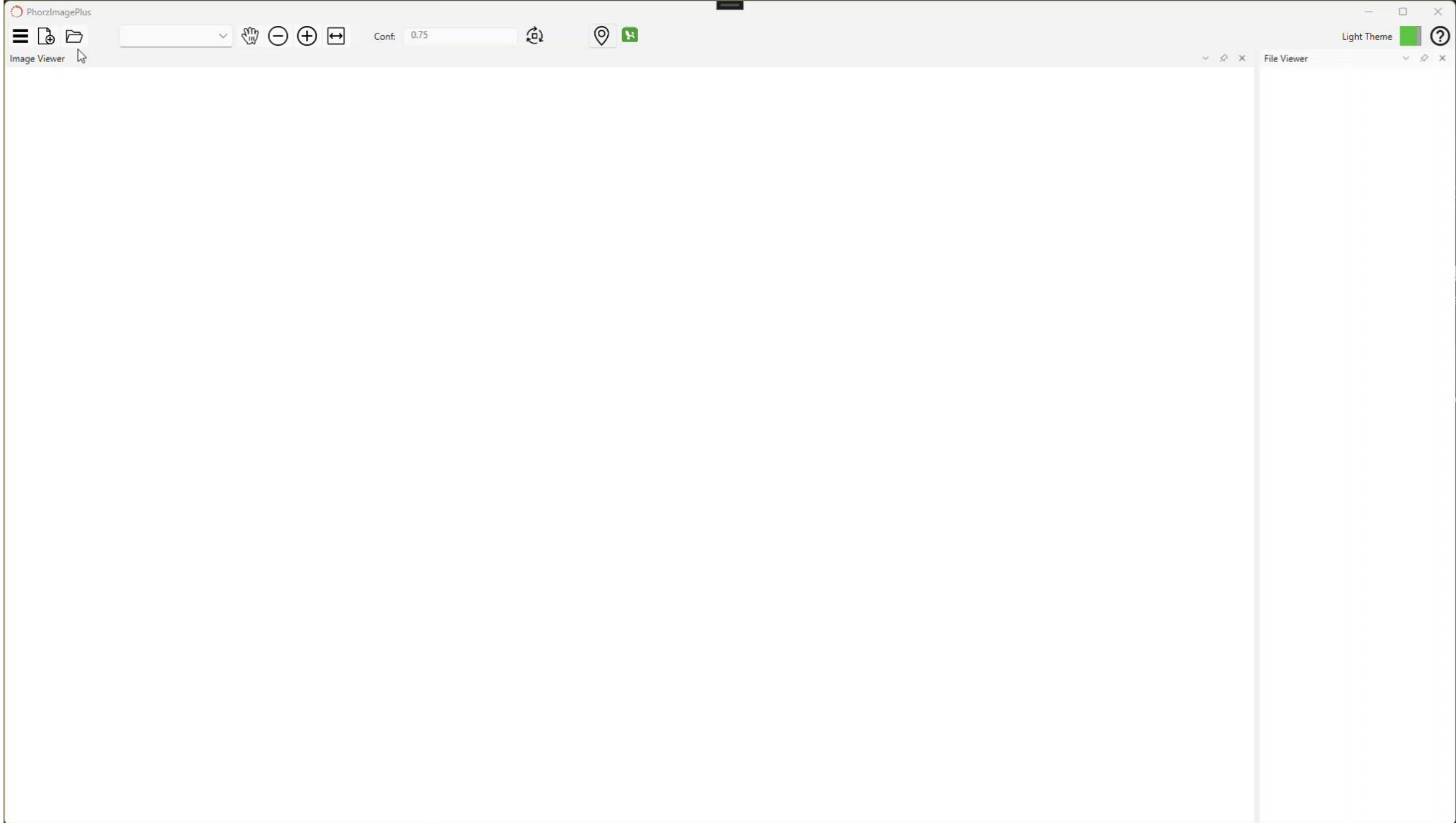
FLUG 2025 COCOA BEACH, FL



DRAWING DETECTION



IMAGERY DETECTION



Contact Info

Mark Stefanchuk

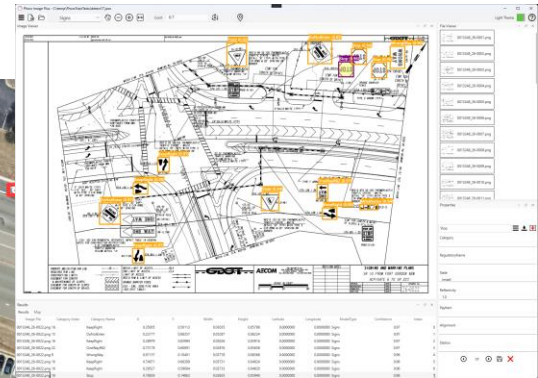
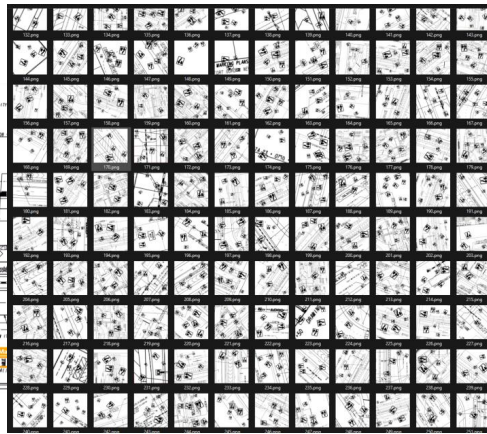
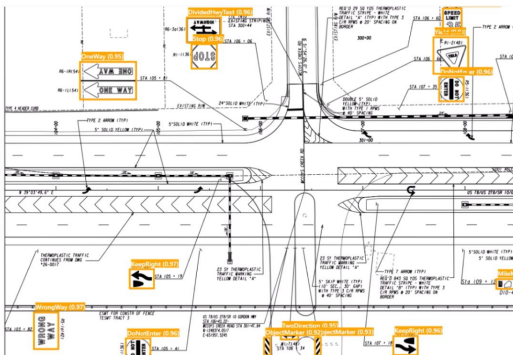
Phocaz, Inc.

256-529-5199

mark@phocaz.com

<https://www.Phocaz.com>

AI/ML | GIS | LRS



FLUG 2025 COCOA BEACH, FL

