ADELE: Overview of a deep learning application for land use and land cover change detection and classification in Switzerland

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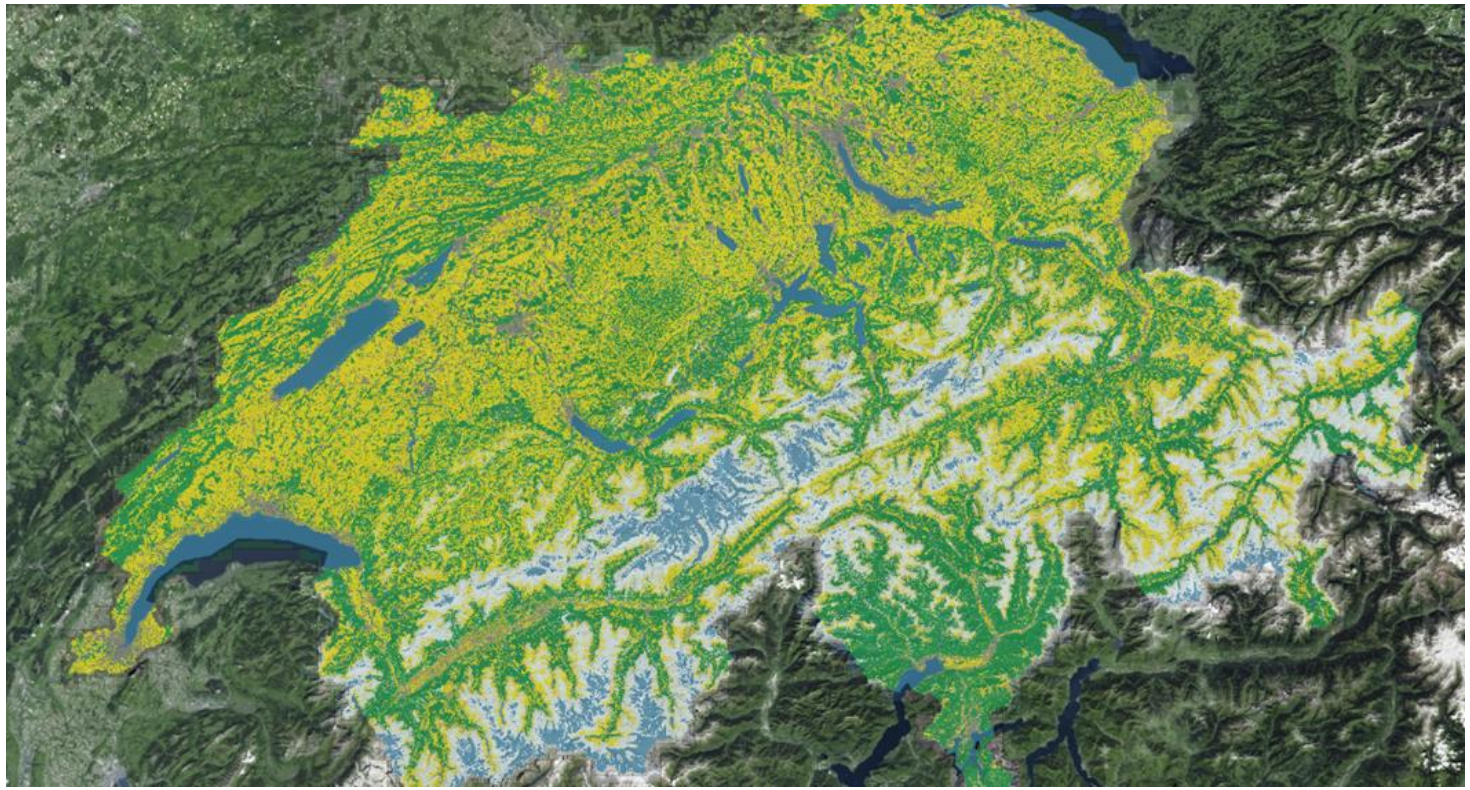
What is LU/LC statistics (Arealstatistik) ?

Classification of swiss **land use** (46 classes) and **land cover** (27 classes)

Time series since 1979, 12 to **6 years** process cycle

Interpretation of aerial images by experts



Point based statistics with over **4 million** points (100m grid)

Aerial images as primary data for interpretation classification

- Image of 200 x 200 pixels (50m x 50m) used as contextual information, for each point
- 3 channels available (RGB), stereo
- 2 periods available with prior ground truth classification:
  - 3rd Survey 2004-2009
  - 4th Survey 2013-2018

Example of point interpretation with classification

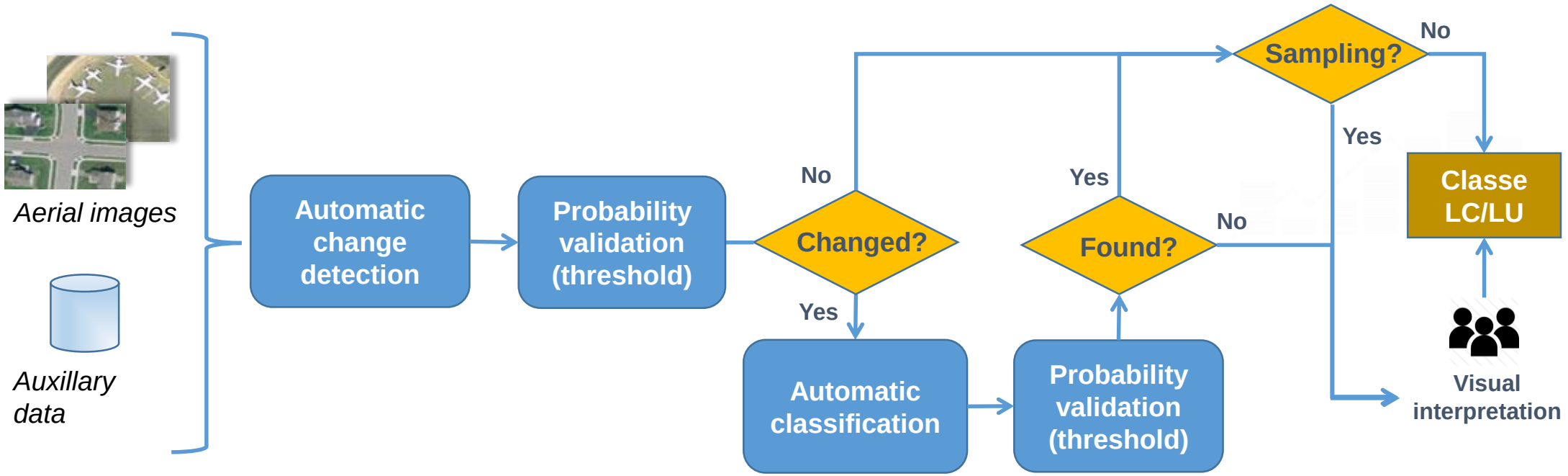
Land Coverage (LC): **11**

Consolidated surfaces

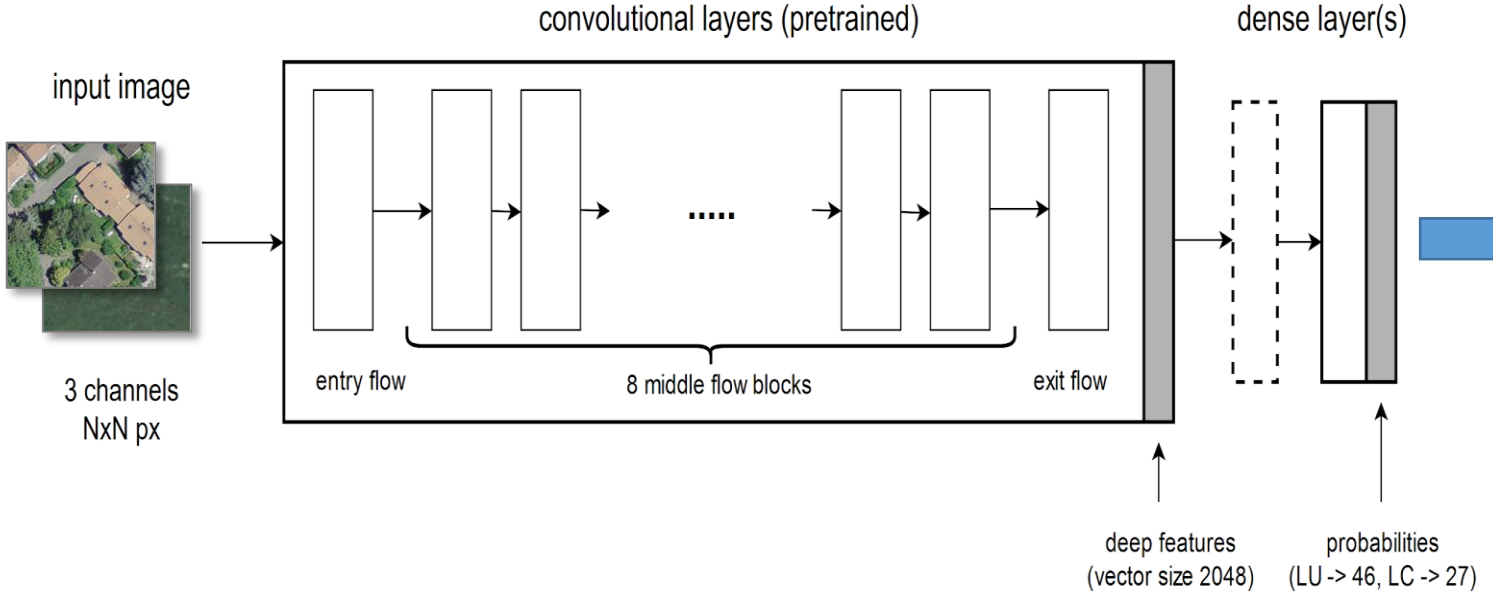
Land Use (LU): **108**

Unspecified buildings and surroundings

Semi-automatized classification process

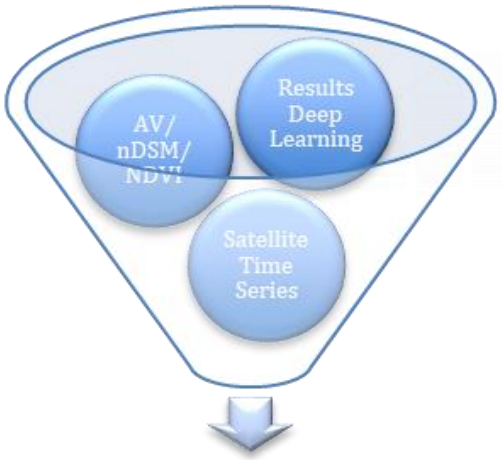


Artificial Intelligence classification worflow



Auxiliary data:

- **Landsat 8**
- **Digital Elevation Model (DEM)**
- **Canopy Height Model (CHM)**
- **Registers (land, agriculture, etc.)**



Random Forest Classifier

Prediction of land use and land cover

Example of point interpretation with prediction

2013-2018

LC 21: Grass and herb vegetation

LU 222: Semi-natural grassland

2020-2025

Visual interpretation

LC 52: Granular soil

LU 146: Construction sites

Prediction

Prediction	Result	%
Change	Yes	88
LC	52	94
LU	146	95

Experimental to productive statistics

- Transfer in production (TIP) documentation
  - Detailed description (models, data, configuration, processes, …)
  - **34 criteria** to satisfy, for example:
    - Contribution to the data innovation strategy
    - Global relevance and added value
    - Impact on the production process
    - Description of features engineering
    - Reproducible description of results validation
- Validated by the FSO executive board on july 7th, 2021

Results and further improvements

- Ability to define for each prediction point a **threshold** on the self-estimated probability
- Proven potential to **reduce the amount of work** with highly accurate no-change detection (in force)
- For classification, prediction probability thresholds are required for each LU and LC class pair due to the **high heterogeneity of classes** distribution (ongoing)

Thank you for your attention