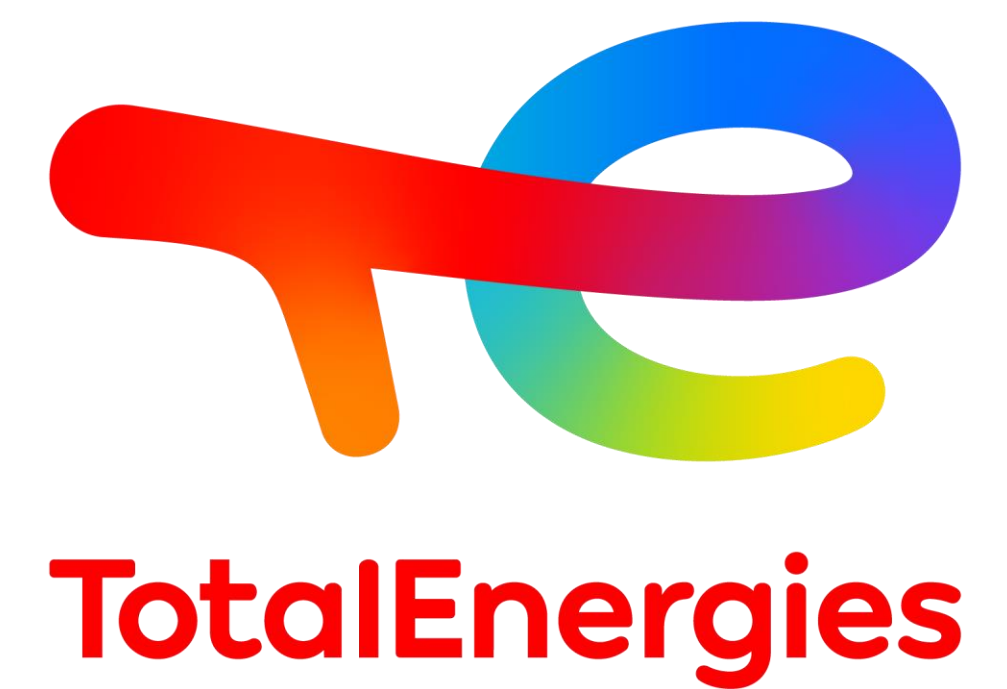


Remote sensing for floating PV site prospection: automatic water body detection and layout generation

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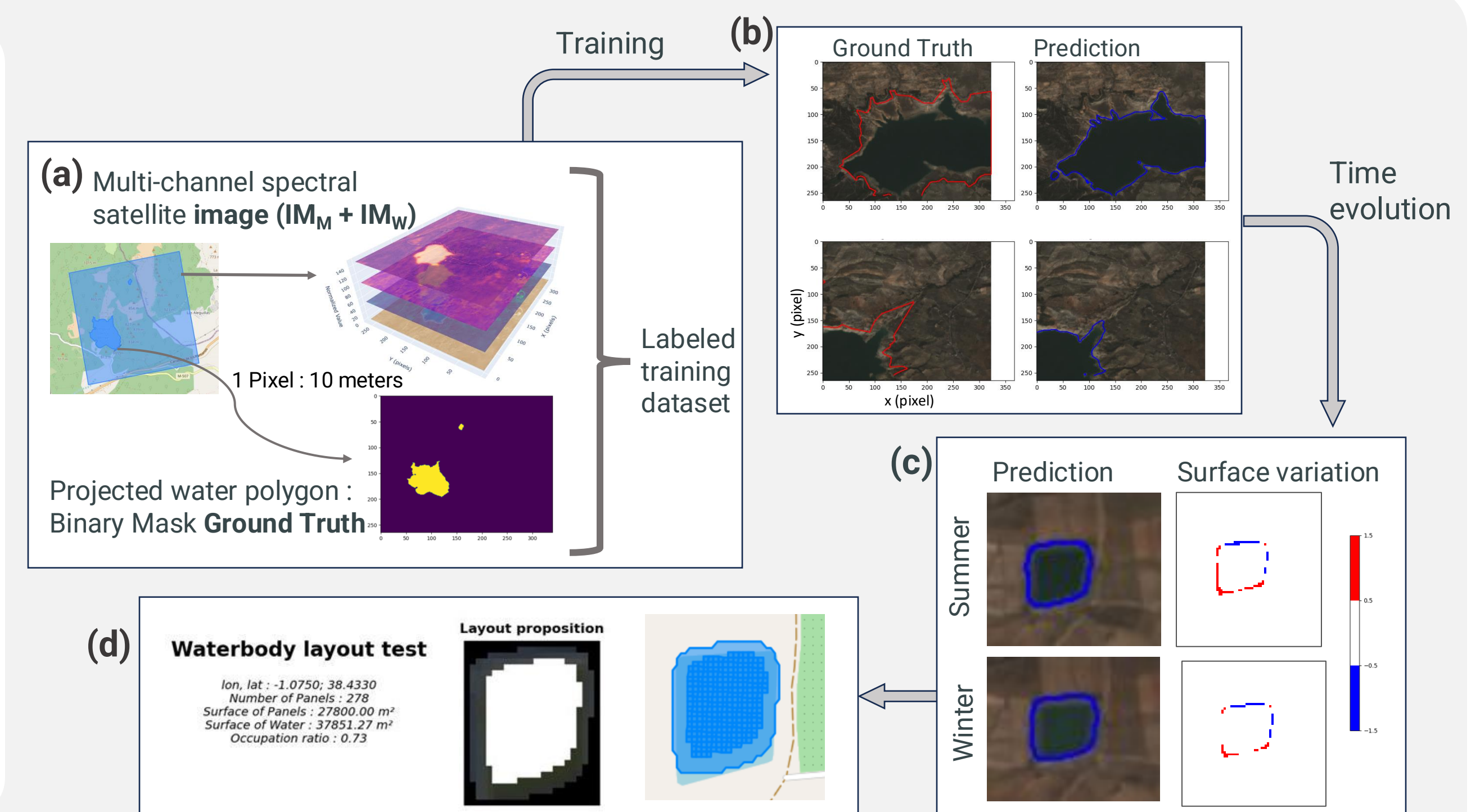


Introduction and objectives

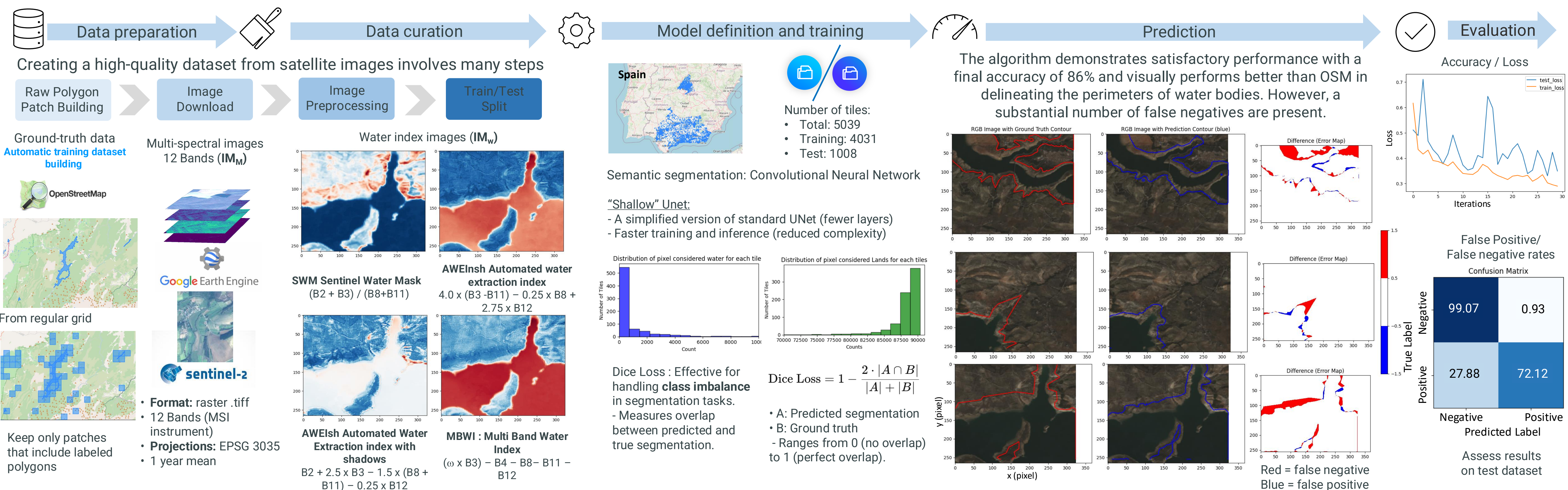
Solar energy plays a pivotal role in the global energy transition, yet identifying new sites for solar plants remains challenging due to land scarcity and land use conflicts. Floating photovoltaic (FPV) systems provide new opportunities to expand solar generation capacity. These systems are particularly advantageous for industrial or private inland water bodies, such as quarry lakes and irrigation basins. However, their implementation is often constrained by fluctuations in water levels. Utilizing remote sensing can assist in the FPV site pre-selection stage by effectively identifying suitable water bodies and monitoring their temporal changes. This work introduces an innovative automated solution that leverages machine learning to detect both artificial and natural water bodies from satellite images. It can evaluate the optimal water surface area for FPV systems over time and automatically propose a preliminary FPV layout. This versatile solution can be deployed worldwide.



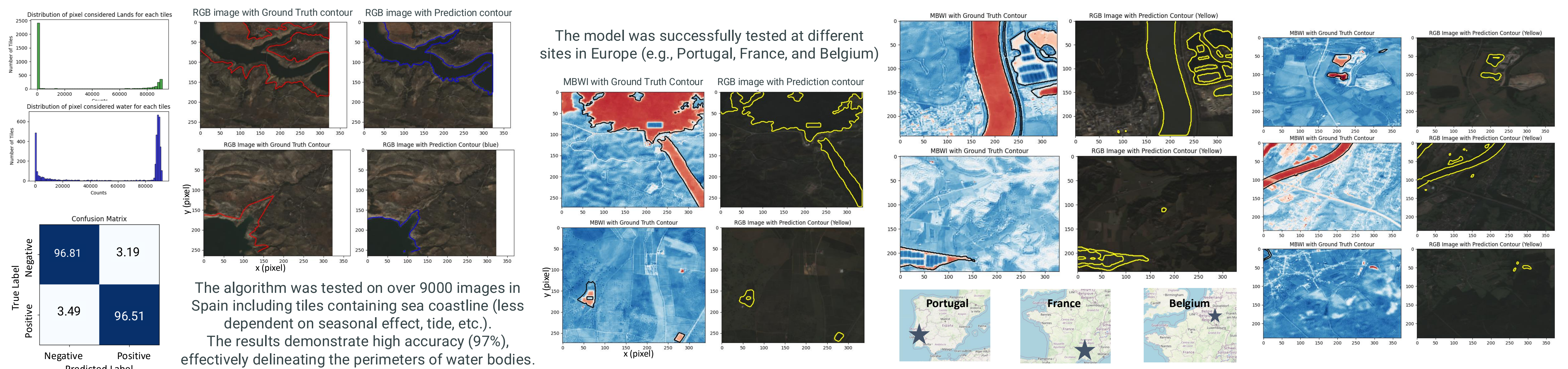
- The workflow consists of the following steps:
1. Retrieve OpenStreetMap (OSM) water body polygons as ground truth (a)
 2. Build patches around these polygons and download raw multispectral Sentinel-2 images $IM_M(a)$
 3. Pre-process the raw images by computing water spectral indices $IM_W(a)$
 4. Train and apply a deep-learning segmentation model on images captured at different time periods (b)
 5. Compute the optimal available water surface (c) for FPV installation (d)



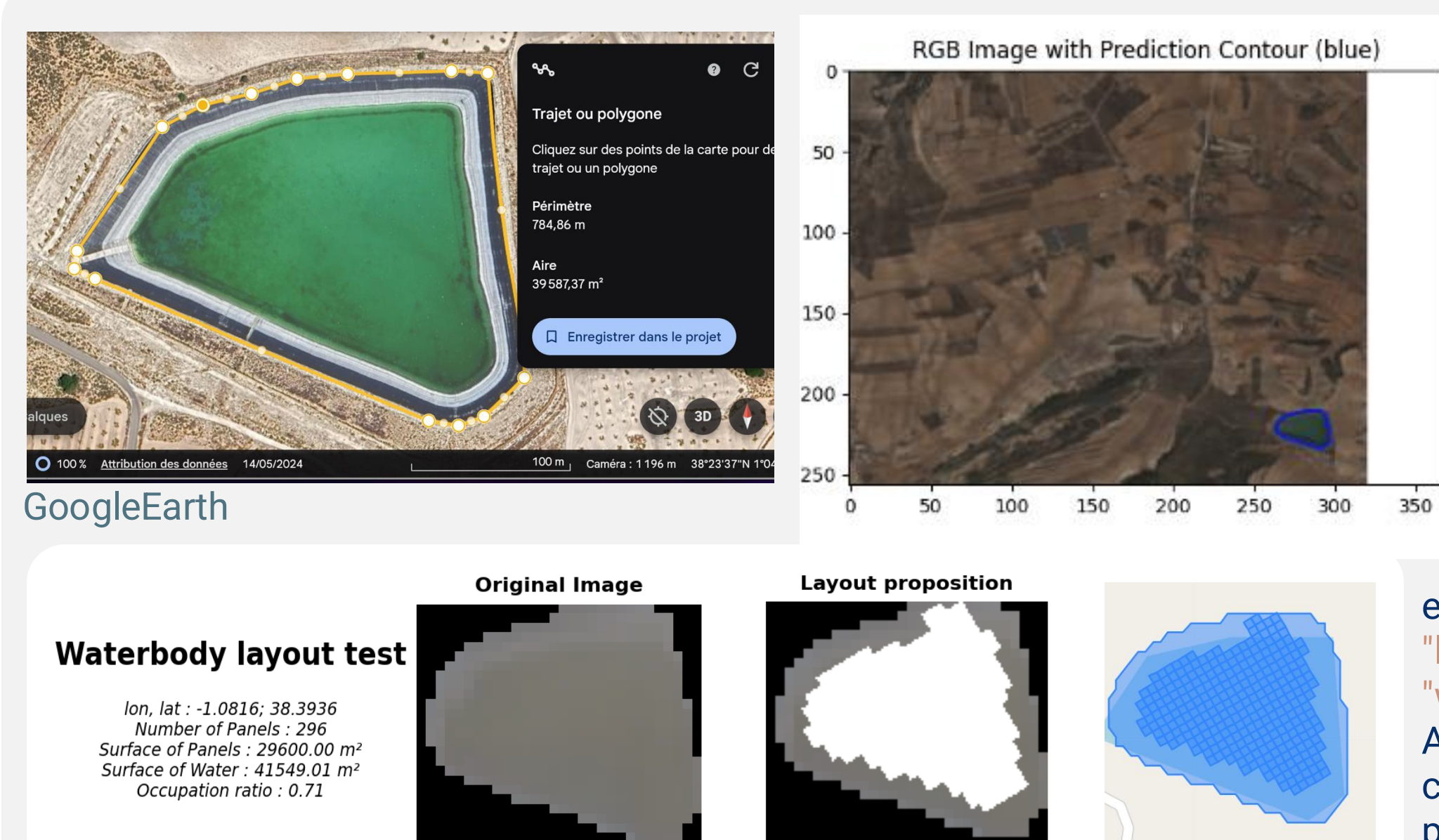
Detection pipeline



Model improvement and Results

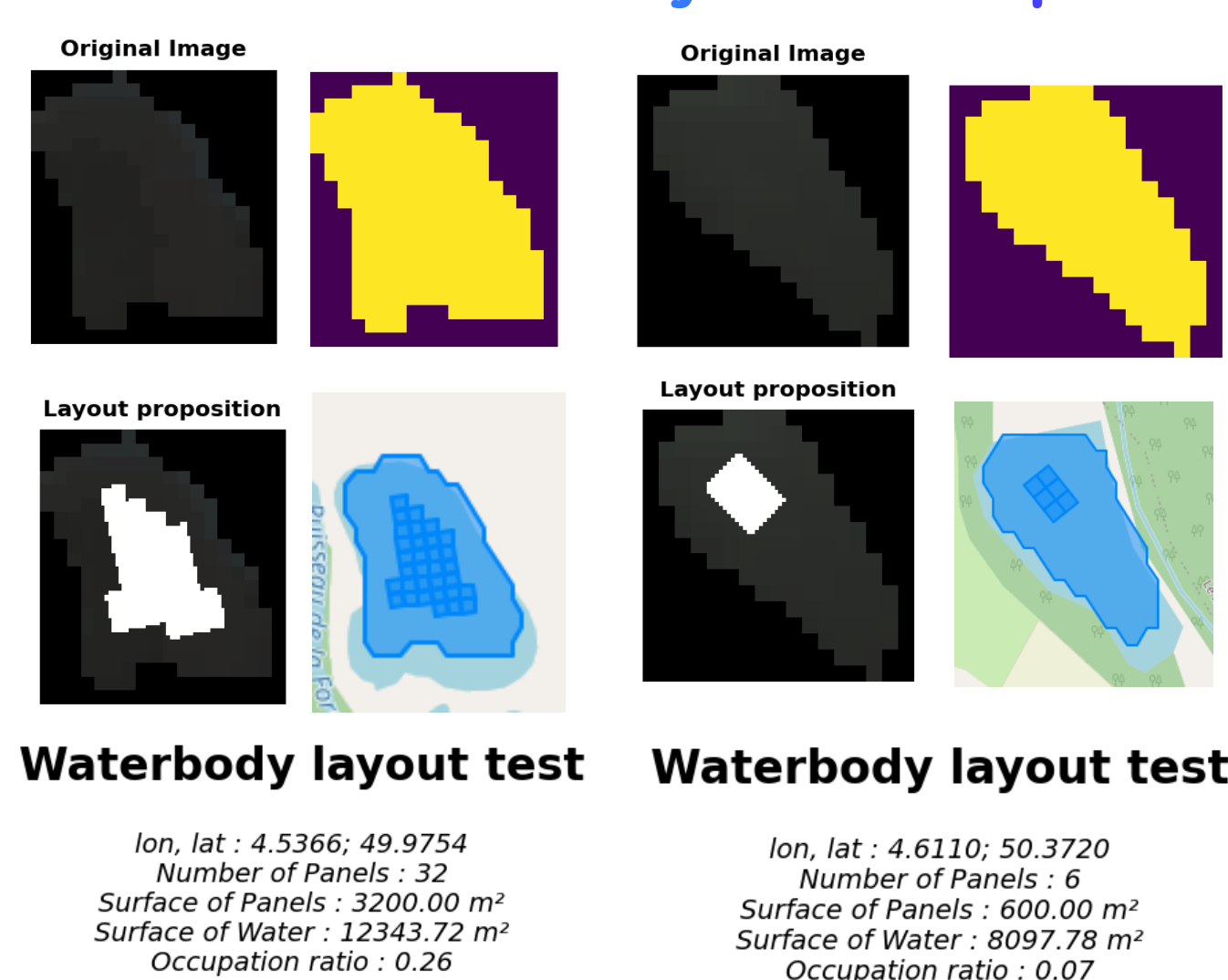


Advanced feature: automatic FPV layout



The algorithm enables the automatic generation of FPV layout, accounting for seasonal variations in the surface area of water bodies

Automatic FPV layout: examples



Conclusions & Perspectives

- We built an in-house solution for water bodies detection based on satellite images that is
 - demonstrating high performance, achieving an accuracy of 97%,
 - accurately delineating the perimeters of water bodies,
 - easily reproducible and applicable worldwide, and
 - offering advanced features beyond simple detection such as the detection of seasonal surface area variation and automatic FPV layout generation
- Future perspectives:
 - Detailed analysis of the coverage ratio of existing FPV systems
 - Automatic estimation of the potential energy output of FPV systems

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