BUILDING A NATIONAL SPATIO-TEMPORAL DATACUBE

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Introduction

We introduce a cloud-native implementation of a national spatio-temporal data cube, that leverages Spatio-Temporal Asset Catalogs (STAC), cloud-friendly storage and distribution technologies. The proposed implementation is suitable for providing training and validation data for geospatial analysis tasks using Deep Learning Techniques.

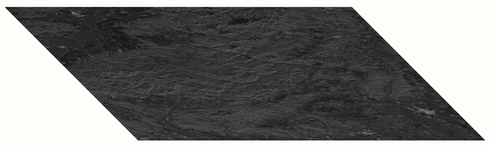

Figure 1: Products available in the National DataCube

The current version of the Romanian data cube hosts STAC catalogs for:

- Sentinel-1 GRD (Ground Range Detected)
- Sentinel-1 RTC (Radiometrically and Geometrically Terrain Corrected)
- Sentinel-2 L1C
- DEM by the Romanian Agency of Cadastre and Land Registration
- ESA WorldCover 2020 and 2021
- Copernicus DEM at 30m resolution
- Corine Land Cover 2018 inventory (raster & vector format)

Data available in the national data cube is stored in Cloud-Optimized GeoTIFF format for facilitating consumption in cloud environments, following CEOS recommendations.

Spatio - Temporal Asset Catalogs (STAC)

STAC allows for a common description of geospatial information, facilitating indexing, discovery and processing. STAC is the main building block of the RoCube solution, aiding our e□orts to o□er value added services that leverage the available data, while maintaining user and developer friendly interactions (e.g. STAC-Browser, QGIS, etc).

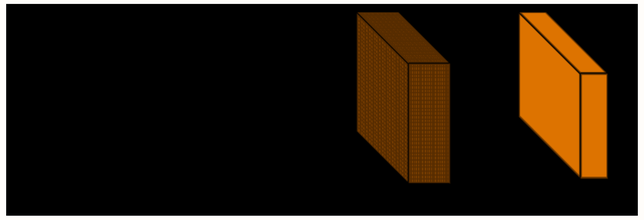

Figure 2: Chunk of RGB and NIR data from Romania for 2018.

Methodology

In contrast to commonly used methods that typically involve manual selection and download of the data, this approach can significantly reduce processing and waiting time required for various tasks, such as multi-temporal change detection analysis.

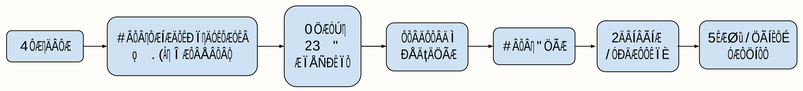

Figure 3: Generalized workflow.

STAC advantages

- Open and standardized.
- Vendor-neutral.
- Distributed data management.
- Scalable processing.
- Customizable and extensible.
- Ecosystem integration.

Summary and conclusions

In the context of the FUSE4DL project, the data cube was validated as the main source of input for training and testing Deep Learning models specialized in:

- Building footprint extraction.
- Road network segmentation.
- Land cover classification.
- Crop classification.

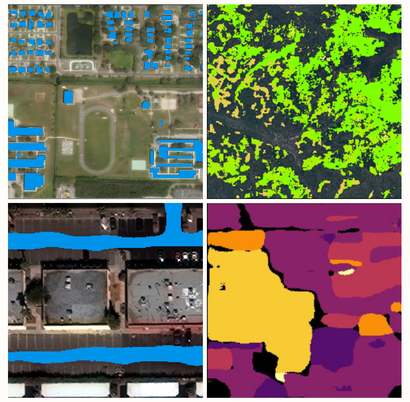

Figure 4: Deep Learning models predictions.

Additional use cases are considered based on recent evaluation made by ROSA as part of the Copernicus uptake activities financed under the Caroline Herschel Framework Partnership Agreement between the Commission and Copernicus Participating States, including but not limited to:

- Forest monitoring.
- Waste sites inspection.
- Air pollution accidents.

Acknowledgements

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