

ENV-408

**Sensing and spatial modeling for earth observation**

Berne Alexis, Skaloud Jan, Tuia Devis

Cursus	Sem.	Type
Civil & Environmental Engineering		Opt.
Environmental Sciences and Engineering	MA2, MA4	Opt.
Minor in Imaging	E	Opt.
Statistics	MA2, MA4	Opt.

Language of teaching	English
Credits	5
Session	Summer
Semester	Spring
Exam	Written
Workload	150h
Weeks	14
<b>Hours</b>	<b>4 weekly</b>
Lecture	2 weekly
Exercises	2 weekly
<b>Number of positions</b>	

**Summary**

Students get acquainted with the process of mapping from images (orthophoto and DEM), as well as with methods for monitoring the Earth surface using remotely sensed data. Methods will span from machine learning to geostatistics and model the spatiotemporal variability of processes.

**Content**

The course is organized in three main parts.

1. 3D reconstruction from images
  - Processes of image creation
  - Image matching, orientation and camera calibration
  - Construction of digital elevation models (DEM) and orthophotos
2. Environmental monitoring with machine learning
  - Extracting features from elevation or image data
  - Prediction with linear and nonlinear regression
3. Geostatistics:
  - Definitions and spatial context
  - Structural analysis
  - Interpolation using kriging

**Learning Prerequisites****Important concepts to start the course**

Good Python programming skills are required

**Learning Outcomes**

By the end of the course, the student must be able to:

- Implement state of the art geostatistical and machine learning approaches in Python
- Establish 3D model from captured imagery.
- Analyze various properties of obtained 3D model.
- Plan relevant aspects in drone & airborne mapping.

### Assessment methods

Final exam (80%) + 1 graded exercise (20%)

### Supervision

Office hours	No
Assistants	Yes
Forum	No

### Resources

#### Virtual desktop infrastructure (VDI)

Yes

#### Moodle Link

- <https://go.epfl.ch/ENV-408>