SOLIDARITY HACKATHON
MOROCCO

Mila

DeepAster

Mapping Hope, Mitigating Disaster

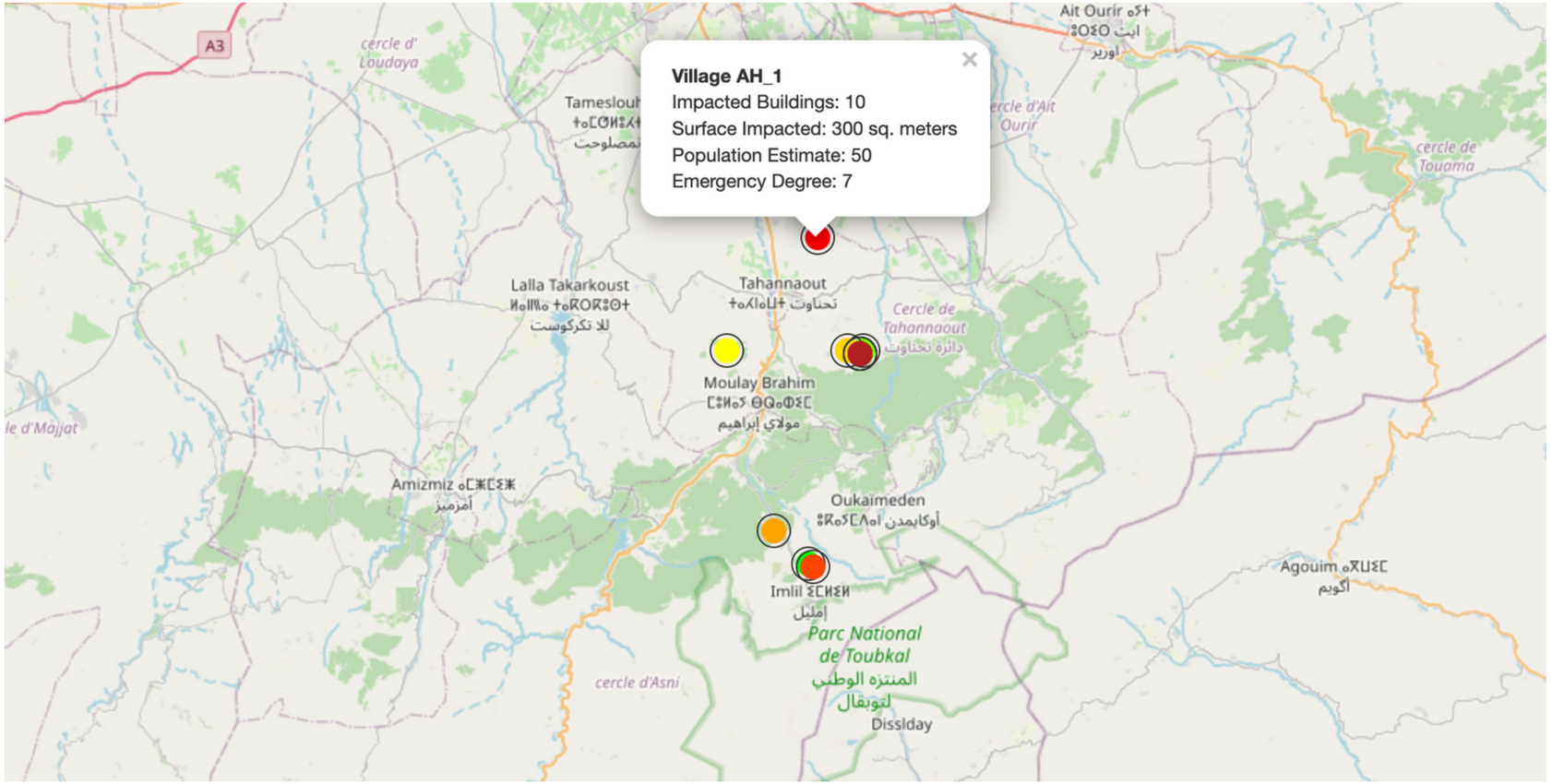
Why DeepAster ?

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 ?

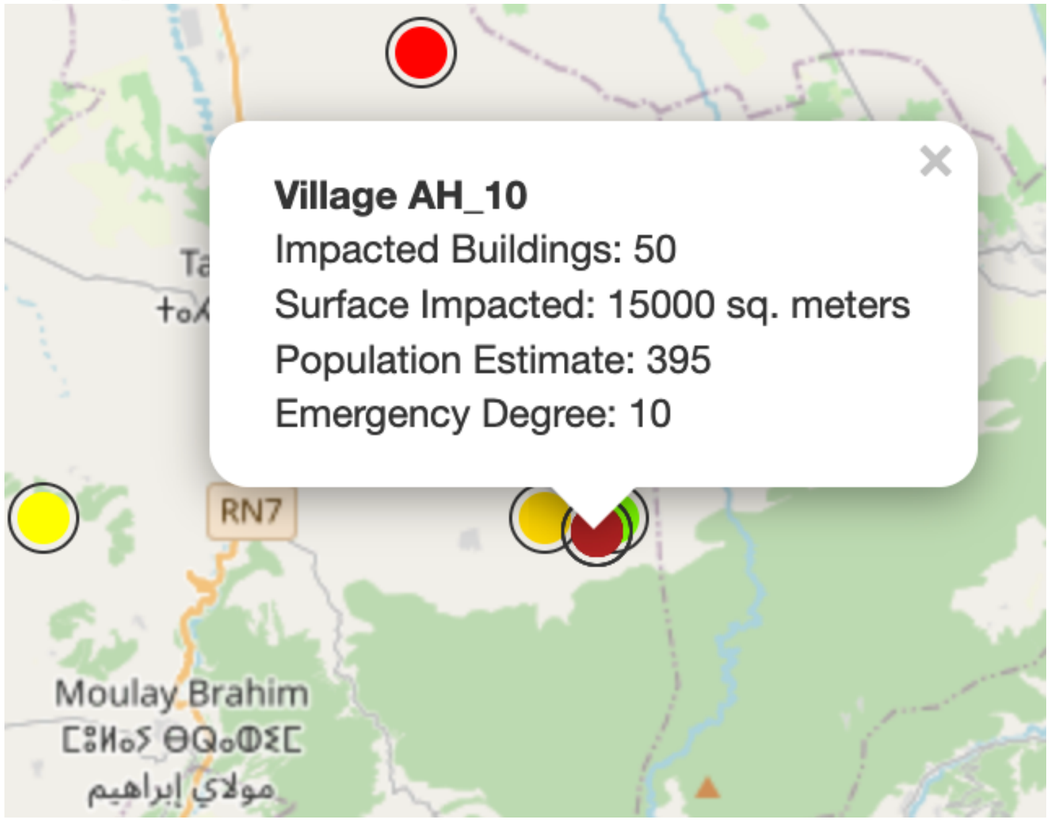
The objective is to use satellite data and imagery analysis to **assess the degree of destruction** in a given area using Real-Time Data
This will **aid authorities** in **estimating** the necessary **assistance** to deploy based on identified needs.



How to DeepAster ?

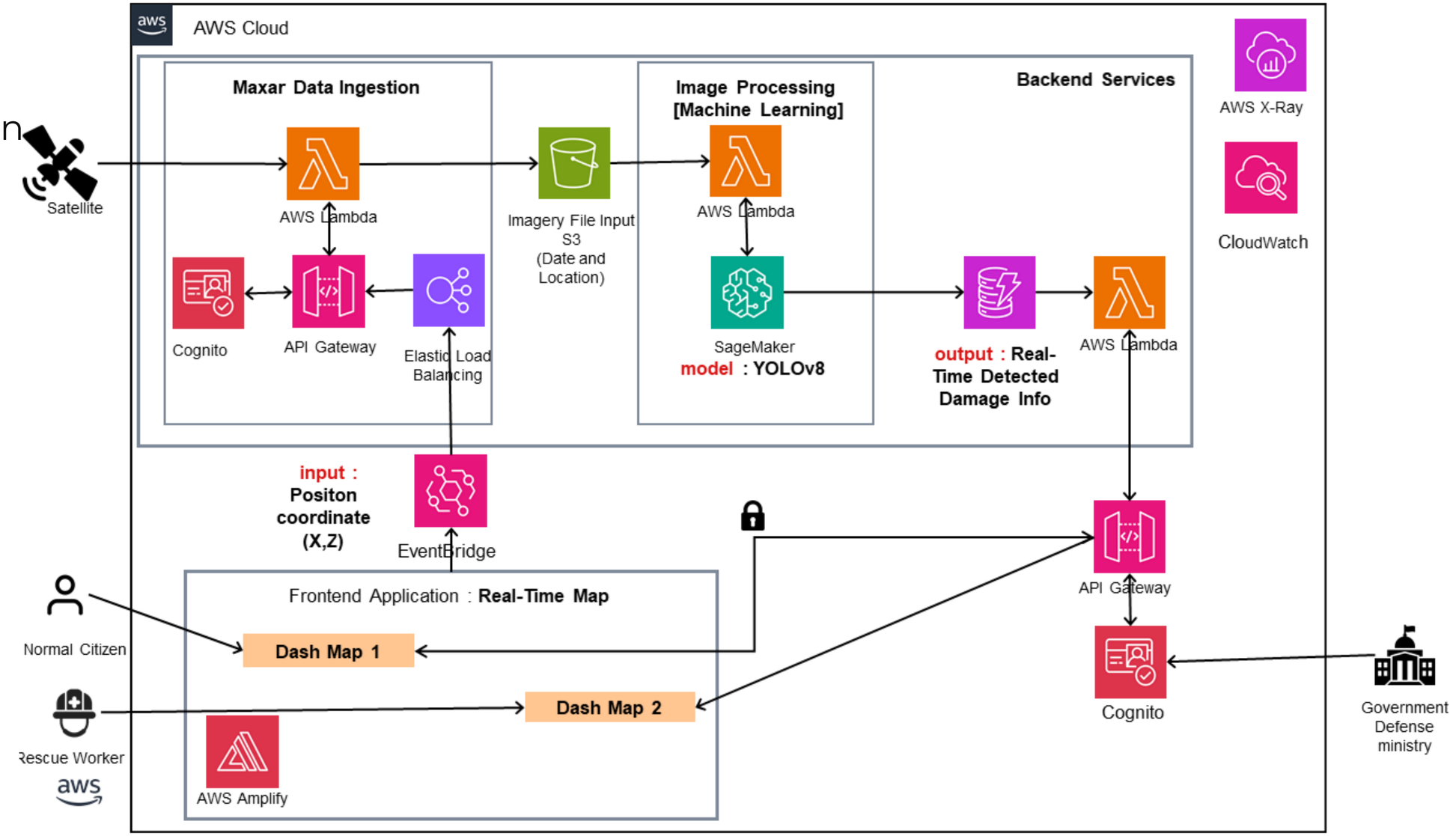
Our Machine Learning Model will focus on :

- **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

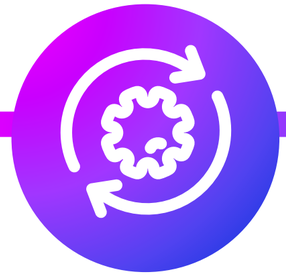
Resilient

Satellite Data : This source of data is **Resilient**.
We can use data from :

- government's satellite
- private entitities 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

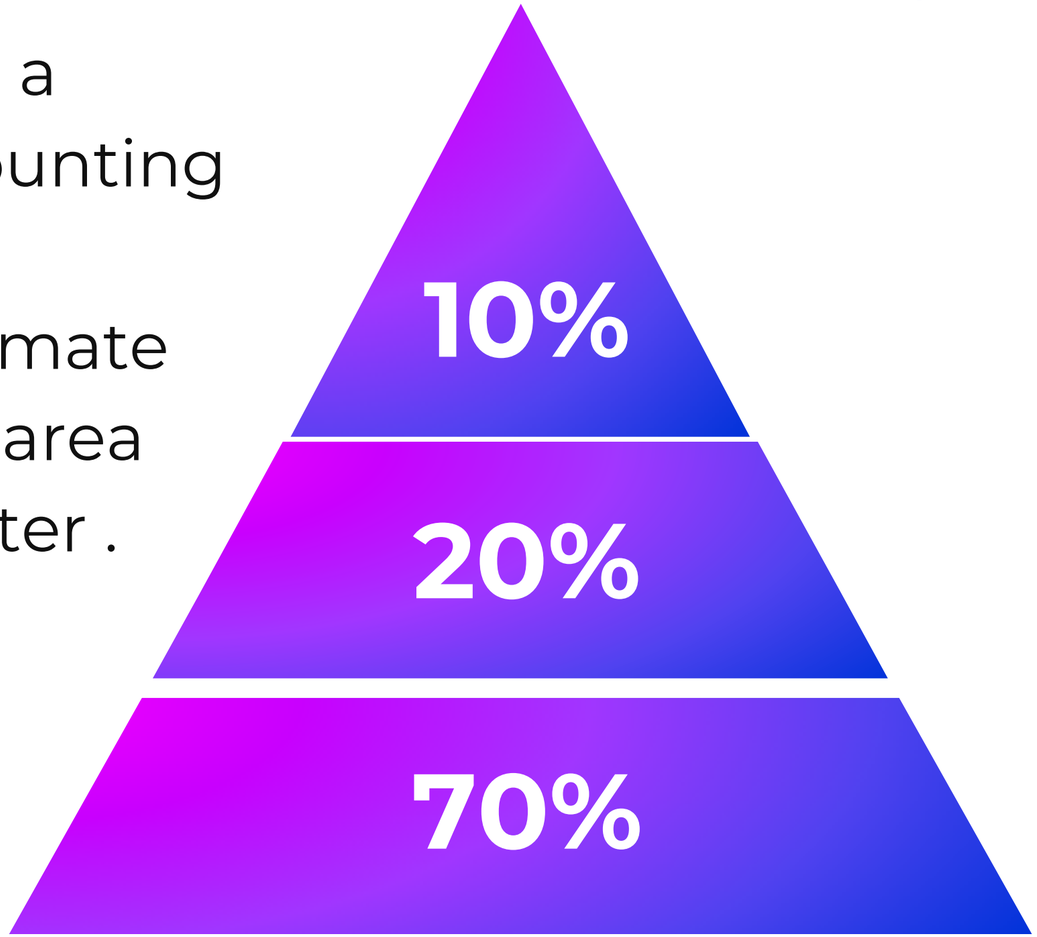
Proof of Concept

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 .

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

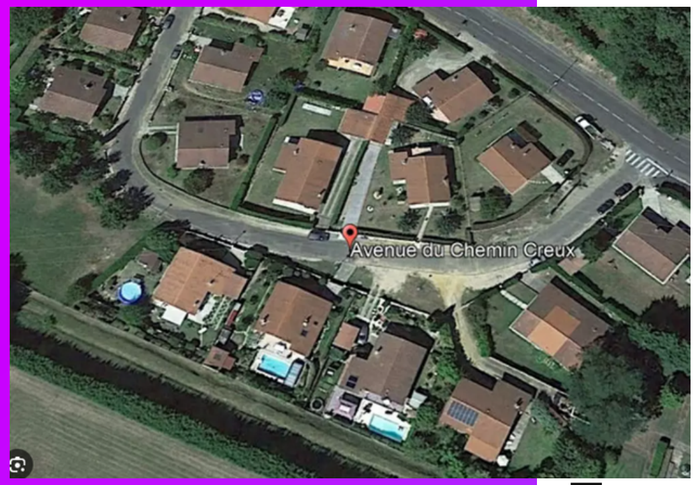


ML Model

- 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

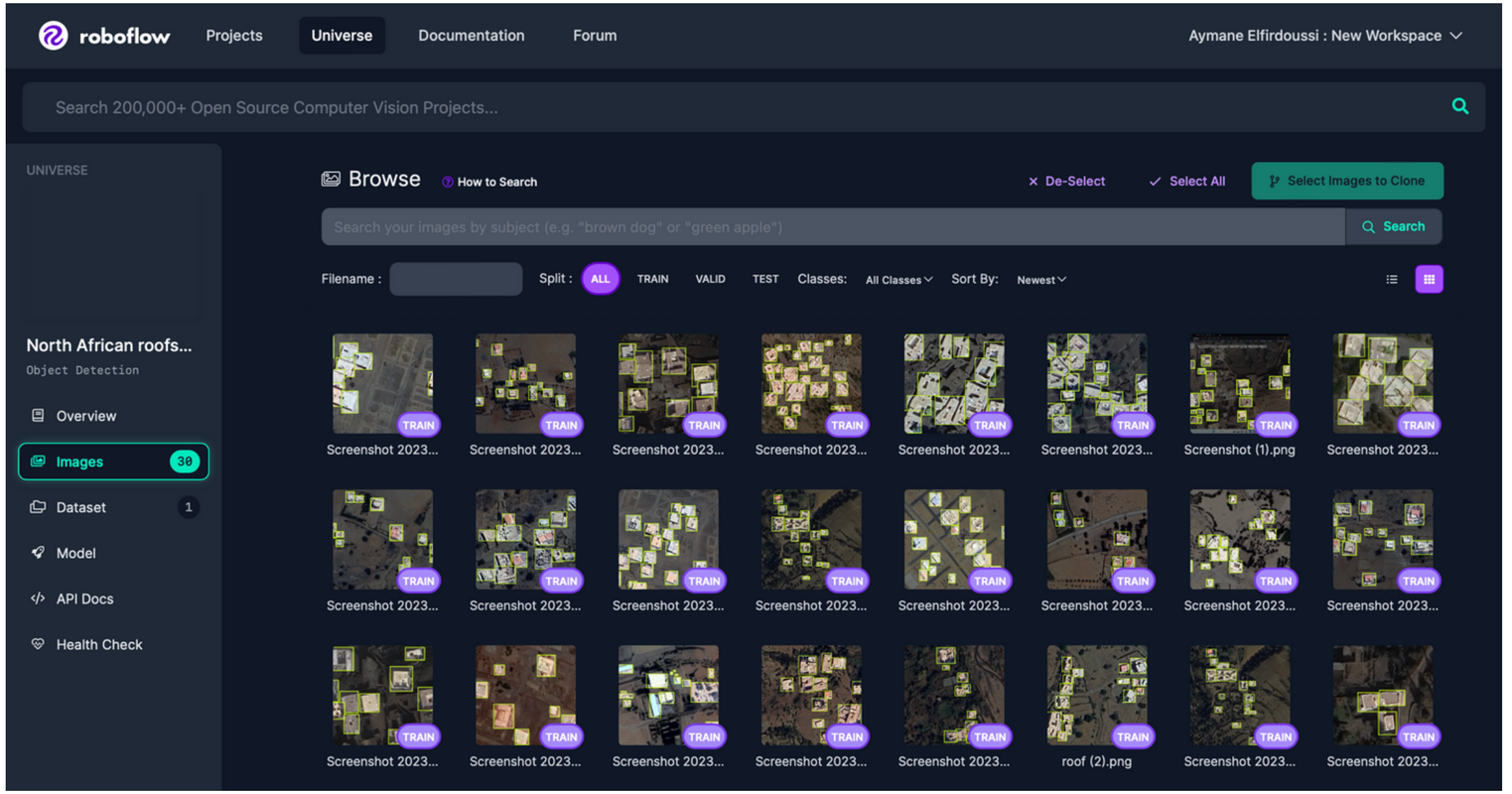


European Style buildings

Moroccan Style buildings

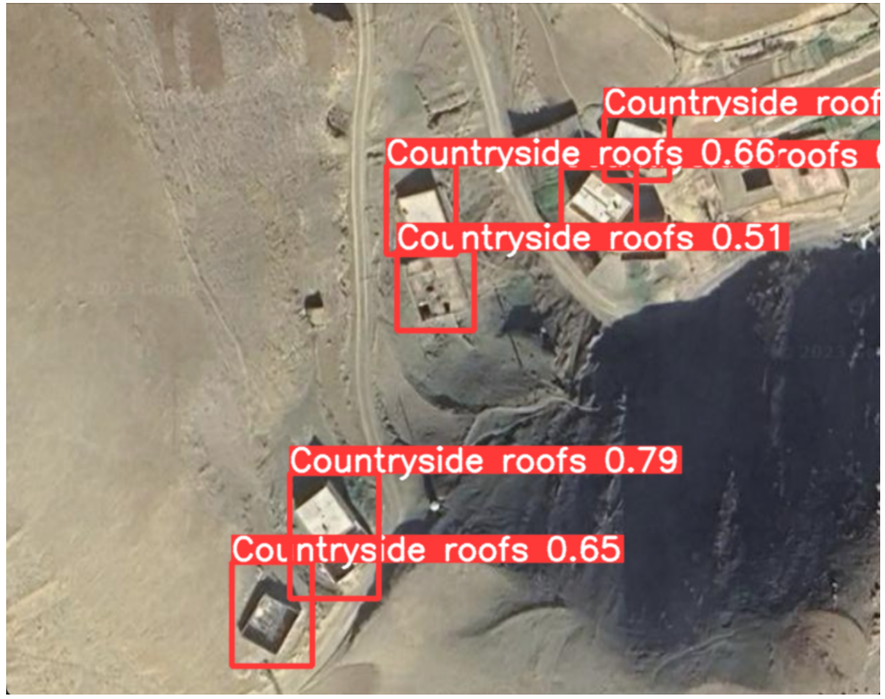
Create our Own Dataset

- 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.



Results of the approch :

- 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.

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