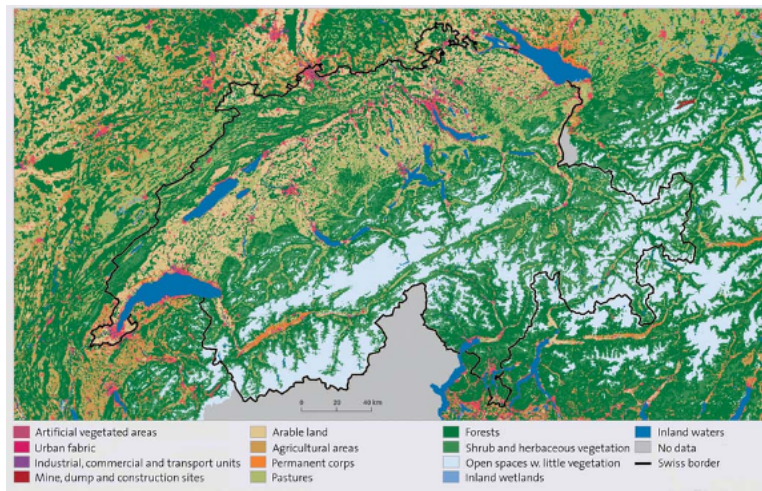


Master thesis subject

Mapping the land usage of the Swiss Alps

Context

Every 6 to 12 years a map of landuse in Switzerland is generated by photointerpretation of aerial imagery. This time consuming work reduces greatly the update time and comes with a very high cost. In this project, you will explore the potential of using modern machine learning (and more specifically deep learning) techniques to automatize this process.



Using machine and deep learning is becoming more and more appealing for geospatial mapping, and especially landuse (OFS, 2018). The sheer amount of information gathered by national mapping agencies in the shape of aerial photographs, together with the availability of previous land usage maps generated by photointerpretation in the past, provides the perfect playground to test the suitability of modern deep learning classification and segmentation to automatically generate land use maps at regional scale (Zhu et al., 2017).

In this project, the student will implement, train, and evaluate state-of-the-art deep learning-based image classification approaches (e.g. ResNet, He, et al. 2016) to classify aerial imagery into a pre-defined set of land use categories. The model will be trained and calibrated in past photointerpreted campaigns, and then applied to a different time step to assess robustness to changes and illumination conditions. The Swiss Alps will be the area under study. To tackle problems due to acquisition conditions mismatch, strategies rooted in domain adaptation will be considered.

Objectives

- Familiarise and successfully setup a CNN-based classification prototype pipeline for land use classification in the Swiss Alps.
- Investigate problems related to sensor changes and illumination mismatches between time periods
- Provide recommendations to automatize the process, also focusing on map updates only.

Requirements and practical info

- Background in machine/deep learning is welcome.
- Programming skills in Python.
- The thesis will be supervised from the Sion campus.
- Access to parallel computing resources is provided.

Literature

- He, Zhang, Ren, Sun (2016), Deep residual learning for image recognition, CVPR. Available at: <https://arxiv.org/abs/1512.03385>
- OFS (2018), Feasibility study about the Surface Statistic 2020. Available at: <https://www.bfs.admin.ch/bfs/fr/home/statistiques/espace-environnement/enquetes/area.assetdetail.5687737.html>
- Zhu, et al. (2017), Deep learning in remote sensing: a review and future directions, IEEE GRSM. Available at: <https://arxiv.org/abs/1710.03959>

Contact

Prof. Devis Tuia, devis.tuia@epfl.ch