FDOT IMPLEMENTATION TO AUTOMATED DISTRESS RATING

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PAVEMENT EVALUATION MANAGER - FDOT

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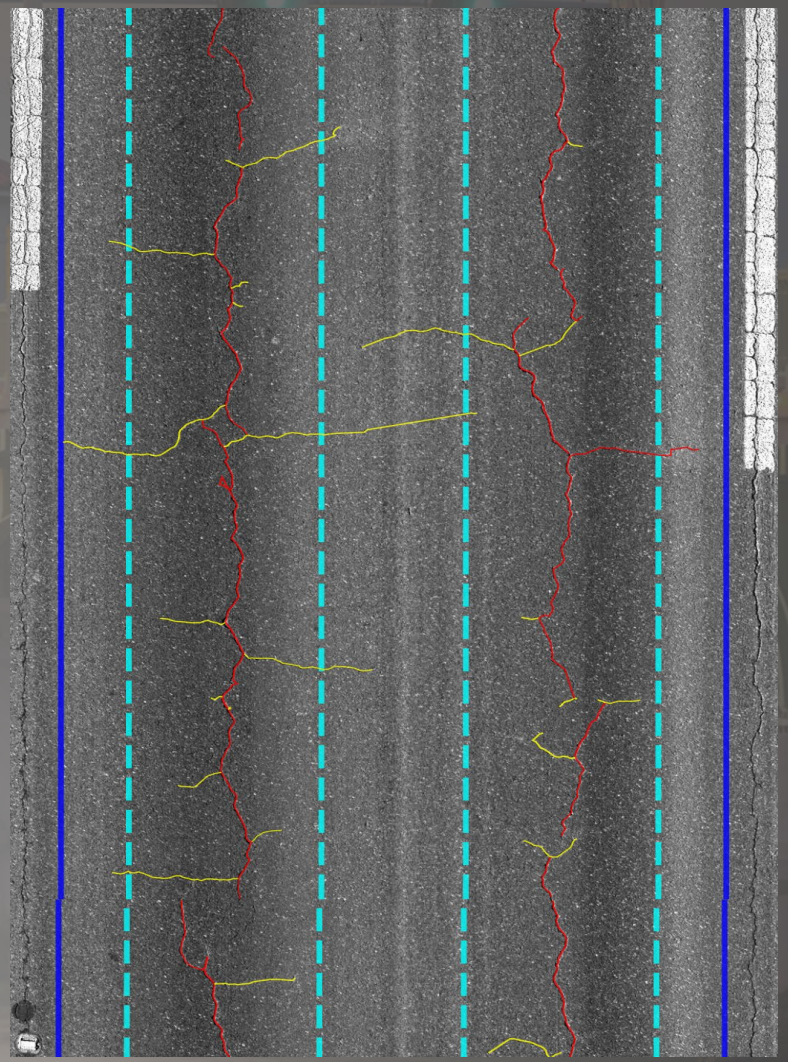
OUTLINE

- Background – Legacy Method
- Legacy Distress Rating Challenges
- Automated Distress System
- Automated Distress Model
- Automated Distress Segmentation
- Automated Rut Depth
- Data Sharing Tools
- Future Enhancements



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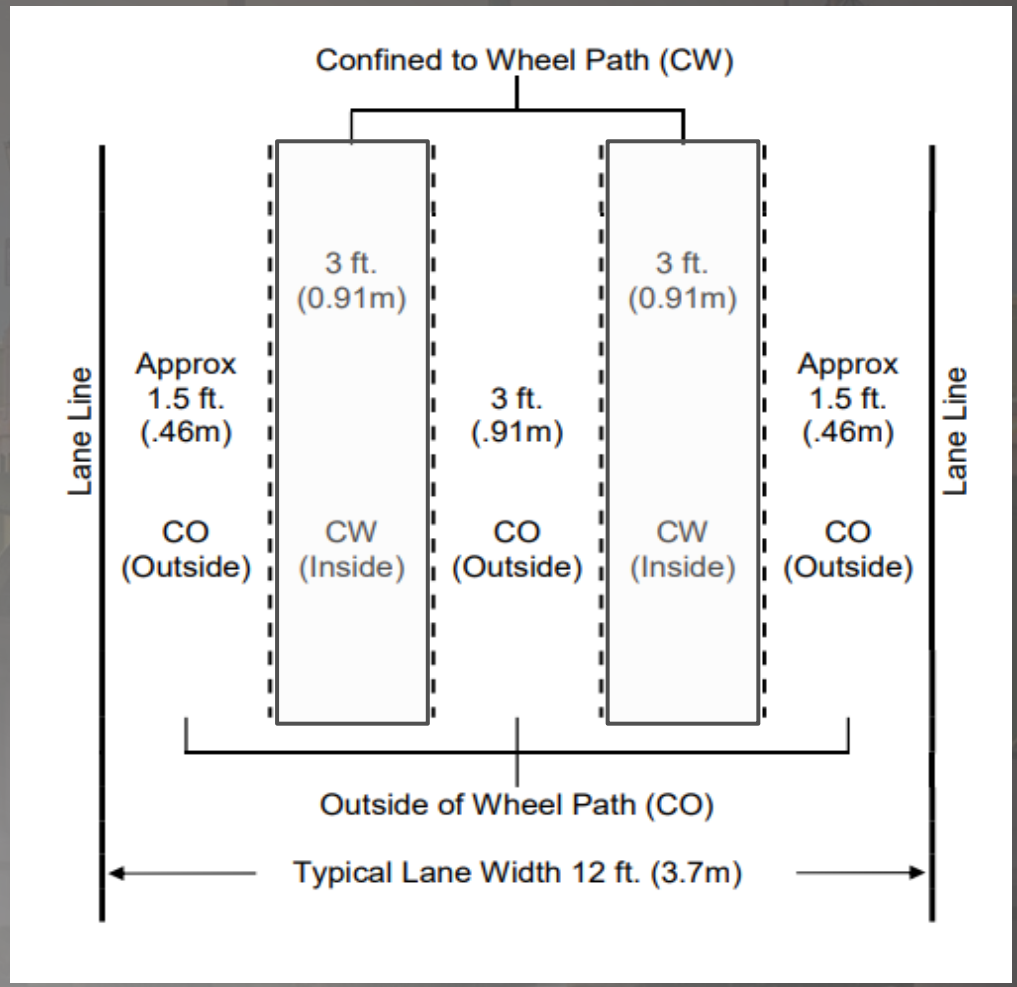
LEGACY METHOD - CRACKING DISTRESS RATING

PERCENT OF PAVEMENT AREA AFFECTED BY CRACKING	CONFINED TO WHEEL PATHS (CW) *PREDOMINANT CRACKING CLASS*		
	CLASS I CRACKING Width < 1/8"	**CLASS II CRACKING** 1/8" < Width ≤ 1/4"	**CLASS III CRACKING** Width > 1/4" (Including Raveling, Patching & Pumping)
	DEDUCT	**DEDUCT**	**DEDUCT**
0 – 5	0.0	0.5	1.0
6 – 25	1.0	2.0	2.5
26 – 50	2.0	3.0	4.5
51+	3.5	5.0	7.0

PERCENT OF PAVEMENT AREA AFFECTED BY CRACKING	OUTSIDE OF WHEEL PATHS (CO) *PREDOMINANT CRACKING CLASS*		
	CLASS I CRACKING Width < 1/8"	**CLASS II CRACKING** 1/8" < Width ≤ 1/4"	**CLASS III CRACKING** Width > 1/4" (Including Raveling, Patching & Pumping)
	DEDUCT	**DEDUCT**	**DEDUCT**
0 – 5	0.0	0.0	0.0
6 – 25	0.5	1.0	1.0
26 – 50	1.0	1.5	2.0
51+	1.5	2.0	3.0

CRACK RATING = 10 – (CW + CO)



LEGACY – DISTRESS RATING CHALLENGES

- Not easy to determine crack width & extent while driving at traffic speed
- Subjective & rater dependent
- Assigned as representative condition of entire section (0.500 to 30 miles, construction limits)
- Same rating for wide range of distress level and amount
  - ✓ Not ideal for performance modeling
  - ✓ Crack rating can plateau for several years
- Not accepted by FHWA for HPMS reporting

% Distressed Area
01 -- 05
06 -- 25
26 -- 50
51+

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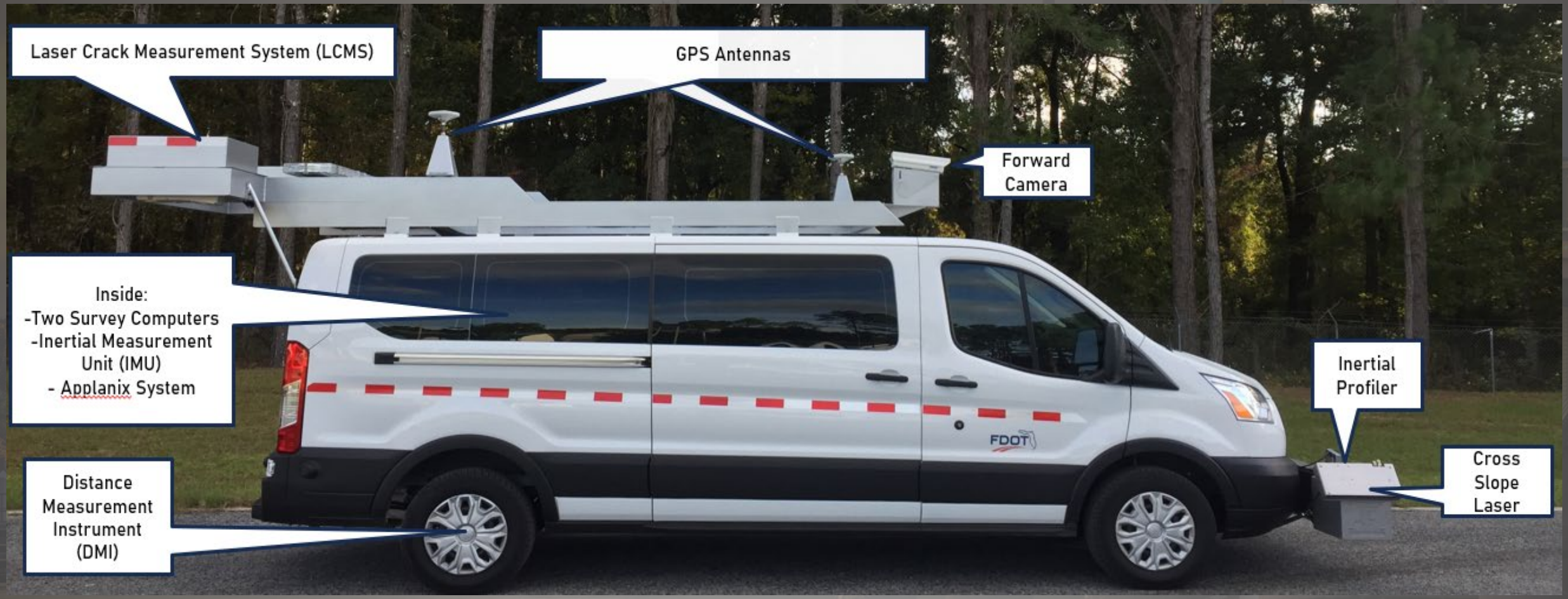
AUTOMATED DISTRESS SYSTEM



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AUTOMATED DISTRESS SYSTEM

- 3D laser data for crack, rut, fault & other features
  - ✓ 4-meter transverse profile consisting of 4160 points
  - ✓ Sampling Interval 2 mm
- Inertial profiling system (smoothness)
- Cross-slope & grade
- Forward imaging
- GPS (sub-meter accuracy)
- All distresses reported at selected intervals (e.g., 0.1-mile, section limits, etc.)

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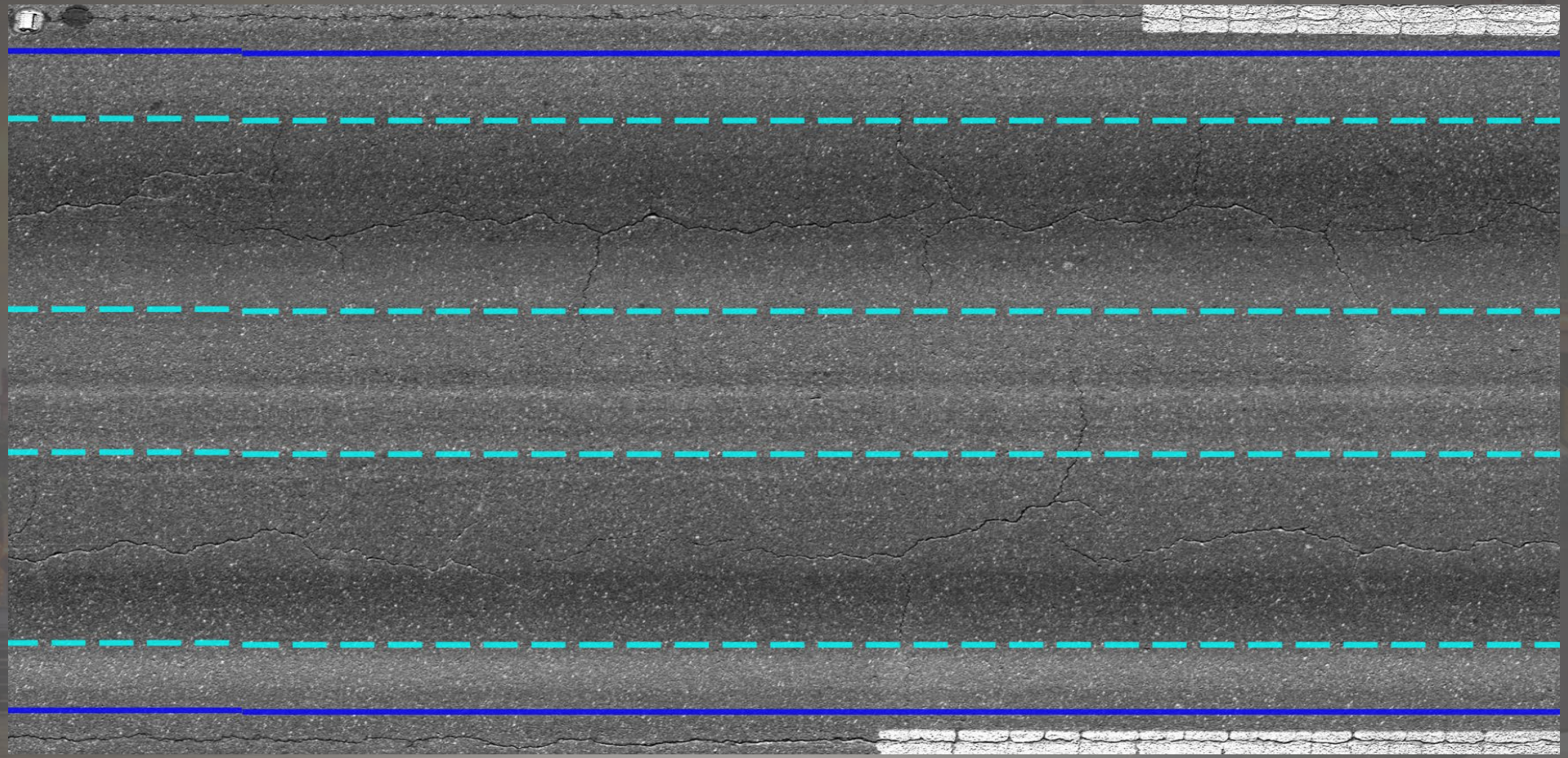
AUTOMATED CRACK DETECTION



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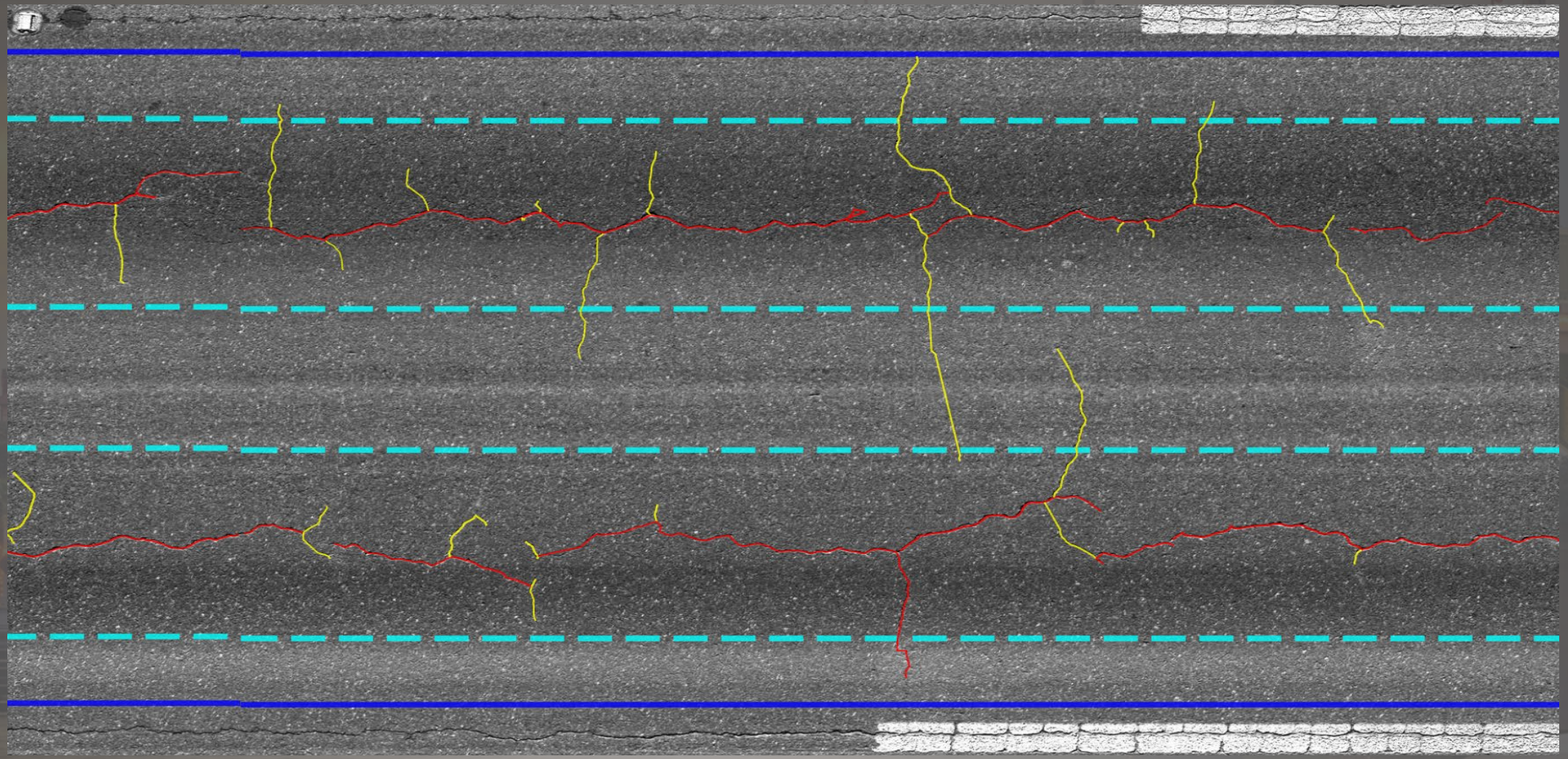
AUTOMATED CRACK DETECTION



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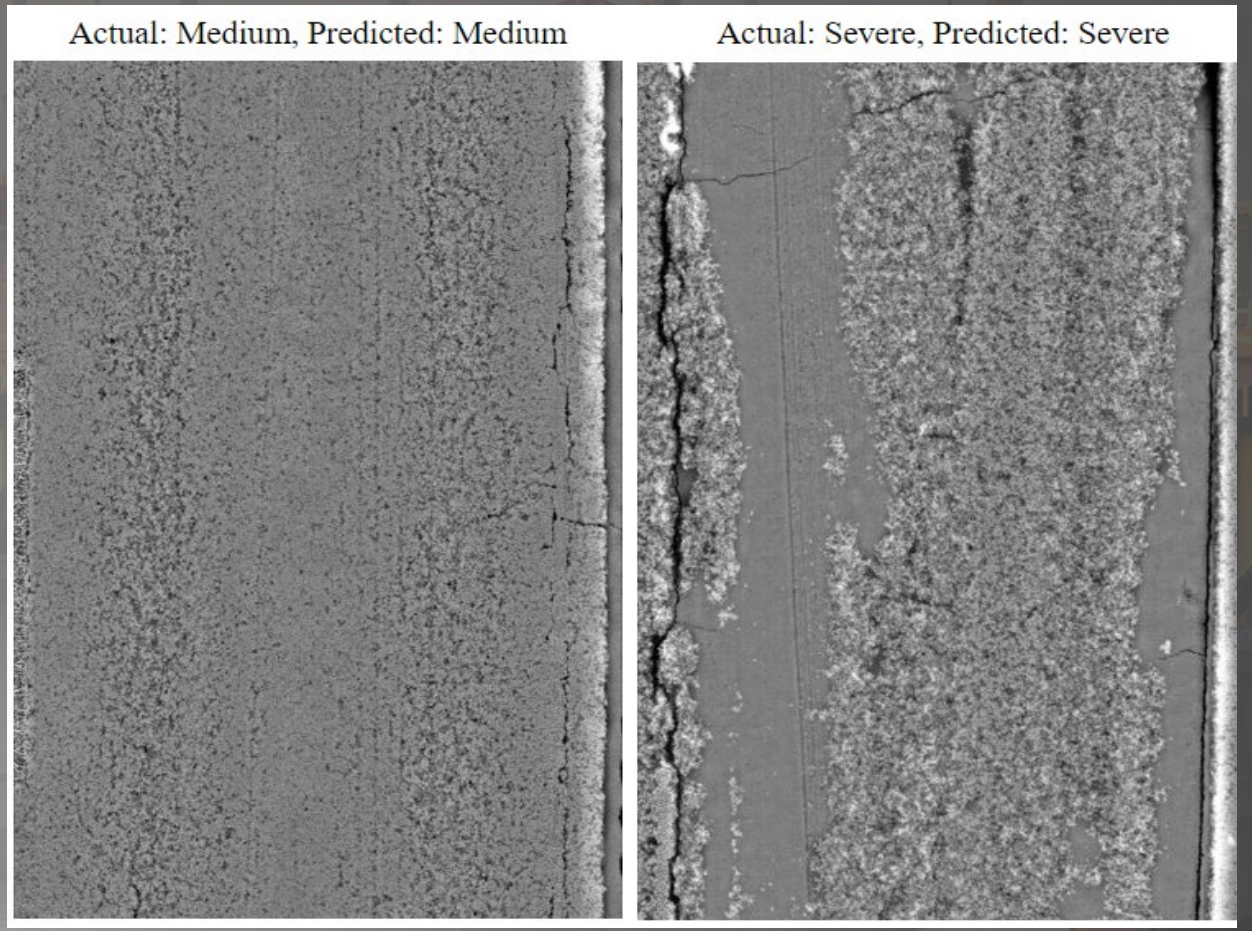
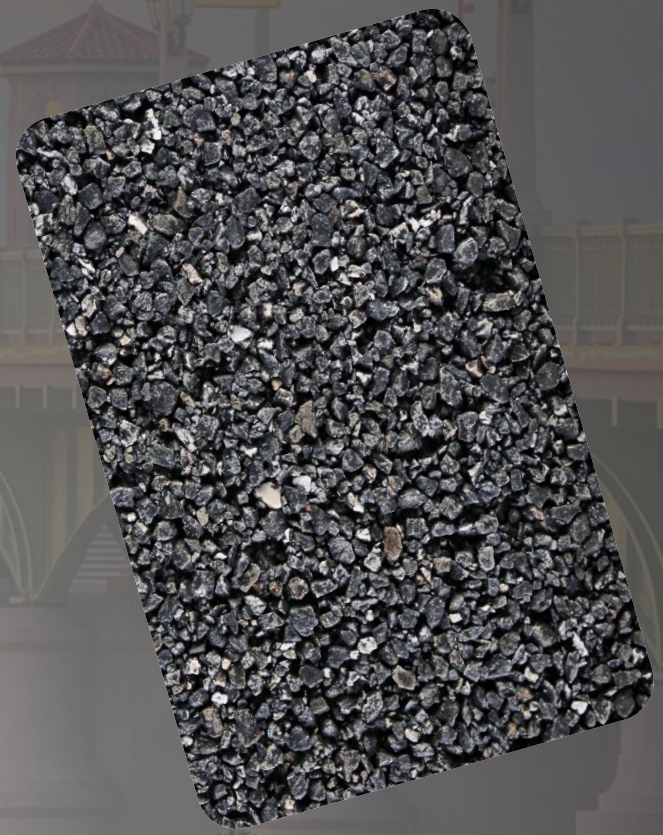
AUTOMATED RAVELING DETECTION

- Macrotexture features calculated from Range images
- Images with known raveling severity & calculated macrotexture features used to train machine learning model
- Machine Learning Technology (Random Forest)



AUTOMATED RAVELING REPORTING



- Raveling severity assessed every image (20 ft.) & summarized in 0.1-mile intervals
- Problem areas within a section can be identified
- Ravel Rating can be used to identify OGFC only candidates
- Coded and stored separately but included in the overall Crack Rating calculations

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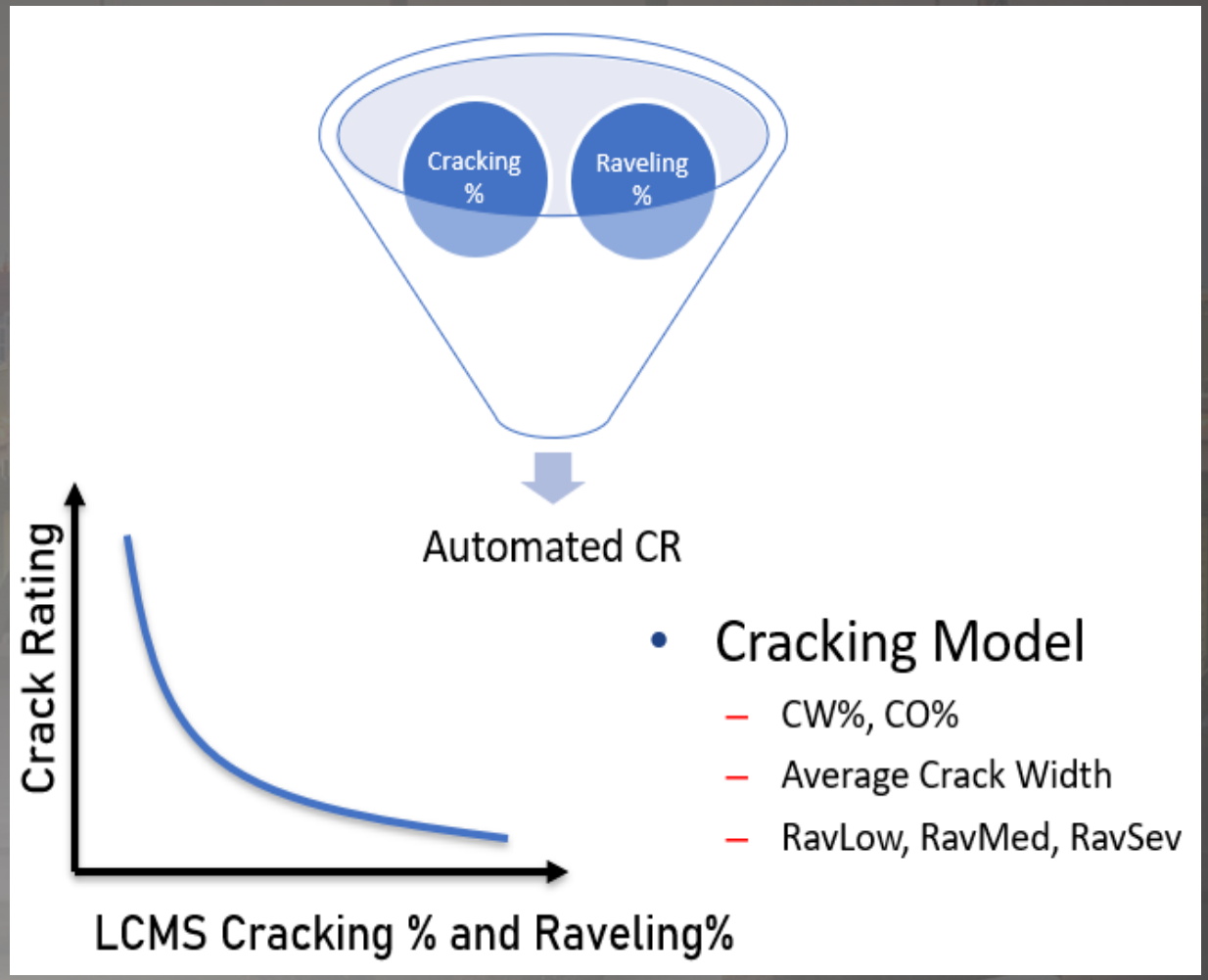
AUTOMATED DISTRESS MODEL

- To determine a model whose inputs are automated cracking and raveling percents and the output is the Automated Crack Rating
- "Crack Rating Transition":
  - ✓ Similar number of failing miles
  - ✓ Highest percent of matching miles
- Model easy to explain and apply



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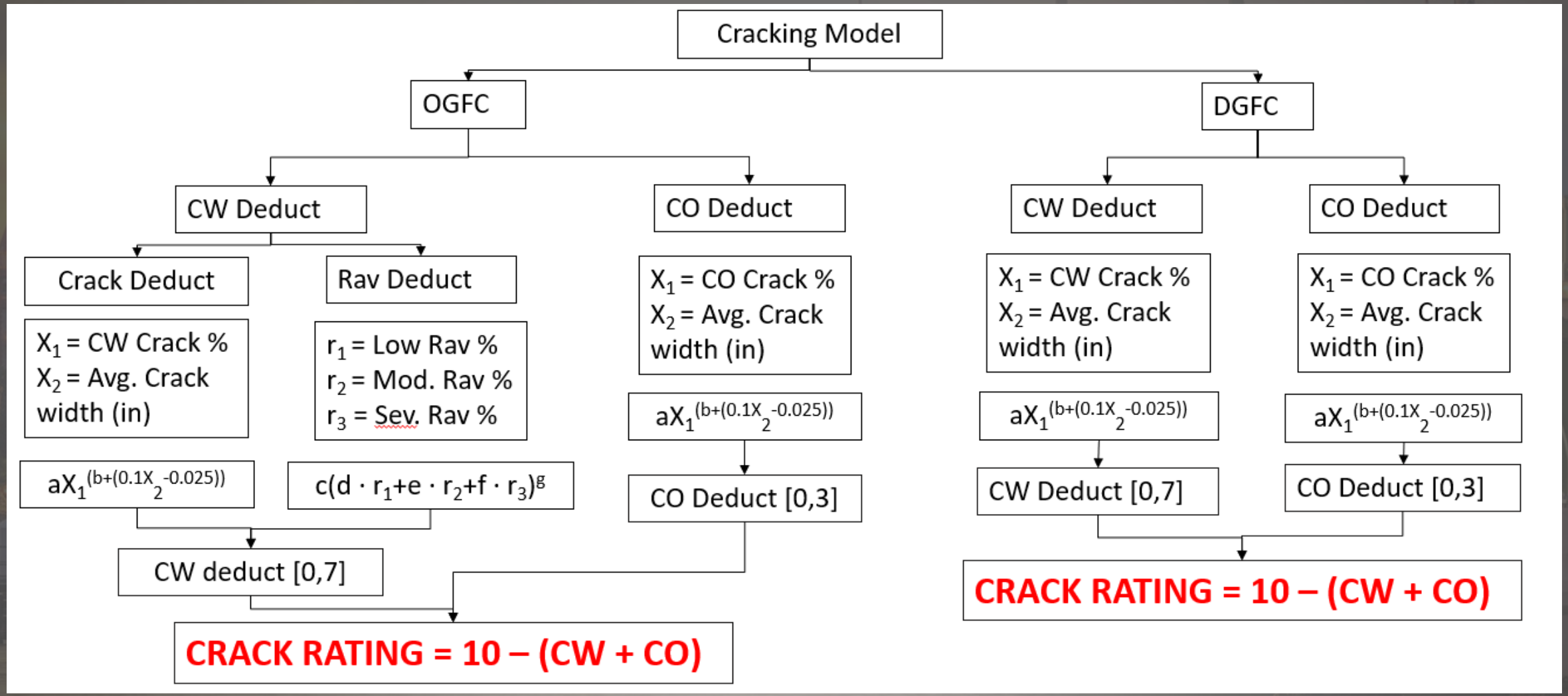
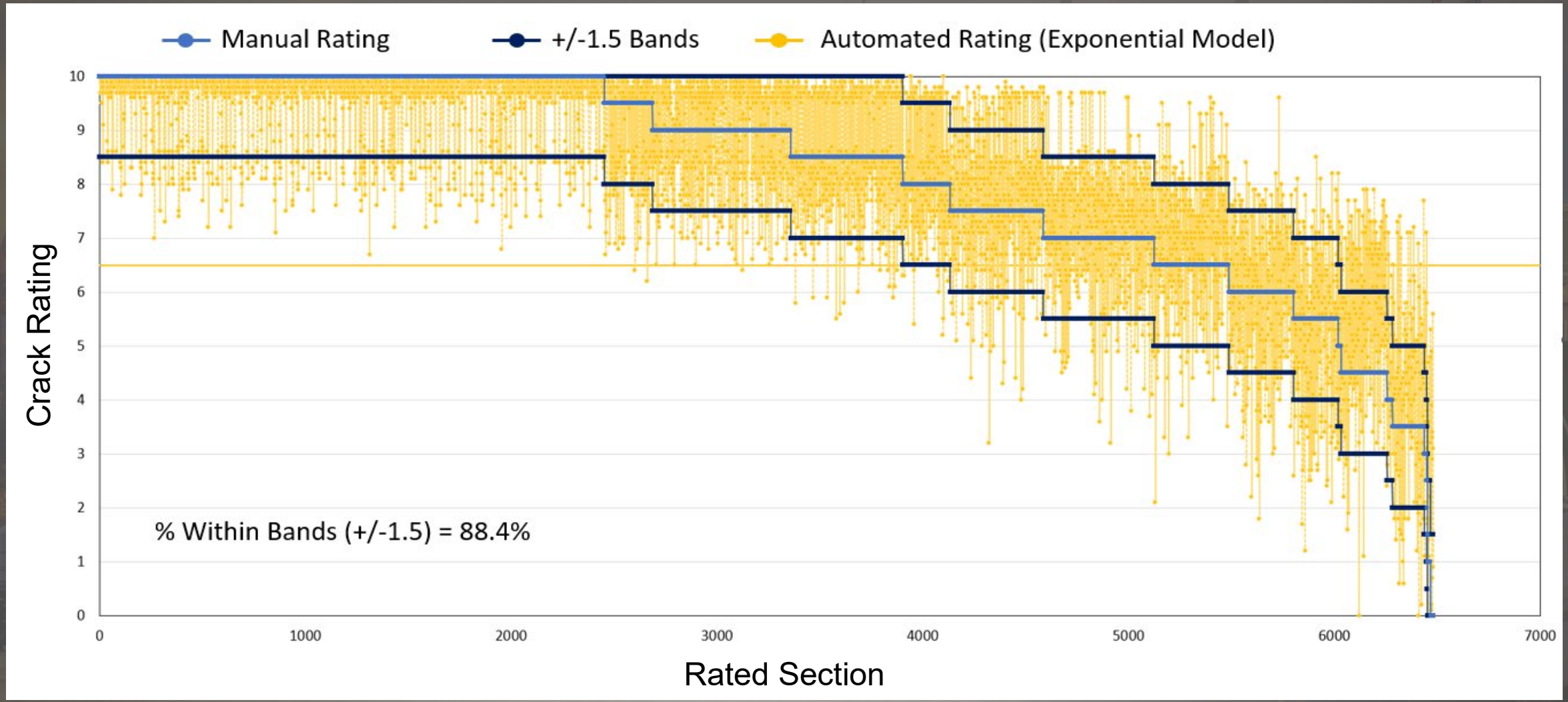
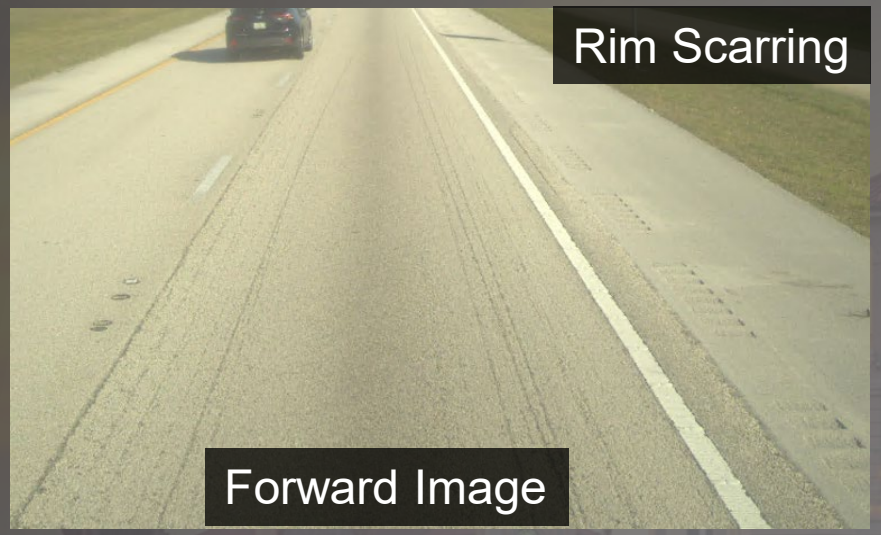
AUTOMATED DISTRESS MODEL

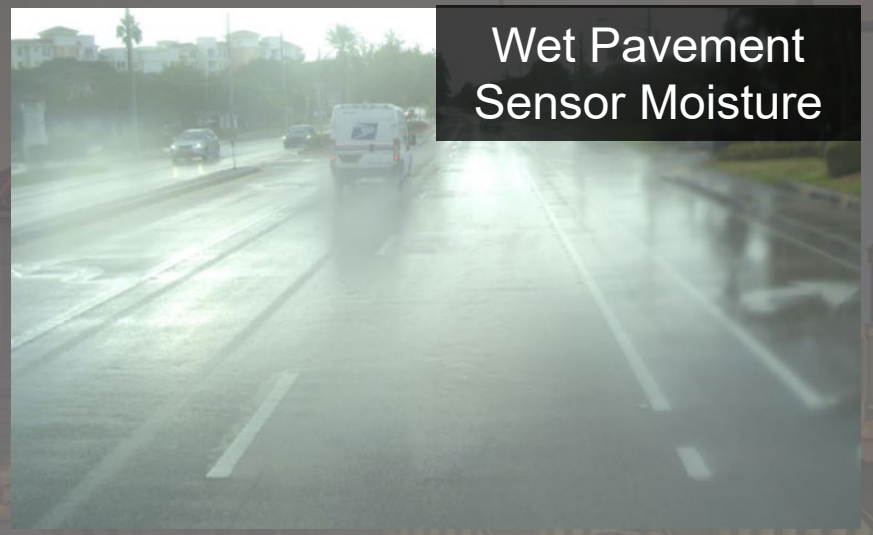


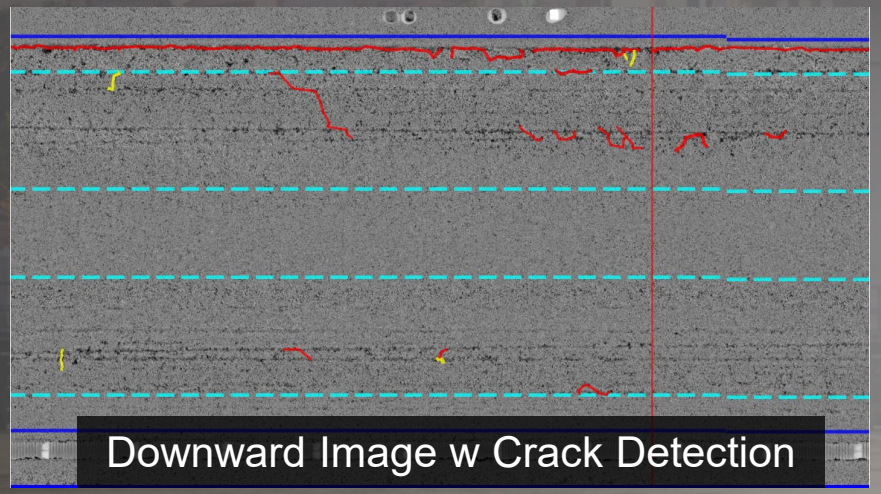
AUTOMATED DISTRESS MODEL

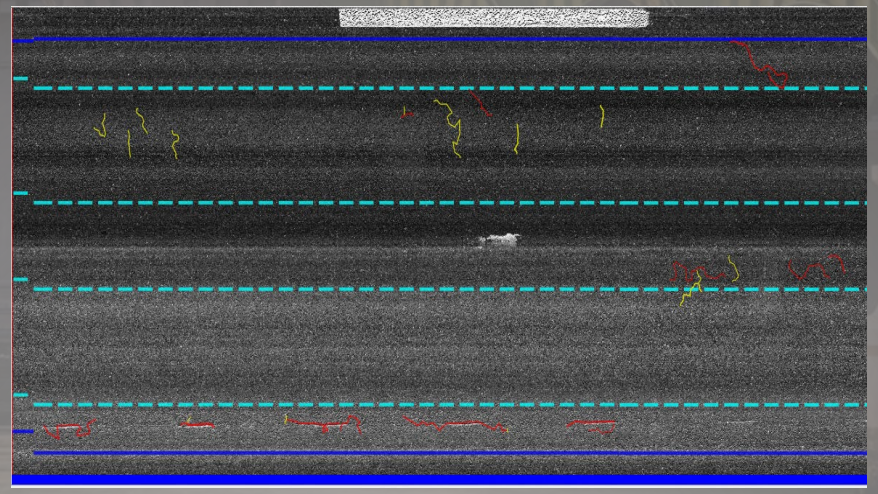


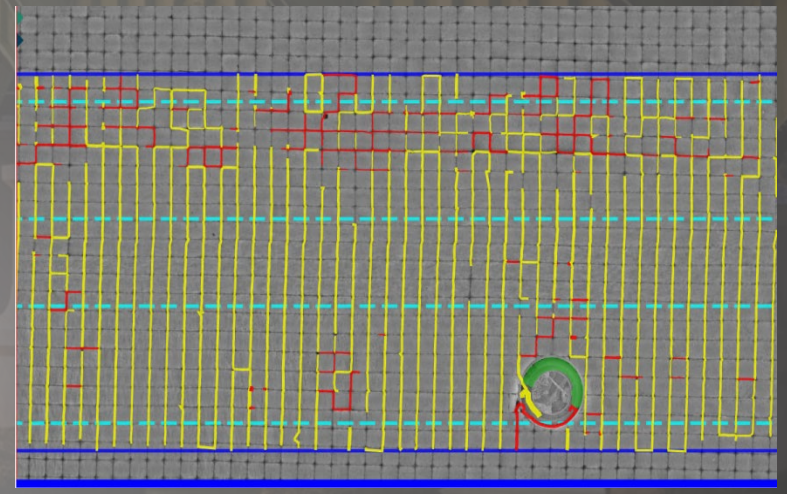
FALSE CRACK DETECTION











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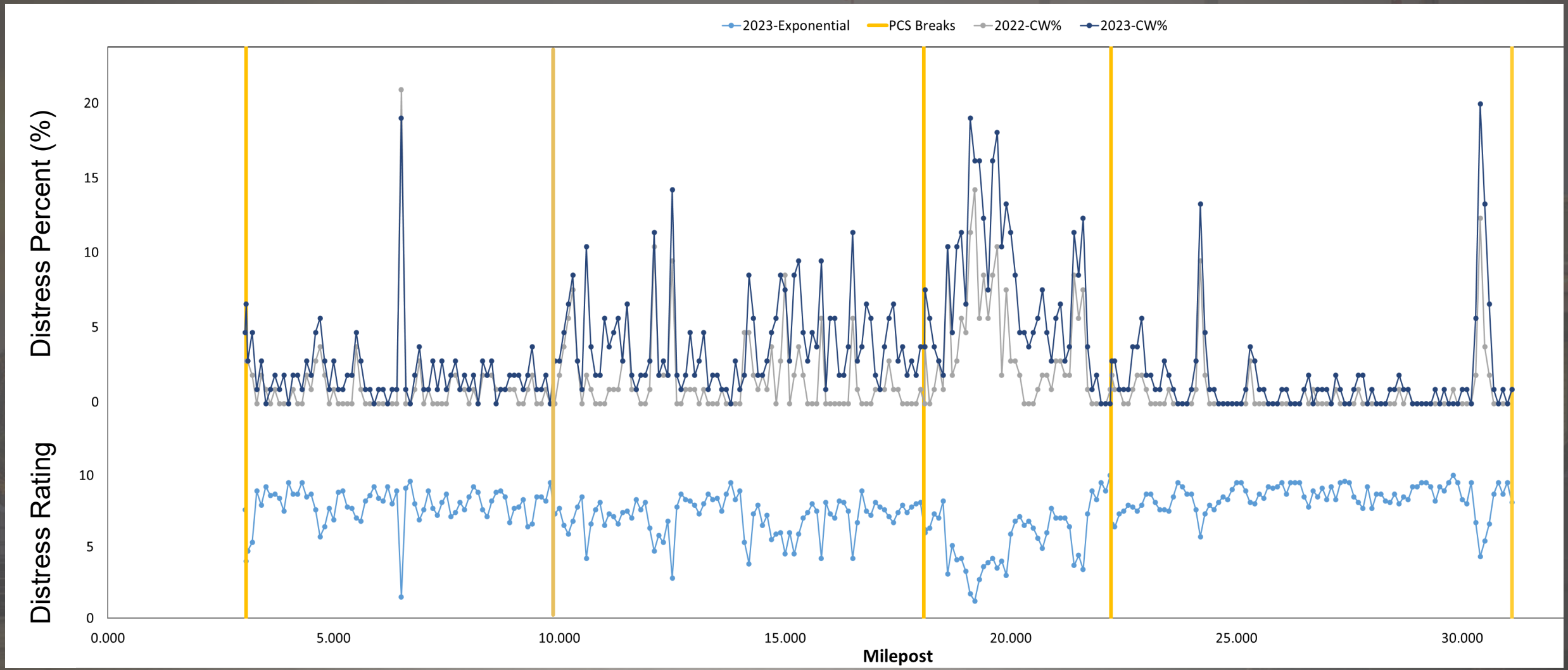
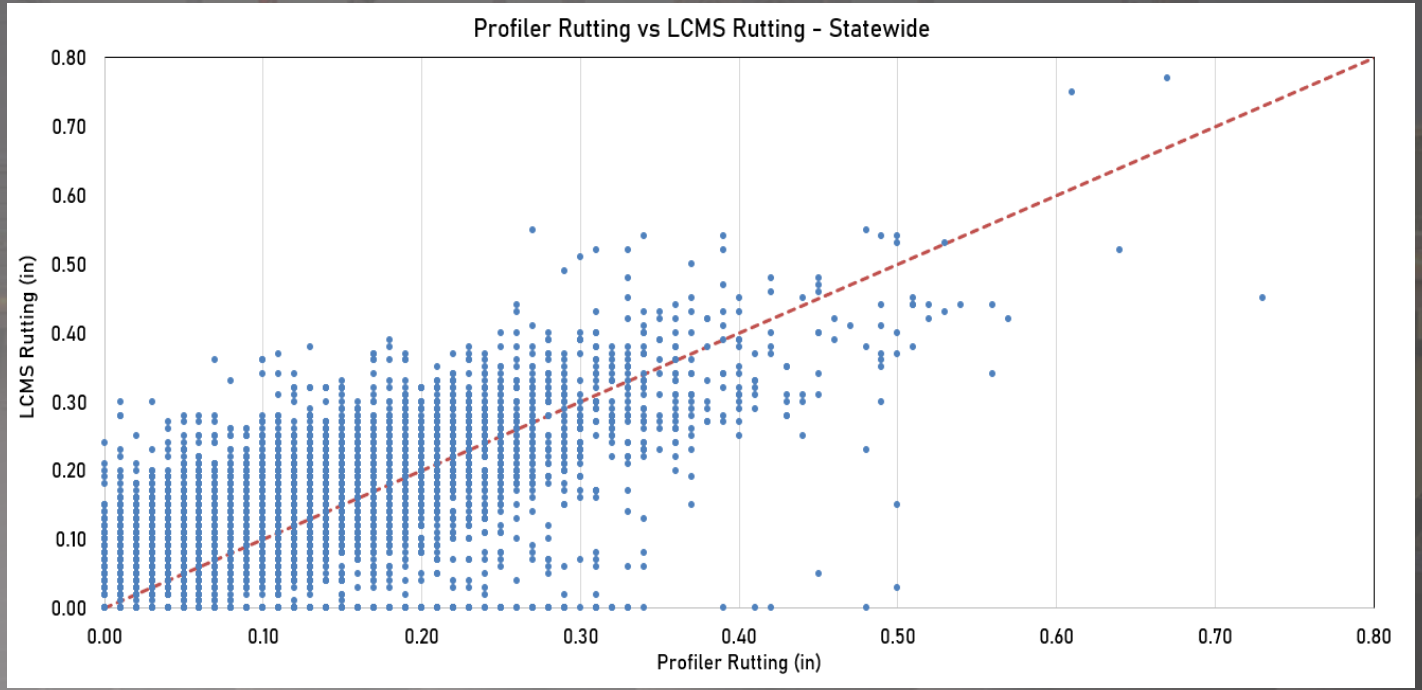
AUTOMATED DISTRESS SEGMENTATION



AUTOMATED RUT DEPTH

- Automated rut provides a more realistic rut depth since wheel path tracking is not critical
- Developed a cross-walk between methods & rut depth
- New process will maintain an equivalent 10 scale rating



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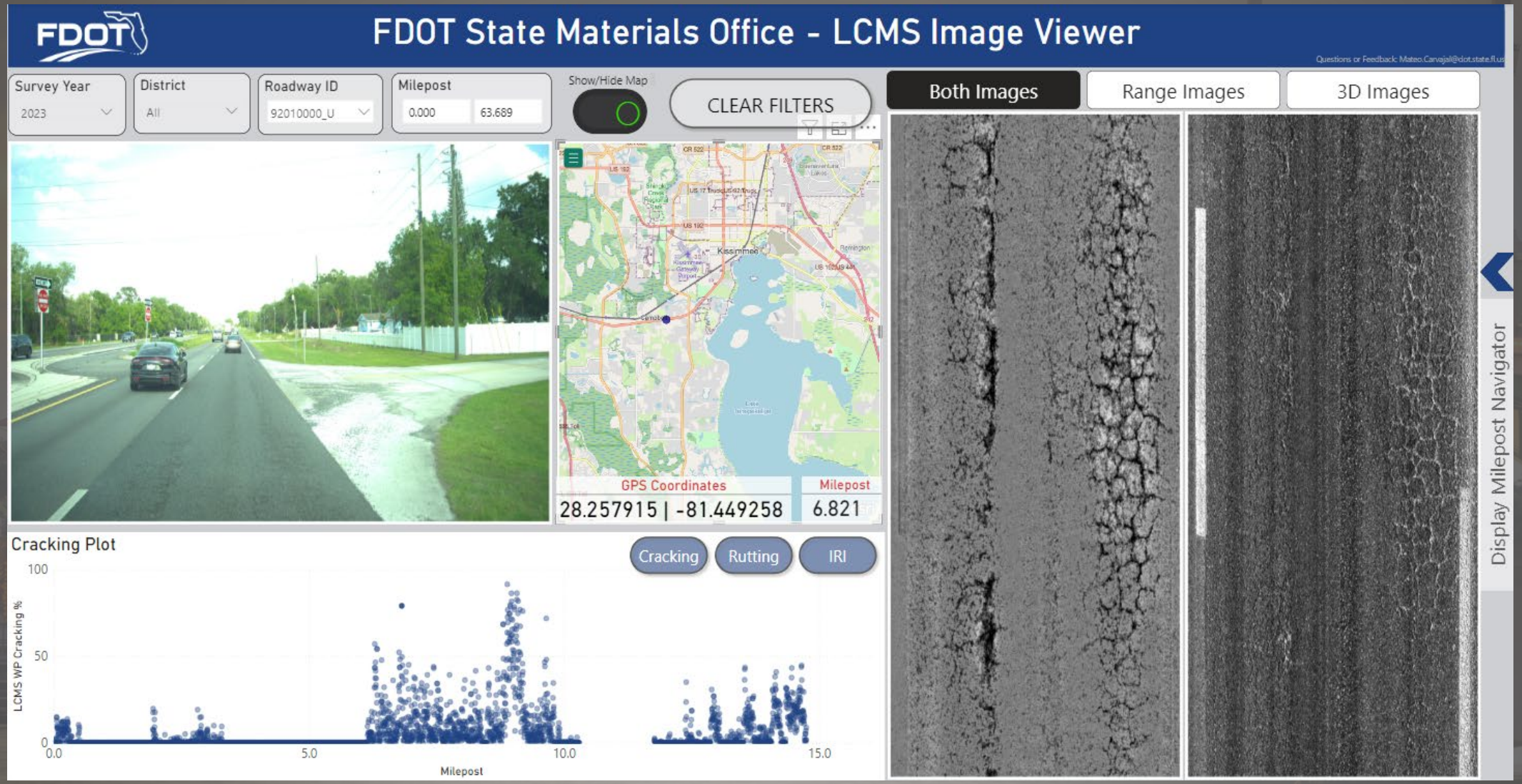
DATA SHARING TOOLS



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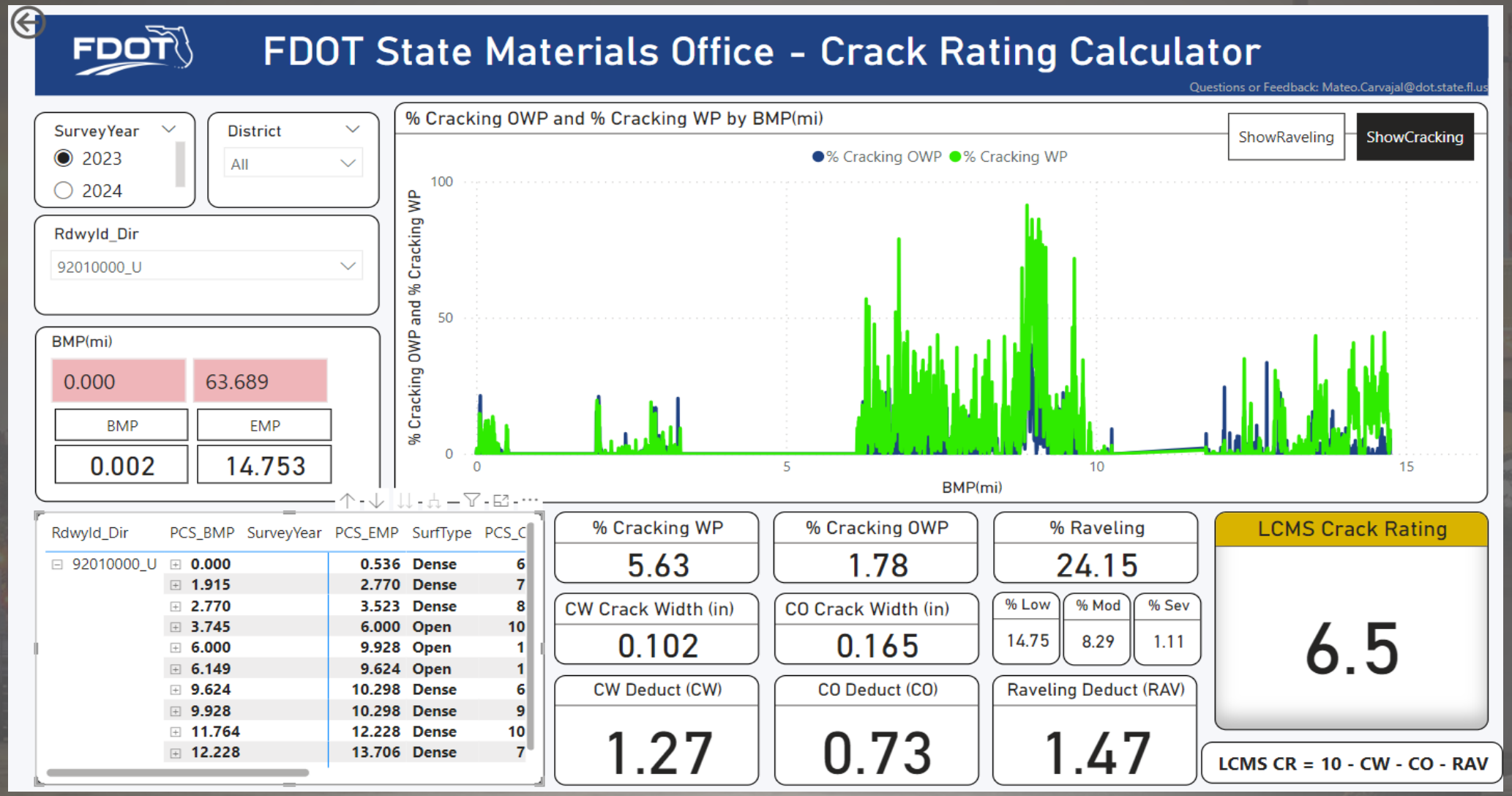

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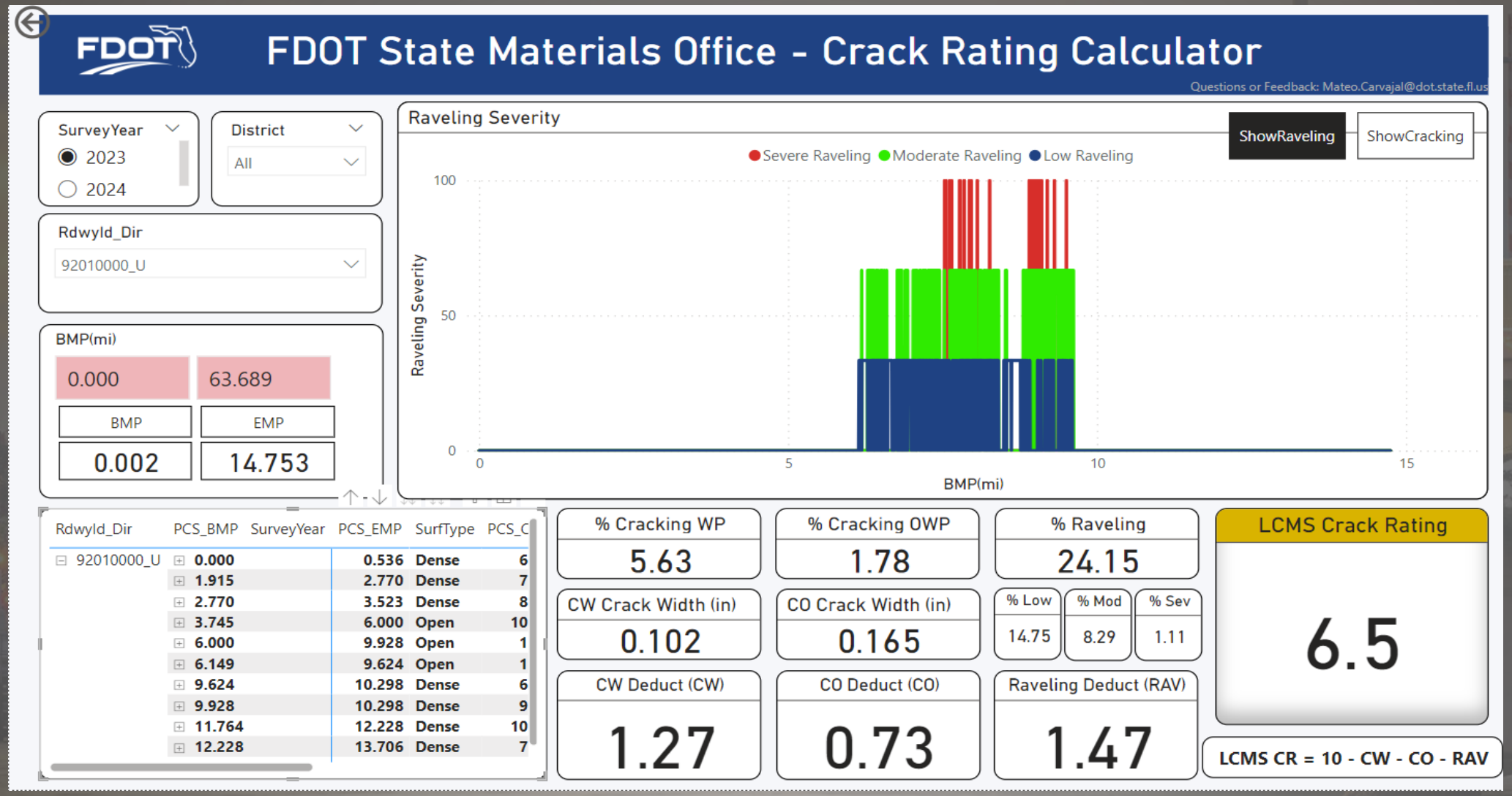

FUTURE ENHANCEMENTS

- Continued effort to clean-up outliers (approximately 3,000 miles)
  - ✓ @ 1 mile per hour roughly 3,000 hrs. of review for 1 person
- Automated detection of patterned pavements (crosswalks)
- Automated approach to quantify the effects of patching and pumping in the Crack Rating
- Improve automation for rigid pavement distresses (semi-automated)
- Enhance QC and data visualization tools
  - ✓ Automated Distress Image Viewer
  - ✓ Crack Rating Calculator/Slicer

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QUESTIONS???

Behind the wheel, the focus must be on only one task:

Safe Driving

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