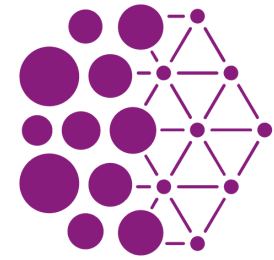




**SOLIDARITY  
HACKATHON**  
MOROCCO



**Mila**

# DeepAster

**Mapping Hope, Mitigating Disaster**



# Why DeepAster ?

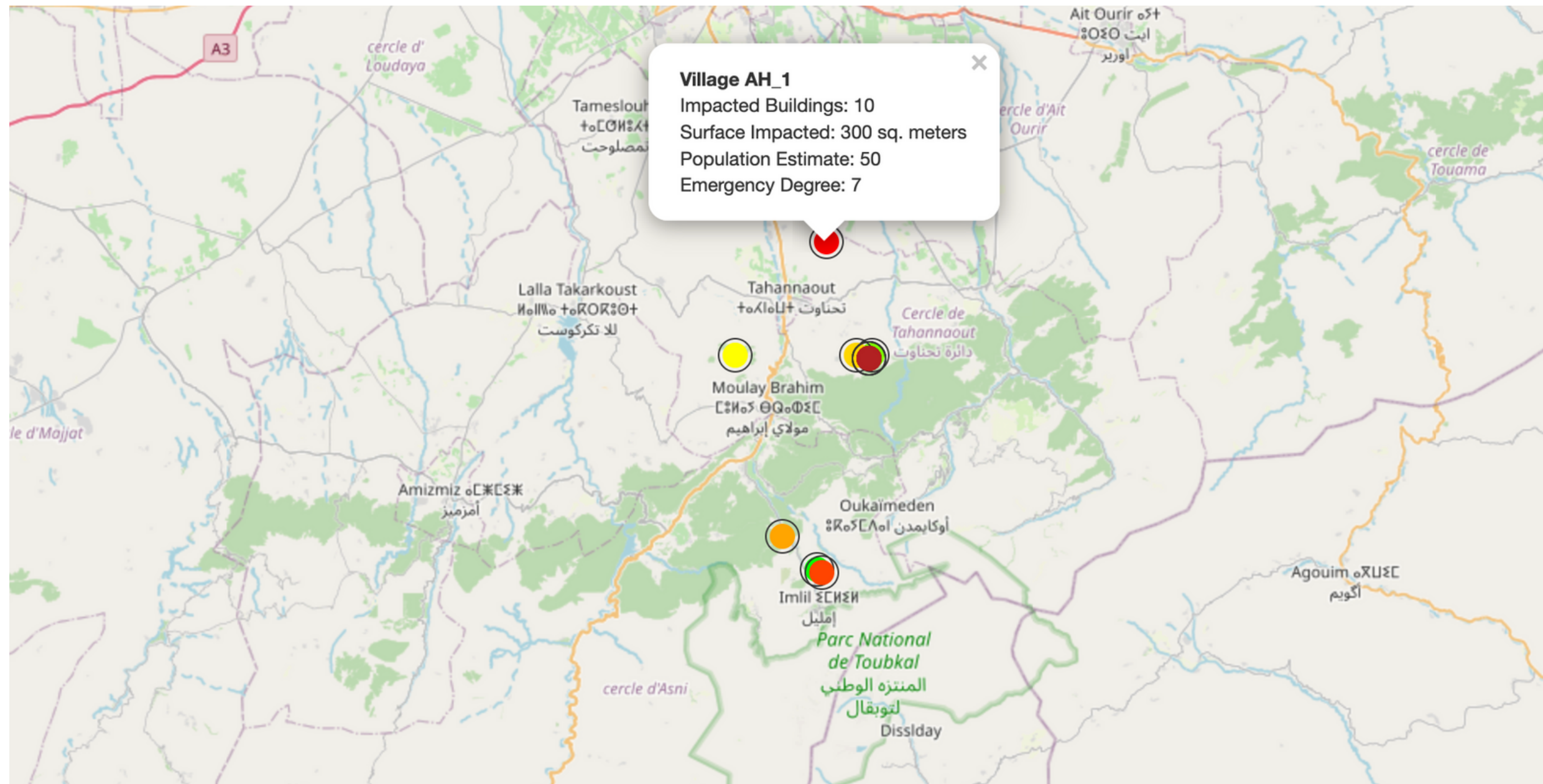
During the last disaster in Morocco, the problems that faced the aids are :

- 1.The lack of information about the impact on the small villages
- 2.The telecommunications means were out of service
- 3.The roads were destroyed by the seism
- 4.The unequal distribution of collected donations

# What's DeepAster ?

The objective is to use satellite data and imagery analysis to **assess the degree of destruction** in a given area using Real-Time Data

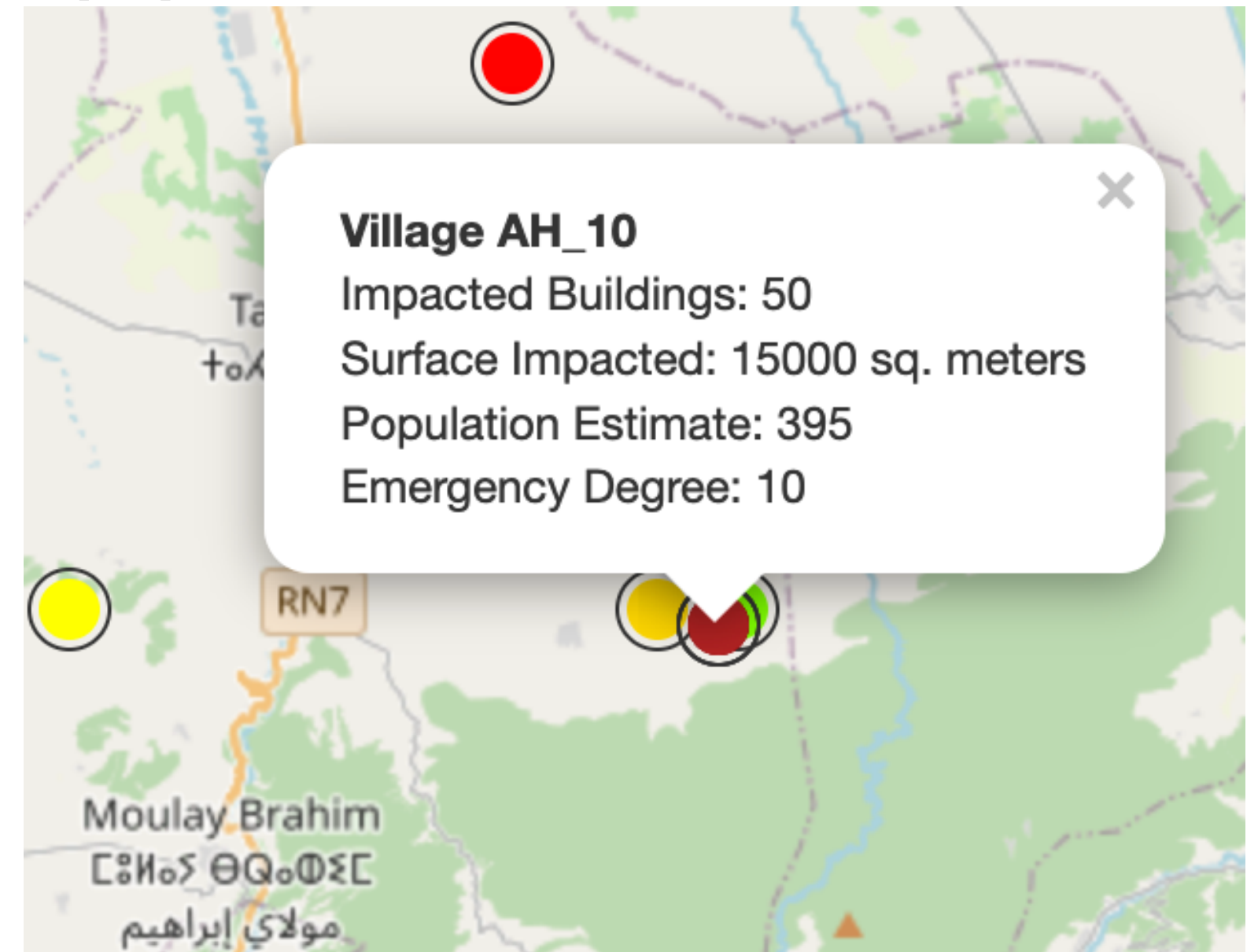
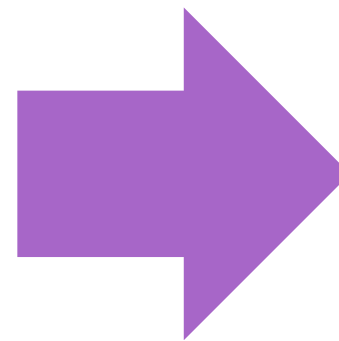
This will **aid authorities** in **estimating** the necessary **assistance** to deploy based on identified needs.



# How to DeepAster ?

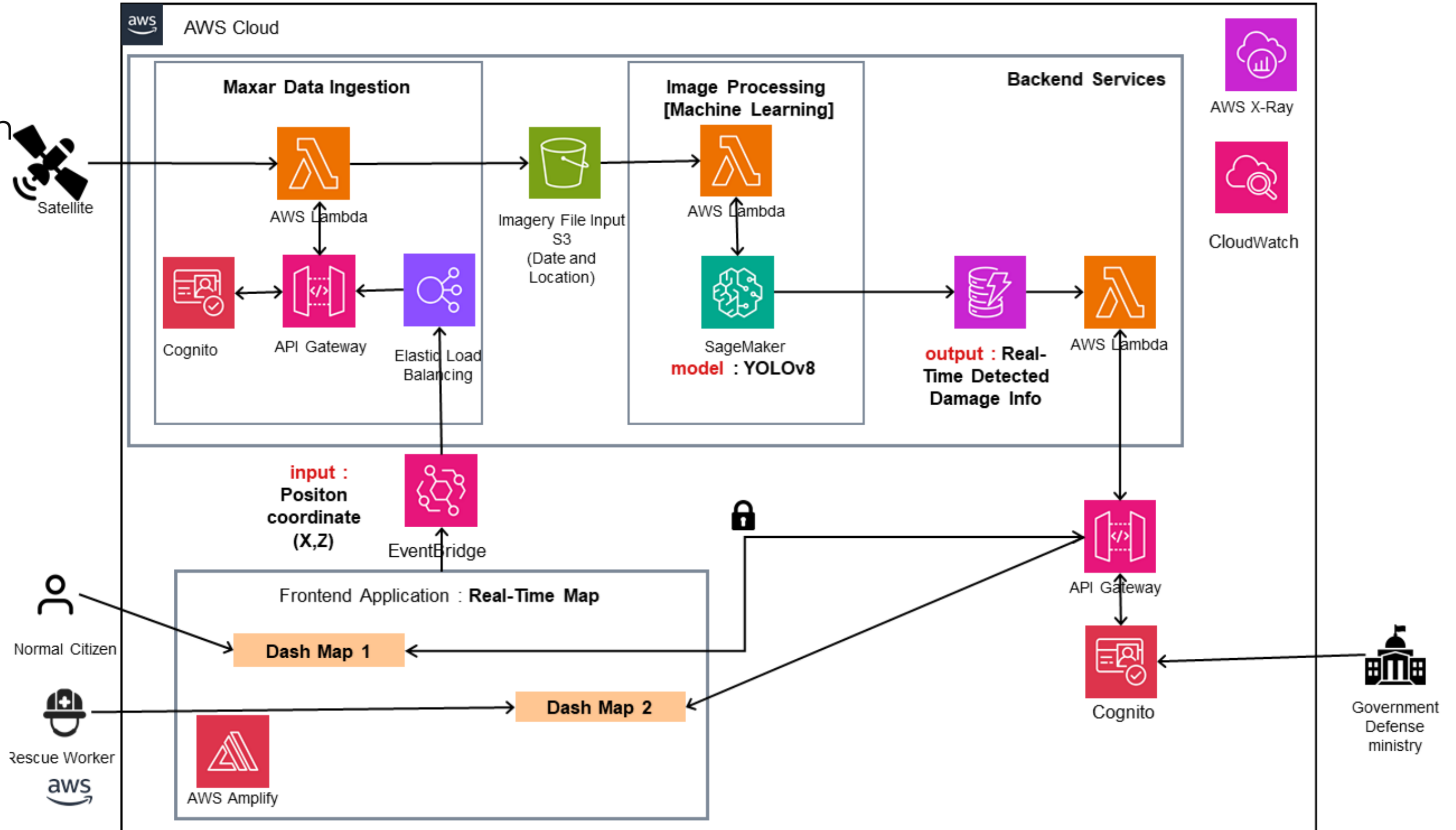
Our Machine Learning Model will focus on :

- **Detecting buildings** on a specific area (Before / After )
- Calculate a **ratio** of impacted **buildings** and deduce an **emergency degree, range {1, 10}**
- Calculate an estimate of **the number of impacted population**.



# DeepAster Architecture?

Here are the major steps to implement the solution based on **AWS Cloud Architecture** :



# DeepAster Solution

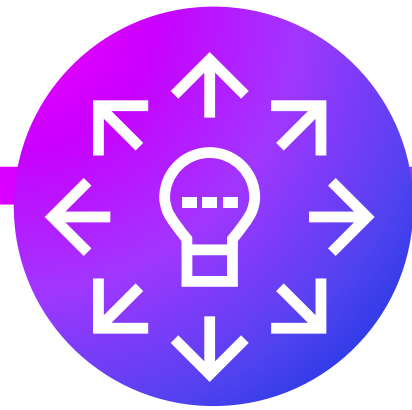


## Resilient

**Satellite Data** : This source of data is **Resilient**.

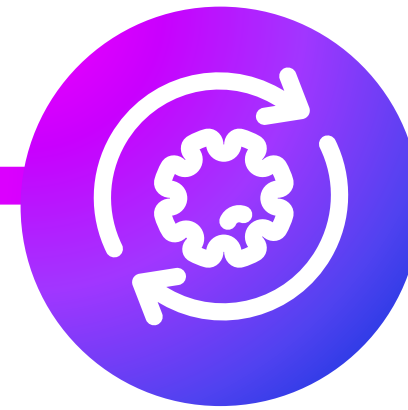
We can use data from :

- government's satellite
- private entities like Maxar, Google Earth,
- Drones



## Scalability

The solution is implemented on AWS Cloud Architecture, Our model is linearly **scalable** .



## Replicability

The detection of the impacted buildings is a crucial info that can be used in many disasters : flood, wildfires, seisms

...



## Community

Collecting data from users is a important point in order to have the most updated info and deliver the most value for rescue workers



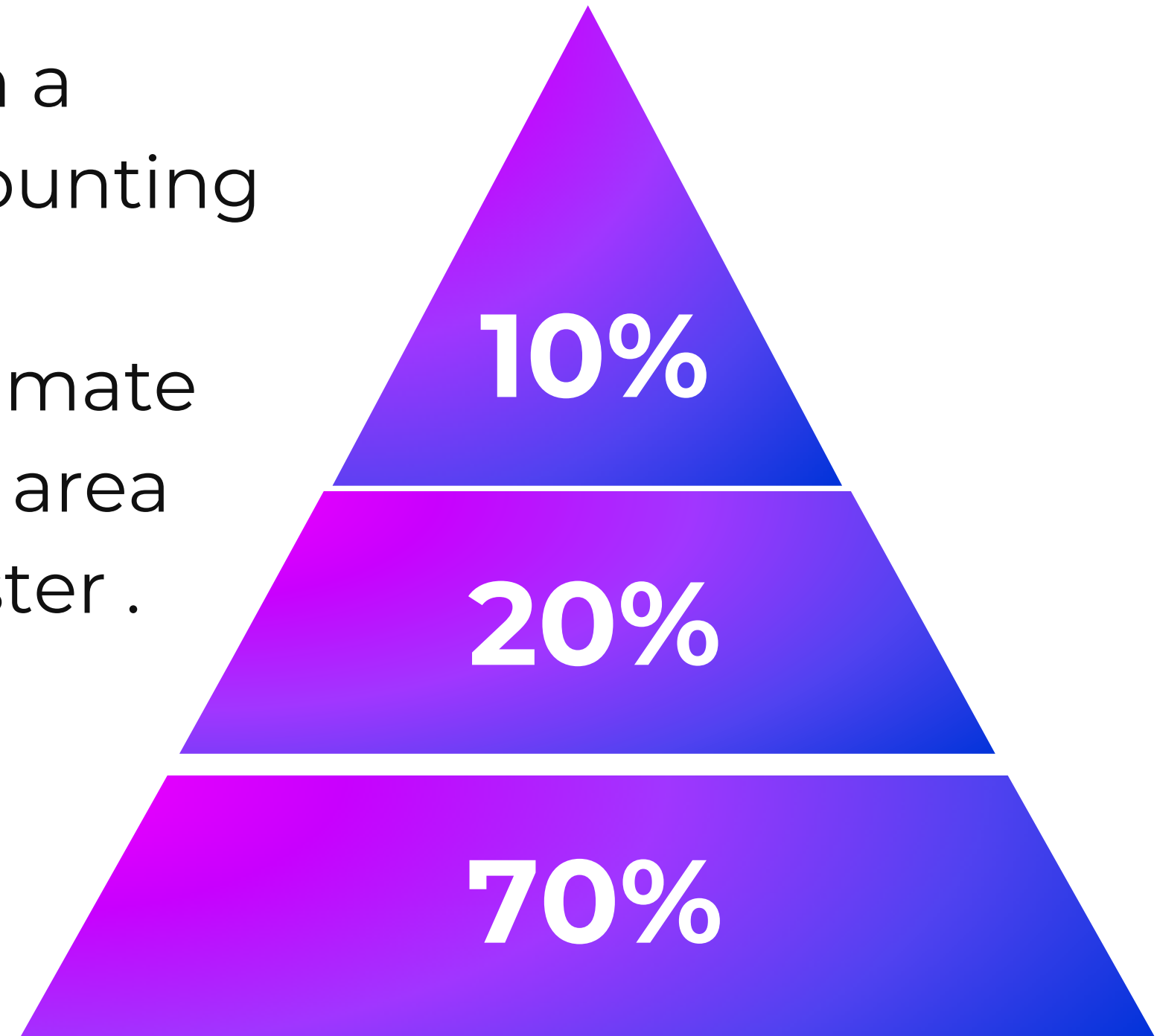
# Proof of Concept a Data Driven Approach

# Main task of the model



- Detecting buildings in a satellite image, and counting them.
- Using this, we can estimate the percentage of the area damaged by the disaster .

$$R(\%) = 1 - \frac{After}{Before}$$



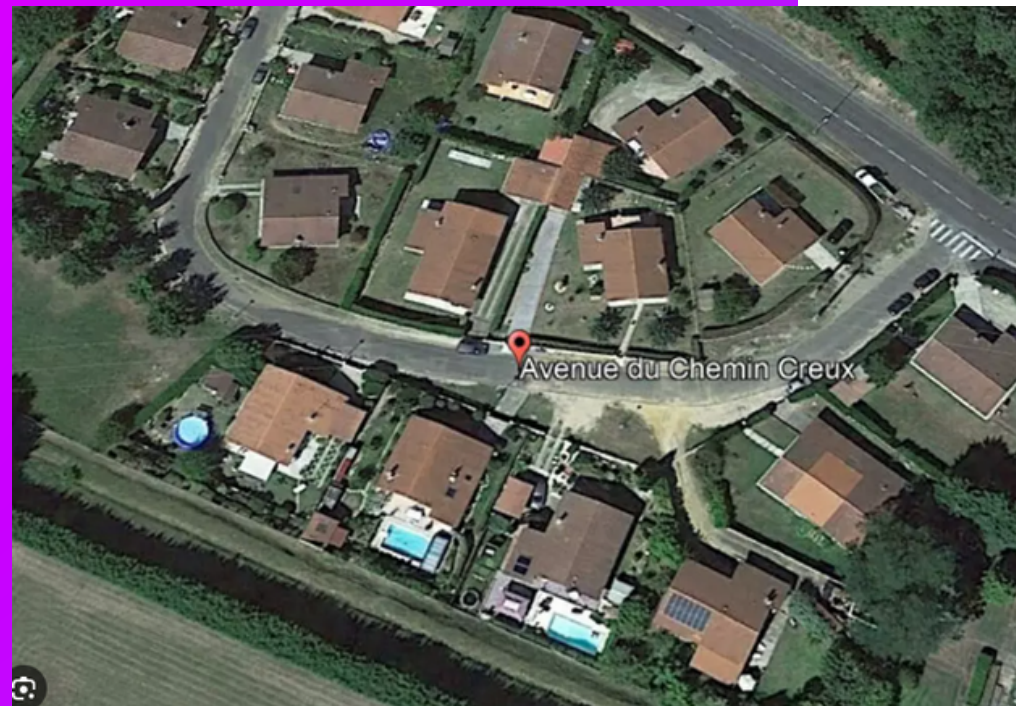


# ML Model



- We chose not to implement a Deep Learning model from scratch.
- Instead, we fine tuned a pre-trained object segmentation model : **YOLOv8**

# Dataset and data Issues



**European Style buildings**



**Moroccan Style buildings**



## Create our Own Dataset

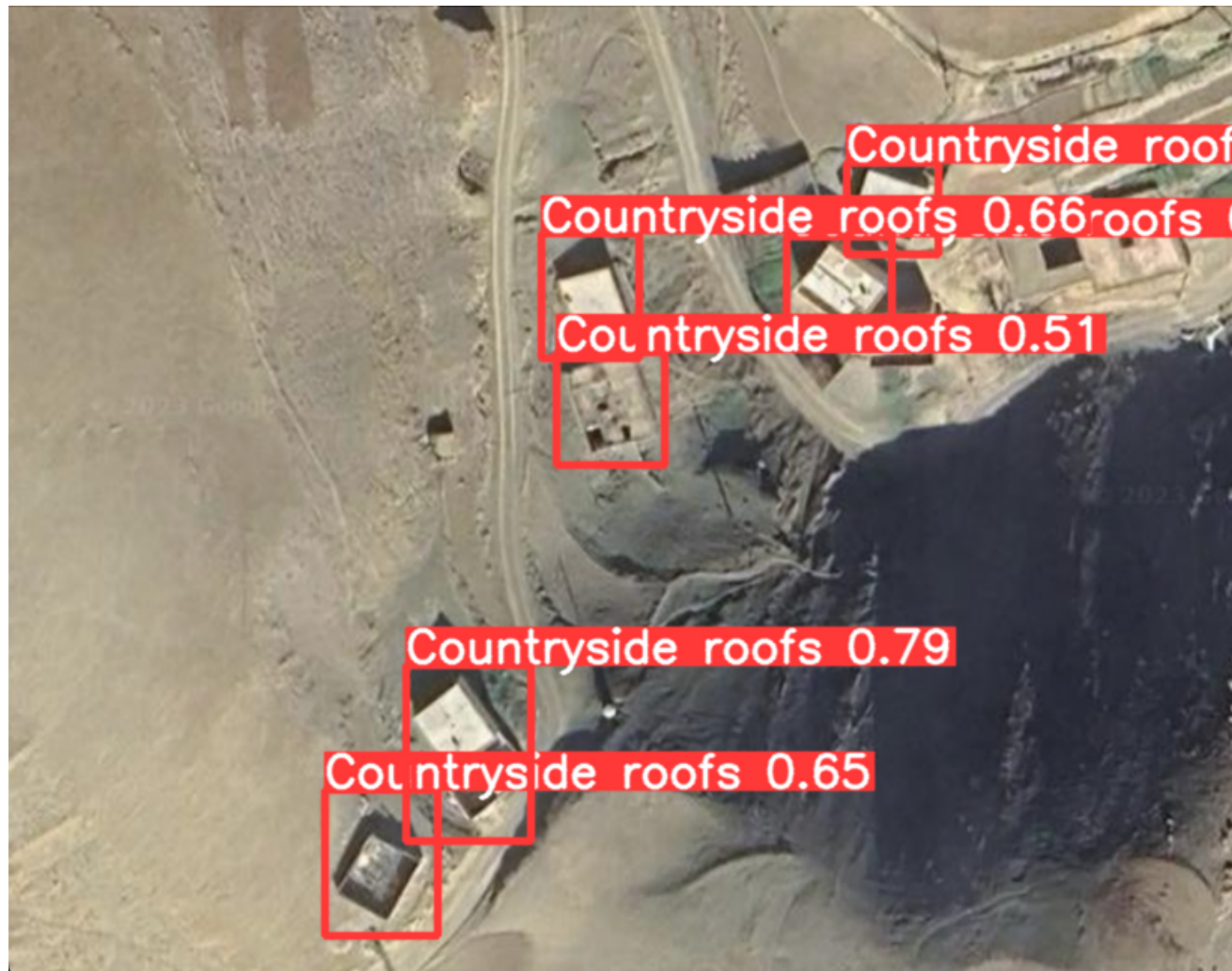
- Dataset link : <https://universe.roboflow.com/achraf-5vwpe/north-african-roofs-dataset>
- 30 training items + data augmentation : Yes we know that it is very sample, however it seems to work in this case of sparse repartition of houses in the villages.
- 5 items a day + Consistency = A coherent large dataset.

The screenshot displays the Roboflow Universe interface. At the top, there's a navigation bar with 'Projects', 'Universe', 'Documentation', and 'Forum'. A search bar is present with the text 'Search 200,000+ Open Source Computer Vision Projects...'. The main content area shows a dataset titled 'North African roofs...' under the 'Object Detection' category. The dataset has 30 images, as indicated by the '30' in a green circle next to the 'Images' tab. The interface includes a 'Browse' section with a search bar for images by subject, and a grid of image thumbnails. Each thumbnail has a 'TRAIN' button. The grid is organized into three rows of eight images each. The first row shows various aerial and ground-level views of roofs with yellow bounding boxes. The second row shows similar views with different bounding box configurations. The third row shows more varied views, including one labeled 'roof (2).png'. The interface also features a sidebar with navigation options like 'Overview', 'Dataset', 'Model', 'API Docs', and 'Health Check'.



## Results of the approach :

- The model re-trained with moroccan-style buildings allows to get good results :
- An accuracy of 85 %
- Following pictures show the obtained results : manu buildings are now recognized



# DeepAster

DeepAster is an ambitious project that has as objective so rescue lives post-disaster in a more efficient way.

We have studied ML models that will help us this goal as well as a complete software and data architecture.

The most sensitive point is the ability to get access to real-time satellite images.



# DeepAster

**Mapping Hope, Mitigating Disaster**

Ilham EL BOULOUMI

Sanae ATTAK

Aymane EL FIRDOUSSI

Achraf Sbai

Ayoub Loubyy

