CHAMELEON

SAFRA

Sustainable **A**erial **F**orestry **R**esilience **A**nalytics

João António Pereira

Founder & Software Architect

FORCERA

jcp@forcera.pt

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About us

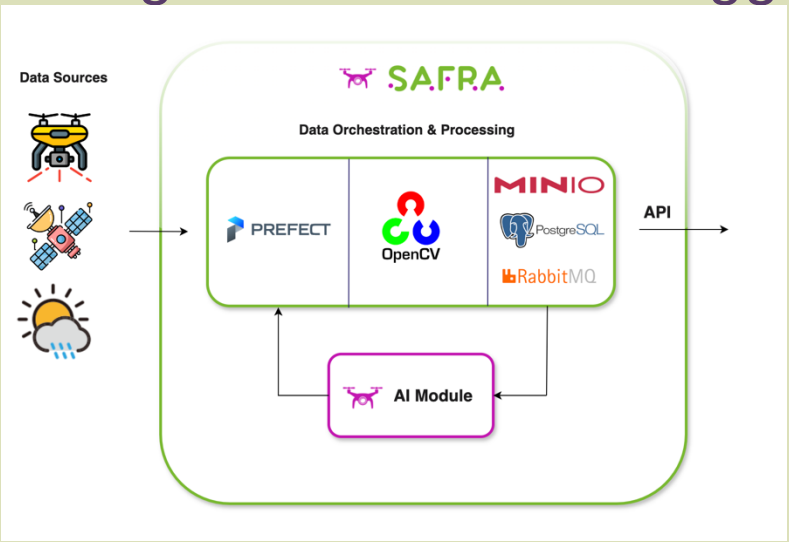
FORCERA is a **technology partner** dedicated to the development of digital solutions with significant impact and a focus on **innovation** and **sustainability**.

FORCERA

Project description

SAFRA bundle

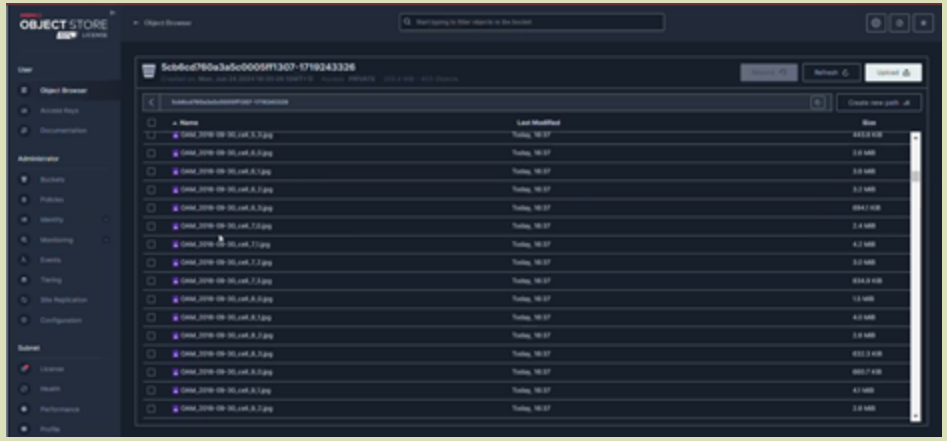
- **Software solution:** collection and analysis of analytical data from drone images in forest environments;
- **Enhanced detection:** geospatial and meteorological data combined lead to enhanced detection of forest health indicators and density status;
- **Automatic:** an input configuration structure triggers all the steps of the bundle.



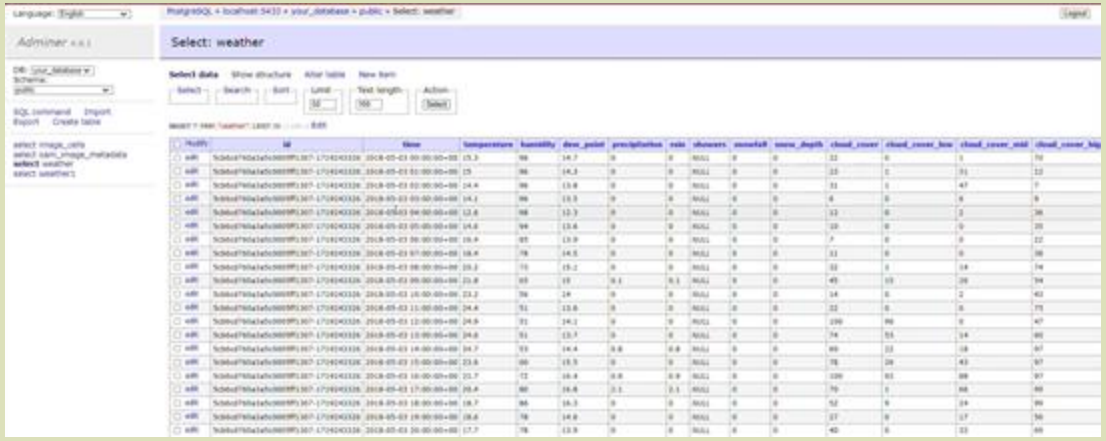
Data collection

Orchestration and processing

- **Modular and scalable design:** fully orchestrated by docker containers;
- **Open Aerial Map:** high resolution drone images for a given location in the EU;
- **Google Earth:** support satellite images for the same region;
- **Open-Meteo:** elaborate weather data information;



MinIO to store all the collected images

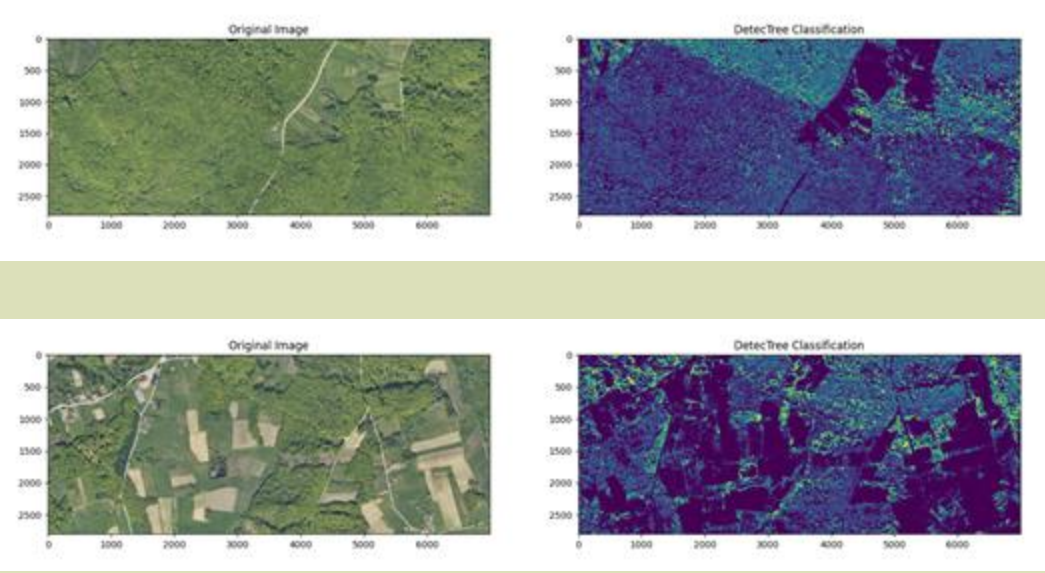


PostgreSQL to store weather data

Tree coverage model

AI Module

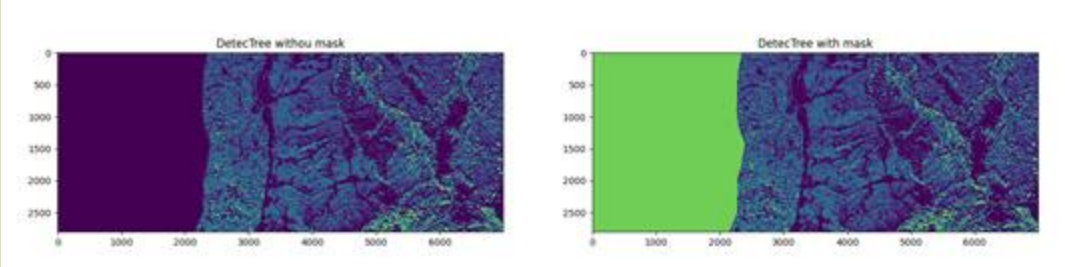
- **DetecTree:** open-source tree identification supervised learning model;
- **Pixel level classification**;
- **Coverage ratio:** the coverage ratio is the total number of pixels identified as trees divided by the total number of pixels of the image.



Tree coverage model

AI Module

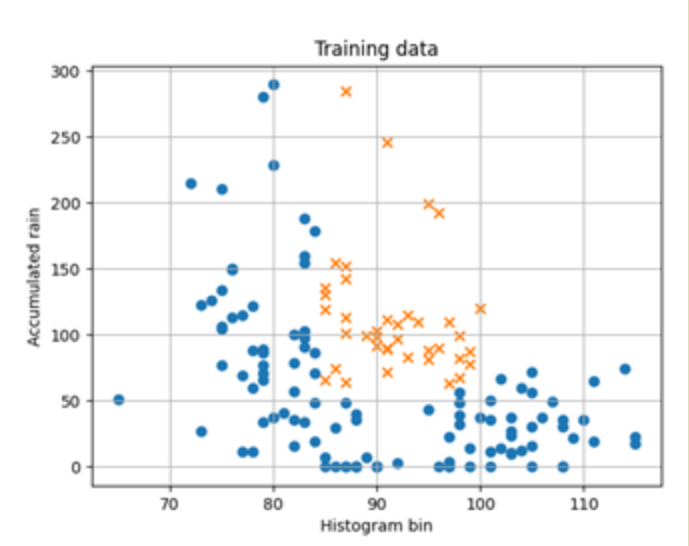
- **Cropped images:** given the size of drone images, the model is computed in pre-processed chunks of the full image;
- **Equal-sized tiles:** some may present no information due to the cropping;
- **Pixel mask:** discard pixels without information from the final ratio count.



Tree health model

AI Module

- **Binary classification:** healthy or unhealthy label;
- **Algorithm:** k-Nearest Neighbours rule in a 2D space;
- **Accumulated rain:** data from the region of the image for the past 30 days;
- **Histogram:** bin of the peak for the green channel of the image.



KPIs

Key Performance Indicators

Classification accuracy

- 10% of the labeled images available were used as test data;
- Measures the ratio of precise tree health predictions against the total number of predictions performed.

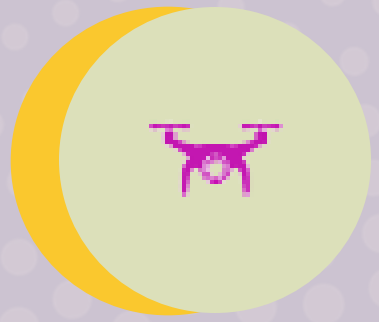
Test Driven Development

- Code base coverage by an unit testing and coverage report framework;
- Goal of a final 70% average coverage of relevant files.

Security

- Automatic code assessment framework;
- Goal of zero security issues due to the open-source nature.

Results



- Tree health accuracy of approximately 86.7%.

- Final codebase average coverage of 79.5%;
- 4.5% above the intended goal.

- No errors or security threats detected by both Hadolint and Bandit frameworks.

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Thank you for your attention!
Do you have any questions?

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www.chameleon-heu.eu

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