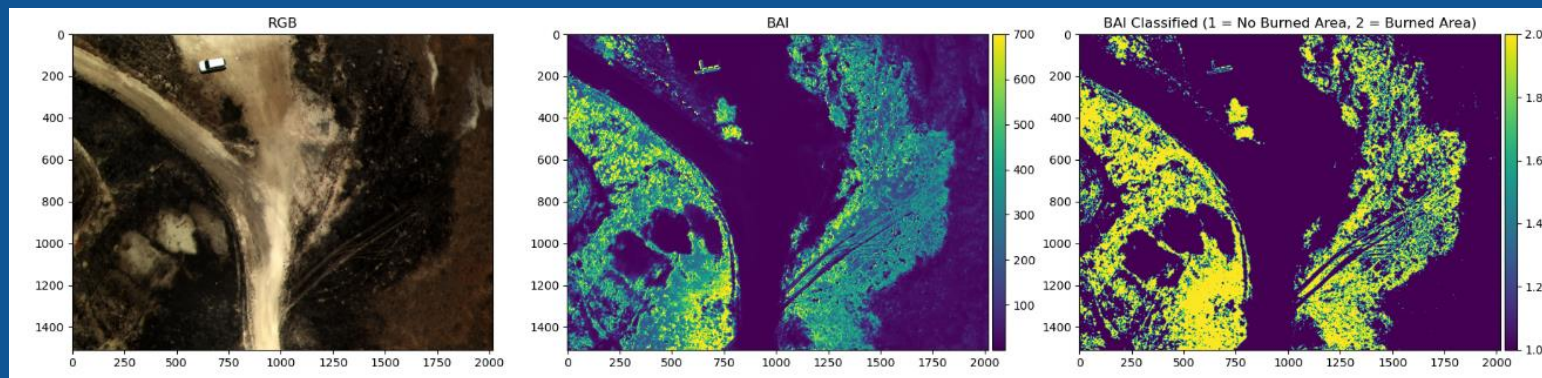




European  
Commission

# Machine learning in the operations of the European Union Civil Protection Mechanism

AIDERS project: real-time  
M.L. in fire rescue  
operations



Ioannis Andredakis  
Situational Awareness Sector  
Emergency Response and Coordination Centre



# European Civil Protection & Humanitarian Aid Operations

# Emergency Response & Coordination Centre

In May 2013, we launched the

## Emergency Response Coordination Centre (ERCC)

Monitors disasters  
around the globe

24/7

Maps disaster risks

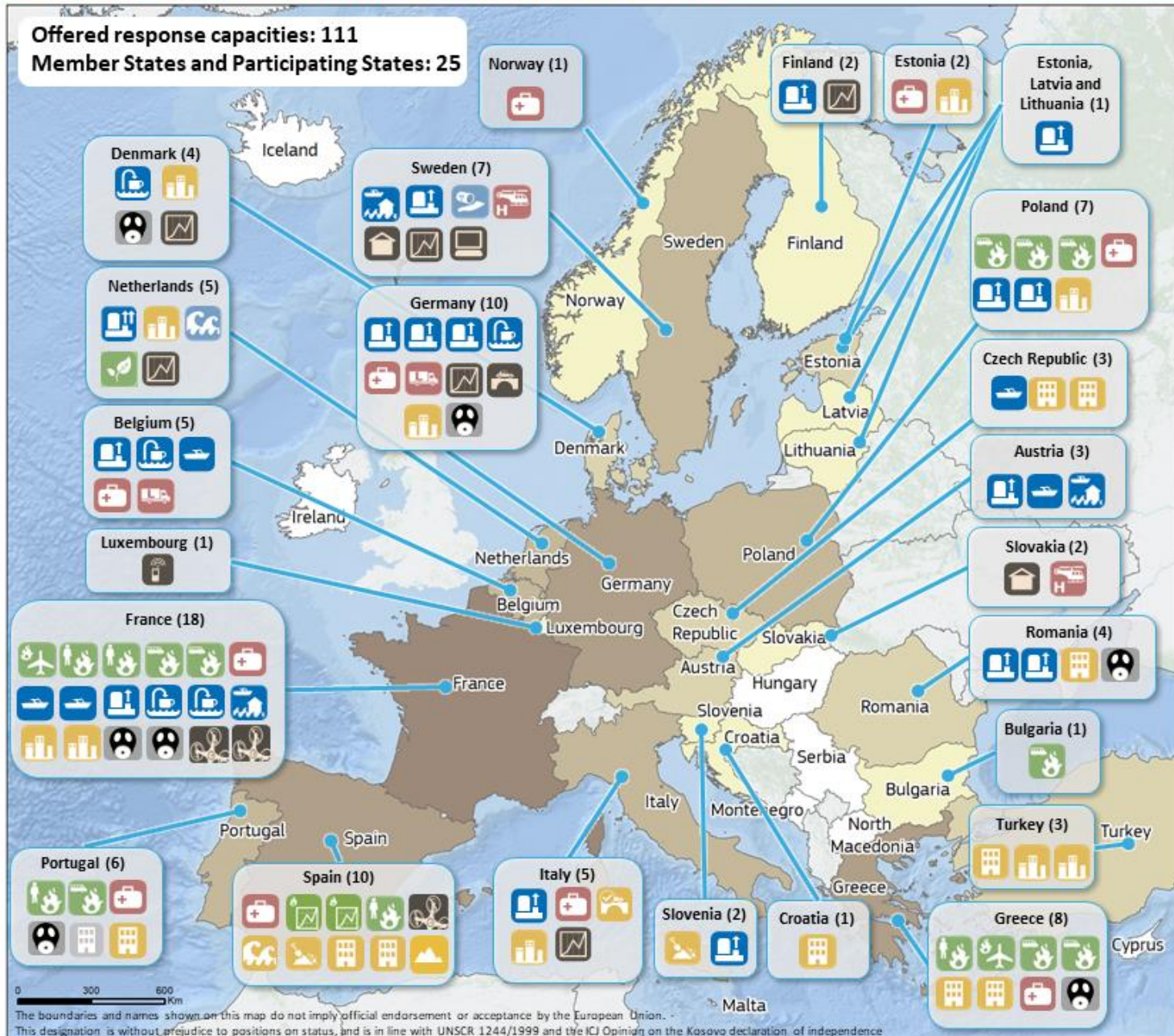


Provides real-time  
information



Coordinates joint European  
response operations





Response Capacities			
Flood Rescue with Boats		Marine Pollution Capacities	
High Capacity Pumping		Environmental Assessment Unit	
Water Purification		Forest Fire Fighting with Planes	
Flood Containment		Ground Forest Fire Fighting	
Extreme High Capacity Pumping		Ground Forest Fire Fighting with Vehicles	
Medium Urban Search and Rescue		Team for firefighting advisory/assessment	
Cave Search and Rescue		CBRN Detection and Sampling	
Heavy Urban Search and Rescue		CBRN Decontamination	
Structural Assessment Capacity		Search and Rescue in CBRN conditions	
Team for mountain search and rescue (M SAR)		Standing Engineering Capacity	
Team for water search and rescue (WSAR)		Technical Assistance and Support Team (TAST)	
Mobile Lab		ICT Help Desk (TAST)	
Medical Air Evacuation		Team with unmanned aerial vehicles	
Emergency Medical Team		Shelter Capacities	
Maritime Incident Response Group		Communication Platforms	

The **European Civil Protection Pool**, commonly referred to as "the pool", consists of a range of emergency response capacities that countries participating in the **EU Civil Protection Mechanism** make available for EU emergency response operations. Since the establishment of the pool in October 2014, 25 Participating States have brought together 109 civil protection capacities which are now available (or will eventually become available) for EU operations worldwide, following a request for assistance through the European Commission's Emergency Response Coordination Centre.

0 1-2 3-4 5-10 11-18

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# EUCPM Requests for Assistance: 2015 - 2020

## 🦠 PANDEMIC (COVID-19)<sup>1</sup>

- |                        |  |                |                      |                 |            |
|------------------------|--|----------------|----------------------|-----------------|------------|
| Afghanistan            | Brazil                                       | Czech Republic | Iran                 | Moldova         | Tajikistan |
| Albania                | Cape Verde                                   | Denmark        | Italy                | Mongolia        | Ukraine    |
| Armenia                | Kingdom of the Netherlands <sup>2</sup> (x2) | Djibouti       | Jordan               | Montenegro      | Uruguay    |
| Azerbaijan             | China  | Ecuador        | Kazakhstan           | Myanmar         | Uzbekistan |
| Bangladesh             | Colombia                                     | EL Salvador    | Kenya                | North Macedonia | Zambia     |
| Belarus (x2)           | Republic of Congo                            | Estonia        | Kosovo               | Palestine       | WFP        |
| Bhutan                 | Costa Rica                                   | Ethiopia       | Kyrgyz Republic (x2) | San Marino      | OCHA       |
| Bolivia                | Croatia                                      | France         | Lebanon              | Serbia          |            |
| Bosnia and Herzegovina | Cuba   | Georgia        | Lithuania            | Sierra Leone    |            |
|                        |  | Greece         | Mauritius            | Spain           |            |

## ✈️ CONSULAR SUPPORT (COVID-19)<sup>1</sup>

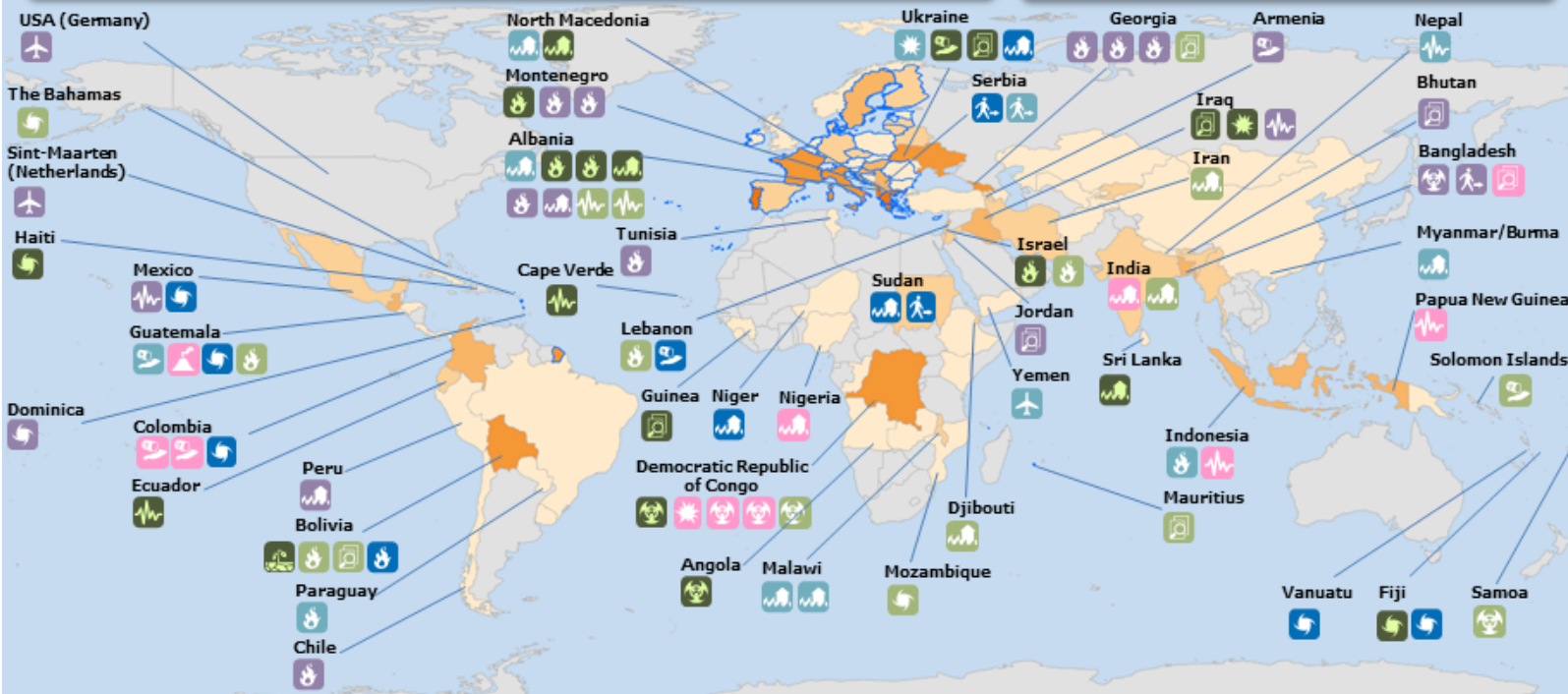
- |                |             |   |
|----------------|-------------|---|
| Austria        | Italy       | Spain                                       |
| Belgium        | Latvia      | Sweden                                      |
| Czech Republic | Lithuania   | Turkey                                      |
| Denmark        | Luxembourg  | United Kingdom                              |
| Finland        | Netherlands | Multiple EU Member States <sup>3</sup> (x5) |
| France         | Norway      |   |
| Germany        | Poland      |   |
| Hungary        | Portugal    |   |
| Ireland        | Slovakia    |   |

## Total EUCPM activations 2015-2020:

# 219

## EU MEMBER STATES

- Portugal: 🇵🇹 🇵🇹 🇵🇹 🇵🇹 🇵🇹 🇵🇹 🇵🇹
- France: 🇫🇷 🇫🇷 🇫🇷 🇫🇷 🇫🇷 🇫🇷 🇫🇷
- Italy: 🇮🇹 🇮🇹 🇮🇹 🇮🇹 🇮🇹 🇮🇹 🇮🇹
- Croatia: 🇭🇷 🇭🇷 🇭🇷 🇭🇷 🇭🇷 🇭🇷 🇭🇷
- Finland: 🇫🇮 🇫🇮 🇫🇮 🇫🇮 🇫🇮 🇫🇮 🇫🇮
- Sweden: 🇸🇪 🇸🇪 🇸🇪 🇸🇪 🇸🇪 🇸🇪 🇸🇪
- Latvia: 🇱🇻 🇱🇻 🇱🇻 🇱🇻 🇱🇻 🇱🇻 🇱🇻
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- Hungary: 🇭🇺 🇭🇺 🇭🇺 🇭🇺 🇭🇺 🇭🇺 🇭🇺
- Greece: 🇬🇷 🇬🇷 🇬🇷 🇬🇷 🇬🇷 🇬🇷 🇬🇷
- Romania: 🇷🇴 🇷🇴 🇷🇴 🇷🇴 🇷🇴 🇷🇴 🇷🇴
- Bulgaria: 🇧🇬 🇧🇬 🇧🇬 🇧🇬 🇧🇬 🇧🇬 🇧🇬
- Cyprus: 🇨🇾 🇨🇾 🇨🇾 🇨🇾 🇨🇾 🇨🇾 🇨🇾



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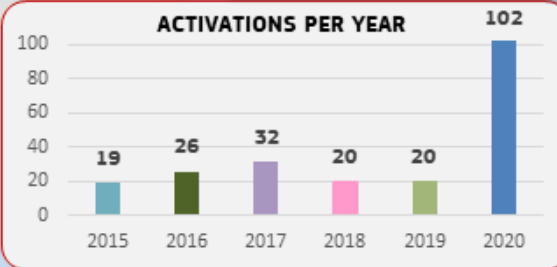
AFFECTED COUNTRY	NATURE OF EUCPM REQUEST	YEAR OF REQUEST
Total activations	✈️ Consular support	2015
1	🚒 Disaster preparedness mission	2016
2	☀️ Conflict	2017
3 - 4	🔥 Forest fire	2018
5 - 6	🚗 Accident / Environmental accident	2019
7 - 10	🦠 Epidemic	2020
EU Member States	🌊 Flood	
	🌪️ Tropical cyclone	
	🌋 Volcanic activity	
	🏥 Medical	

EUCPM: EU Civil Protection Mechanism

<sup>1</sup>Activations related to the 2020 COVID-19 pandemic are not labelled in the map due to the high number of countries requesting assistance. These are included in the total activations graduated shading and are listed in the two separate boxes.

<sup>2</sup>The Kingdom of the Netherlands on behalf of Dutch Caribbean Islands

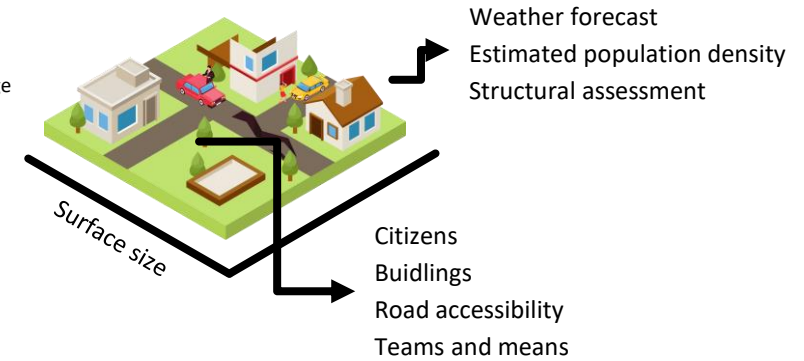
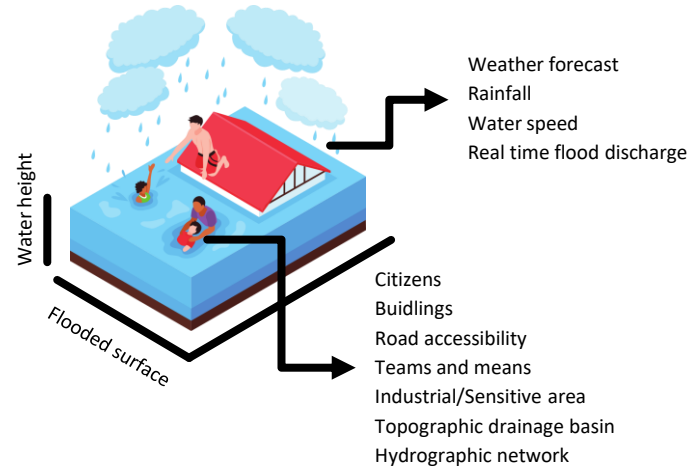
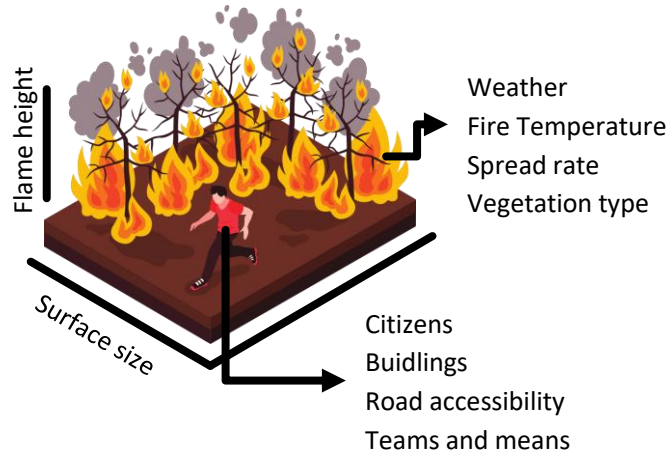
<sup>3</sup>Consular support operations/repatriations of EU citizens with multiple EU Member States involved in these operations



# Real-time Artificial Intelligence for decision support via RPAS data analytics: AIDERS

- Develop algorithms and tools that will harness the large volume of data collected using drones (including visual, thermal and multispectral cameras, LIDAR, CBRN sensors, etc.) and converting that data into actionable decisions for improved emergency response
  - Identify which information needs to be extracted from the collected data
  - Design online machine learning algorithms to process and analyse the received data in real-time in order to build knowledge maps
  - Implement novel visualizations that higher-command can use to take intelligent decisions.
- Test in small and large scale exercises
- Share knowledge through dedicated workshops and trainings

# Operational environment, data types



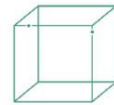
## Camera

Conventional  
RGB Images



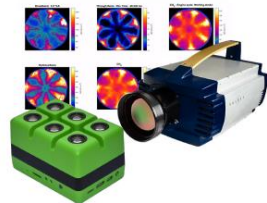
## Thermal

Relative  
Temperature Data



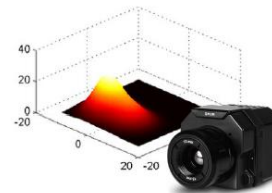
## Multispectral

Broad Spectral Data  
(between 3-5 bands)



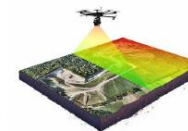
## RadioMetric

Thermal and  
Radiometric data



## Lidar

Elevation and  
structural data

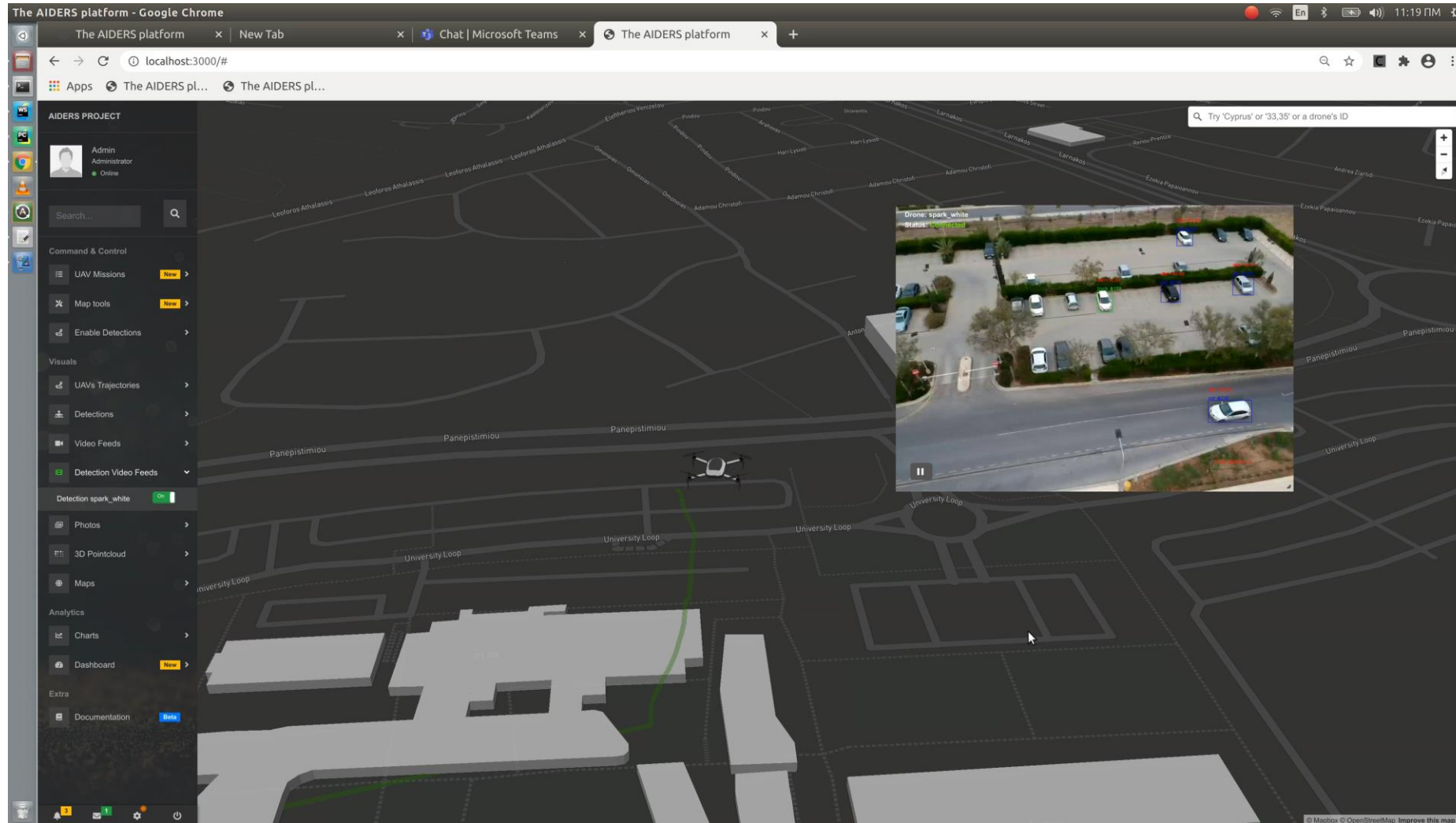


## CBRNE

Multi-Gas  
detection data

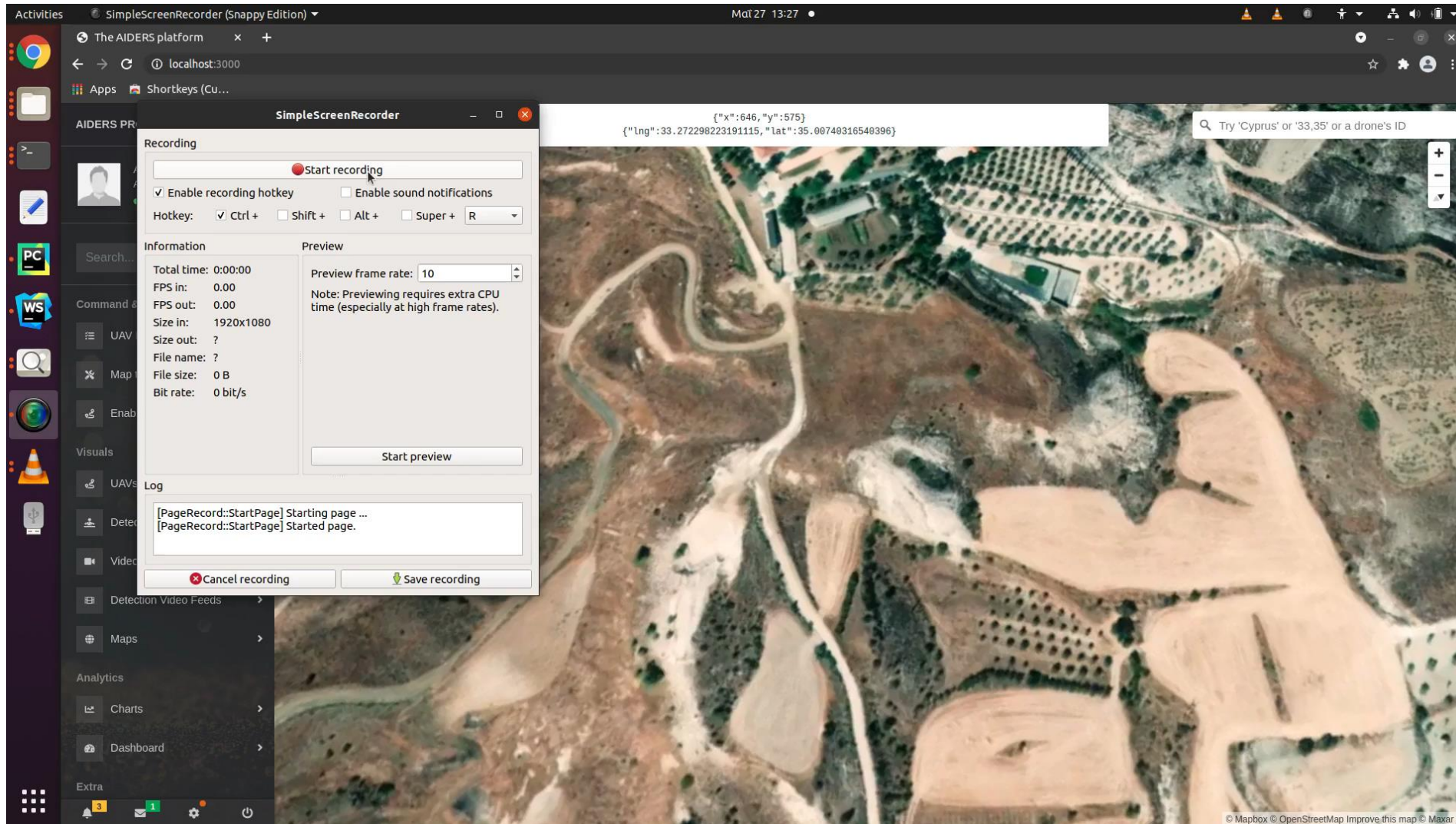


# ML for object detection





# Classification and clustering of indexes



# Implementation, testing and experimentation

- Algorithm implementation
- Integration and testing
- Field exercises and evaluation

