



# Image processing for Earth Observation

Short Projects

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EPFL, fall semester 2025

# Project types

## 1 – deep learning

- Two options:
  - We choose a relevant problem and provide the necessary data (examples on Moodle)
  - You choose a different problem
    - You choose your own data source\* (e.g., Kaggle)
    - Data preprocessing: **NOT** taken into account for grading
- You design a processing pipeline in PyTorch.
- We expect that you test several approaches and are critical about what you are doing. Discuss in terms of accuracy, training time, etc.

\* Topic needs to be confirmed with the TAs

# Project types

## 2 – Build Your Own Pipeline\* (BYOP)

- You choose a relevant problem requiring image processing (e.g., landcover change, temporal monitoring, land planning)
- You find the necessary data, create or find the labels
- You design a processing pipeline\* that makes sense with the ML methods seen in the class (or others, to be discussed)
- We expect that you are critical about what you are doing, discuss what works and what not, discuss in terms of scientific (domain) output

\* Including dataset creation

# What we expect

- Groups of 3 students
- Deadline: **January 15<sup>th</sup>**, midnight\*.
- Submission on Moodle.
  
- The project will consist of
  - A .pdf document (10 pages max – we won't read further) with:
    - Topic and challenges, short literature review;
    - Methods (typically including a flowchart);
      - BYOP: How data was acquired and processed.
    - Results (a few maps, assessment of metrics);
    - Discussion → being critical about what has been done.
  
  - Your code in Python (more details later).

\* NB: our advise is to hand in before December 31st, so that you have two full weeks to study for your exams.  
But we leave it up to you.

	1 <sup>st</sup> hour	2 <sup>nd</sup> hour	3 <sup>rd</sup> hour	4 <sup>th</sup> hour	Expected progress
3 October	Classification 1 course		Introduction about the projects Exercise classification 1		
10 October	Classification 2 course		Exercise classification 2 Brain storm ideas		
7 November*	Semantic segmentation course		CNN model training		
14 November	Sequence modelling + change detection		Semantic segmentation exercises		Topic chosen, groups ready <b>in a google form</b>
21 November	Q&A mid-term	Project			Implement first processing chain
28 November	Mid term			Project	
05 December	Project				Analysis
12 December	Project				First results
19 December	Project				Improved results, start writing report

\* We provide the deep learning project datasets

# Evaluation criteria

Criterion	Explanation	Pts. on BYOP	Pts. on deep learning topic
Data (BYOP only)	<ul style="list-style-type: none"> <li>- Choice of relevant data (resolution, bands, ...)</li> <li>- Data preparation (including dataset splits)</li> </ul>	2	0
Method	<ul style="list-style-type: none"> <li>- Relevant choice of methods</li> <li>- Several methods are compared</li> <li>- Decisions are justified</li> </ul>	3	5
Reproducibility, code	<ul style="list-style-type: none"> <li>- Provided code can be run easily</li> <li>- A readme file with instructions is provided</li> </ul>	2	2
Evaluation of results	<ul style="list-style-type: none"> <li>- Several relevant metrics are computed over train / val splits</li> <li>- Computational complexity (e.g. training time, inference time) is assessed</li> </ul>	3	3
Report	<ul style="list-style-type: none"> <li>- Report is clearly written</li> <li>- Graphics are readable and complete (e.g. axis titles)</li> <li>- Results are analysed</li> <li>- Discussion in terms of scientific (domain) output</li> <li>- Limitations are clearly discussed</li> </ul>	2	2
	<b>TOTAL</b>	<b>12</b>	<b>12</b>

# Some advice

- Timing is short, so work well, don't go for over complicated topics.
- Discuss with the assistants to ensure you have a doable idea, so that you can start straight away
- Look for teammates on Slack (You can not do a project alone)
- Create a Slack channel for your group, so you can reach the assistants easily