

Smartathon Pitch Deck

Falcoeye

2D Multi-Model platform for intelligent
data acquisition and analysis

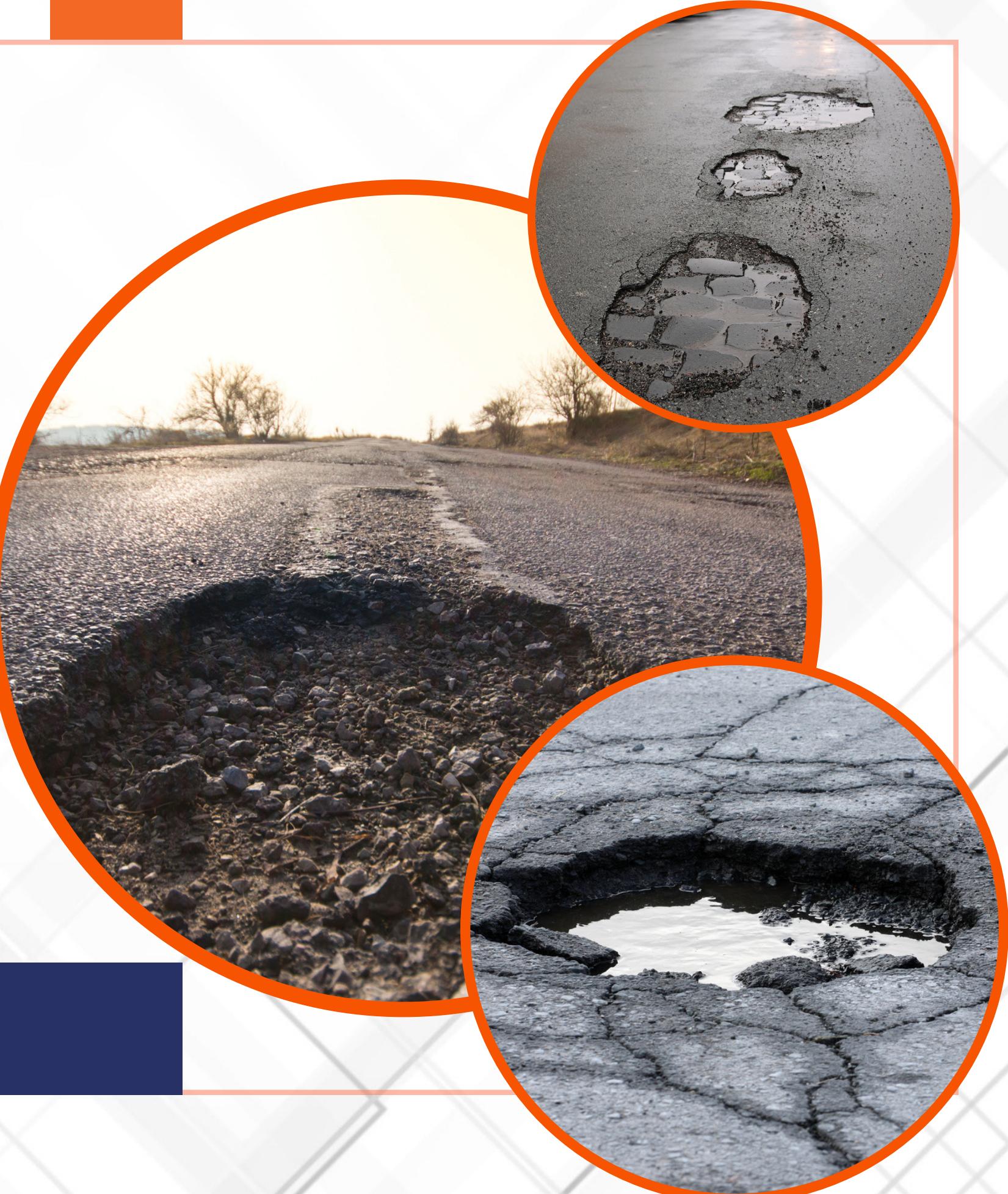
Application on road damage and
potholes identification



PROBLEM

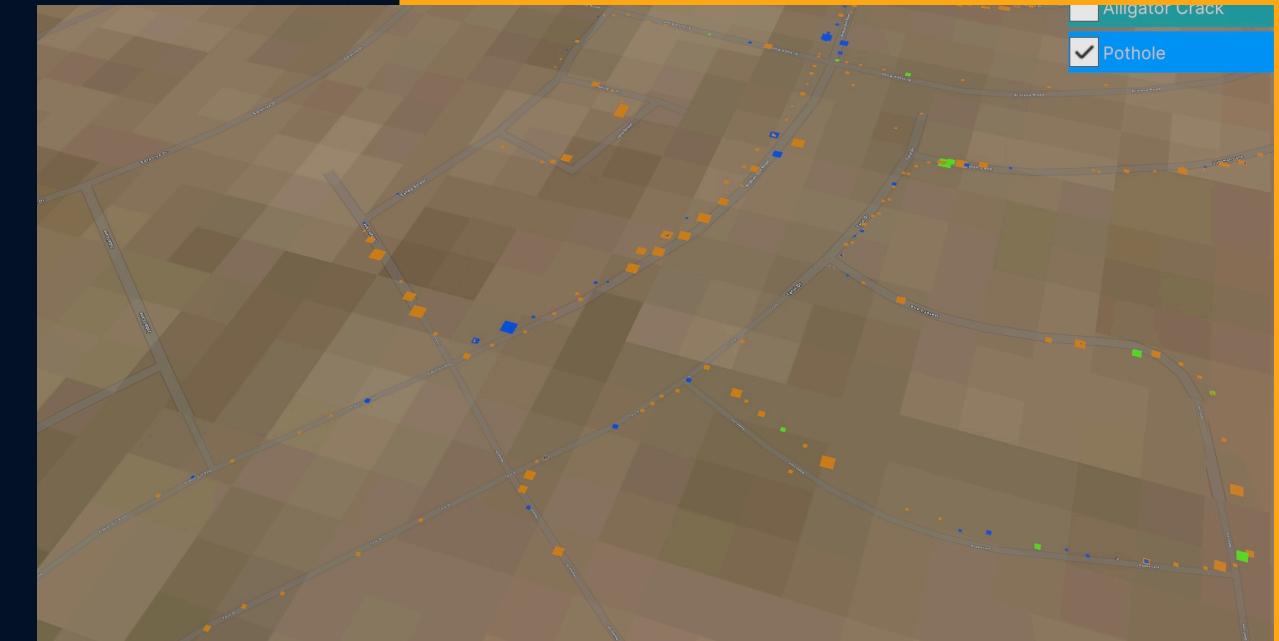
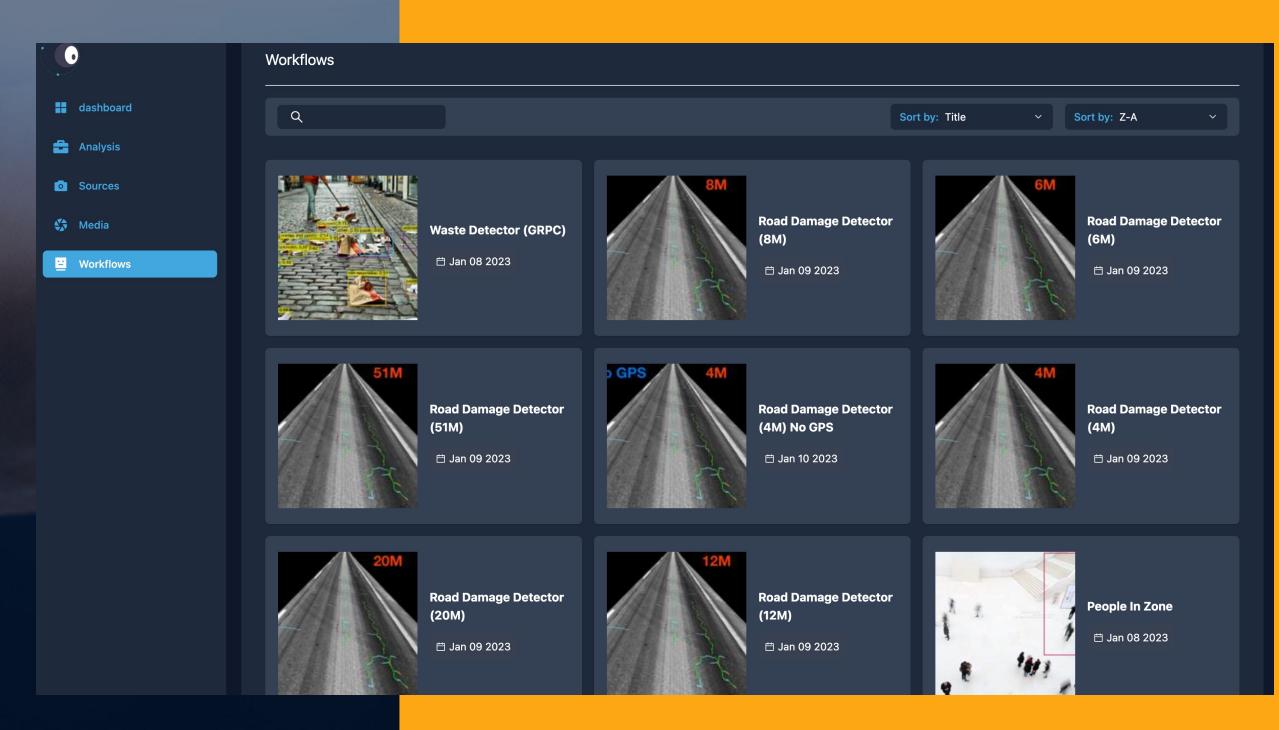
Potholes are a major issue for road maintenance agencies, causing damage to vehicles and posing a safety risk to drivers and passengers.

To efficiently repair potholes, it is important to accurately identify and classify them according to their severity.



Solution

- Collect data using a low-cost dashcam equipped with GPS
- Develop a set of Falcoeye workflows for extracting pothole data and GIS information
- Develop 3D GIS Visualization dashboard to facilitate advanced and interactive analysis of the extracted data



Benefits:

LOW COST

low-cost dash-cam can be easily deployed on a large scale, making it an affordable solution for road maintenance agencies

MULTIPLE WORKFLOW

Using ensemble of AI workflows give more accurate and more holistic estimate of the distribution of road damages

3D MODELING & RENDERING

The 3D environment allows for immersive and digital view of the roads and set the ground for a digital twin experience

Dash-Cam

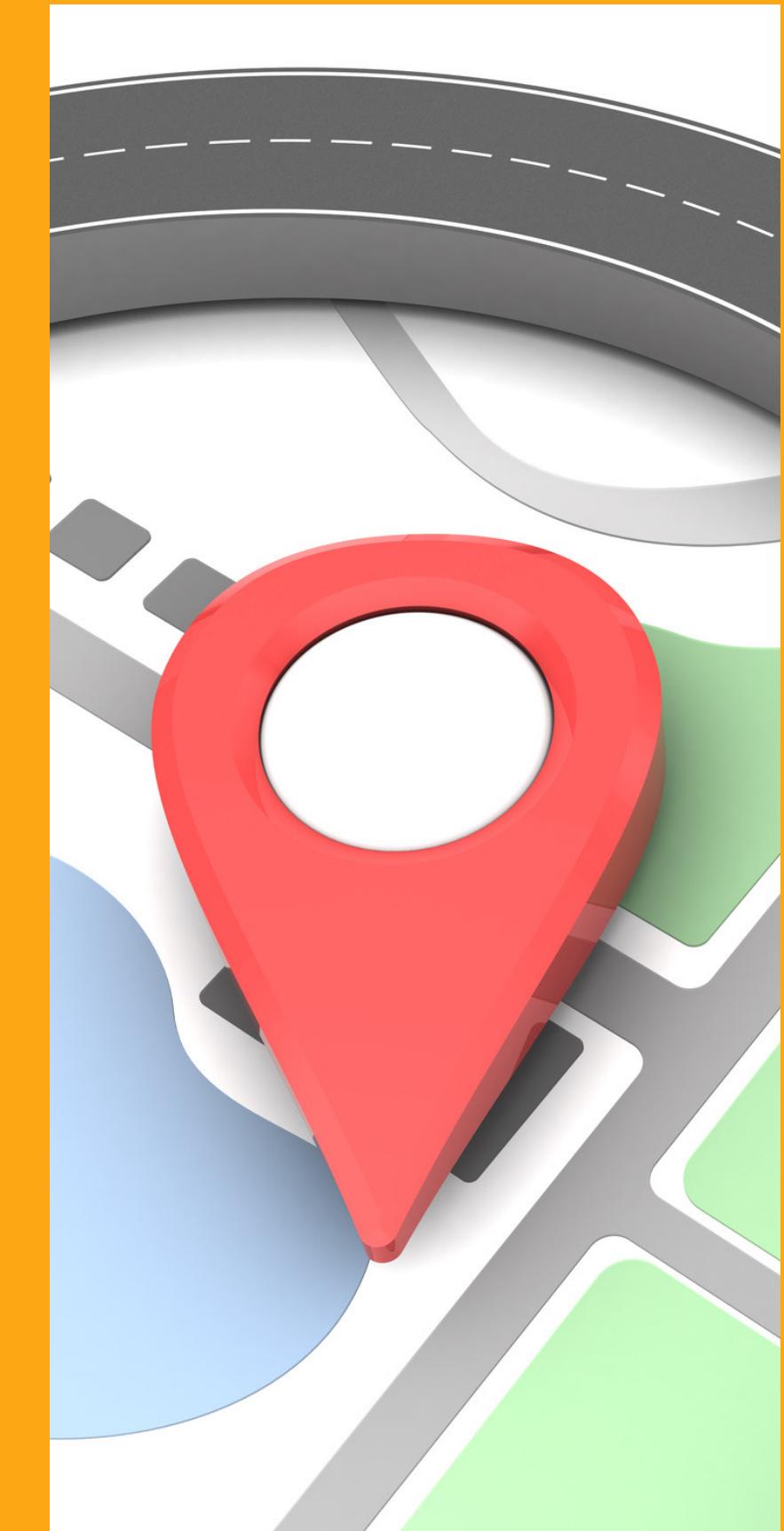
Capture the Footage

A dash-cam will be mounted on a vehicle to capture video footage of the road as the vehicle travels



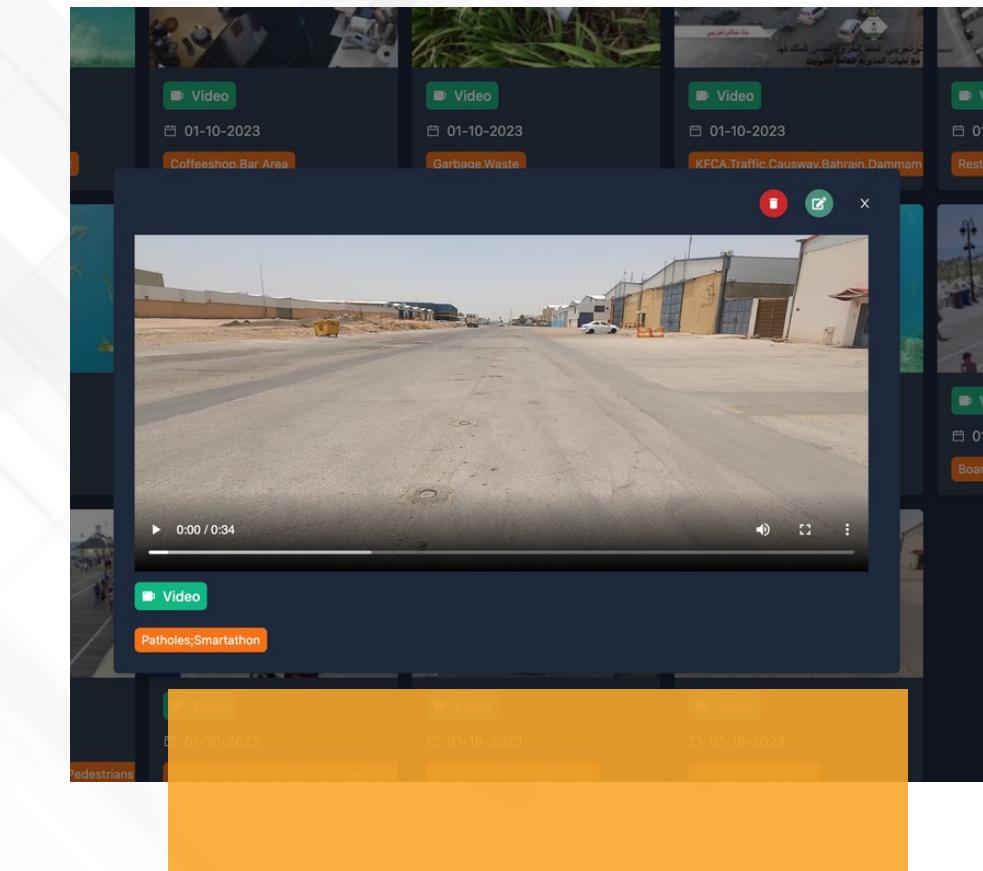
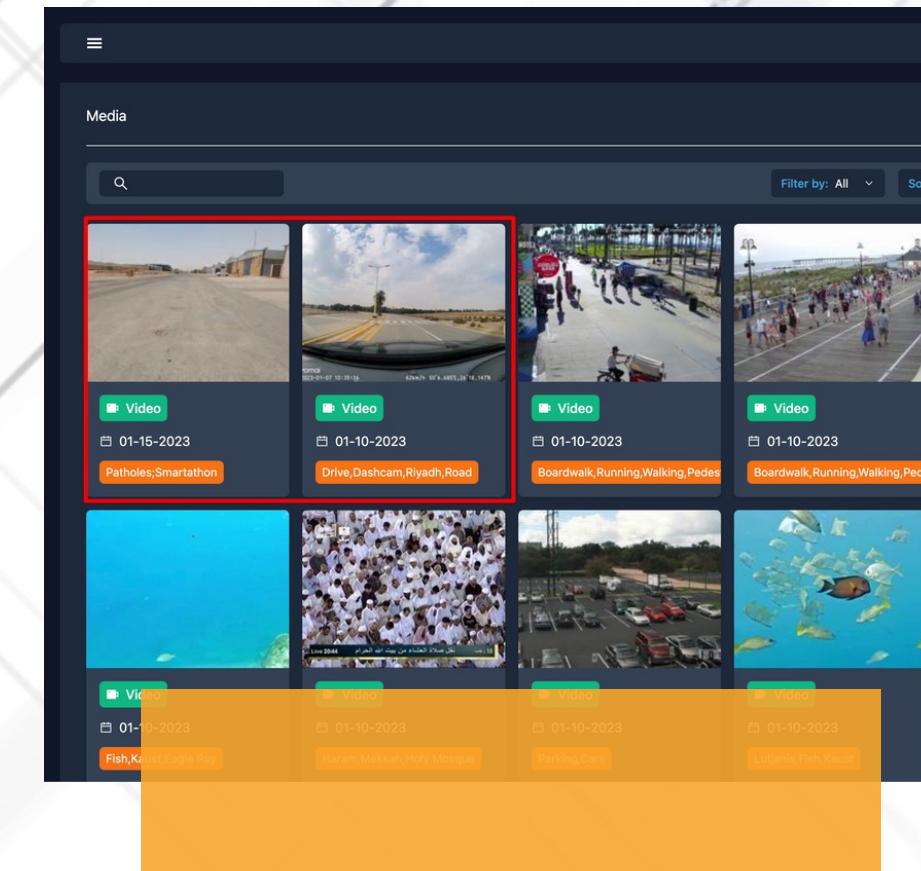
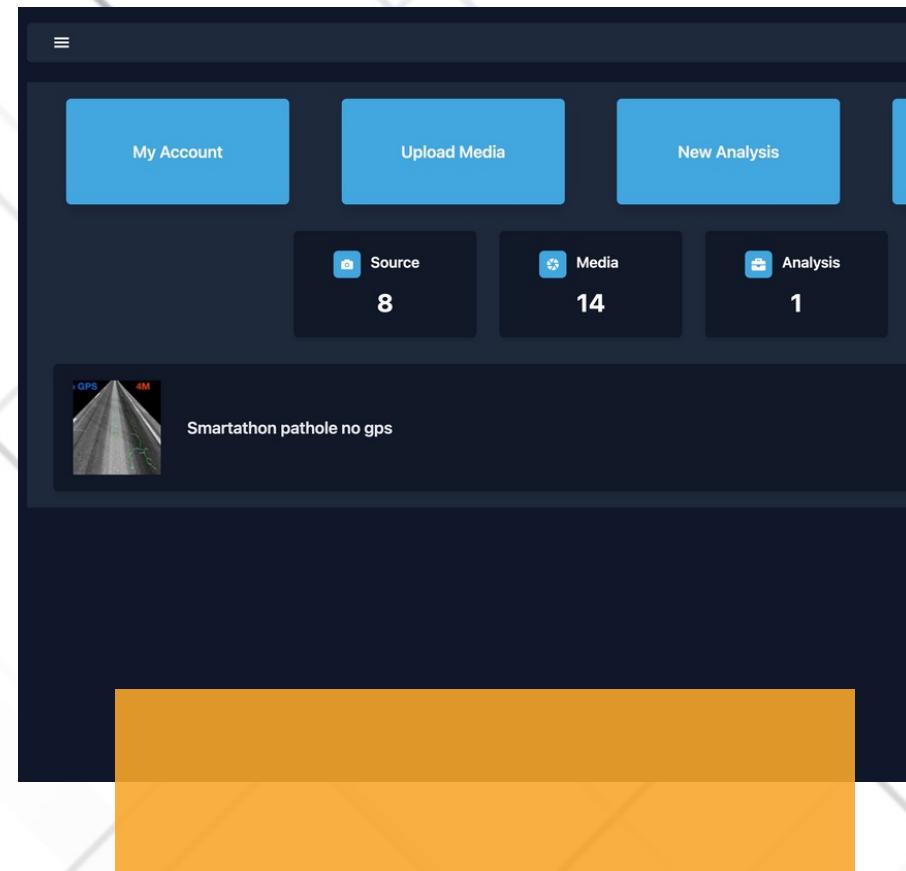
Get Geographical Info

The dash-cam will be equipped with GPS to provide accurate geographical information for each frame of the video



Share-Riding Drivers

The dash-cams can be provided to share-riding drivers to cover most of the city as part of their daily job. This will ensure coverage of highways, as well as living areas



What Is Falcoeye?

Falcoeye is a platform to host the pothole detection workflows and provide the user interface for uploading dash-cam videos and extracting pothole data, including classification, abundance, shape, and GIS information.

Falcoeye Platform

The screenshot shows the Falcoeye Platform's "Workflows" section. On the left is a sidebar with icons for dashboard, Analysis, Sources, Media, and Workflows (which is highlighted in blue). The main area is titled "Workflows" and contains a search bar and sorting options ("Sort by: Title" and "Sort by: Z-A"). Below is a 3x3 grid of workflow cards:

Workflow Type	Resolution	Date
Waste Detector (GRPC)	8M	Jan 08 2023
Road Damage Detector (8M)	8M	Jan 09 2023
Road Damage Detector (6M)	6M	Jan 09 2023
Road Damage Detector (51M)	51M	Jan 09 2023
Road Damage Detector (4M) No GPS	4M	Jan 10 2023
Road Damage Detector (4M)	4M	Jan 09 2023
Road Damage Detector (20M)	20M	Jan 09 2023
Road Damage Detector (12M)	12M	Jan 09 2023
People In Zone	-	Jan 08 2023

At the bottom left of the main area, it says "0.9.10".



The platform can scale automatically
on a Kubernetes cluster



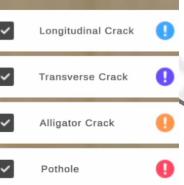
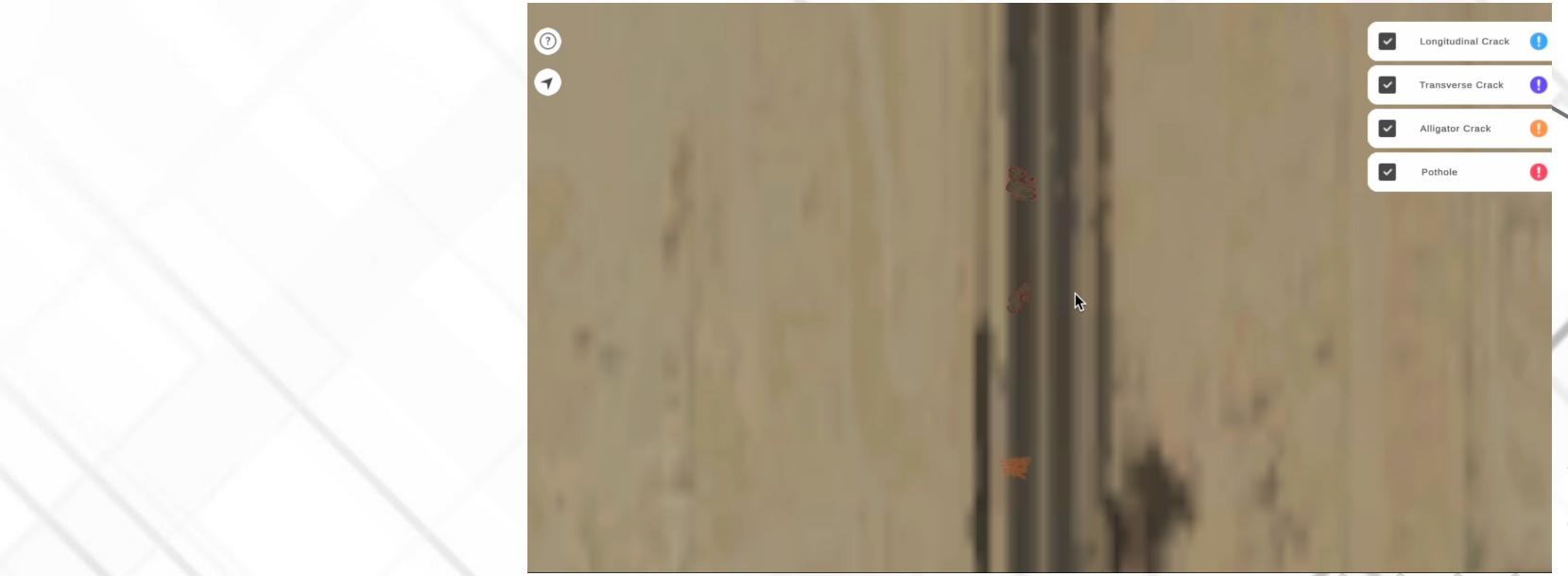
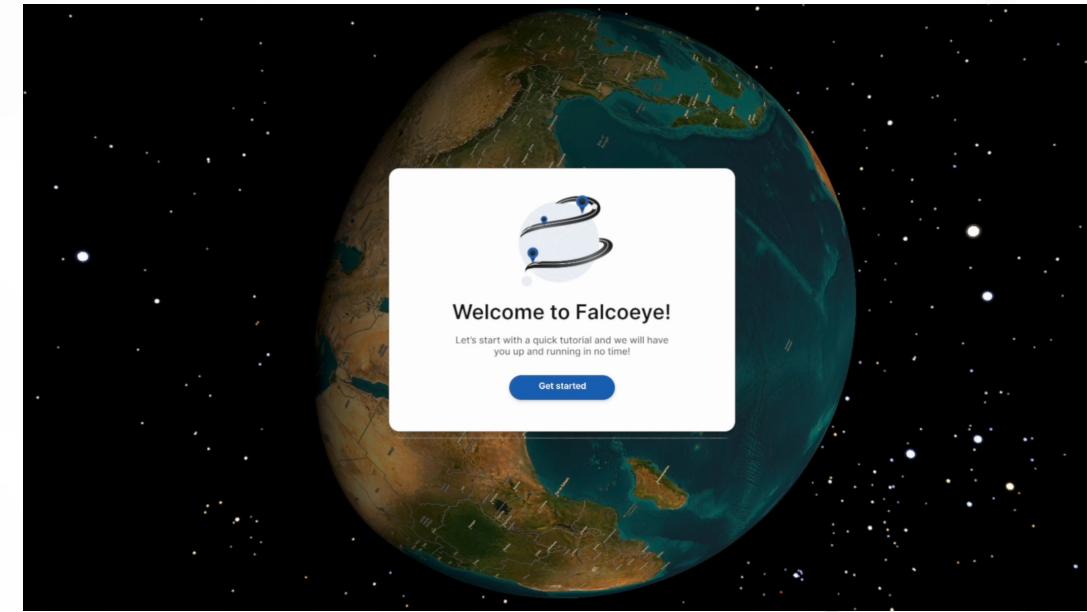
Developers can build new workflows
and aggregation techniques

Visualization & Analysis



We have also implemented a 3D dashboard with a GIS map and filters. The data extracted from Falcoeye is reprojected on the GIS map:

- This allows for a better understanding of the distribution of potholes in a given area and can aid in prioritizing repairs.
- The 3D application enables the user to filter the data by pothole type, size, and severity, allowing for more targeted analysis of the data.
- The user can also navigate in the map using a 3D model and see the potholes in the context of the road.



CASE STUDY

Built multiple AI workflows based on EfficientNet for the extraction and aggregation of the data



70mai True 2.7K 1944P M500
(120\$)

Classify the road damage into 4 categories

- **Longitudinal Crack**
- **Transverse Crack**
- **Alligator Crack**
- **Pothole**

Calculate crack size based on box diameter and normalize it by the diameter of the frame



Riyadh-Dammam Intercity

Data:

4 hours of driving video at average speed of 120 km/h

Resolution: 2592X1944

Frame Rate: 30 f/s

Model:

Model type: EfficientNet

Model size: ~4 Million Parameters

Sample rate: 6/s (1 every 5 frames)

Device: Nvidia A100

Time: 5 hours

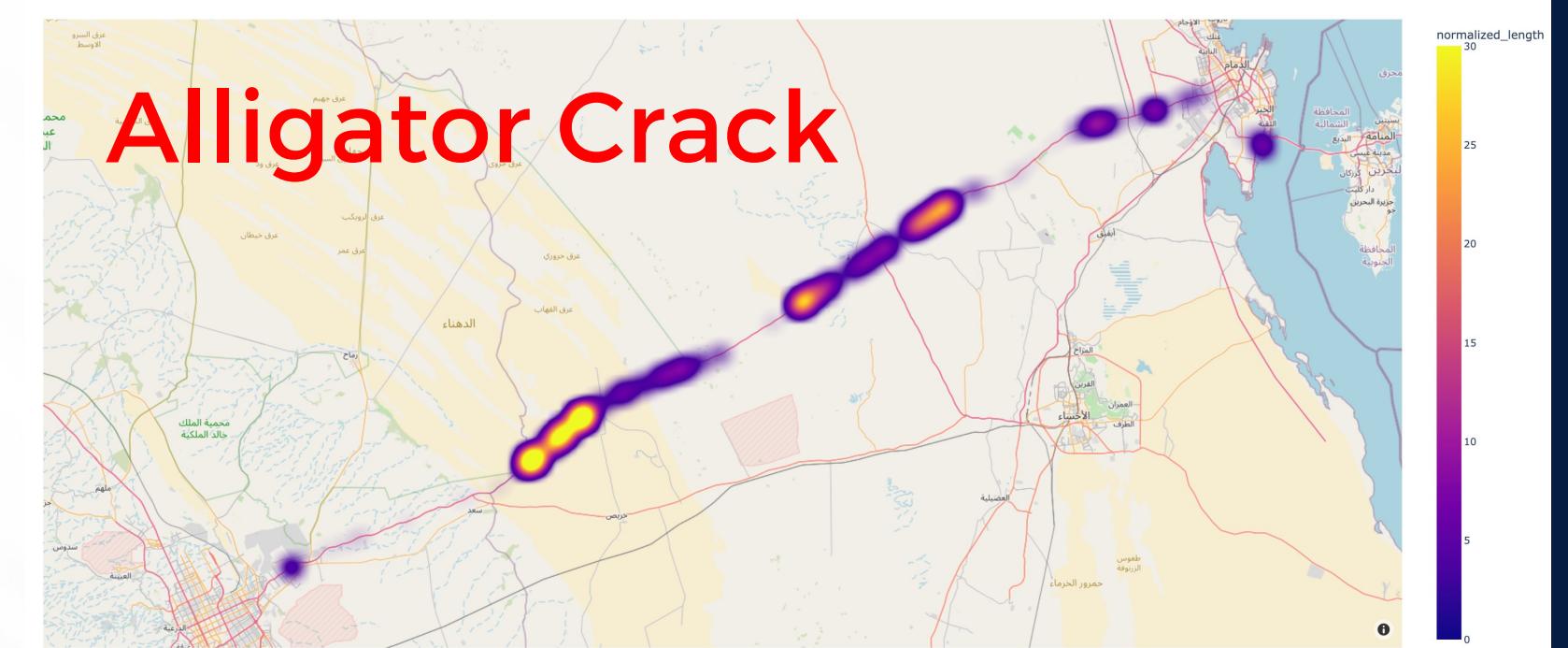
Findings:

26992 Longitudinal Crack

4675 Transverse Crack

1002 Alligator Crack

316 Pothole



Future Work



Extract detailed information per detection such as shape, size, direction, and depth

- 
- Parametric pothole mesher
 - Displacement depth map
 1. Using deep learning
 2. Stereo view (pair of dash-cams)



AR/VR experience of detections



Thank You For Your Attention

In conclusion, we propose a pothole detection and severity classification system using a low-cost dash-cam with GPS and a set of pothole detection workflows served on Falcoeye, combined with a 3D application for data visualization and analysis

The system has the potential to significantly improve road safety and reduce the cost of road maintenance for agencies.