UNICORN

#EUSpace

Copernicus emergency Applications for Resilience addressing businesses' needs and policy making

EUSPA AI week 2026

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EUSPA
European Union Agency for the Space Programme

Project

UNICORN aims to contribute to building resilience against climate risks by developing Earth Observation-powered tools for early warning, forecasting, and hazard monitoring, empowering businesses and communities, and boosting emergency management.

By providing a suite of services that can be integrated into current systems, and leveraging cutting-edge tech and Copernicus data, UNICORN empowers communities and authorities to proactively anticipate and prepare for natural hazards through improved forecasts of floods, wildfires, and volcanic eruptions.

Project funded in the Horizon Europe Programme HORIZON-EUSPA-2023-SPACE under Grant Agreement 101180172

Vision

UNICORN envisions a future where advanced Earth Observation technologies provide critical tools for predicting and mitigating natural disasters, ensuring that societies and industries are better equipped to handle the impacts of climate change. We aim to develop Copernicus based applications that integrate scientific knowledge into emergency management policies, improving forecasting, preparedness, and response at local, regional, and national levels.

UNICORN seeks to be a leading force in advancing disaster resilience strategies through collaboration, innovation, and technology, empowering stakeholders to face an uncertain climate future with confidence.

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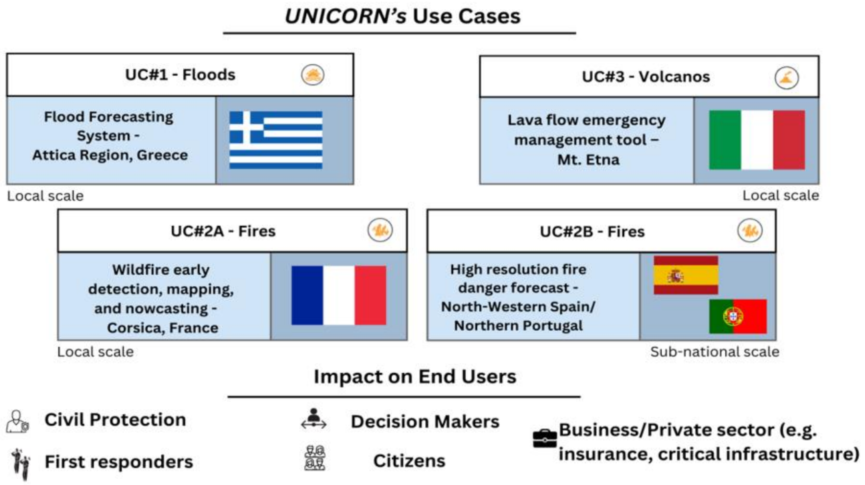
Unicorn Use Cases

Copernicus Emergency use cases with public and private end-users

UNICORN's foundation is laid on the development of four strategically selected Copernicus emergency applications corresponding in 4 use cases which incorporate specific areas, regions, and countries from the Mediterranean area of Europe that have a long history of natural hazards and extreme events.

These use cases through which the applications are implemented, monitored, and validated in real-world conditions are diverse due to the scale of operation (local, regional, and sub-national), the hazards, the type of engaged stakeholders, and the applied technologies.



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Results

Enhance the technologies that can help Responders and Private sector operators

Test and evaluate selected tools in the field, reaching high TRL levels

New services targeting the private sector

Exploitation activities among the SMEs involved in the Consortium

Define replicability scenarios and provide lessons learned

Use Case #2B

High-resolution fire danger forecast, North-Western Spain/Northern Portugal

The objective of this use case is to develop a high-resolution fire danger forecasting tool for the northwestern Iberian Peninsula.

Given the complex drivers of fire activity, the tool is designed to incorporate all relevant factors, including meteorology, fire dynamics, vegetation, and human influences.

Copernicus Emergency Management Service 2025 Burnt areas

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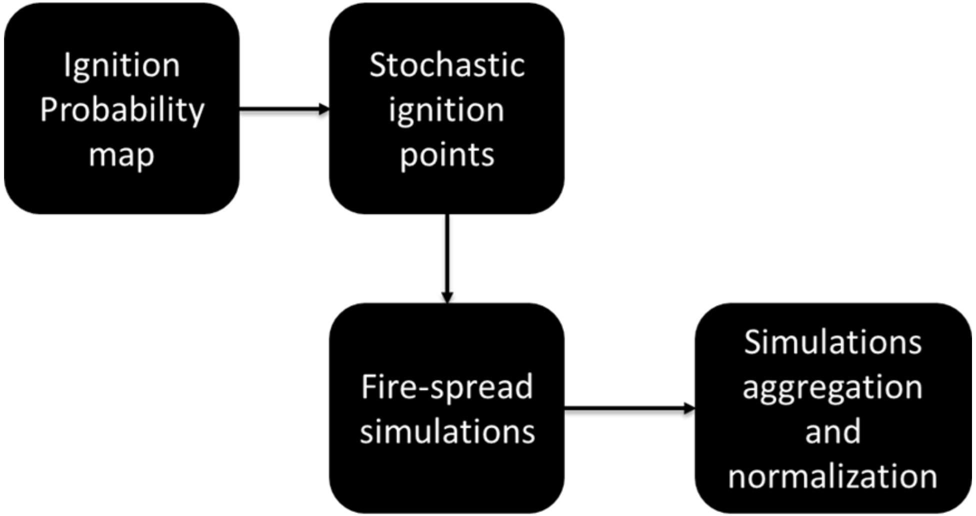
Methodology

The approach combines two modeling techniques:

- A machine learning model to estimate fire ignition probability
- A physics-based model to simulate fire spread.



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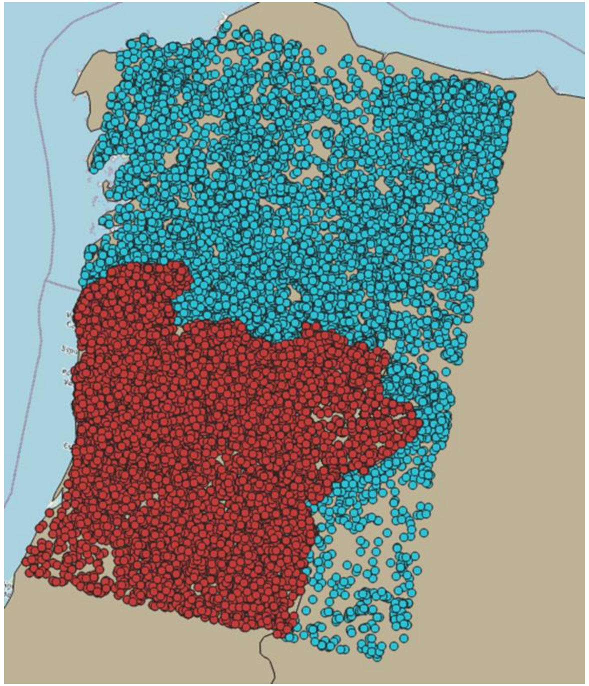
Methodology

The selected machine learning algorithm for ignition probability estimation is an eXtreme Gradient Boosting Classifier

The target variable are historical ignition points within the area of interest, obtained from two different sources:

- The Portuguese data come from the Forest Fire Information Management System (SGIF, ICNF).
- The Spanish data come from the General Forest Fire Statistics (EGIF, MITECO).



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Methodology

The selected machine learning algorithm for ignition probability estimation is an eXtreme Gradient Boosting Classifier

For predicting the ignitions we use landscape, weather and anthropogenic features or variables.

Input variable	Type	Source
Elevation	Landscape	NASA EarthData DEM
Slope	Landscape	NASA EarthData DEM
Aspect	Landscape	NASA EarthData DEM
Land cover	Landscape	Copernicus Land
Distance to built-up area	Anthropogenic	Copernicus Land
Distance to roads	Anthropogenic	Open Street Maps
Distance to rails	Anthropogenic	Open Street Maps
Distance to electric lines	Anthropogenic	Open Street Maps
FWI	Fire weather	Copernicus EFFIS
FFMC	Fire weather	Copernicus EFFIS
DMC	Fire weather	Copernicus EFFIS
DC	Fire weather	Copernicus EFFIS
ISI	Fire weather	Copernicus EFFIS
BUI	Fire weather	Copernicus EFFIS

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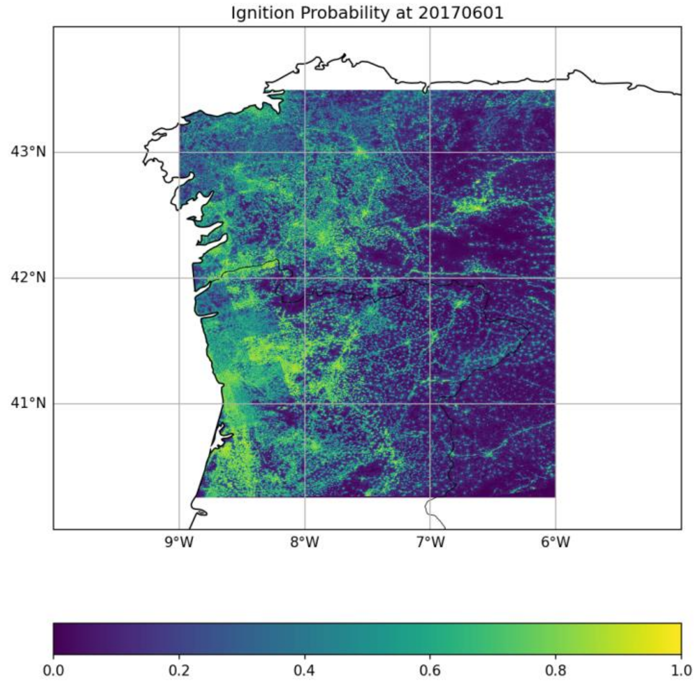
Results

The model outputs, for each spatio-temporal point, a value between 0 and 1 representing the likelihood of ignition

This information is used to generate daily maps of ignition probability.



Preliminary results

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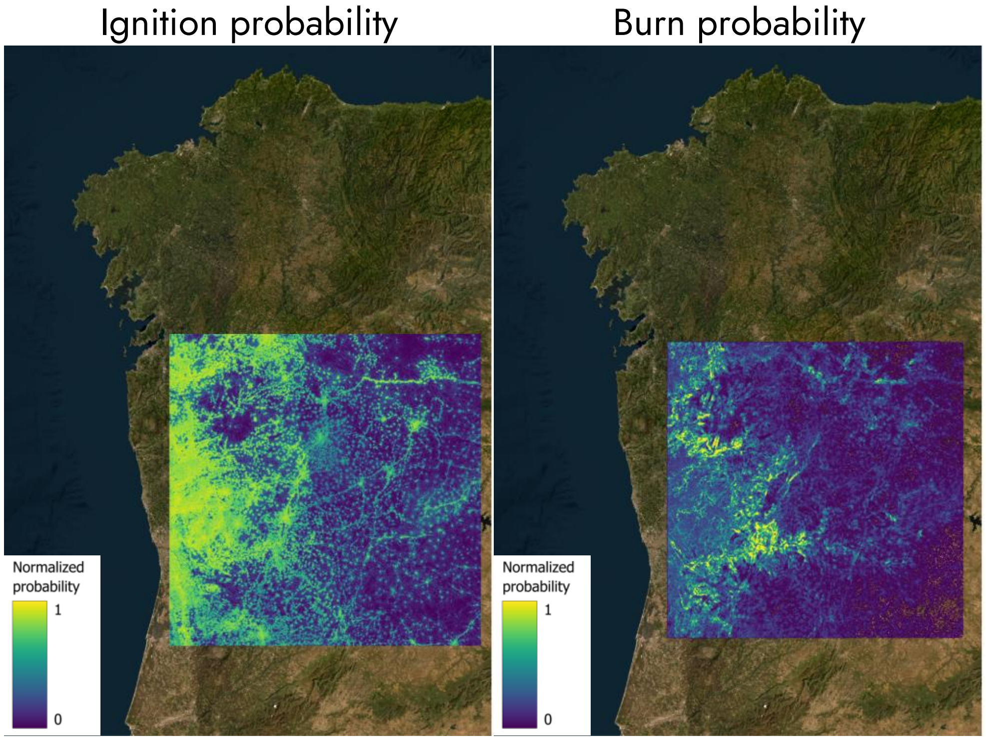
Results

These daily maps of ignition probability then serve as the basis for thousands of stochastic fire ignitions to run the fire-spread model



Preliminary results

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Linking space to user needs

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