Tutorial: Machine and Deep Learning for Earth Observation: Advanced Approaches and Practical Use Cases – Abstract

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Abstract

Nowadays, modern space missions continuously collect information about the earth surface that corresponds to massive amounts of data. The multitude of Earth Observation (EO) systems allows the acquisition of data via different sensors (e.g., optical, radar, LiDAR) at different spatial and temporal resolutions, with diverse spectral characteristics. This huge and diverse volume of information opens up new opportunities to better understand and monitor agricultural, natural and anthropized spaces at different scales.

In this context, data-intensive methodologies such as machine and deep learning approaches are demonstrating their value, as they already did in several domains dealing with signal data. Multiple data science challenges were already addressed using satellite imagery (e.g., building footprints, road networks, iceberg detection) but crucial open questions remain unsolved (e.g., biodiversity monitoring, urban mapping, deforestation tracking and food risk prevention, triaging disaster zones). We are at the beginning of a new era for the analysis of Earth Observation data (EOD) where one of the main questions is how to leverage the complementarity and the diversity of the information collected by the different available observation systems, in order to answer important societal challenges and monitor changes on the Earth Surface.

The MDL4EO team (Machine and Deep Learning for Earth Observation) at the UMR TETIS (Montpellier, France) has the objective to scientifically contribute to this new era providing AI methods and algorithms able to extract valuable knowledge from massive heterogeneous Earth Observation Data.

In this tutorial, we will discuss in detail the main research questions addressed by the MDL4EO team: How to exploit data streams of satellite Images (Satellite image Time Series) in order to characterize natural and agricultural areas? How to effectively combine multi-sensor and multi-scale information? How to transfer knowledge between different geographical areas?

It's time to fill the gap between Remote Sensing and AI. To this end, MDL4EO is working in that direction bringing together different expertises: Data Science, Computer Vision, Machine Learning, Remote Sensing and Geoinformatics. In this tutorial we will give an overview on how such interdisciplinary dynamics can be successfully exploited in an applied research context.

Keywords

Remote Sensing, Earth Observation Data, Deep Learning, Land Cover Classification