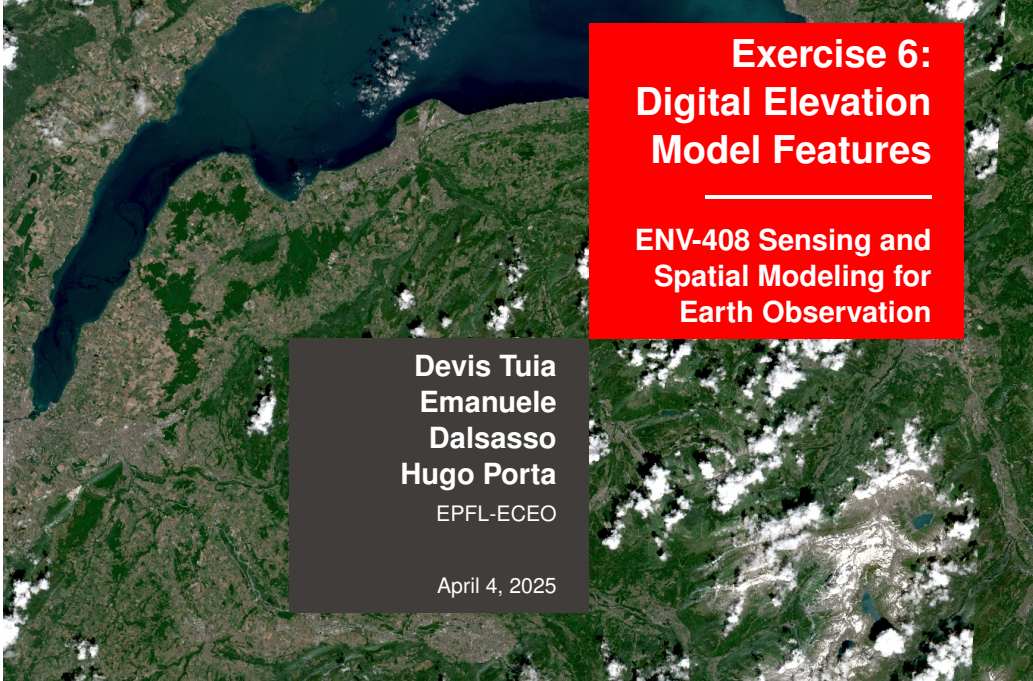

Exercise 6: Digital Elevation Model Features

ENV-408 Sensing and Spatial Modeling for Earth Observation

Devis Tuia
Emanuele Dalsasso
Hugo Porta
EPFL-ECEO

April 4, 2025

École polytechnique fédérale de Lausanne

Welcome our Exercise on calculating DEM features

In this exercise 6 **Feature extraction from the DEM**

- we use a DEM like the one computed in Ex 5 (21/03/2025)

Ex 1 (CRYOS)	Image measurements, coordinates and distorsion model
Ex 2 (ECEO)	Keypoint detection, description and matching
Ex 3 (CRYOS)	Absolute Orientation (Camera Pose)
Ex 4 (CRYOS)	Image Relative Orientation (Two Views)
Ex 5 (CRYOS)	Image Orientation, Orthophoto and DEM Creation
Ex 6 (ECEO)	**Feature extraction from the DEM**

Welcome our Exercise on calculating DEM features

In this exercise 6 **Feature extraction from the DEM**

- we use a DEM like the one computed in Ex 5 (21/03/2025)
- extract features (DoG, Derivatives, Slope, Aspect) with Python

Ex 1 (CRYOS)	Image measurements, coordinates and distorsion model
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Welcome our Exercise on calculating DEM features

In this exercise 6 **Feature extraction from the DEM**

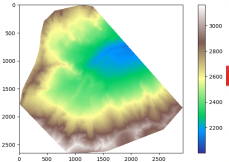
- we use a DEM like the one computed in Ex 5 (21/03/2025)
- extract features (DoG, Derivatives, Slope, Aspect) with Python
- that we need for the Linear Regressions in Ex7 on April 11th

Ex 1 (CRYOS)	Image measurements, coordinates and distorsion model
Ex 2 (ECEO)	Keypoint detection, description and matching
Ex 3 (CRYOS)	Absolute Orientation (Camera Pose)
Ex 4 (CRYOS)	Image Relative Orientation (Two Views)
Ex 5 (CRYOS)	Image Orientation, Orthophoto and DEM Creation
Ex 6 (ECEO)	**Feature extraction from the DEM**
Ex 7 (ECEO)	Linear and Non-linear Regression Models (April 11th)

Machine Learning Pipeline

Machine Learning Pipeline

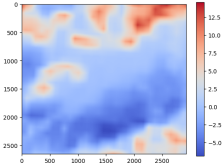
elevation model



Extract something that differentiates the classes

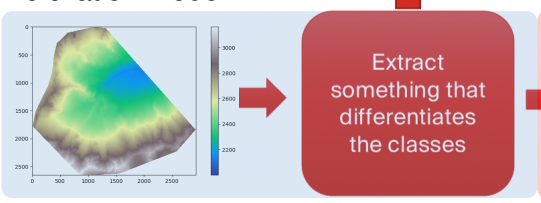
Train and use the model

surface temperature



Machine Learning Pipeline

elevation model



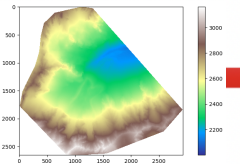
surface temperature

exercise 6 lead by H. Porta

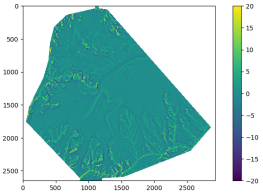
exercise 7 lead by G. Sümbül

Machine Learning Pipeline

elevation model

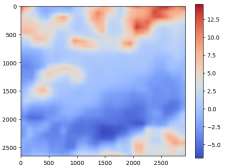


Extract something that differentiates the classes



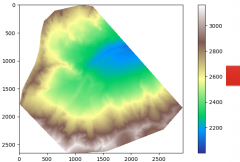
DoG

surface temperature

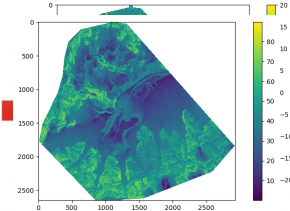


Machine Learning Pipeline

elevation model

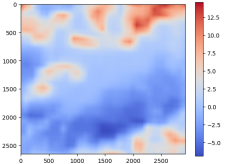


Extract something that differentiates the classes



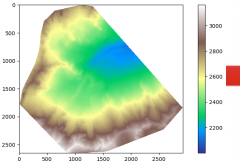
slope

surface temperature

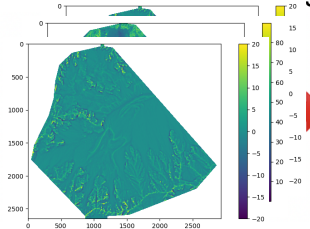


Machine Learning Pipeline

elevation model

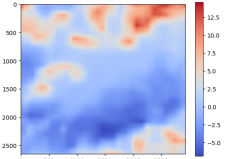


Extract something that differentiates the classes

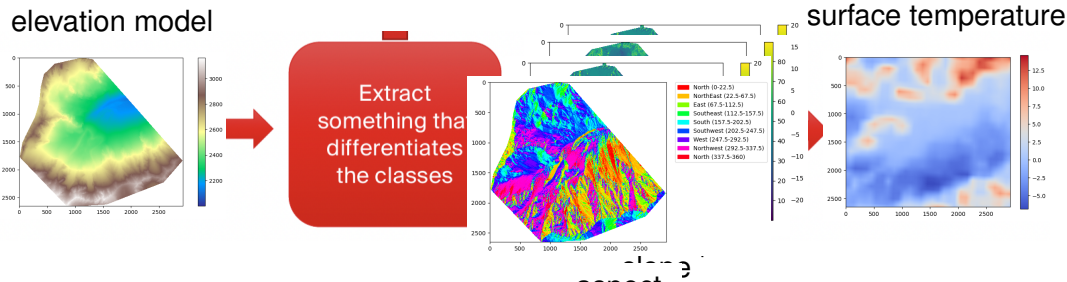


sobel

surface temperature



Machine Learning Pipeline

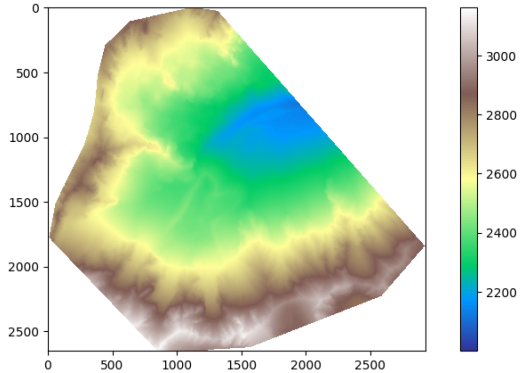


Overview of the Exercise

Plan of the lab work:

1. Setup and Download
2. Data Exploration
3. Feature Computation
    1. Differences of Gaussian
    2. Directional Derivative
    3. Slope
    4. Aspect

Val d'Arpette



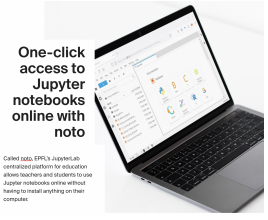
Jupyter Notebook Exercise

Download the notebook from Moodle and open it in your editor of choice

Jupyter

Visual Studio code

EPFL Noto



Google Colab

Instructions are in the notebook. Ask your colleagues and us if you have technical issues or questions.

Best of Success!