Arealstatistik « Deep Learning » (ADELE)

HLG-MOS ML Project
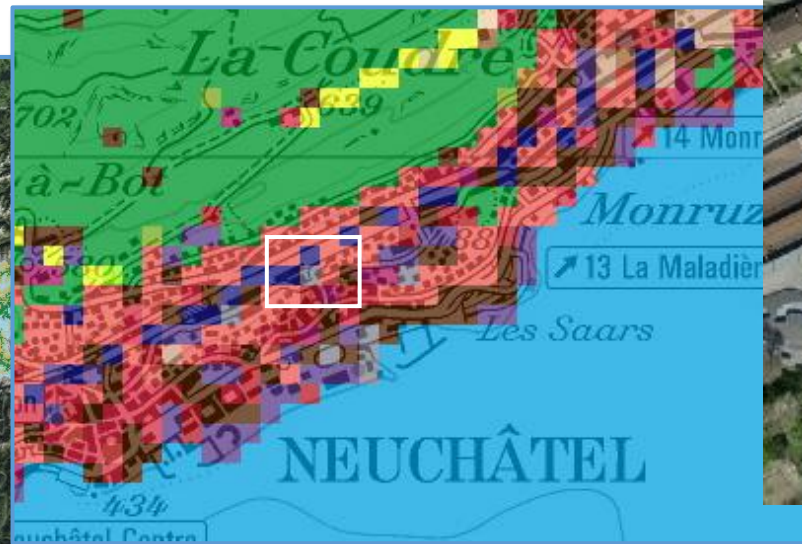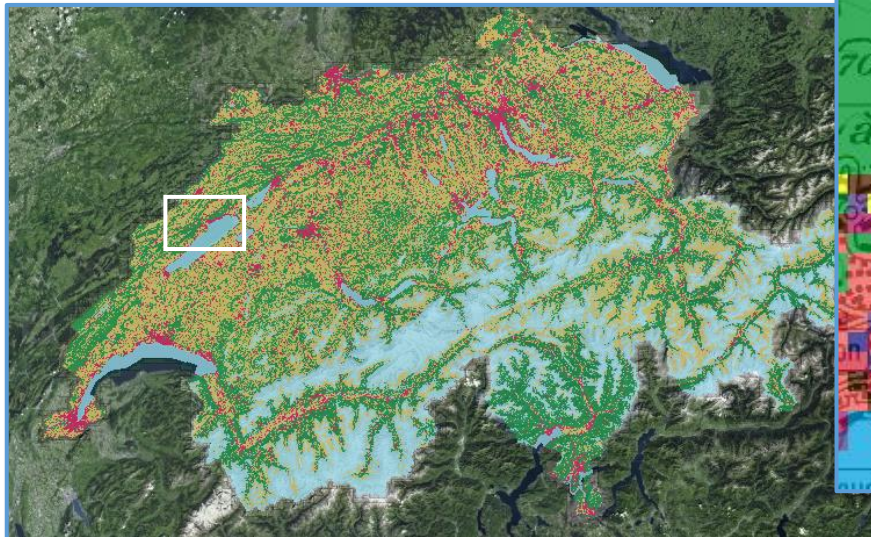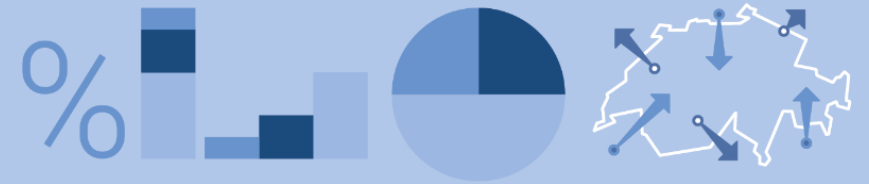
Claudio Facchinetti, Office fédéral de la statistique, Neuchâtel

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Area statistics

- Evaluates evolution of land use and coverage

- Measured by hectometric grid (~ 4 millions points)

- Time series over nearly 40 years

Revision of the 2020 methodology

Actaul state and evolution of the methodology

- Periodicity reduction from 12 years (in 1979) to 6 (in 2013)

- Future alternative sources of data to evaluate (registers, satellites, ...)

- Resources allocated almost entirely to visual interpretation

- Necessity to strengthen data analysis and diffusion

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Revision of the 2020 methodology

Two sub-projects:
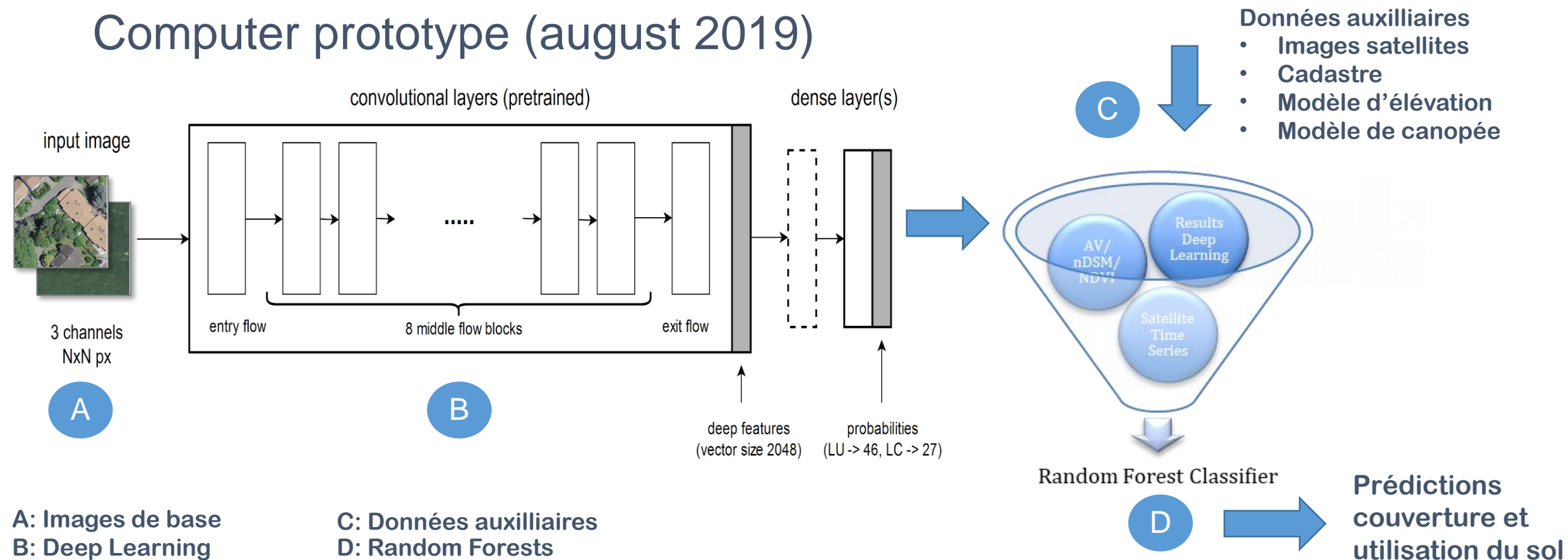
- *Methodenrevision* : characterize the areas of business process improvements, quality, data and application for the 2020 land use statistics

- *Arealstatistik Deep Learning* (ADELE) : use of fully or semi-automatic learning methods from deep learning technologies applied to image recognition

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ADELE progress

Computer prototype (august 2019)

Données auxilliaires
- **Images satellites**
- **Cadastre**
- **Modèle d'élévation**
- **Modèle de canopée**

Prédictions couverture et utilisation du sol

A: Images de base
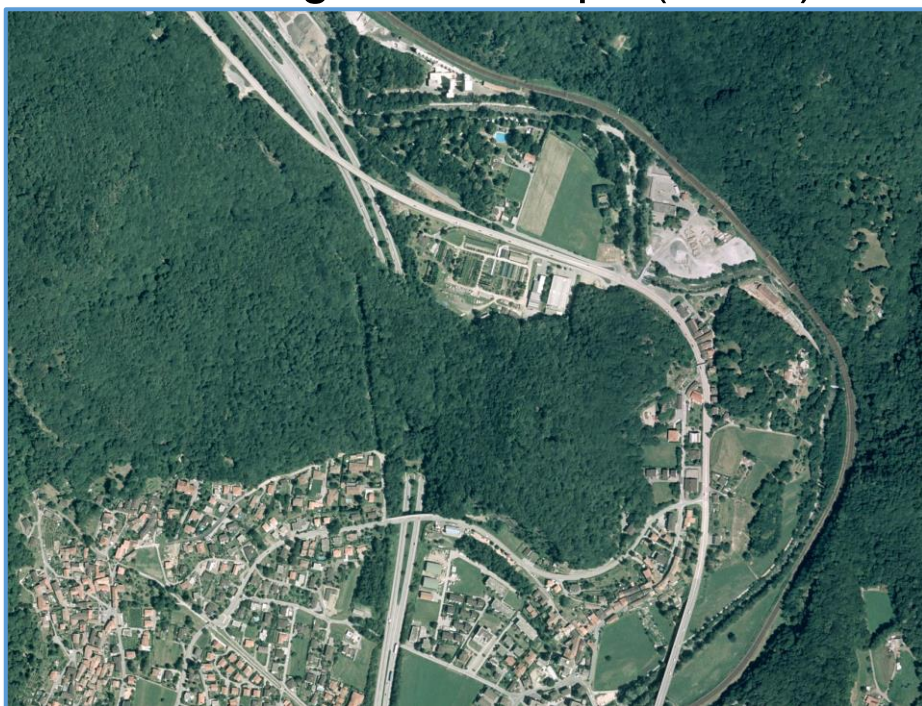B: Deep Learning

C: Données auxilliaires
D: Random Forests

ADELE results

Predictions for unkown images

Aires boisées
Agriculture
Habitat et infrastructure
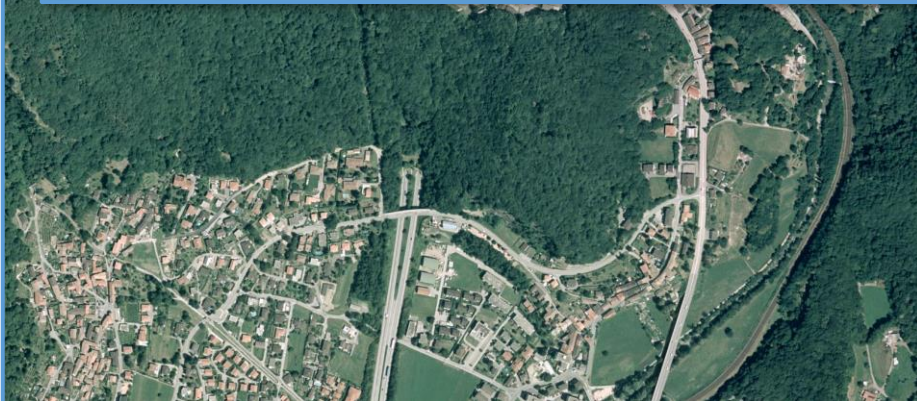Aires improductives

4 groups

Aerial images swisstopo (25cm)
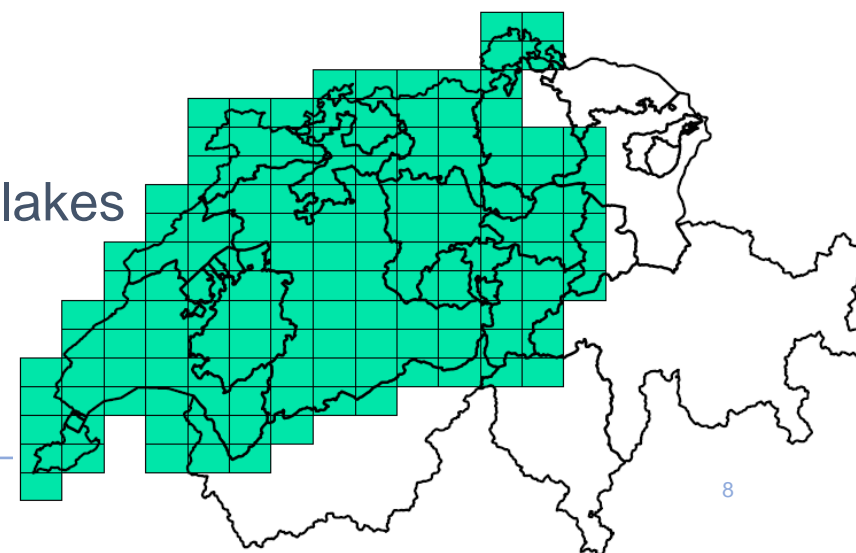
Simple neuronal network (2018)

ADELE results

Aires boisées
Agriculture
Habitat et infrastructure
Aires improductives

4 groups

… 73 classes

AI Prototype (2019)

ADELE results

Overall accuracy

- Land cover
  - Precision ≥ 90% for 5 classes out of 27
    - › Bodies of water, herbaceous vegetation, trees, glaciers
  - Representing **81%** of all sample points

- Land use
  - Precision ≥ 90% for 10 classes out of 46
    - › Viticulture, arable land, mountain pastures, forests, lakes
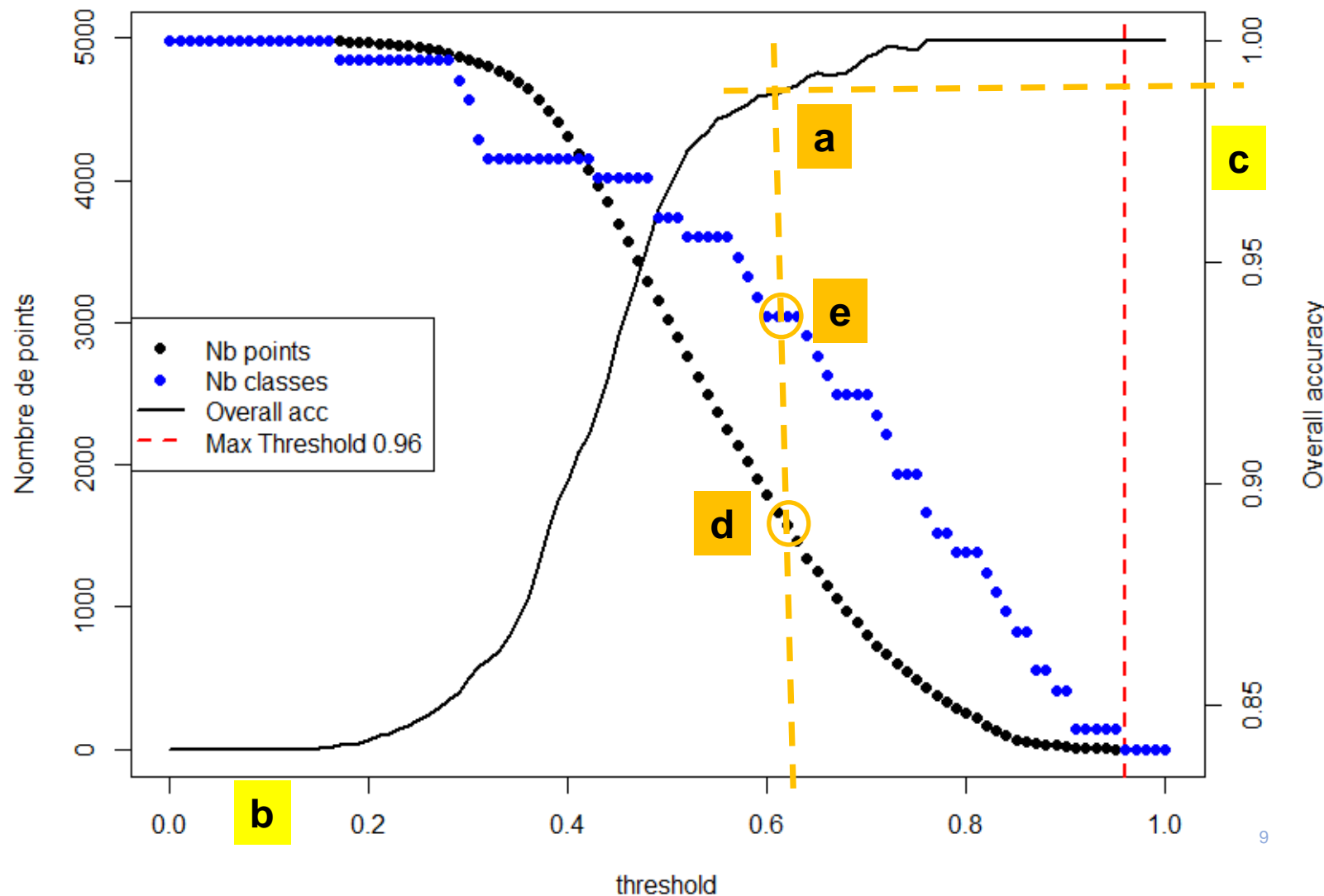 - Representing **44%** of all sample points

Résultats ADELE

Qualitative analysis

Small trial dataset (5000 pts) :

a) Analysis of threshold
  b) Prediction probability
  c) Accuracy
  d) Number of points
  e) Number of classes

Nombre de points vs. Overall Accuracy par threshold (LU)

- Nb points
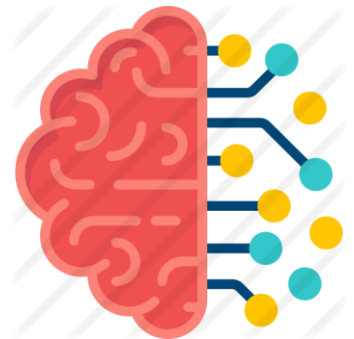- Nb classes
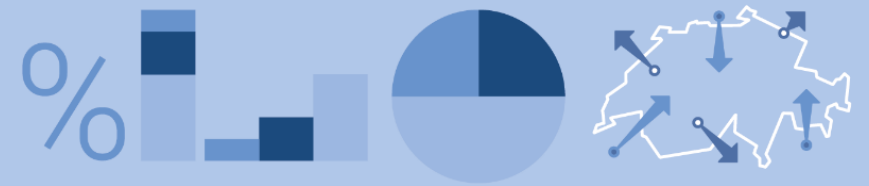- Overall acc
- Max Threshold 0.96

Avancement du sous-projet ADELE

Key takeaways

- Improvement potential :
  - Additional data sources (eg 10m satellite images 10m, topographic model)
  - Time adjustment between data
  - Optimization of learning by category (eg vegetation)
  - Optimization of change detection

- Next challenges :
  - Statistical validation of results (reliability and reproducibility)
  - Concept of integration in classical methodology
  - Technology watch: state of the art of AI in rapid progression

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Questions

Merci pour votre attention