



Norwegian University of
Science and Technology

Crack Detection on County Roads with Mobile Cameras

NADim Seminar – Norsk Asfaltforening

Nov 27th , 2025

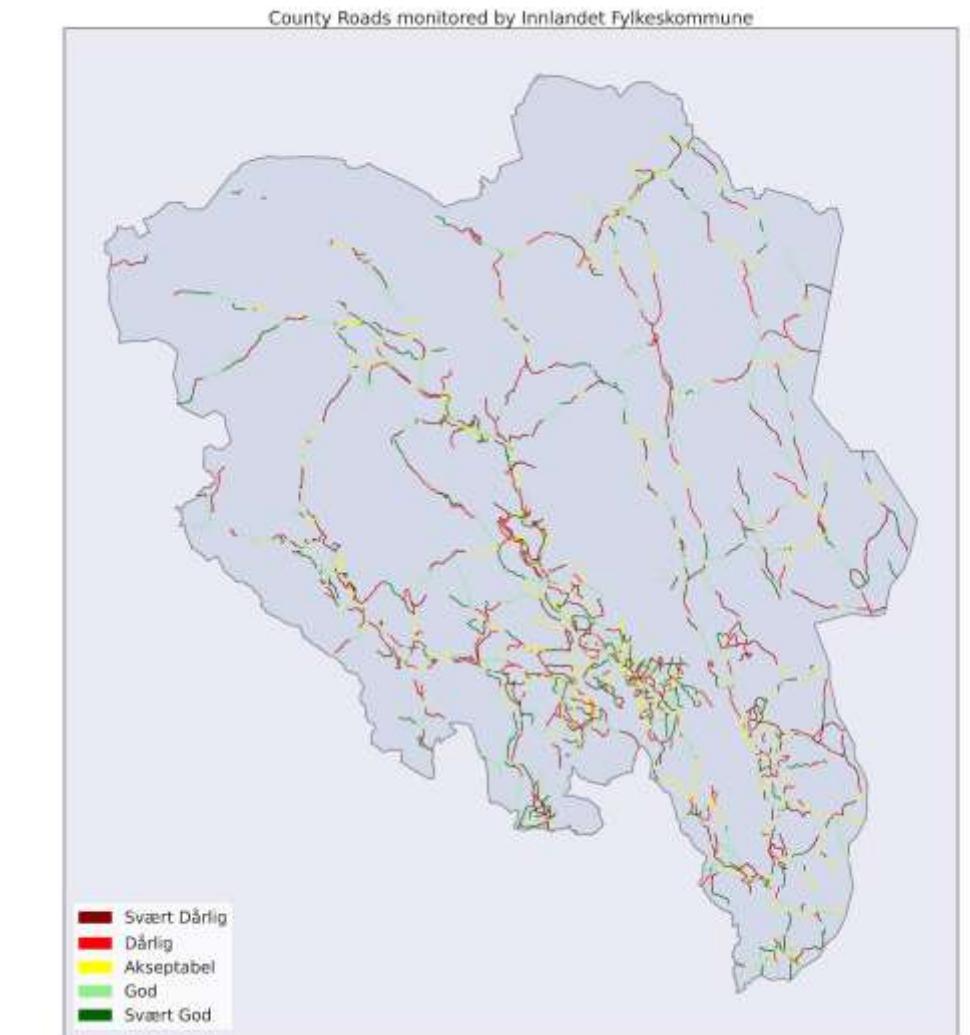
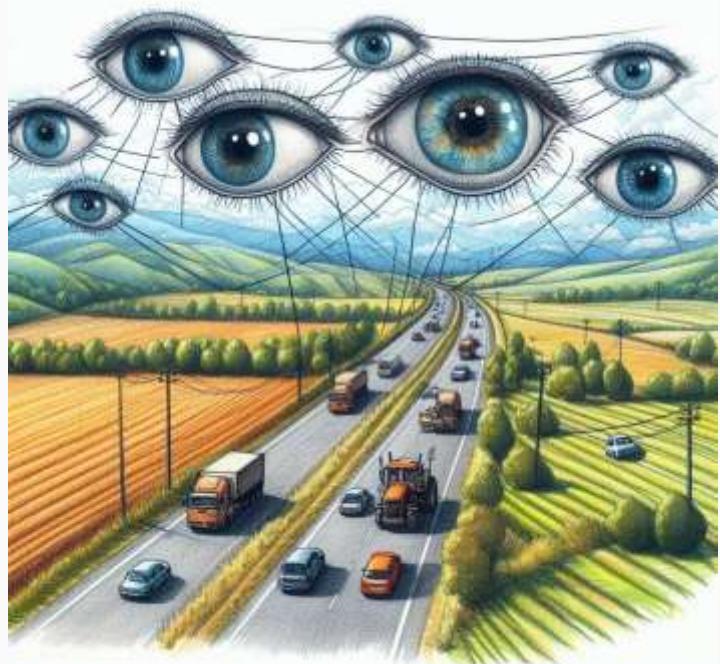
Madhavendra Sharma
PhD Candidate, NTNU



Presentation Overview

- AutoRegFV
- What are we working with?
 - AI Models : Automatic Damage Detection
 - Section Condition Rating
- Challenges
- County Crack v1.0

AutoRegFV



AutoRegFV

- ✓ Use of **Public Vehicles** to collect image data
- ✓ **Automatic Detection** of Multiple Road Surface Damages
- ✓ **Road Surface Condition** Rating at Network Level
- ✓ **GIS Mapping** of Road Damages and Section Condition at Network Level

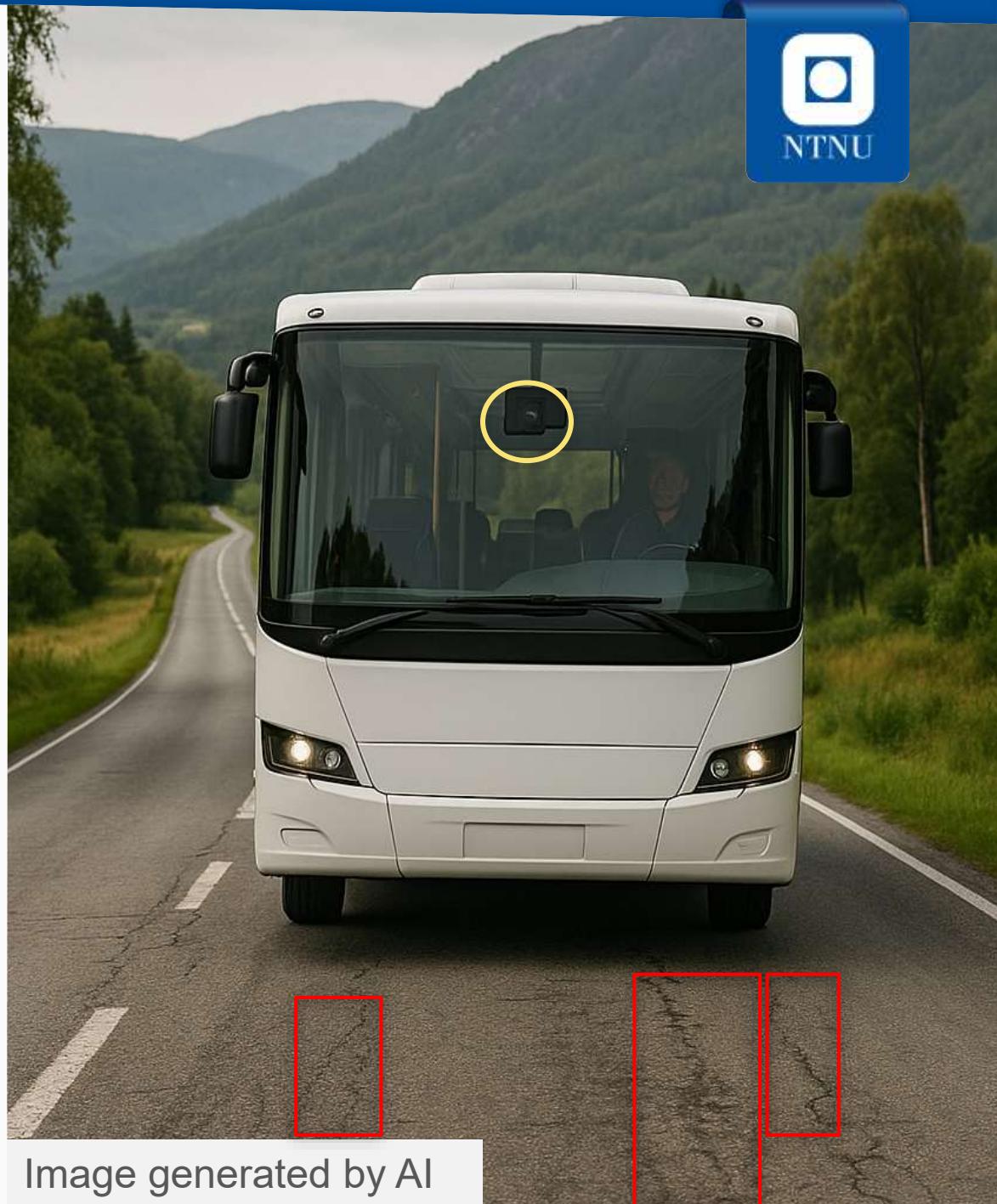
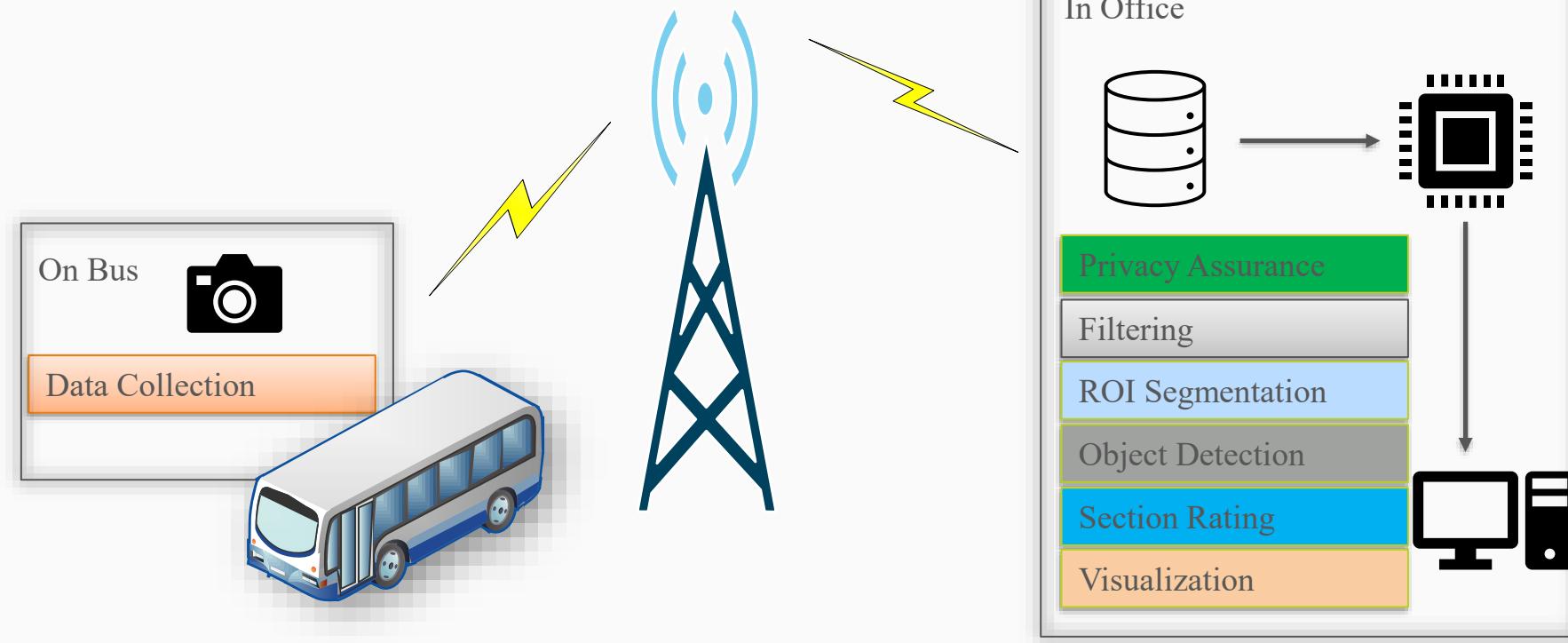


Image generated by AI

AI Models : Automatic Damage Detection

- Full automation



AI Models : Automatic Damage Detection

Privacy Assurance

- Mask Personally Identifiable Information (PII)
- **Mask2Former** Model pretrained on MS-COCO

1



AI Models : Automatic Damage Detection

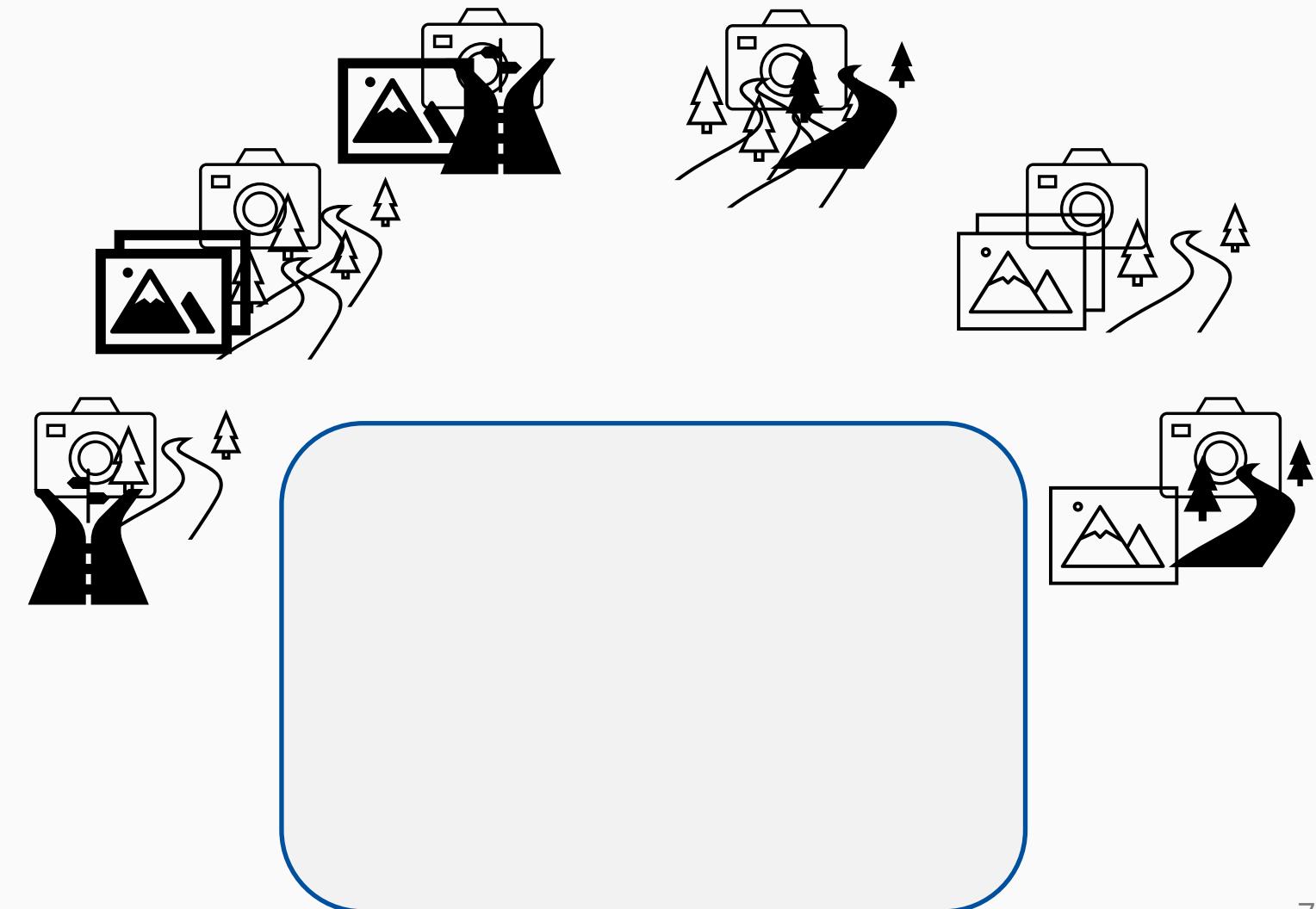
1

Filter Model

WHY?

3

2



AI Models : Automatic Damage Detection

1

Filter Model

- Multi-Level Custom Model
- **Unsuitable image**
- **Segment Road surface**

3

2

Factors Considered:

- Road Presence
- Weather
- Lighting Condition
- Road Surface

AI Models : Automatic Damage Detection



1

Filter Model

- Multi-Level Custom Model
- **Unsuitable image**
- **Segment Road surface**

2



3



Unsuitable Images
DELETE



Suitable Images
SAVE

AI Models : Automatic Damage Detection

1

Filter Model

- Multi-Level Custom Model
- **Unsuitable image**
- **Segment Road surface**

2



3



Unsuitable Images
DELETE



Suitable Images
SAVE

AI Models : Automatic Damage Detection

1

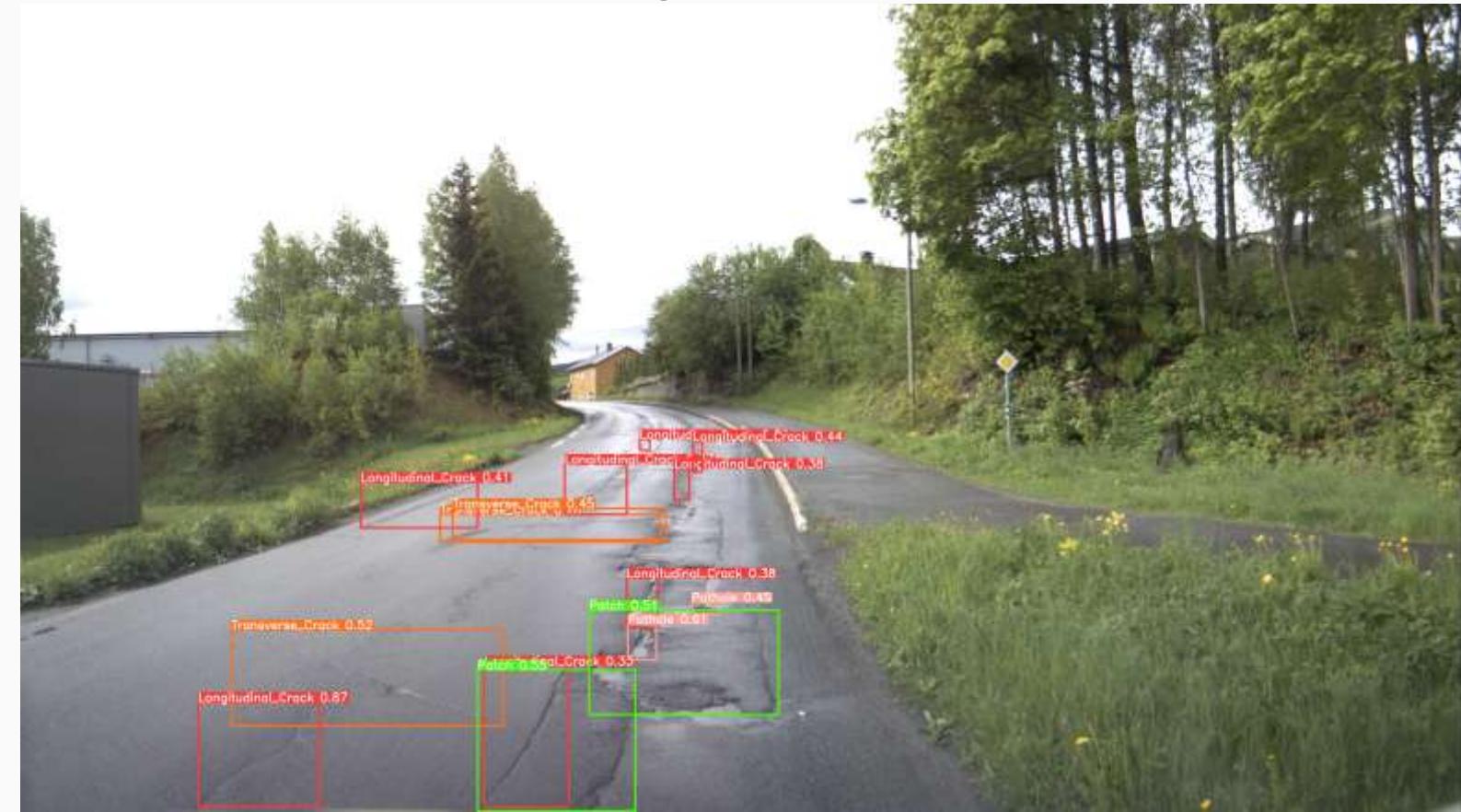
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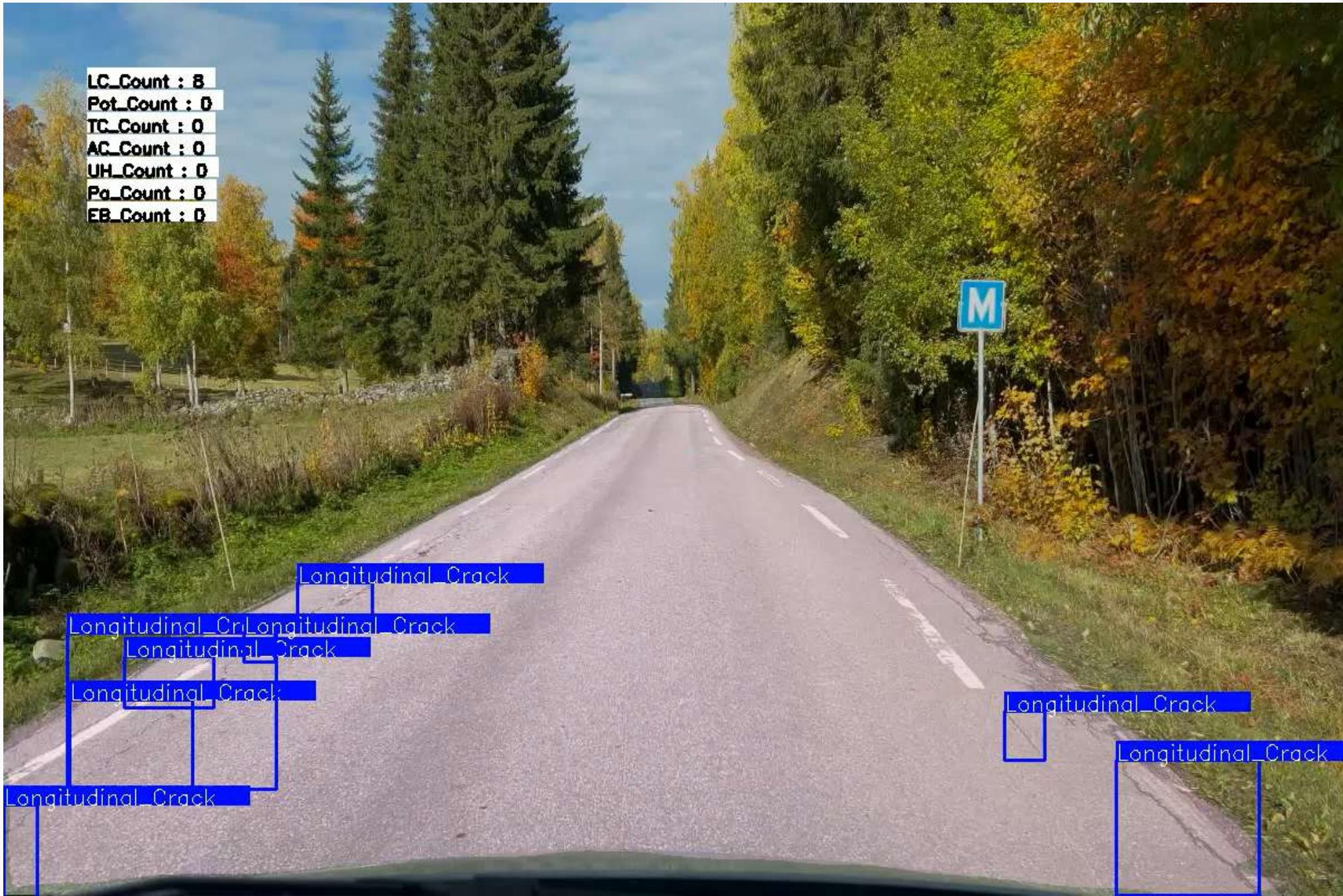
3

Road Damage Detection

- Detect multiple Road Surface Damages (Surface Distresses)
- **YOLOv11** and **Deformable DETR** model

Detected Road Surface Damages:





How to define road surface condition based on detected damages?

Section Condition Rating



Manual Surface Condition Rating

Expert Rating Survey



Manual Surface Condition Rating

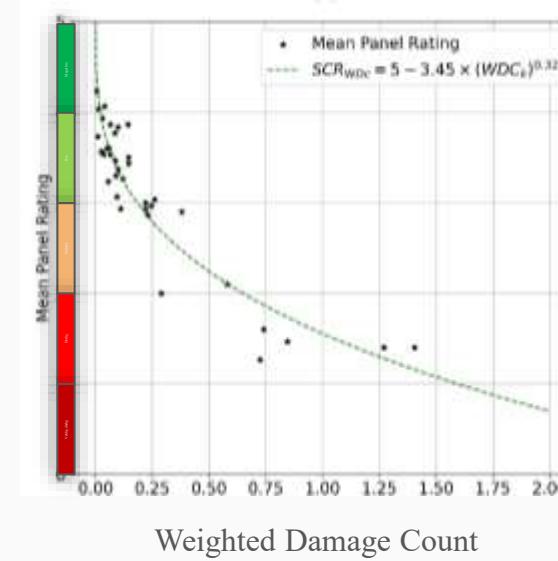
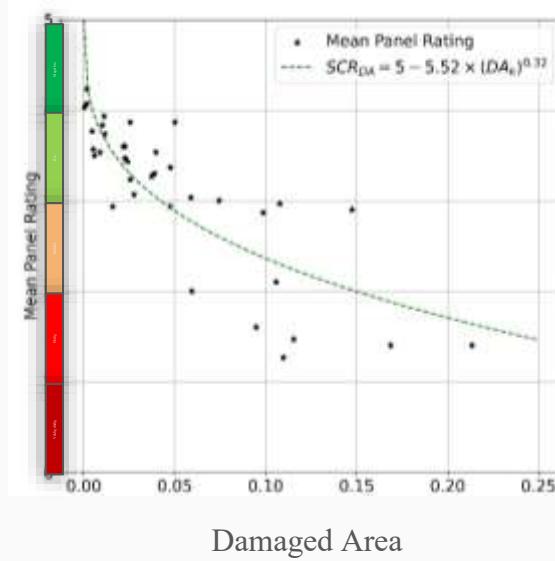
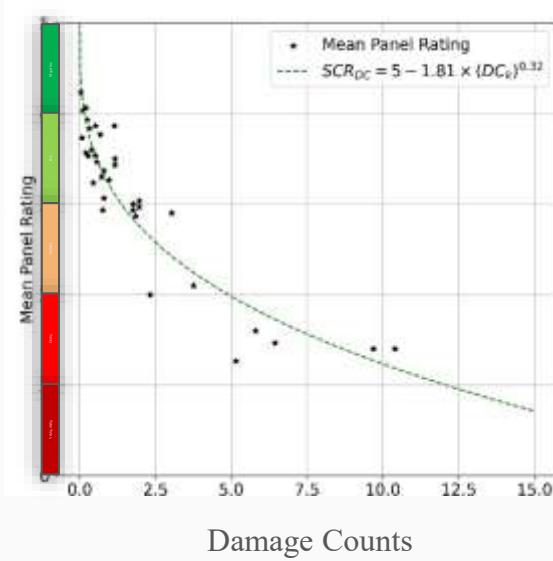
Expert Rating Survey



Seksjon Nr	Lengde (m)	PSR vurdering				
		Svært dårlig	Dårlig	Akseptabel	God	Svært God
1	269				✗	✗
2	500				✗	
3	500				✗	
4	396				✗	
5	500				✗	
6	500				✗	
7	376				✗	
8	500				✗	
9	500				✗	
10	500				✗	
11	500				✗	
12	500				✗	
13	500				✗	
14	500				✗	
15	500				✗	
16	500				✗	
17	500				✗	
18	500				✗	
19	500				✗	
20	276				✗	
21	500				✗	
22	500				✗	
23	500				✗	
24	476				✗	
25	500				✗	
26	500				✗	
27	500				✗	
28	500				✗	
29	540				✗	
30	500				✗	
31	500				✗	
32	500				✗	
33	500				✗	
34	500				✗	
35	500				✗	
36	367				✗	

Seksjon Nr	Lengde (m)	PSR vurdering				
		Svært dårlig	Dårlig	Akseptabel	God	Svært God
36	367				✗	
35	500				✗	
34	500				✗	
33	500				✗	
32	500				✗	
31	500				✗	
30	500				✗	
29	540				✗	
28	500				✗	
27	500				✗	
26	500				✗	
25	500				✗	
24	476				✗	
23	500				✗	
22	500				✗	
21	500				✗	
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13	500				✗	
12	500				✗	
11	500				✗	
10	500				✗	
9	500				✗	
8	500				✗	
7	276				✗	
6	500				✗	
5	500				✗	
4	396				✗	
3	500				✗	
2	500				✗	
1	269				✗	

Section Condition Rating



$$SCR_{WDC} = 5 - 3.45 \times WDC_k^{0.32}$$

$$WDC_k = \frac{1}{n} \sum_{i=1}^n (0.125 \times DC_{LCi} + 0.125 \times DC_{TCi} + 0.25 \times DC_{ACi} + 0.5 \times DC_{POi})$$

Section Condition Rating

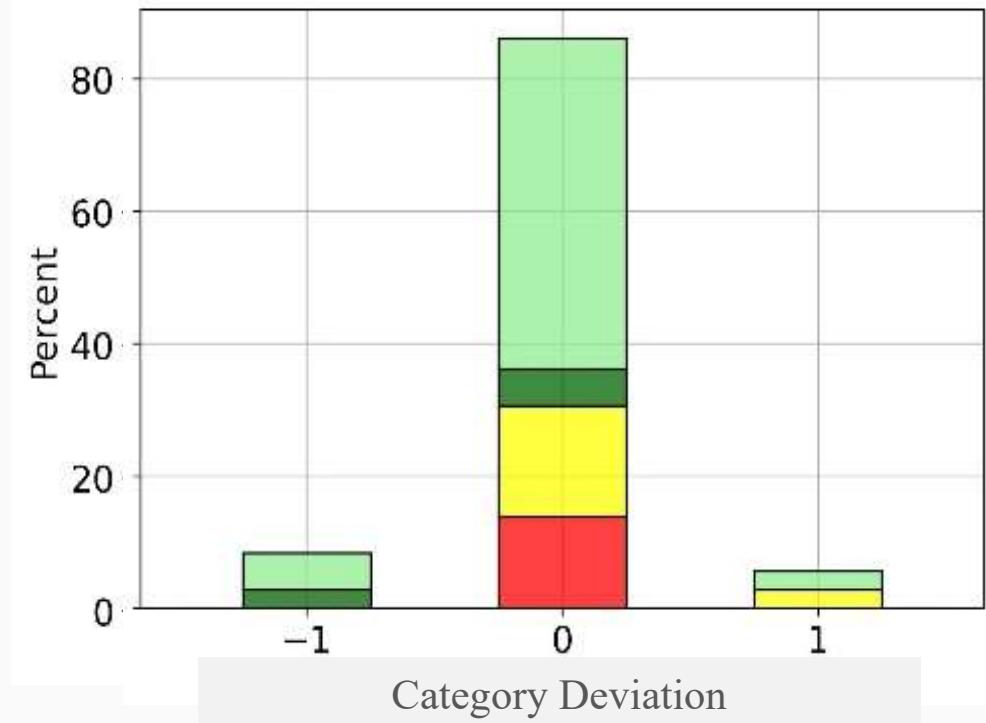
Manual



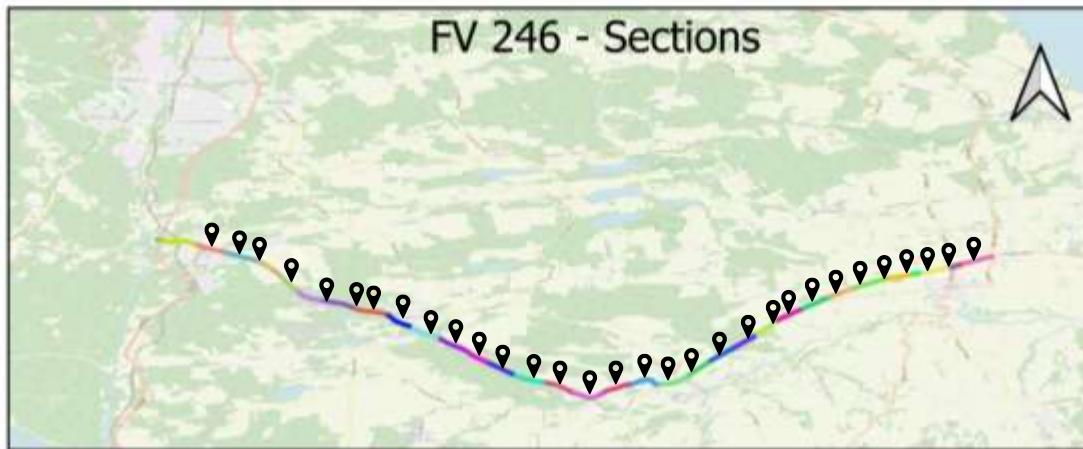
Automatic



Very Poor Poor Satisfactory Good Very Good



Section Condition Rating



Pilot Study

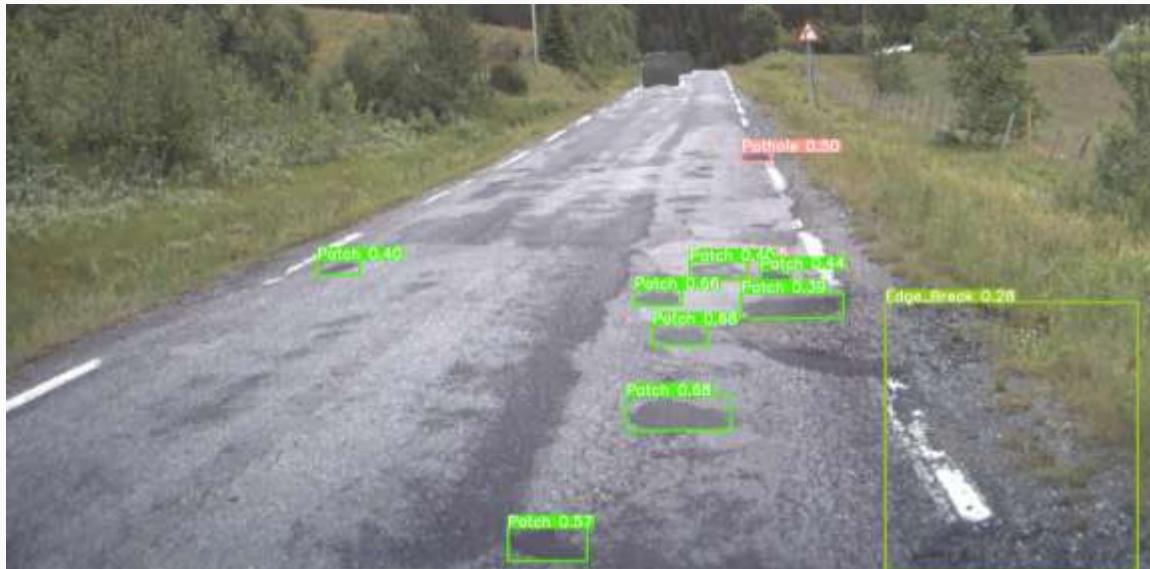
- 2 Cameras on Buses and 2 on inspection Vehicles
- Around 3000 images/day



Challenges

Learning from Pilot Study

Challenges



Camera Sensor: ViaPPS Front Camera
Damage Detection Model: YOLOv8-Large



Camera Sensor: Streamax AD plus 2.0
Damage Detection Model: Deformable DETR

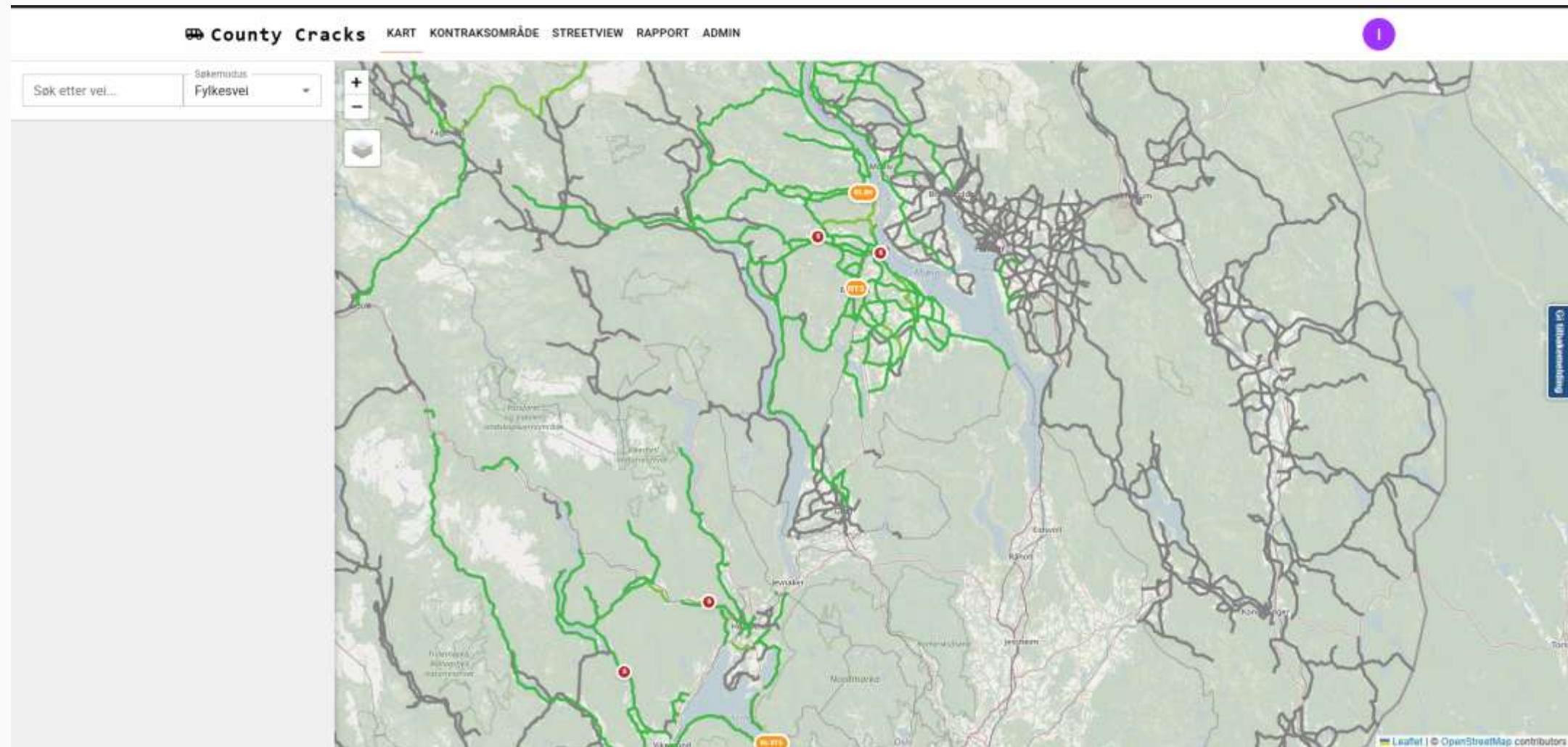
Challenges

Camera Difference

Geo-Localization

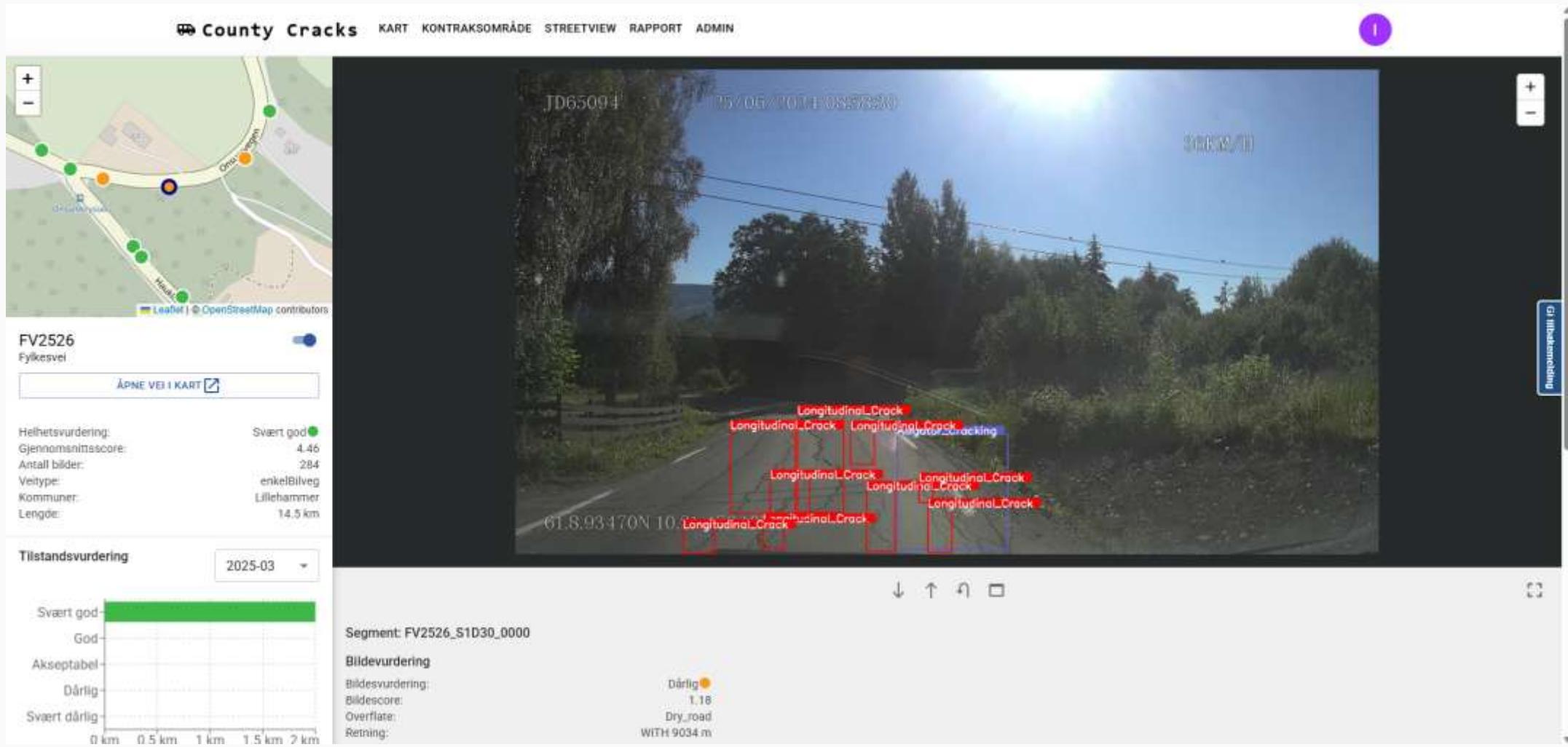
Reflections from Windshield

County Crack v1.0



County Crack v1.0

County Cracks KART KONTRAKSOMRÅDE STREETVIEW RAPPORT ADMIN



FV2526
Fylkesvei

ÅPNE VEI I KART

Helhetsvurdering: Svært god 4.46
Gjennomsnittsscore: 4.46
Antall bilder: 284
Veitype: enkelBilveg
Kommuner: Lillehammer
Lengde: 14.5 km

Tilstandsvurdering 2025-03

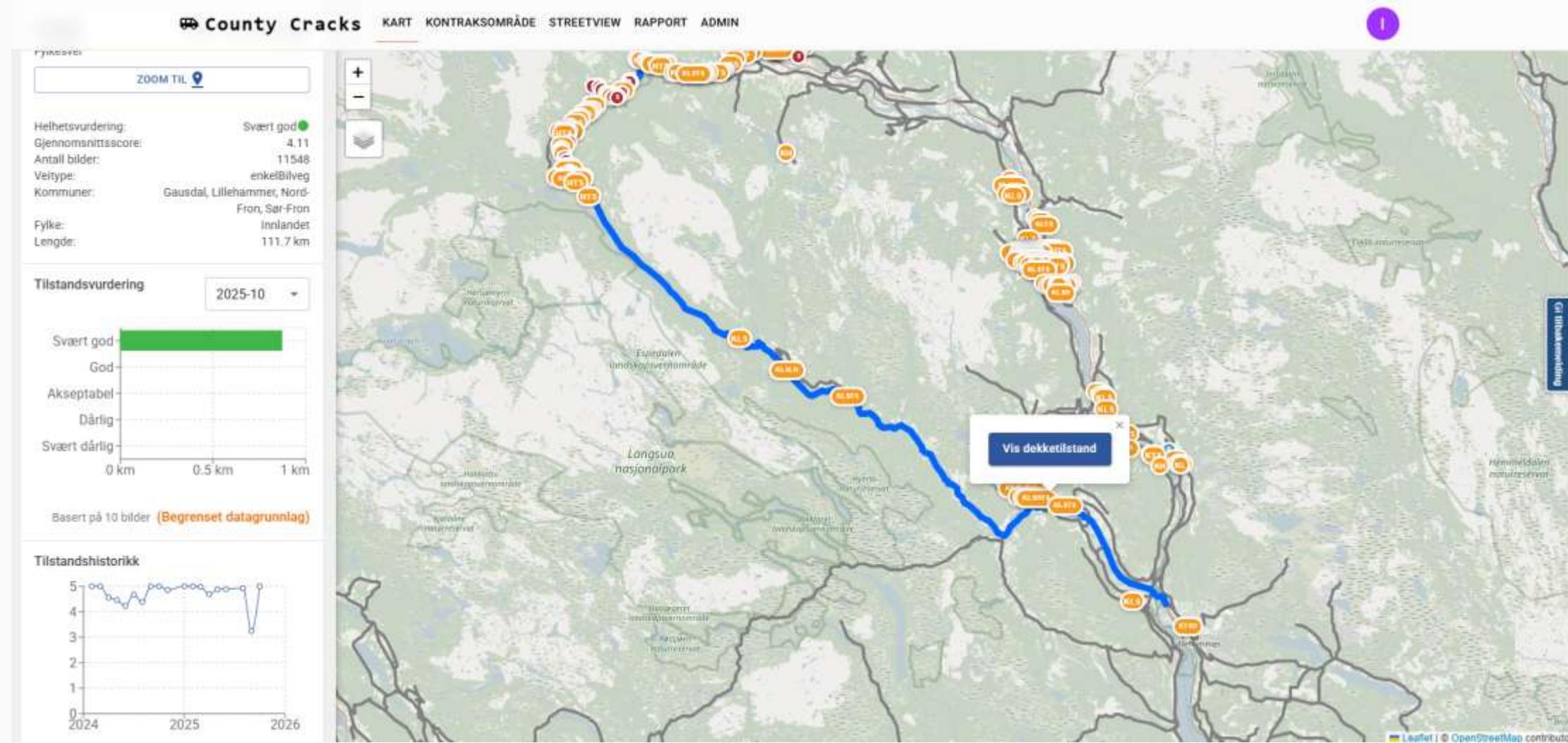
Svært god	God	Akseptabel	Dårlig	Svært dårlig
0 km	0.5 km	1 km	1.5 km	2 km

Segment: FV2526_S1D30_0000

Bildevurdering

Bildesvurdering: Dårlig 1.18
Bildescore: 1.18
Overflate: Dry_road
Renning: WITH 9034 m

County Crack v1.0



Thank you for your attention!

Questions?

Contact me:

