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AUTOMATED FEATURE DETECTION (from PDF, PNG, TIFF, JPG)

An AI/ML Application [for Engineers]

Mark Stefanchuk, Phocaz Inc.

CTO, VP Development

FLUG 2025 COCOA BEACH, FL

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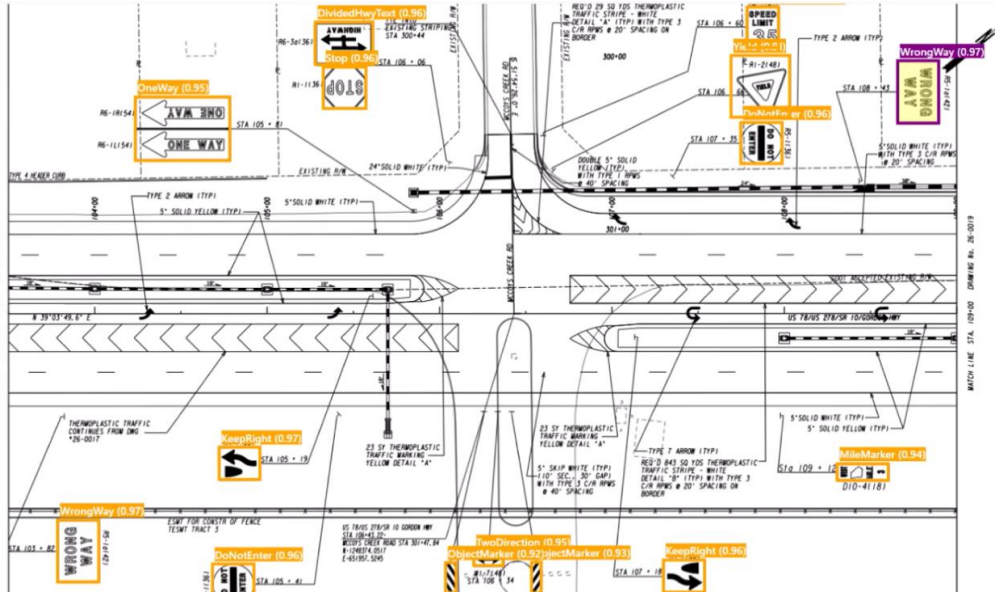
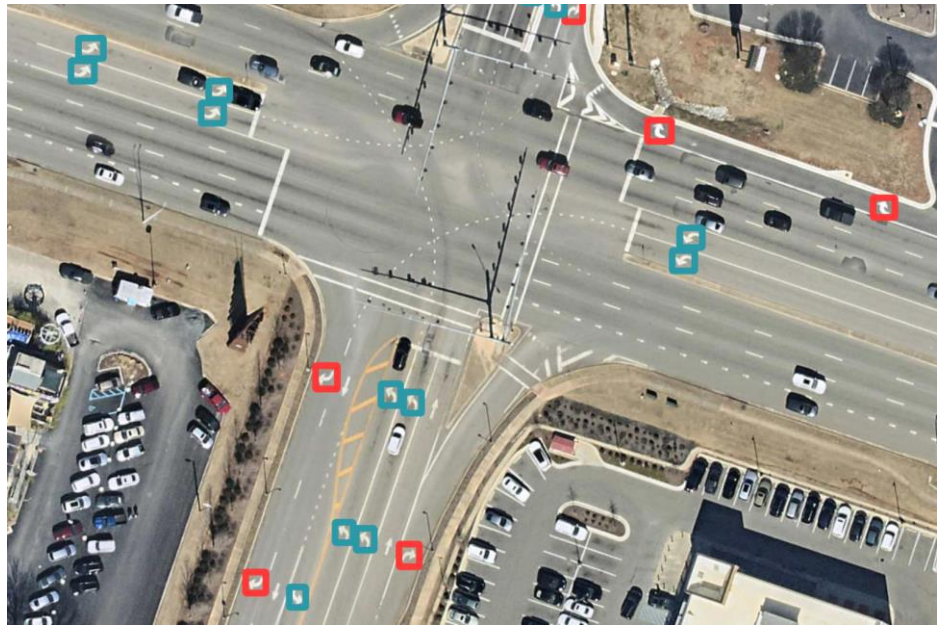
Detections



Can we detect features in drawings and images?



Can we build the models ourselves?

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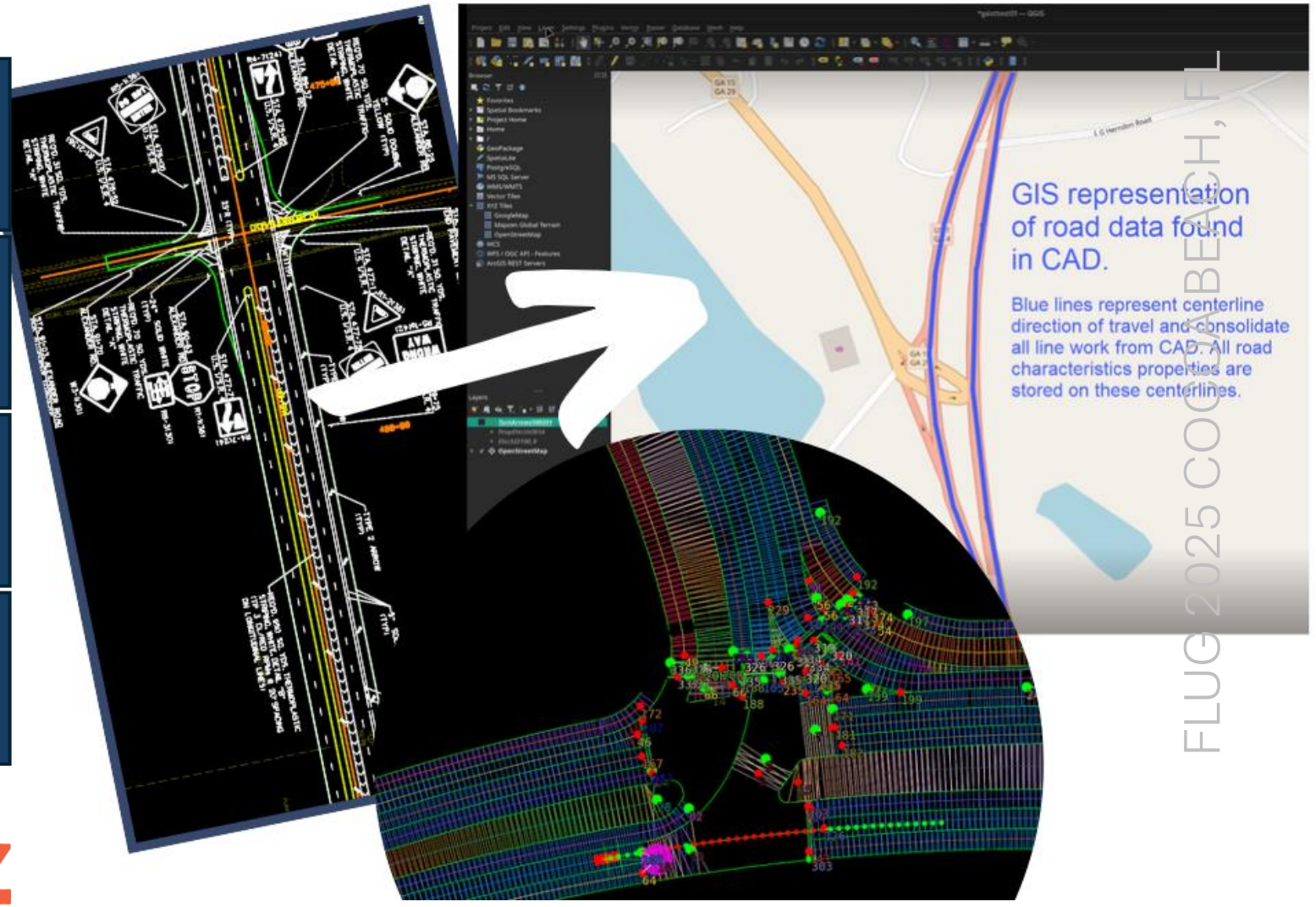
GDOT Original Use Case

- LEGACY CAD
- DIGITAL TWIN
- AI/ML
- GEOJSON



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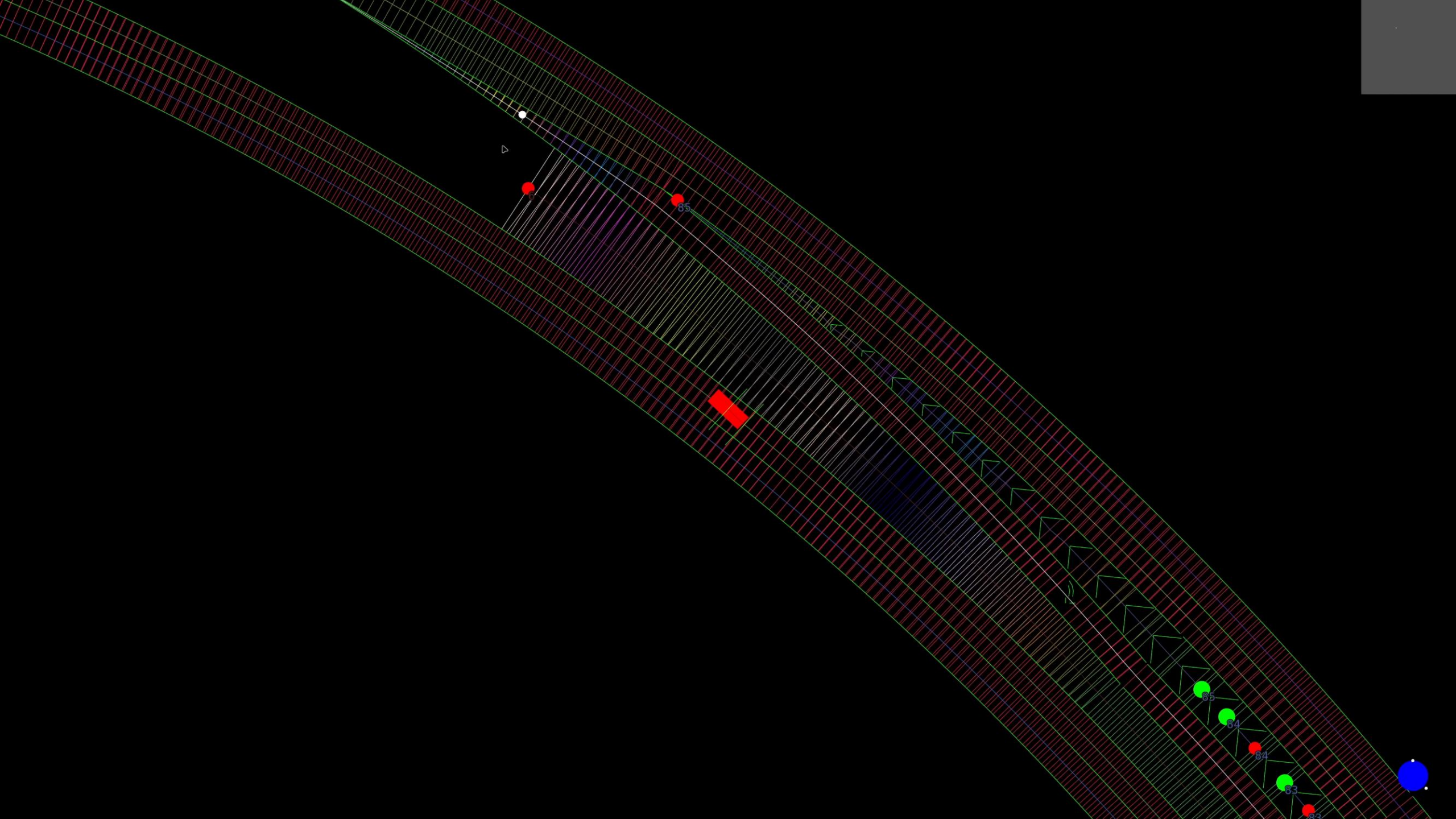
85
85
84
84
83

Challenges

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

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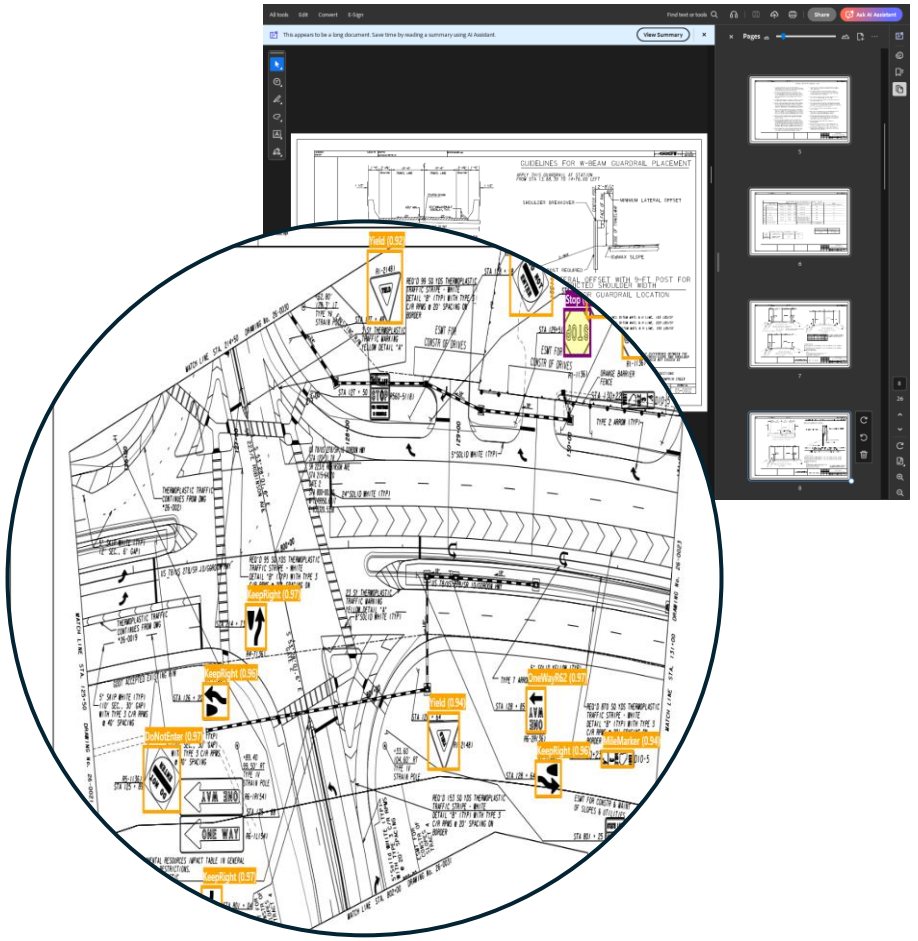
PDFs . PNG . TIFF . JPG

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



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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.

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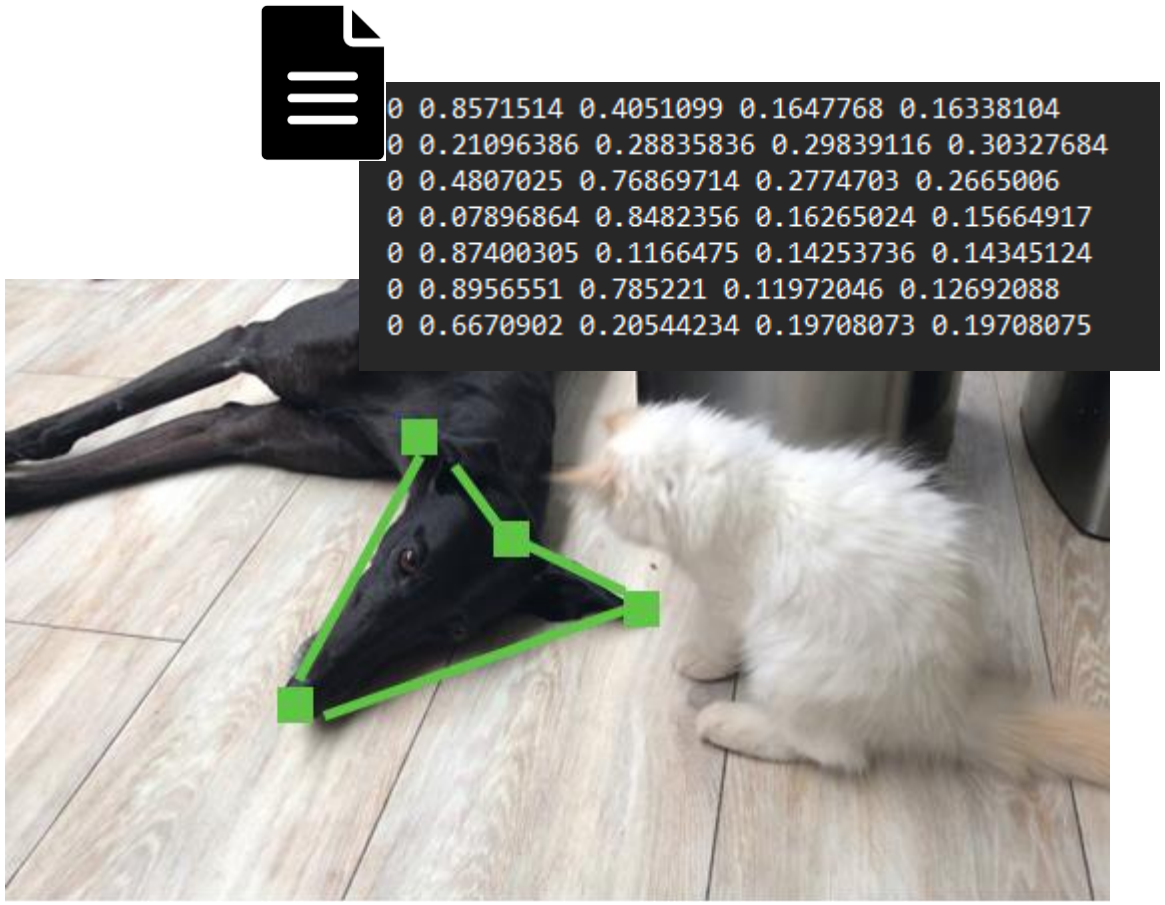
Not Easy

- 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.



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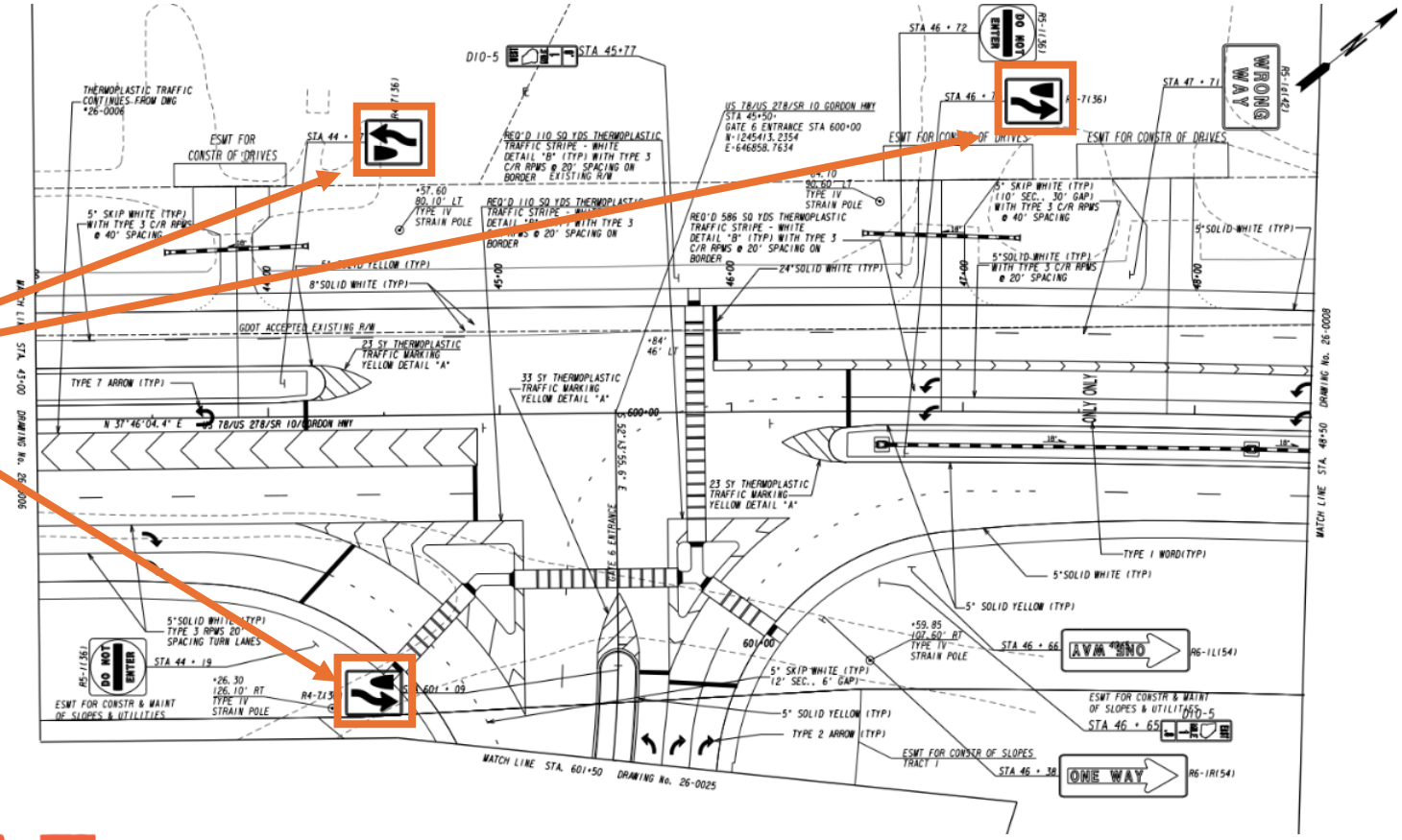
Same Thing for Drawings

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



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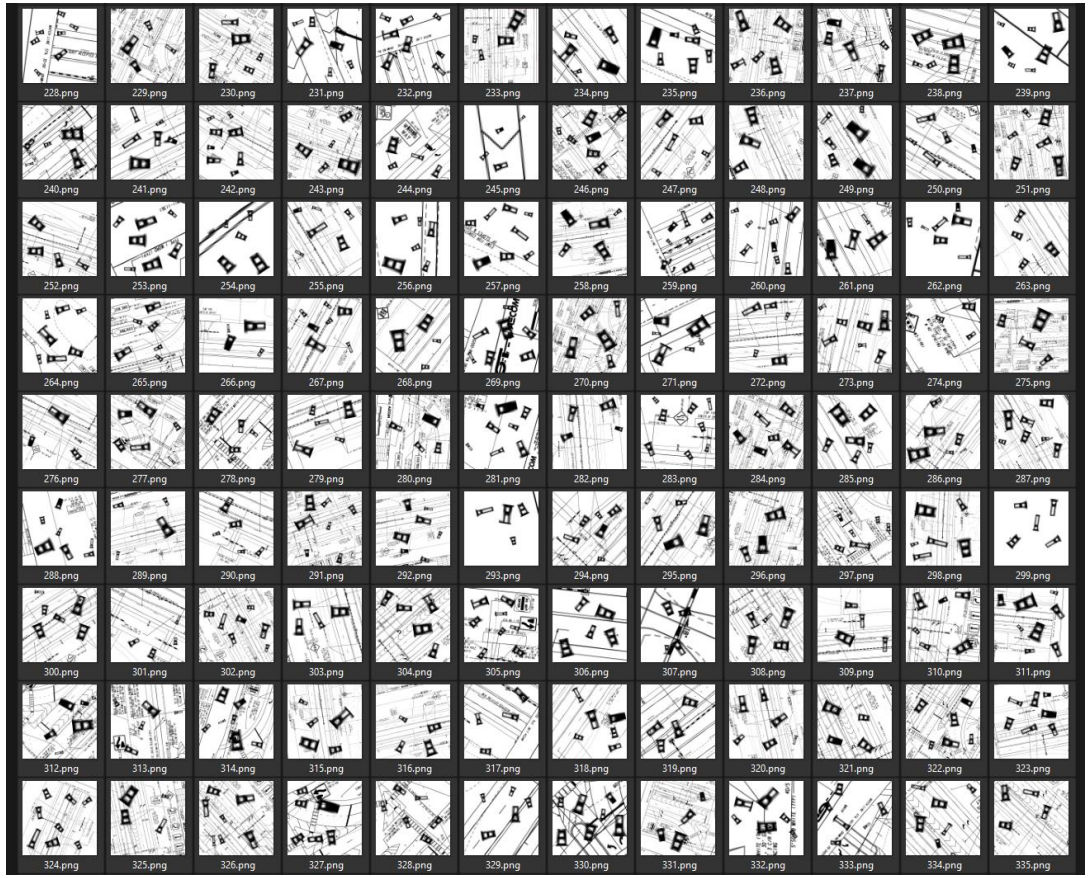
I don’t have facebook money

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



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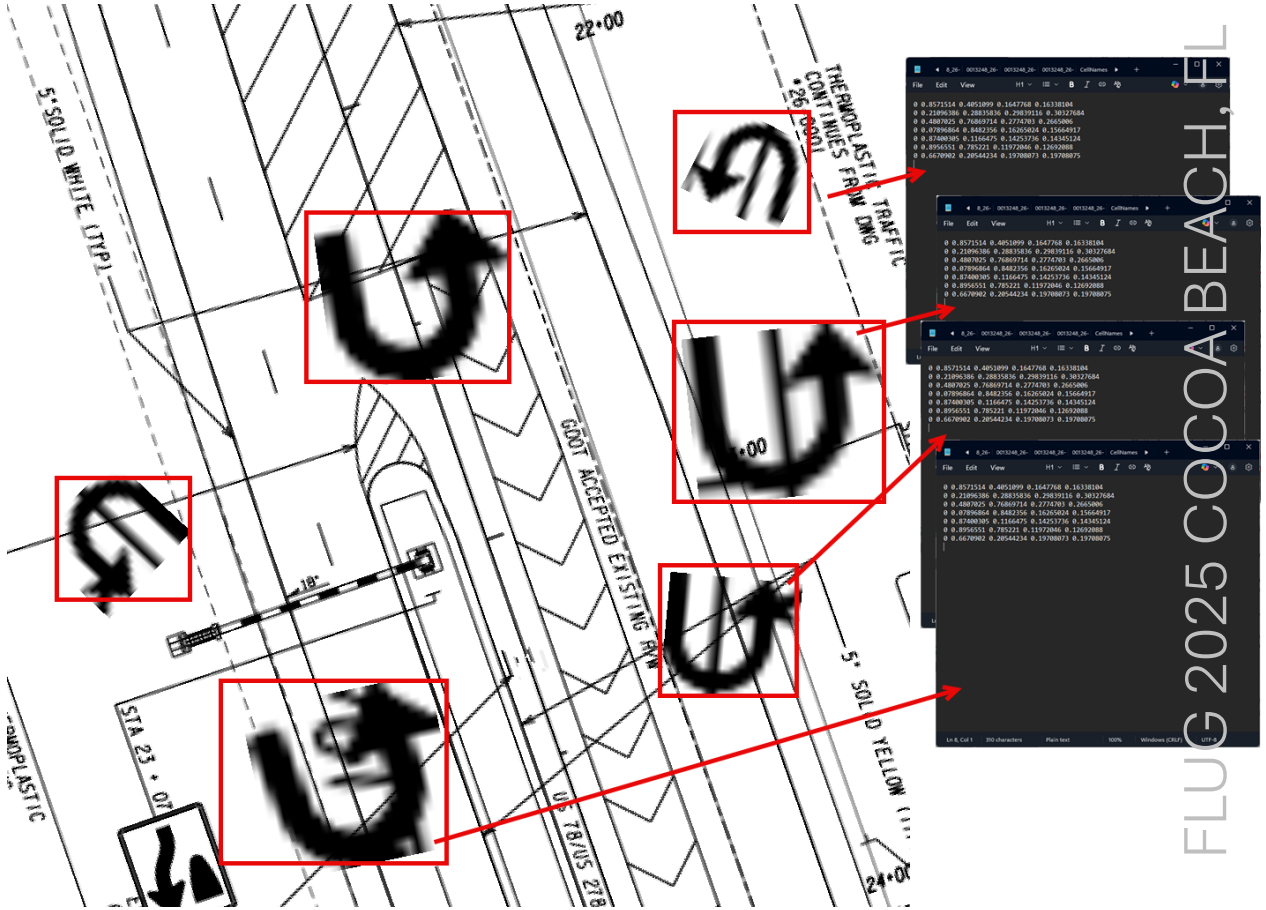
Synthetic Imagery

- 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.



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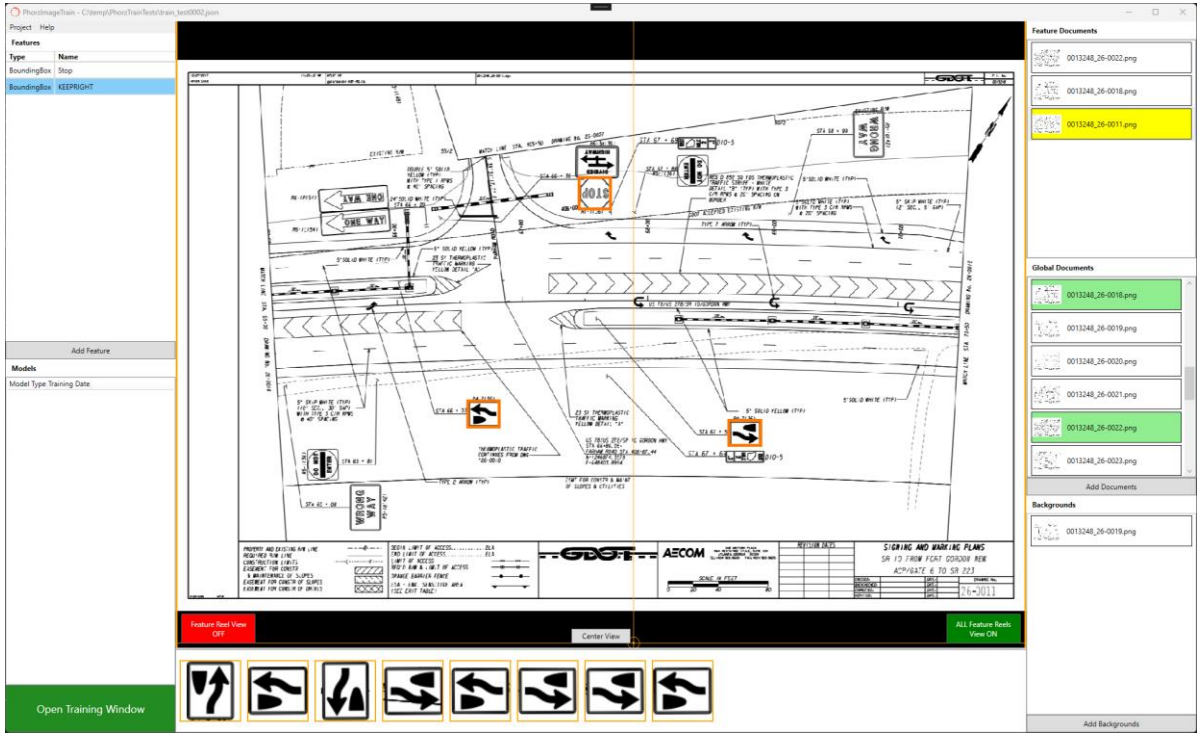
AI Training; How-to:

Let’s build our own model.



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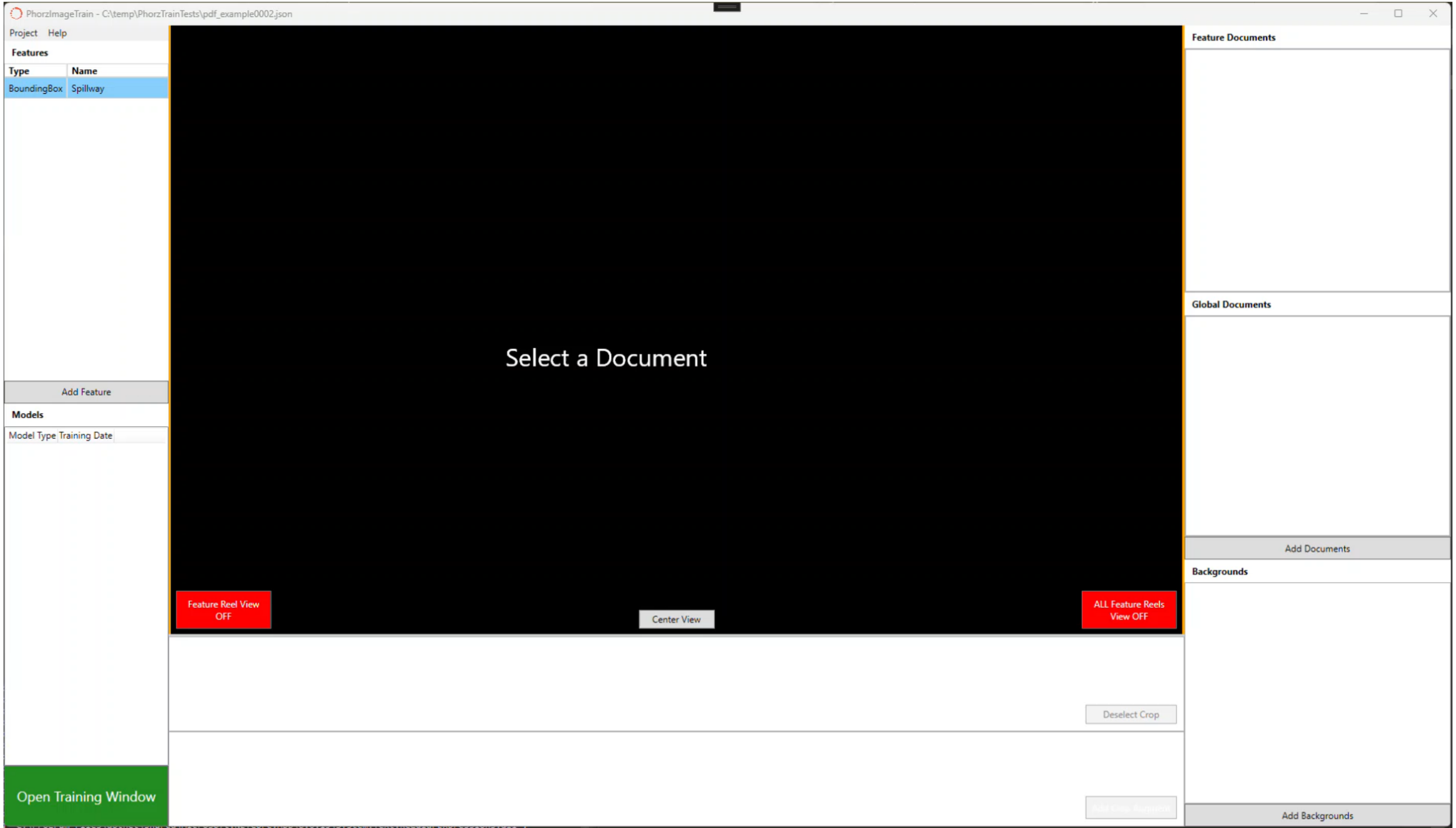
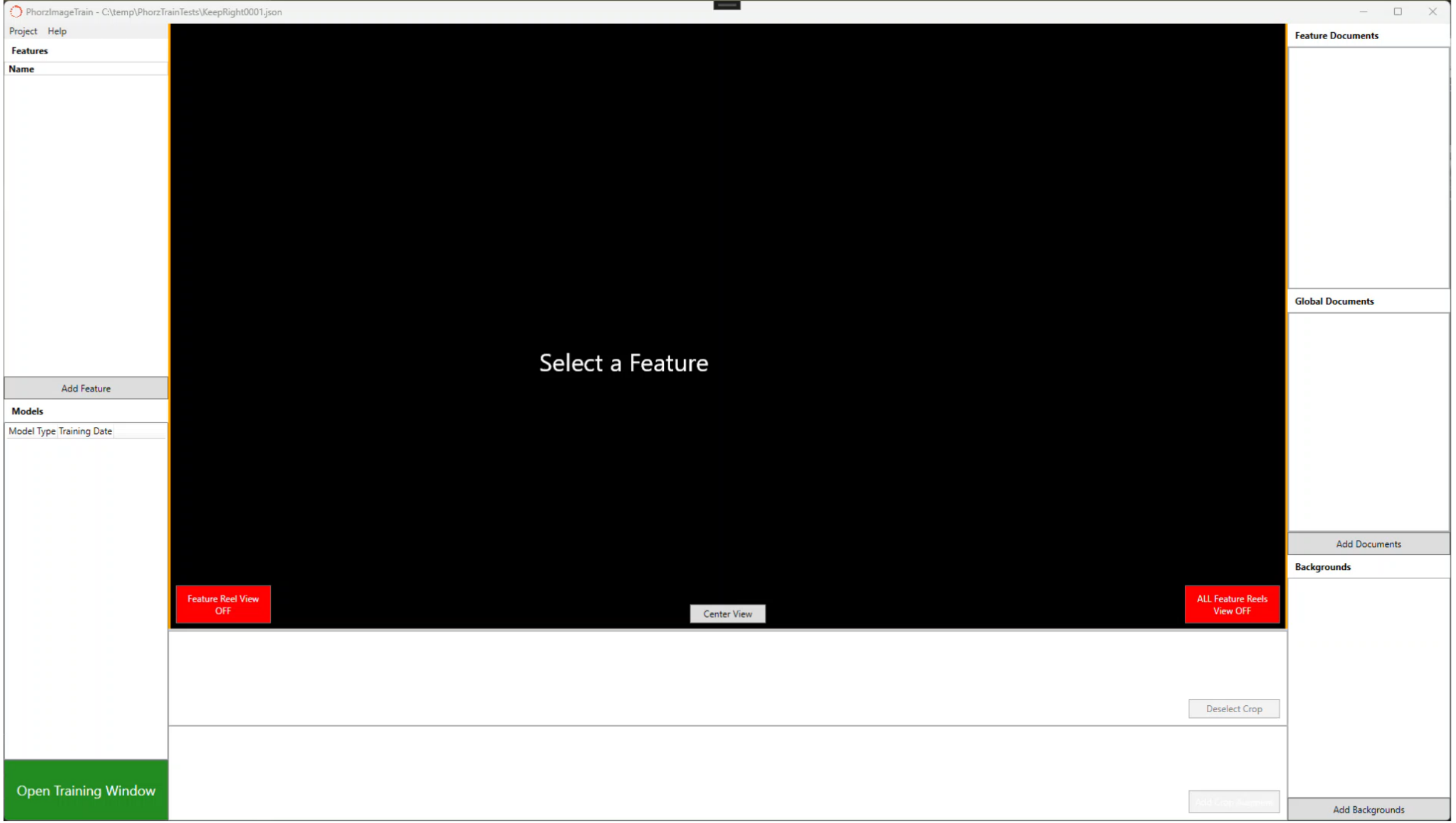
PDF EXAMPLE


PhorzImageTrain - C:\temp\PhorzTrainTests\pdf_example0002.json
Project
Help
Features
Type
Name
BoundingBox
Spillway
Add Feature
Models
Model Type
Training Date
Open Training Window
Select a Document
Feature Reel View OFF
Center View
ALL Feature Reels View OFF
Deselect Crop
Feature Documents
Global Documents
Add Documents
Backgrounds
Add Backgrounds

KEEP RIGHT EXAMPLE



TRAINING DATA

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

Project Help

Features

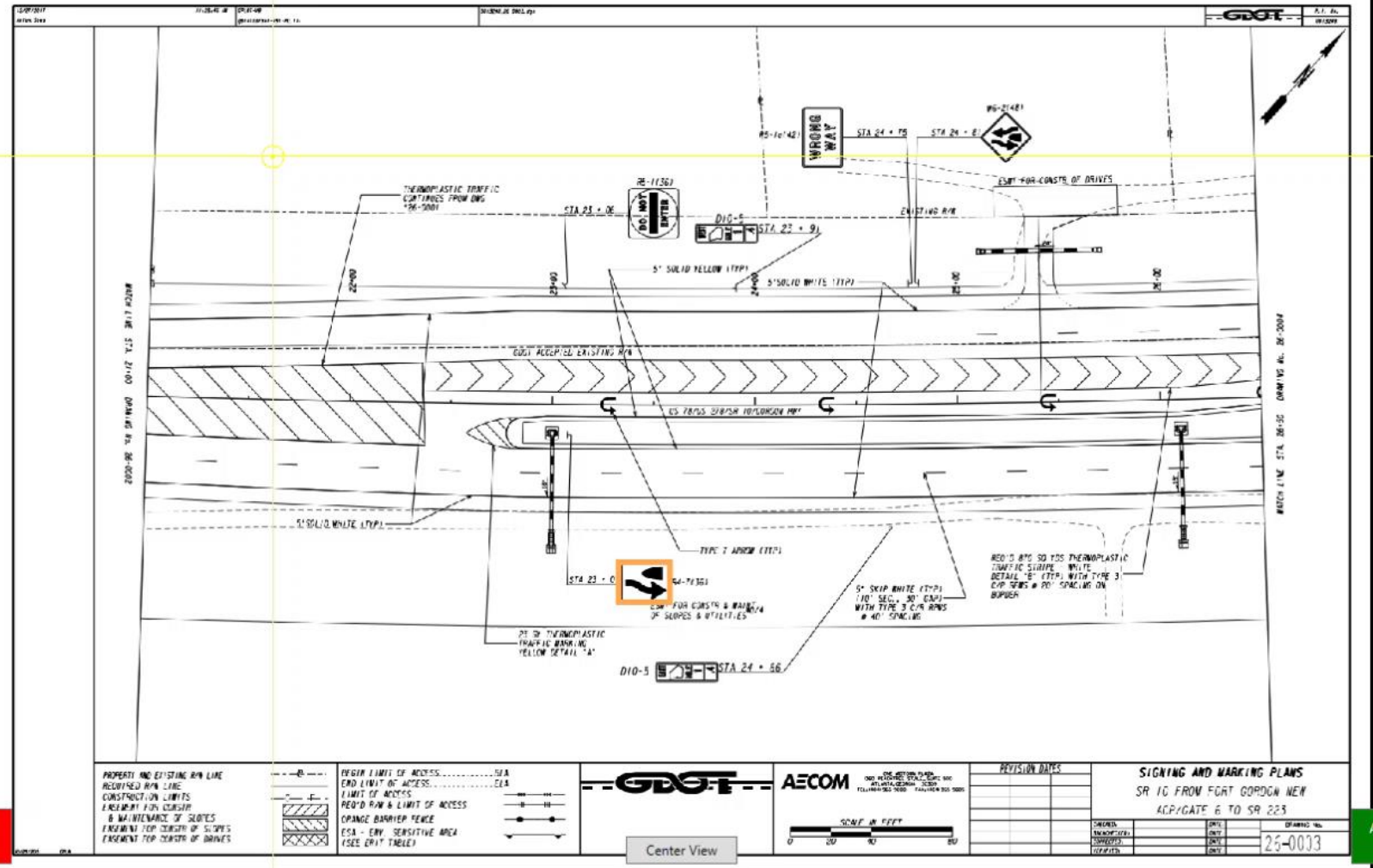
Name	
BoundingBox	KeepRight

Add Feature

Models

Model Type	Training Date

Open Training Window



Feature Reel View OFF

Center View

ALL Feature Reels View ON

Deselect Crop

Feature Documents

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

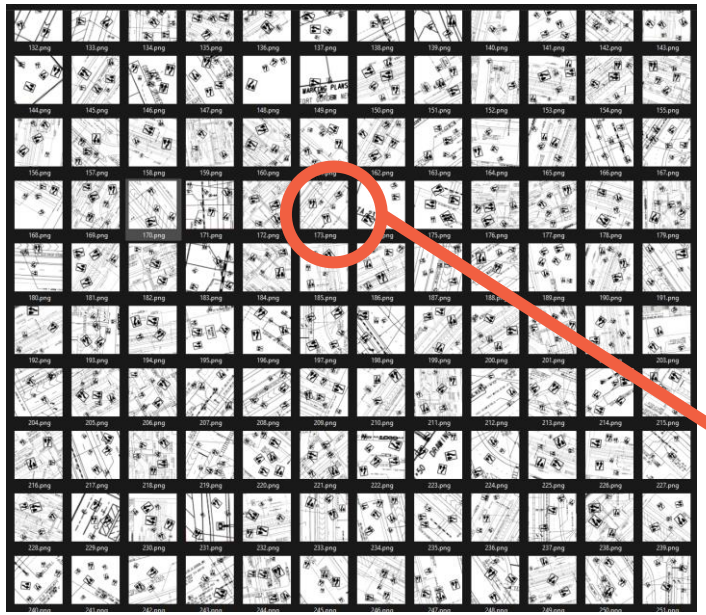
Global Documents

- 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 0.8956551 0.785221 0.11972046 0.12692088
0 0.6670902 0.20544234 0.19708073 0.19708075
```

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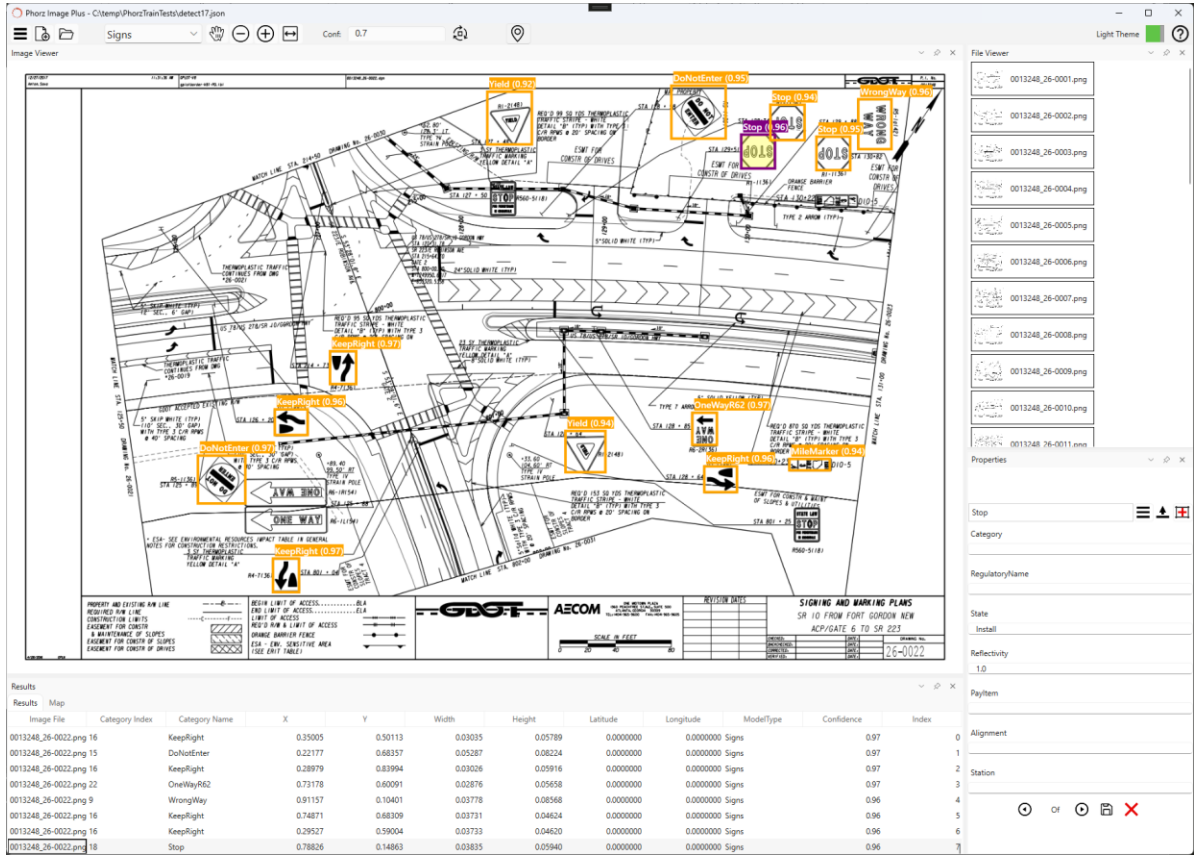
AI DETECTION



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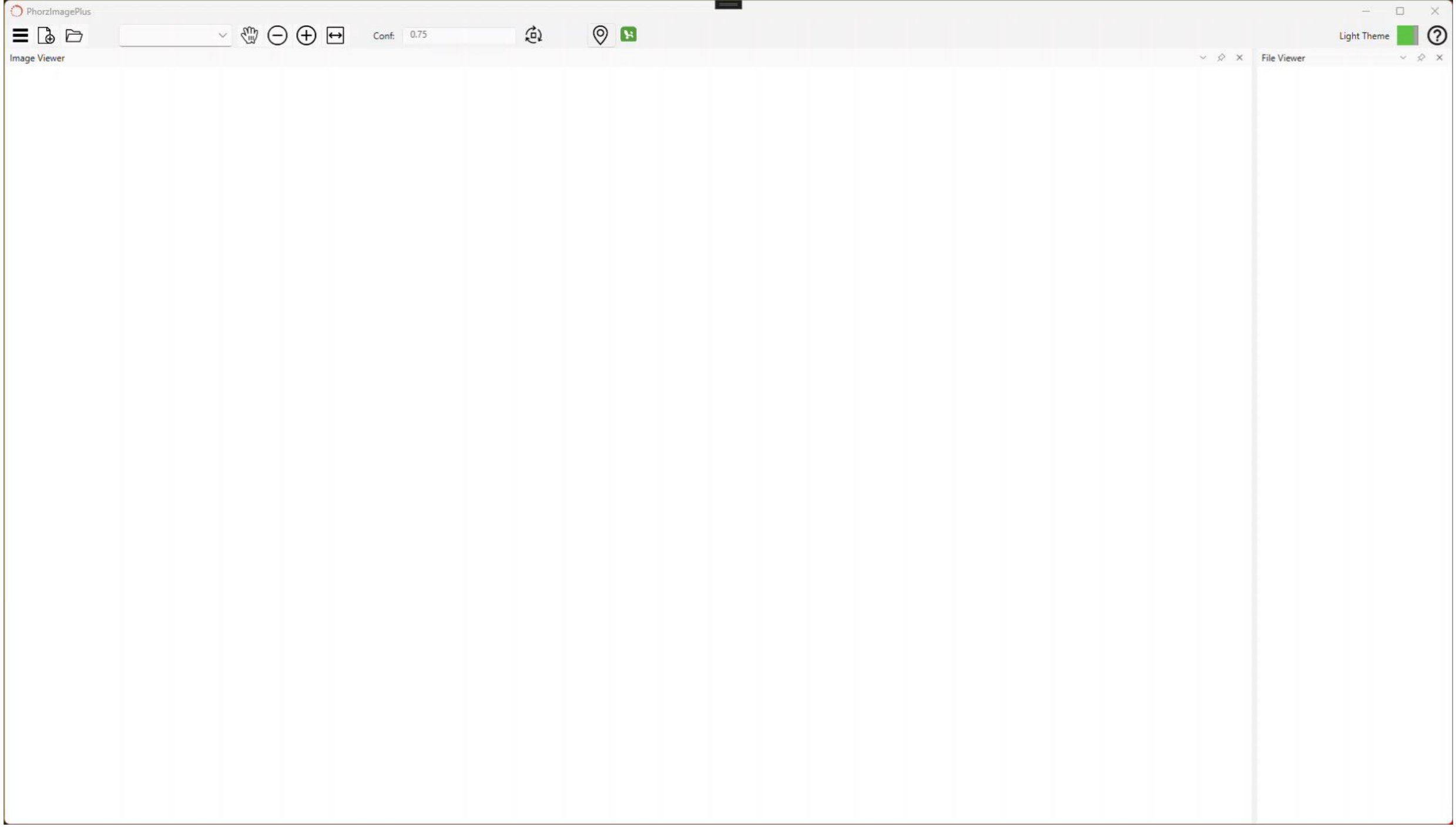
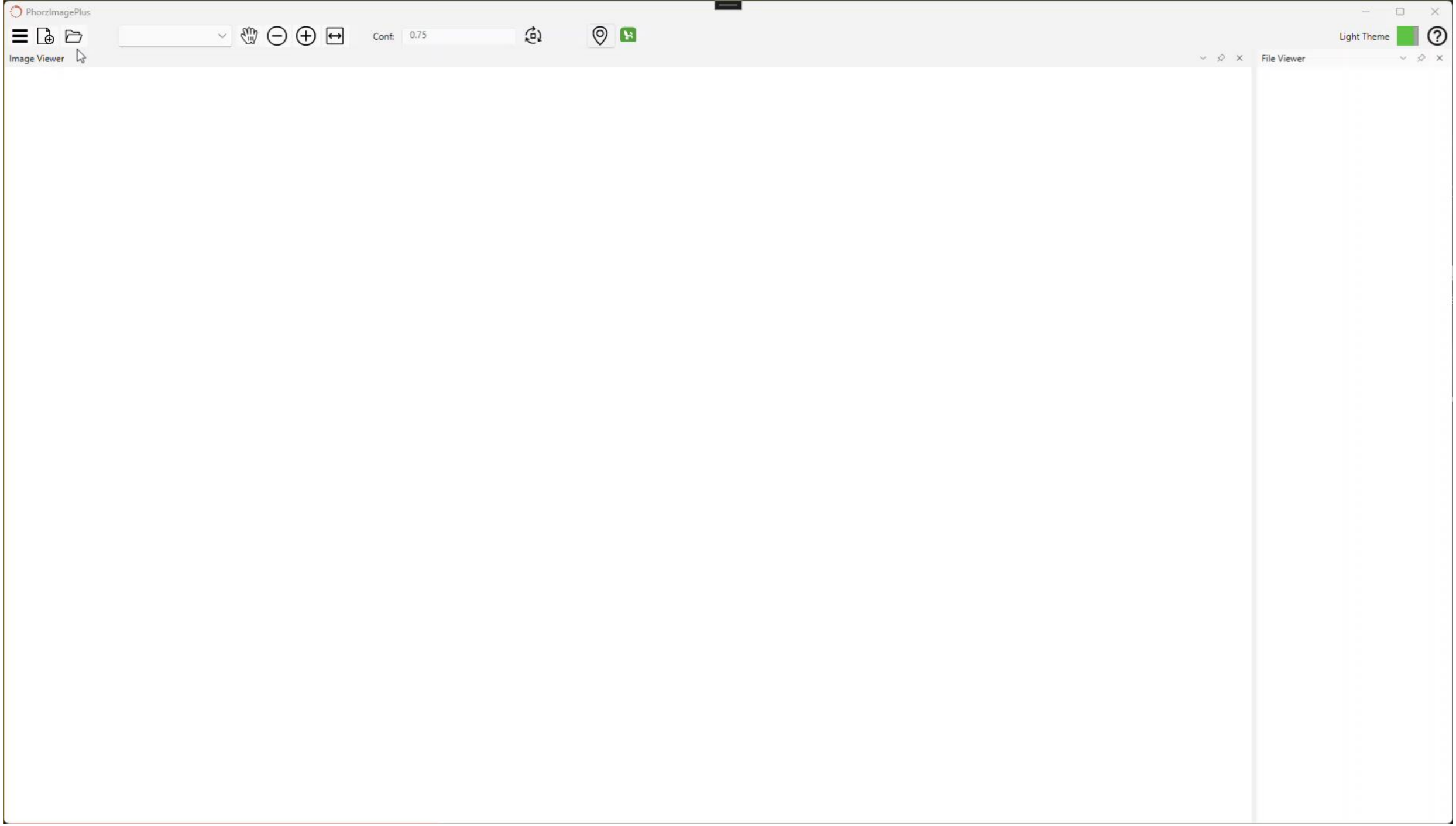
DRAWING DETECTION





IMAGERY DETECTION

Contact Info

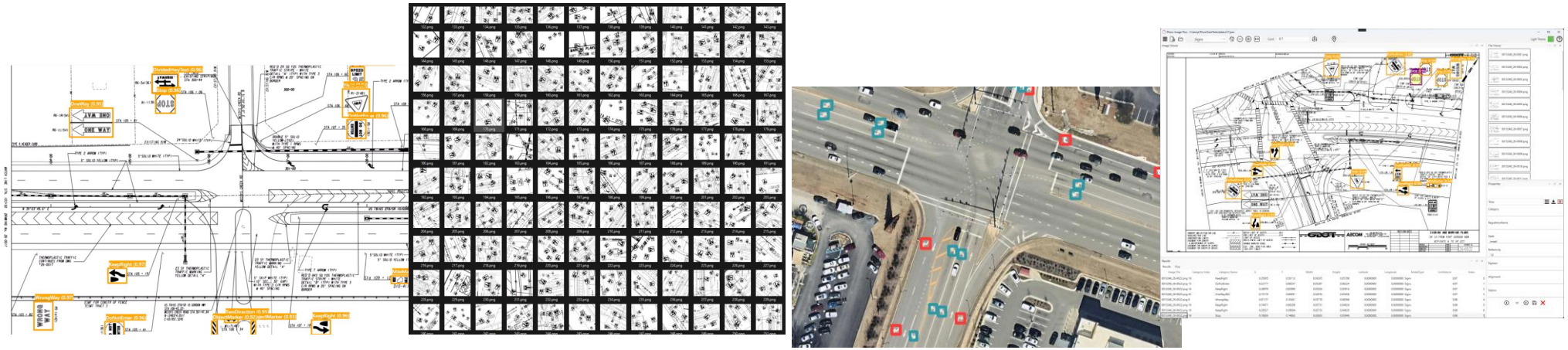
Mark Stefanchuk

Phocaz, Inc.

256-529-5199

mark@phocaz.com

https://www.Phocaz.com



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