FPCUP Appathon: Copernicus Innovative Solutions

Using Satellite Data for Natural Disasters

This hackathon offers participants the flexibility to select their area of focus within disaster management, whether its prediction, monitoring, damage assessment, or beyond. Your objective is to create inventive products or applications that leverage satellite data from CREODIAS to contribute to disaster resilience.

Change Detection

The products of satellite Earth Observation data can be used to detect sudden or slower ground changes in extended areas about e.g. vegetation status, human structures, water/snow coverage etc. Some of those changes, especially the sudden ones may imply a great disaster event.
(e.g. earthquake, fire, flood, landslide/avalanche etc)
After such events an important need is to promptly estimate and map the extension of the damage from the disaster.

Proposal:

Use a set of Creodias EOData products and change detection algorithms and models
for EO data to design an application that produces a damage map after a disaster event (e.g., wildfires, floods, earthquakes).

Indicative Data: Multi-temporal satellite imagery for change detection (e.g., Sentinel-2, Landsat series)

Disaster Risk Prediction / Time-Series trend monitoring

By monitoring the time series of some EO Data variables it is possible to detect the trend of variables that affect risk parameters associated with several disasters.
(eg the vegetation status and the land surface temperature affect the fire ignition probability,
the ground motion affects the landslide probability, the snow coverage/ice melting affect the flood probability etc)

Proposal: Build predictive models to assess disaster risk by analyzing time-series satellite data (e.g., weather patterns, vegetation health, land cover changes). / Design an application that produces insights about the projection of an event risk in the short- or mid-term future.

Indicative Data: Time-series data from various satellites (e.g., MODIS, Sentinel-1 for radar data, and Sentinel-3 for ocean and land temperature).

Super-Resolution

Super-resolution techniques allow for the enhancement of spatial resolution in satellite imagery, providing a sharper and more detailed view of disaster-affected regions.

Proposal: Enhance the spatial resolution of satellite images to better analyze disaster-affected areas.

Indicative Data: Higher-resolution satellite imagery and encourage participants to upscale lower-resolution data.

Information on Satellite Systems

Sentinel-1:
Spatial Resolution: Varies from 5 m to 40 m depending on the operational mode.
Revisit Time: Typically 6 to 12 days, but varies by location.

Sentinel-2:
Spatial Resolution: 10 m, 20 m, and 60 m for different spectral bands.
Revisit Time: Approximately 5 days.

Landsat Series (Landsat 8, Landsat 9):
Spatial Resolution: 15 m for panchromatic band, 30 m for visible and near-infrared bands.
Revisit Time: Approximately 16 days.

MODIS (Moderate Resolution Imaging Spectroradiometer):
Spatial Resolution: 250 m (for bands 1-2), 500 m (for bands 3-7), and 1000 m (for bands 8-36).
Revisit Time: Approximately 1 to 2 days at the equator.

Sentinel-3:
Spatial Resolution: Varies between instruments (e.g., OLCI has a resolution of 300 m for ocean color).
Revisit Time: Typically 1 to 2 days for most instruments.