

OPEN DATA SCIENCE EUROPE

WORKSHOP

Spatiotemporal machine learning in Python

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Spatiotemporal machine learning in Python

- Conceptual background about machine learning
- Machine learning for geospatial data
- Purely spatial and spatiotemporal
- Hands-on

What is machine learning ?

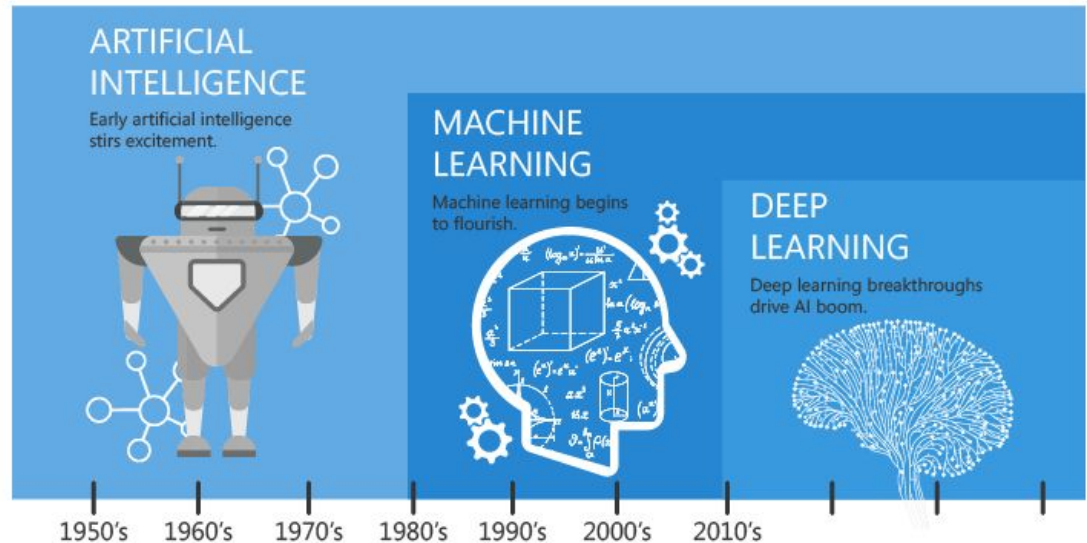
Machine learning is essentially a subfield of artificial intelligence (AI), using techniques able to learn from data and make accurate predictions, without being explicitly programmed.



Source: [Machine Learning: In a Nutshell](#)

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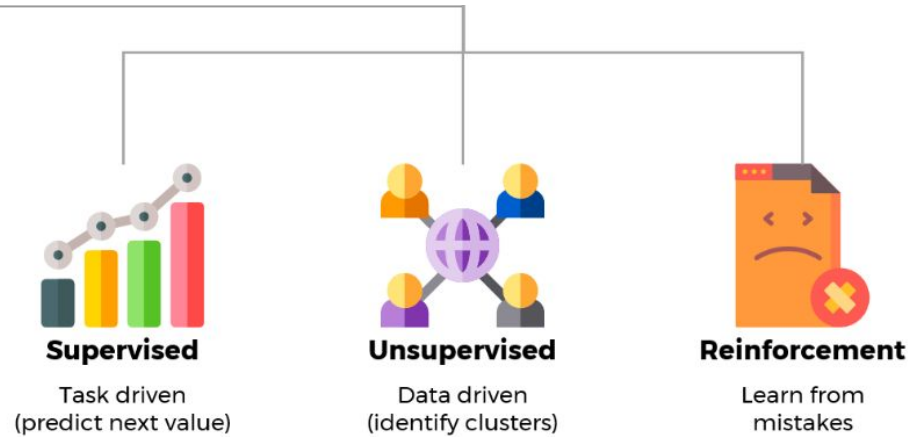
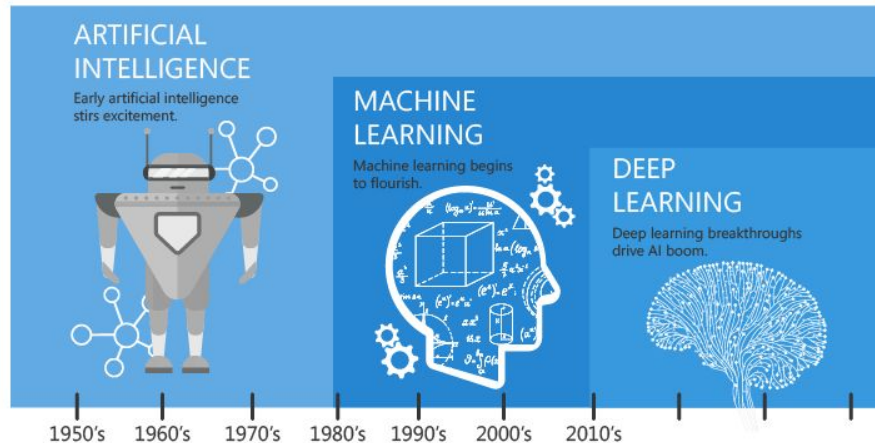
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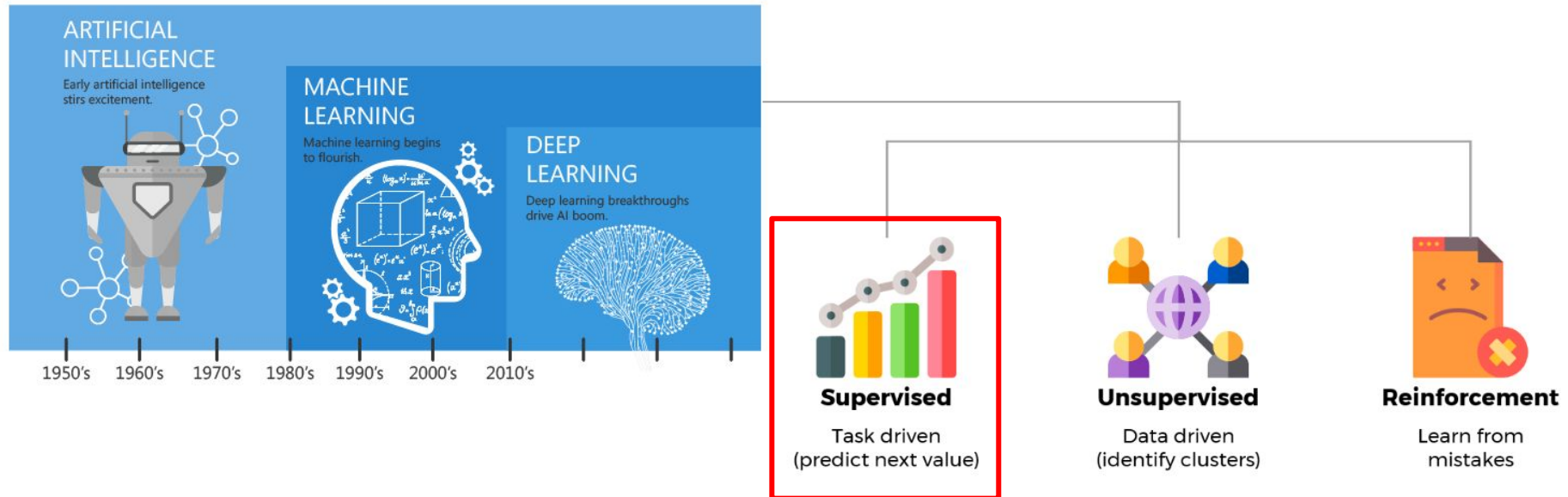
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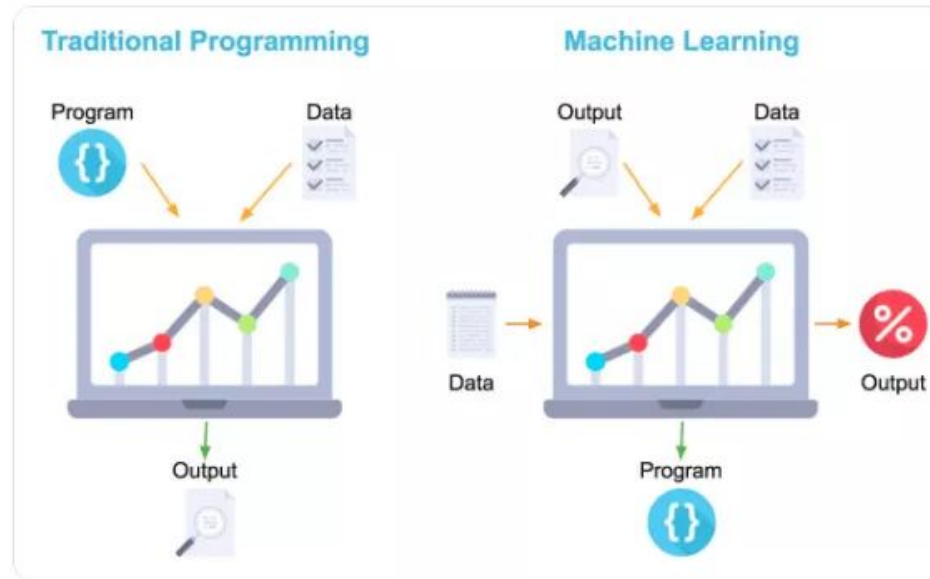
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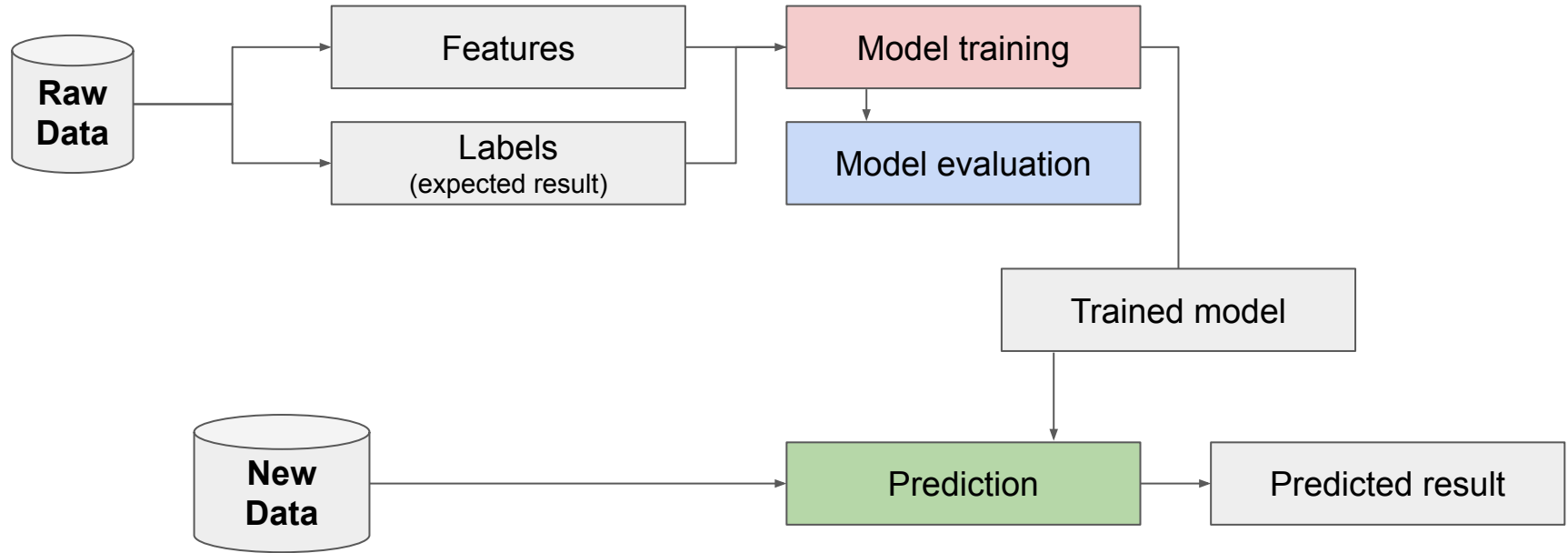
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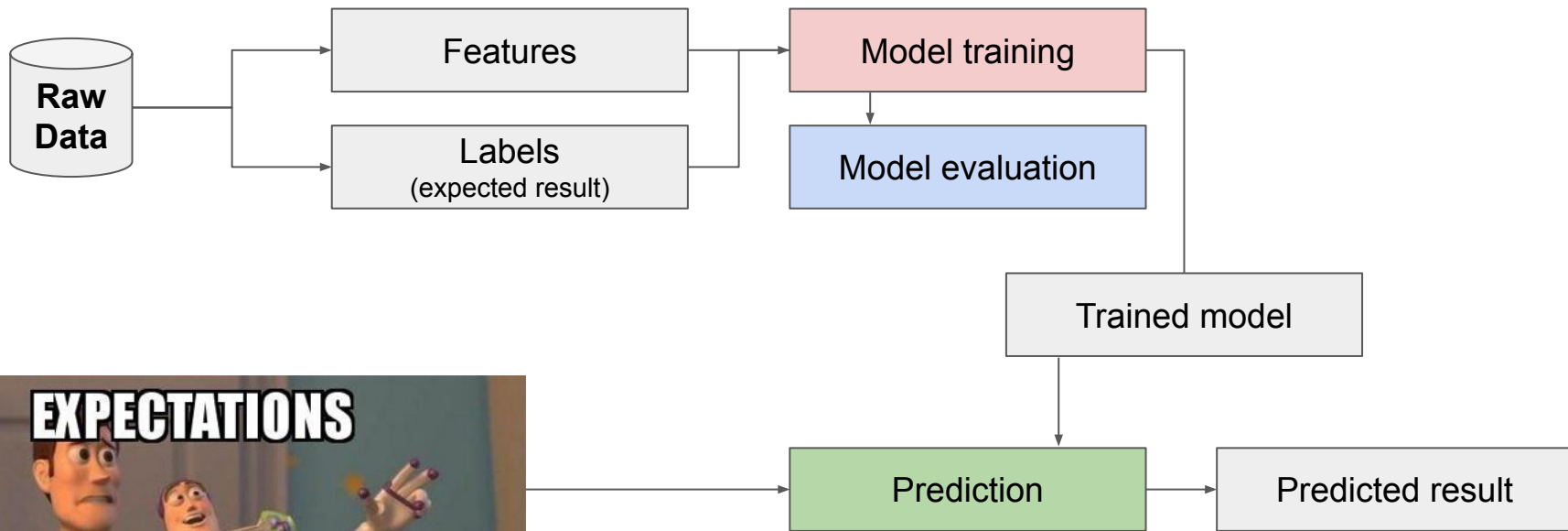
Supervised machine learning

Expected ML workflow



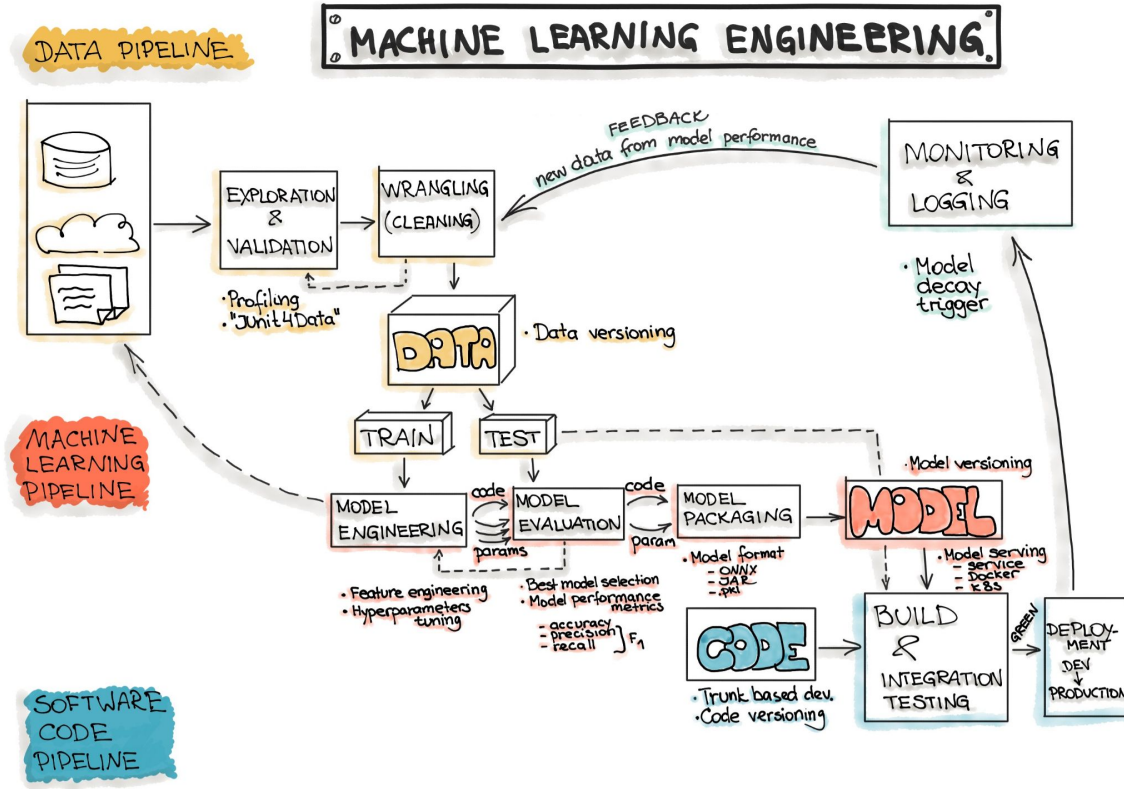
Supervised machine learning

Expected ML workflow



Supervised machine learning

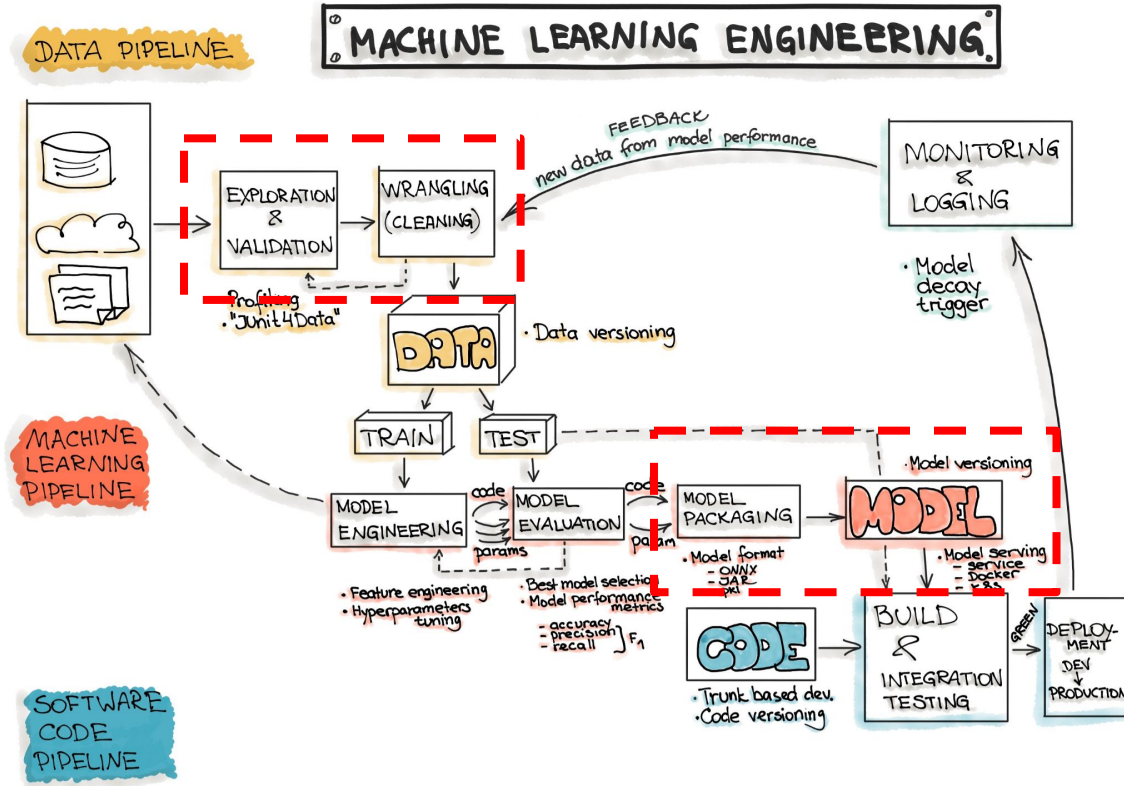
Reality



Source: [An Overview of the End-to-End Machine Learning Workflow](#)

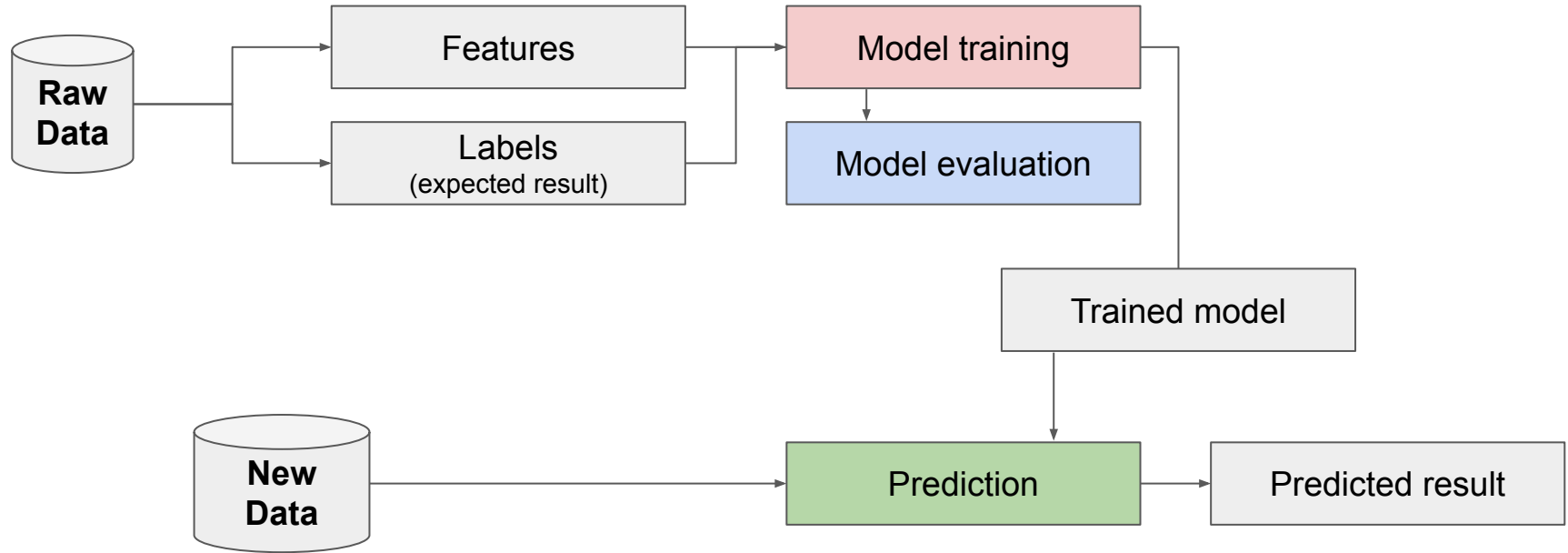
Supervised machine learning

Reality

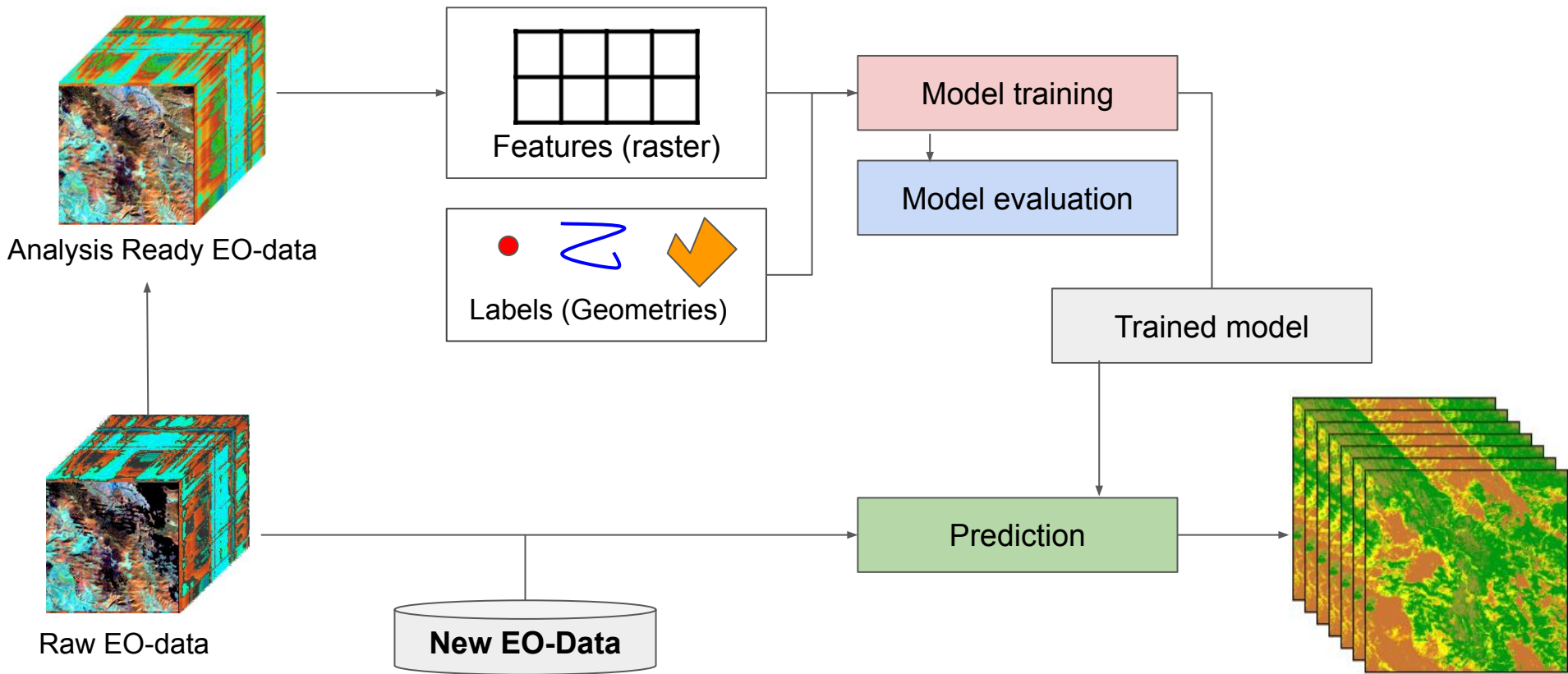


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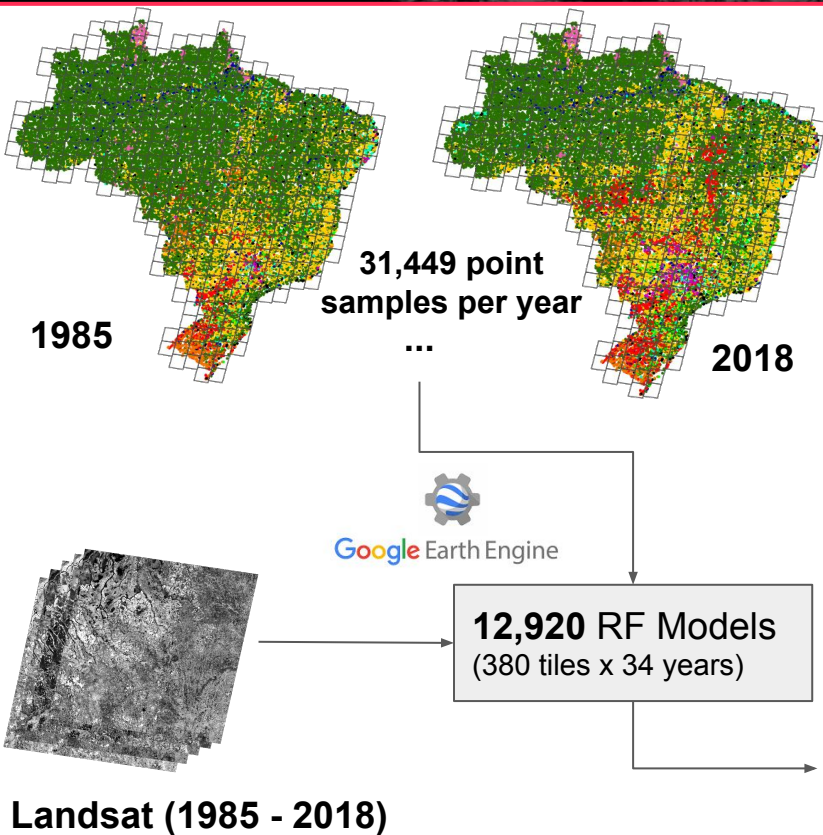
Supervised machine learning



Machine learning for geospatial data



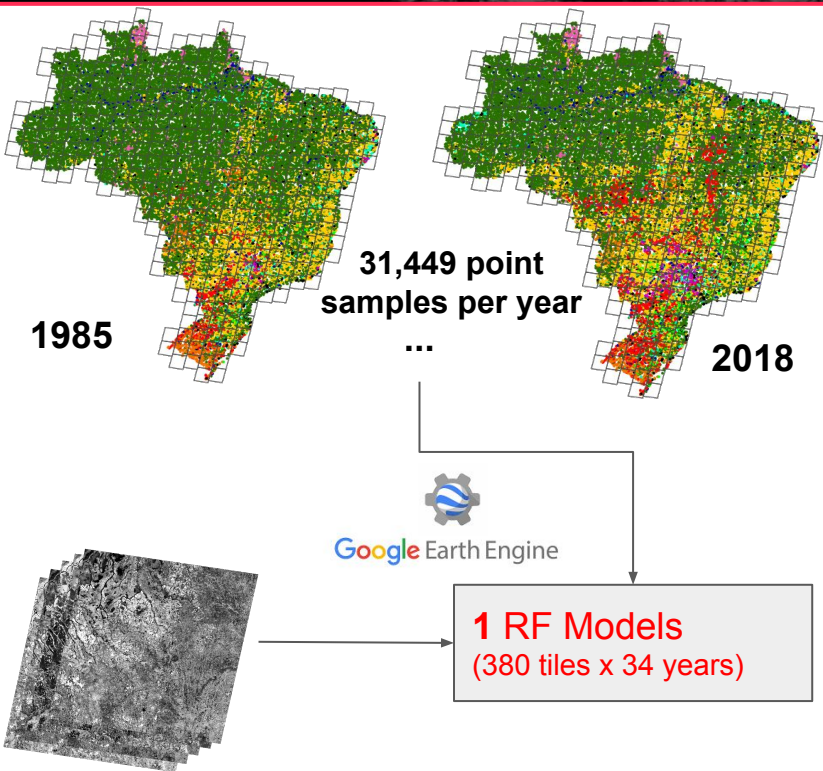
Purely Spatial



[Parente et al., 2019](#)

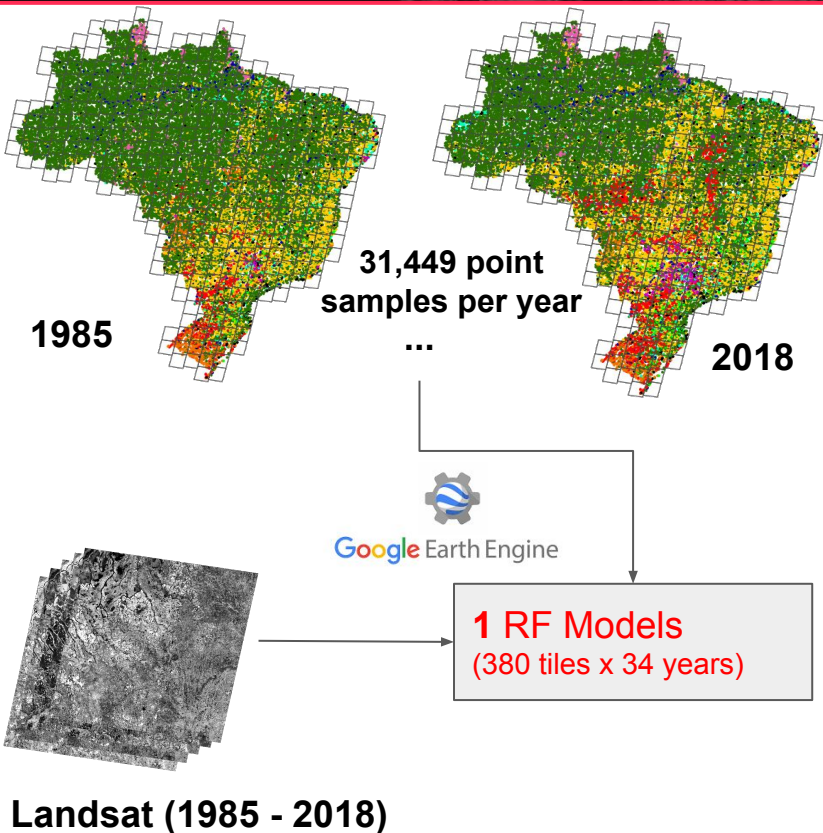
1985
118.33 mha

Purely Spatial



Landsat (1985 - 2018)

Purely Spatial



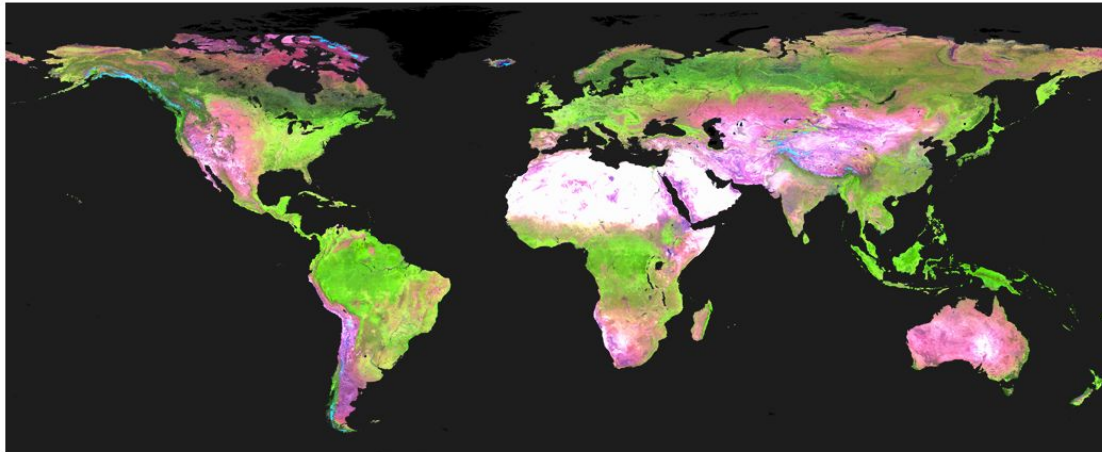
- Capacity (software and hardware) to train a ML model using millions of samples;
- Harmonized EO data ([The problem with satellite data is that it is no a commodity](#))

Harmonized EO data



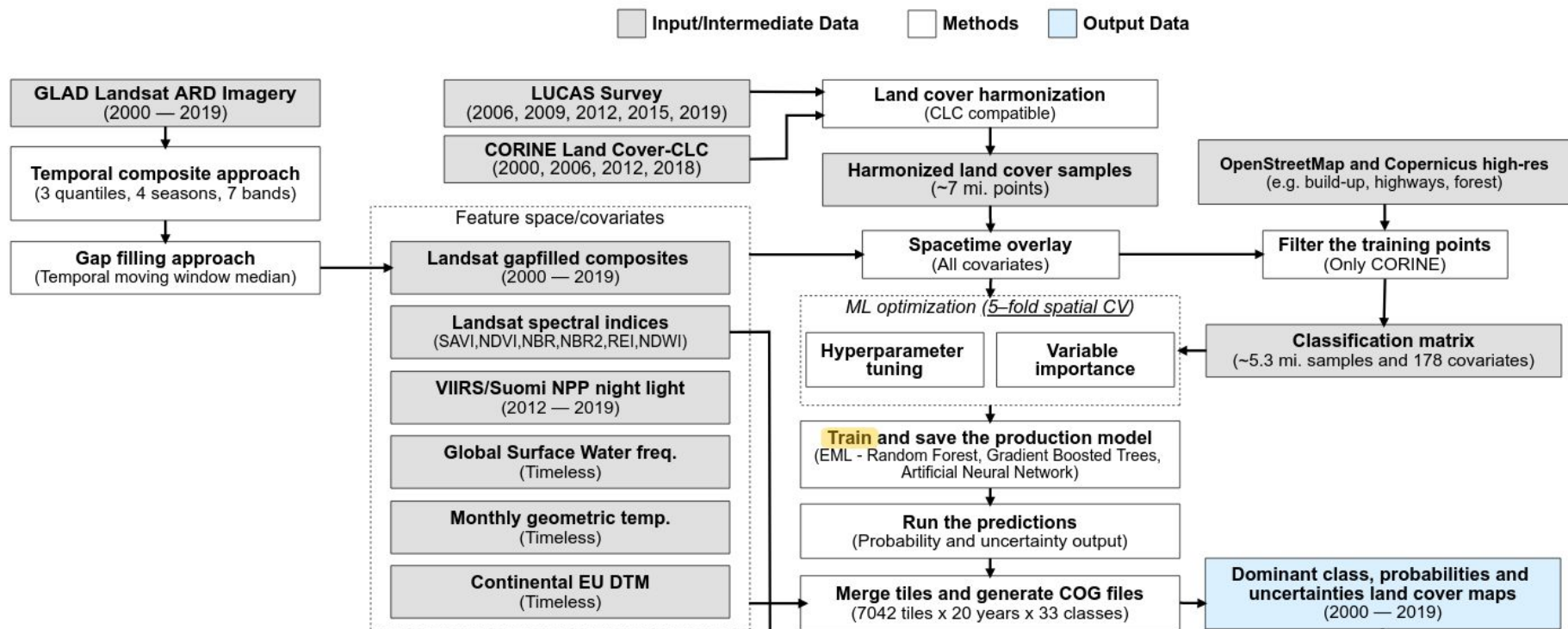
<https://hls.gsfc.nasa.gov/>

GLAD Landsat ARD

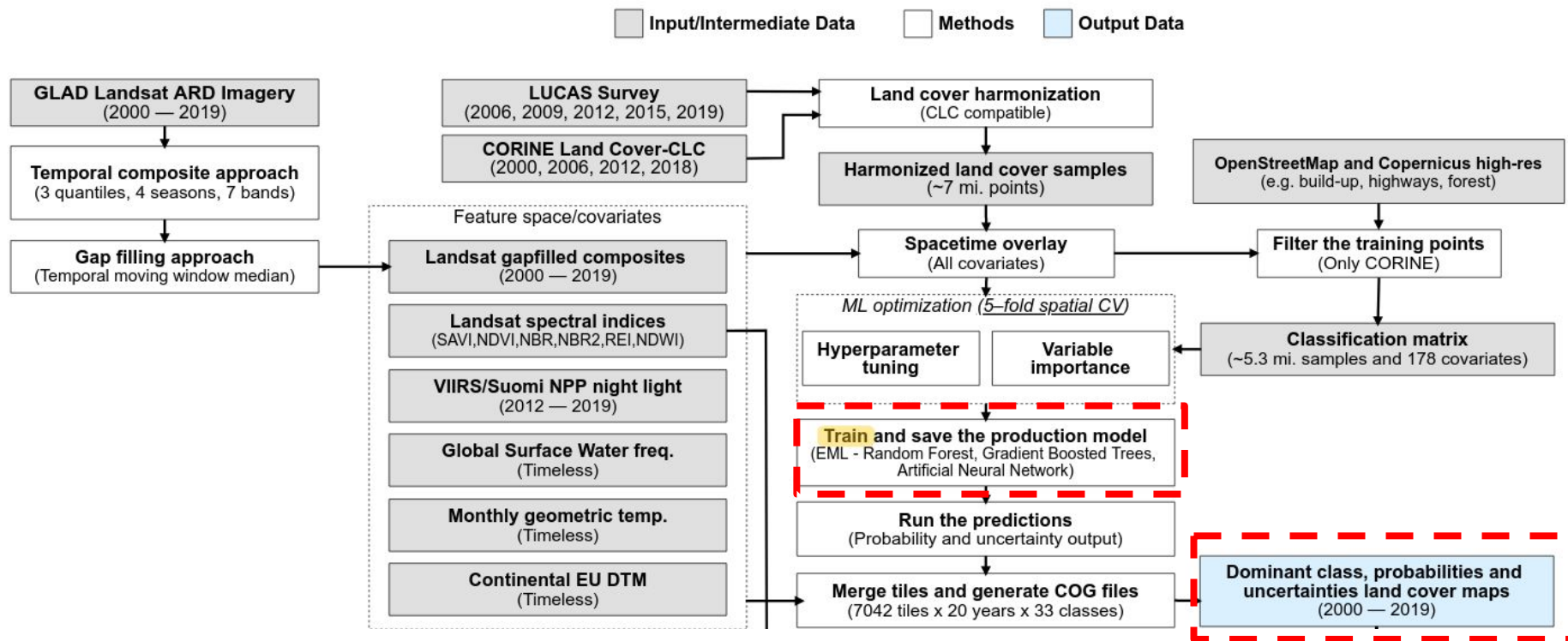


<https://glad.geog.umd.edu/ard/glad-landsat-ard-tools>

Spatiotemporal



Spatiotemporal



Hands-on

https://gitlab.com/geoharmonizer_inea/odse-workshop-2021

03-
04- SPATIOTEMPORAL_MACHINE_L

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Spatiotemporal machine learning

A regular Random Forest

Random Forest with hyperparameter optimization

Random Forest with probabilities and hyperparameter optimization

EML with probabilities, uncertainty and hyperparameter optimization

03-04_Spatiotemporal_n x

Markdown

Python 3 (ipykernel)

Spatiotemporal machine learning

In this tutorial, you will learn how to use the [LandMapper class](#) to train multiple machine learning models, fully compatible with [scikit-learn](#) and able to produce spatial predictions for land cover in two pilot tiles (5606 and 14580), extracted from the ODSE [tiling system](#). The training will consider a subset of a [harmonized land cover samples based based on LUCAS and CORINE](#), which were overlaid with the DTM and Landsat raster layers produced in the scope of ODSE. A detailed description of the implemented workflow is available in [Witjes et al.,2021](#), and the first version of the produced land cover maps (probabilities, uncertainties and dominant class) are accessible in the [ODSE Viewer](#).

maps.opendata-science.eu

Open Data Science Europe viewer

56 Europe Search location

Confusion Forest

Transitional woodland-shrub

Confusion Forest prob. slope

Confusion Forest prob. B1

uncertainty

Turn on

Training points

