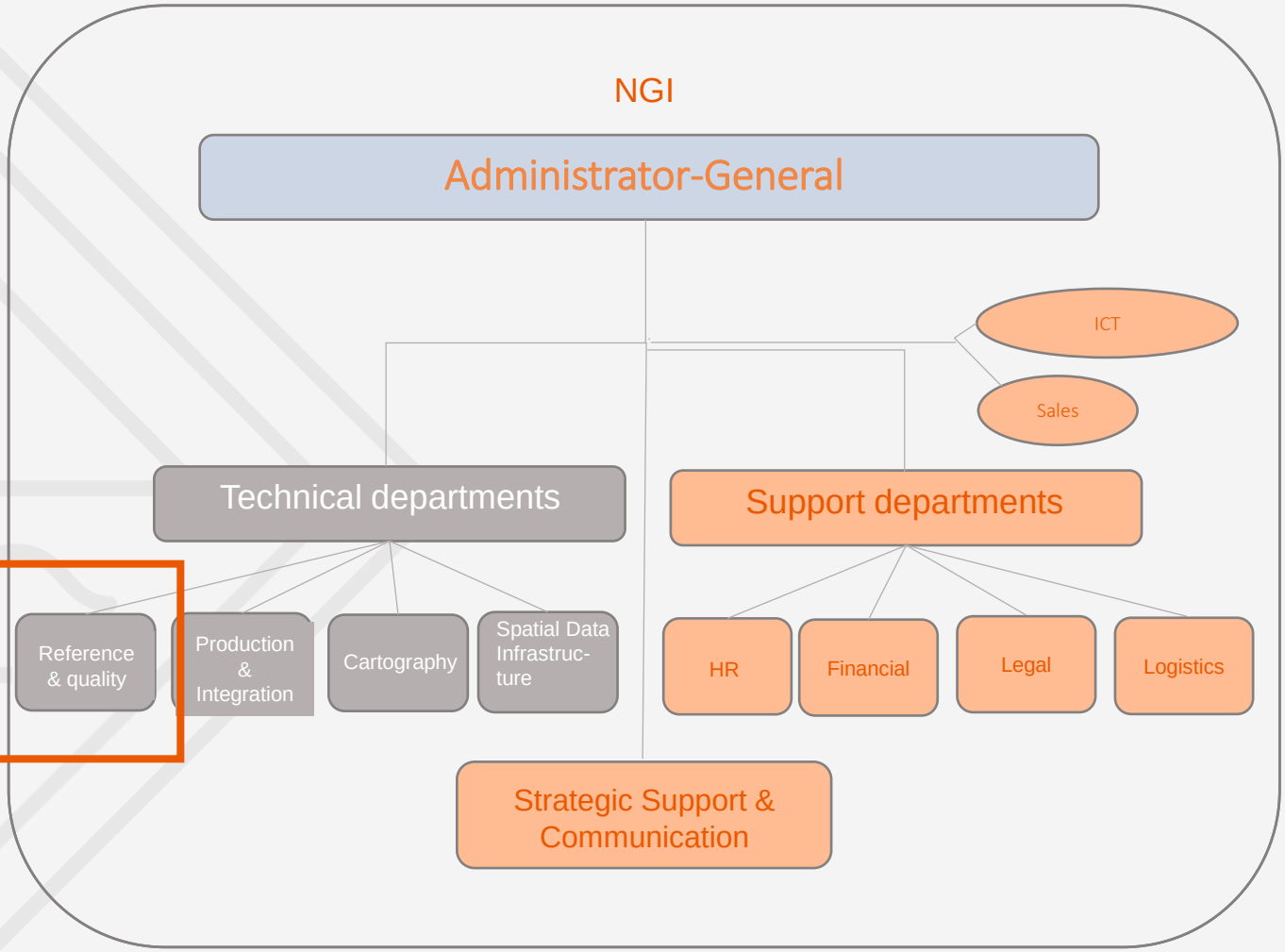
DEEP LEARNING FOR QC

JOREN VAN GYSEGEM

NGI
Nationaal
Geografisch
Instituut

IGN
Institut
Géographique
National

Introduction:

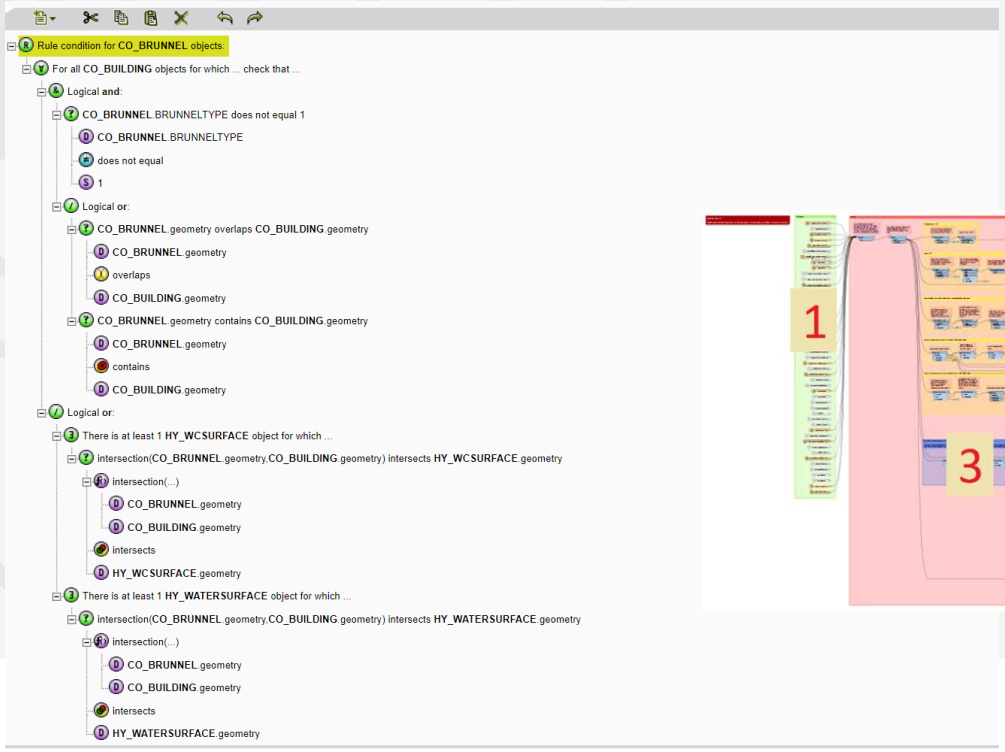


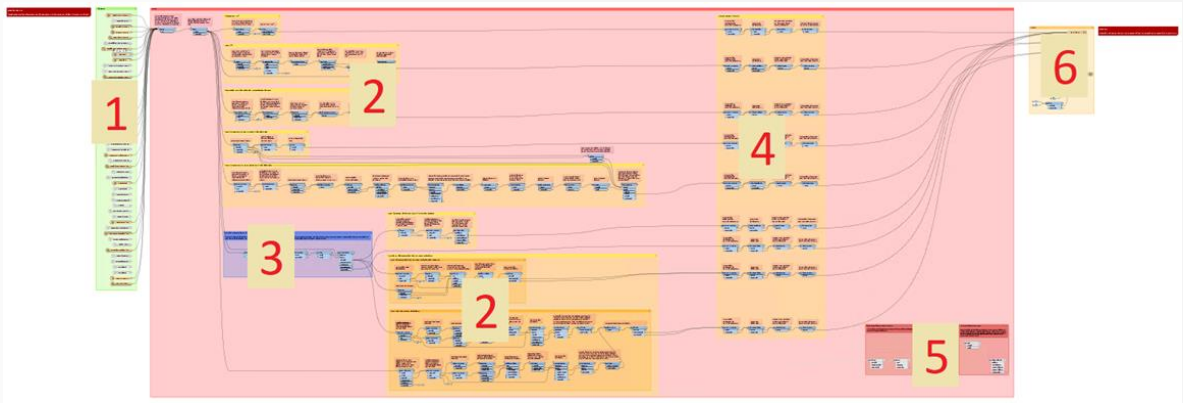
NGI IGN

Quality control

Context

- Quality control team has two kinds of checks:
  - Automated checks for validation of geometry, topology, domains



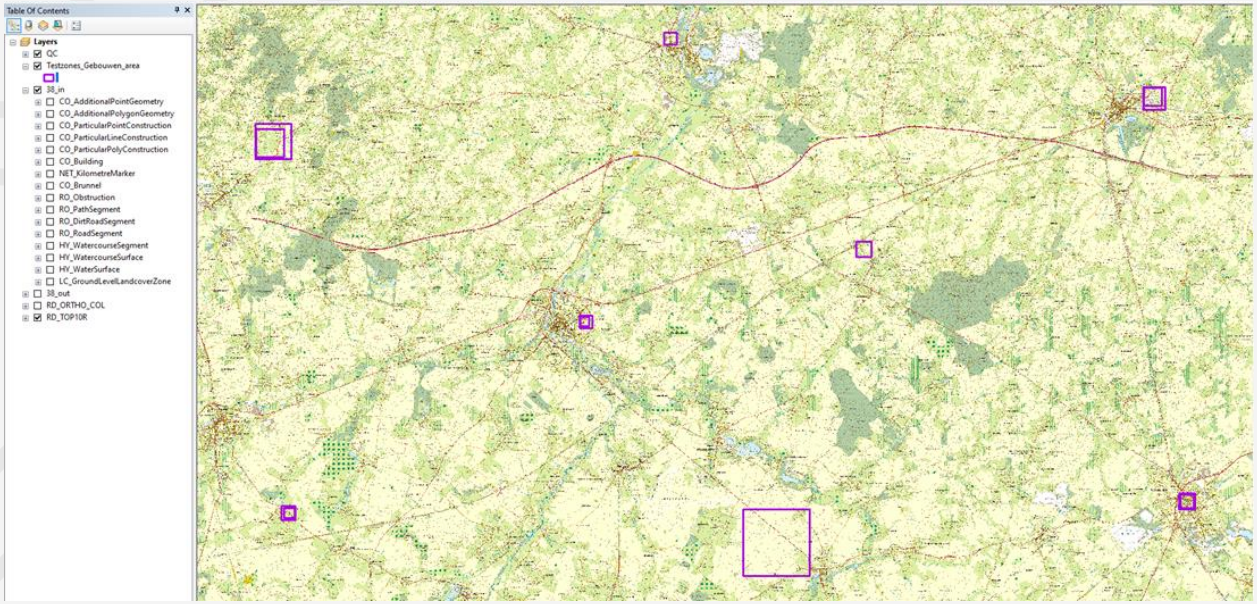


NGI IGN

Quality control

Context

- Quality control team has two kinds of checks:
  - Visual checks for validation of completeness, positional accuracy: Use of testzones

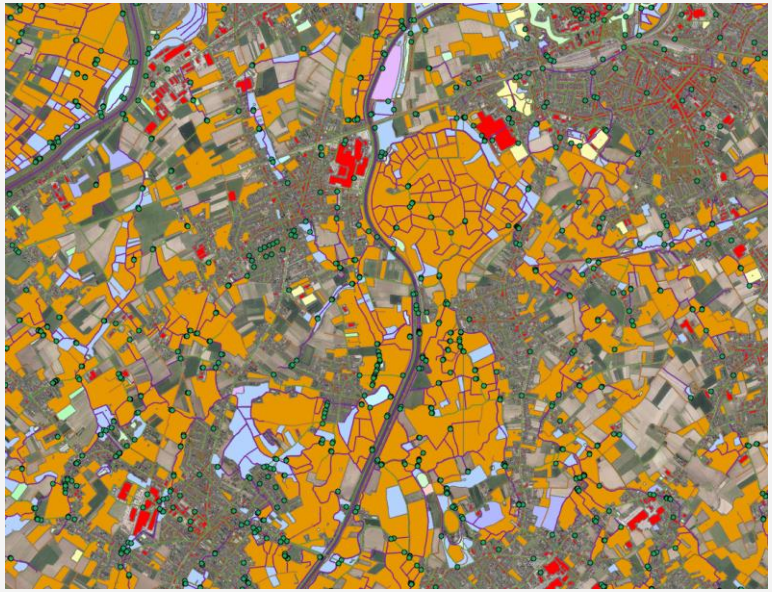


NGI IGN

Updating of our geodata

Context

- Past: systematic update of all features → (Too) long process!
- Up-to-dateness becomes more important → flexible production

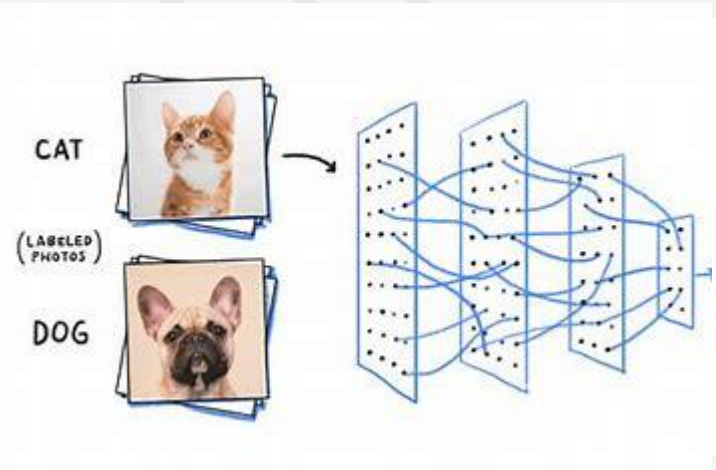


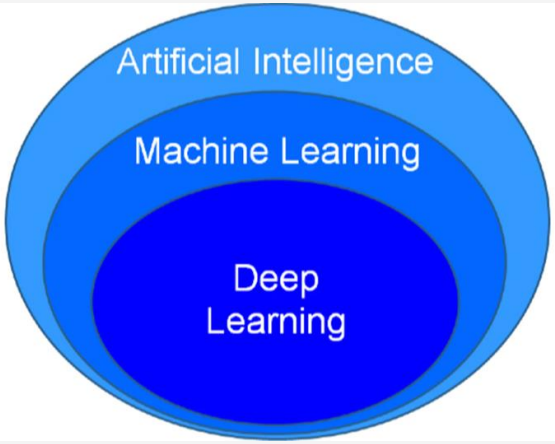
NGI IGN

Introduction

Deep learning

- ‘Self-learning’ algorithm made up of interconnected neurons in different layers





NGI IGN

Introduction

Deep learning

- Prerequisites for using deep learning
  - Lots of data!
  - Computational capabilities (GPUs)
  - Algorithm
  - Patience

NGI IGN

NGI pilot project

Deep learning

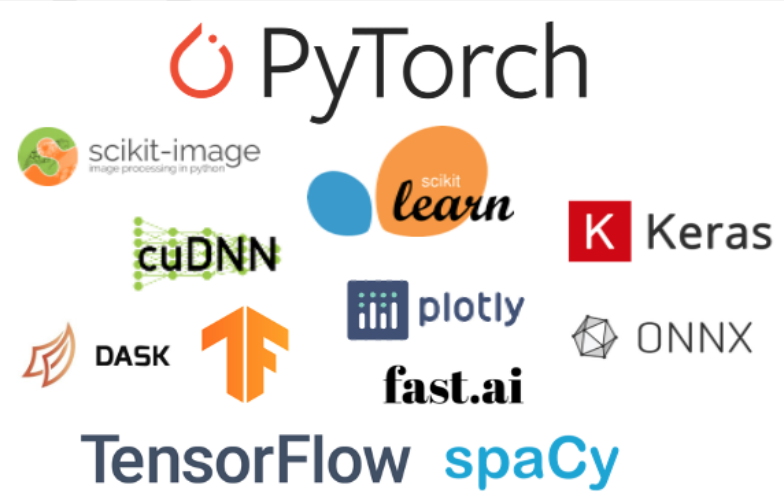
- Objective:
  - Can deep learning help QC team to more efficiently perform visual checks of our reference data?
- Questions:
  - Which geographical objects?
  - What platform?
    - Software
    - Hardware
  - Which algorithm?
  - What further usages?

NGI IGN

NGI pilot project

Deep learning

- Detection of buildings missing in our reference dataset, by creating an algorithm that detects differences between aerial images and our data
- Tool used: ArcGIS Pro Deep Learning toolset



NGI IGN

Workflow

NGI pilot project

1. Select appropriate data: Test zones for buildings where no errors have been found
2. Create a training dataset with corresponding image tiles by using the tool ‘Export Training Data For Deep Learning’
3. ‘Train Deep Learning Model’ tool
4. ‘Detect Objects Using Deep Learning’ tool

NGI IGN

Prepare training data

NGI pilot project

NGI IGN

Train deep learning model

Workflow

- Model architecture: ResNet50
  - 50 layers, 23 million trainable parameters
- Train / test: 90 / 10
- Epochs: 20
- Training time: 12h on 1 GPU

NGI IGN

Results

NGI IGN

Results

NGI IGN

Results

NGI IGN

Future steps

- Very promising results!
- Future options:
  - Other themes, like landcover
  - Change detection in updating procedure
  - Include lidar data

NGI IGN

THANK YOU FOR YOUR ATTENTION!

NGI IGN