Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Department of Economic Affairs,
Education and Research EAER

Agroscope

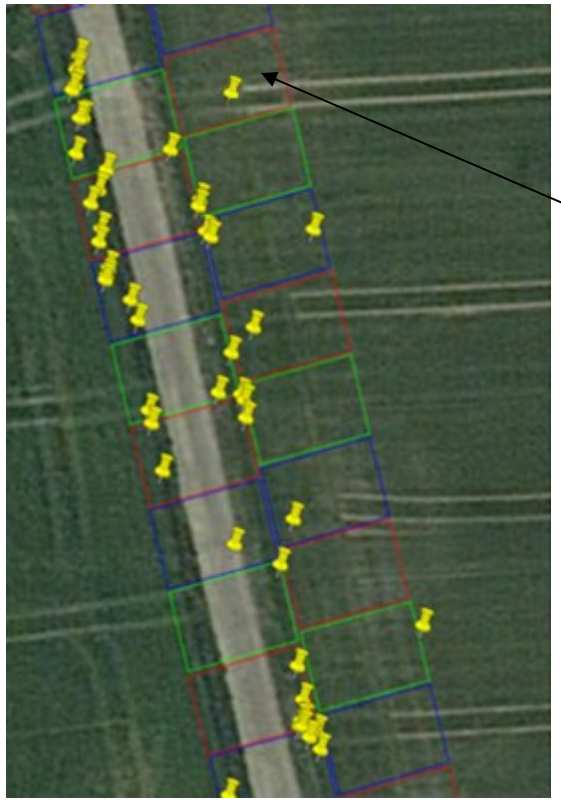
From Seeds to Roots to Fruits: Growing Computer Vision Together at Agroscope

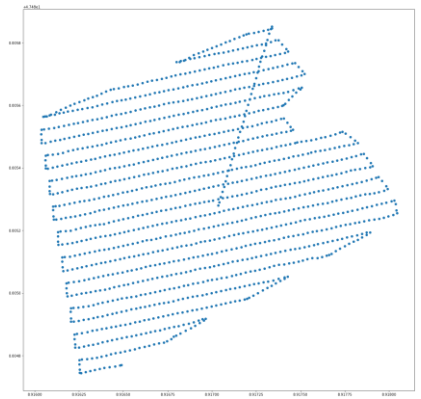
Hassan-Roland Nasser

18 September 2025

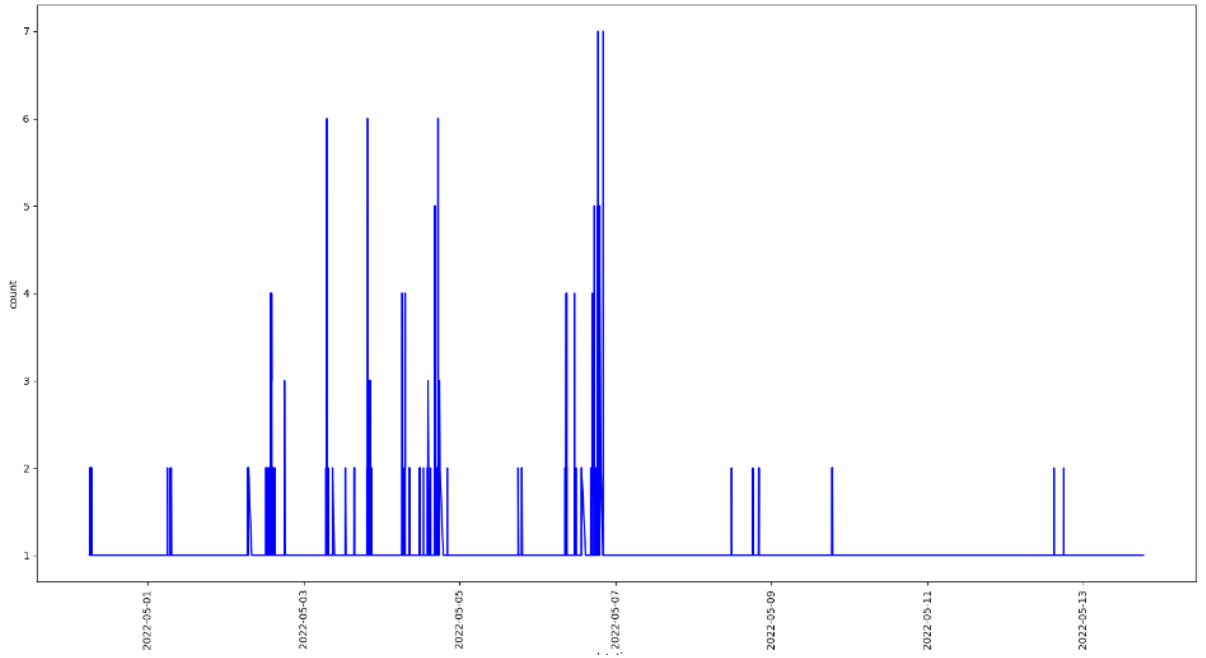
Pigs Behavior recognition and classification

Rumex map from drones





Counting birds in ~5 years camera-days



Computer vision is a strategic field for agriculture and agricultural research

Automation

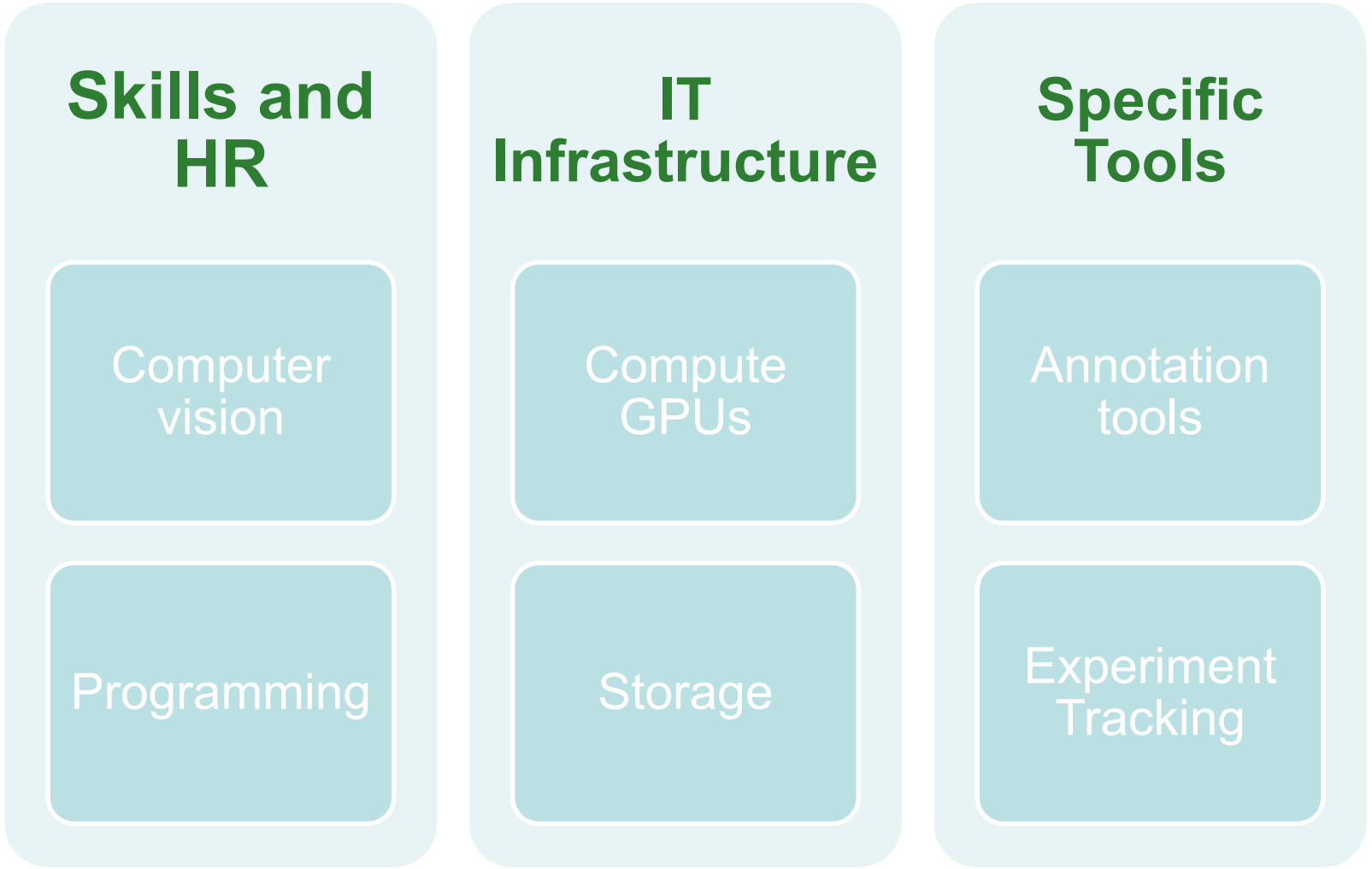
Scalability

Standardisation

Increase research throughput

Contribute to solving agricultural challenges

‘The Strategic Leverage of CV’ comes at a cost!



Plan of the talk

Part	Goal
How do we do computer vision	**A non deep technical overview**
The seeds: Computer vision Coordination project	How we got started
The roots: What we achieved in SFF11	Highlight the agroscope-wide collaboration for getting things done.
	Highlight the transformation journey
The Fruits: AP26	Where are we heading next, together.

Computer Vision with Deep Learning

- Using artificial neural networks to automatically analyze and understand images or videos, e.g., **classification**, object detection, segmentation or key points detection.

Pig 1

Pig 2

Pig 3

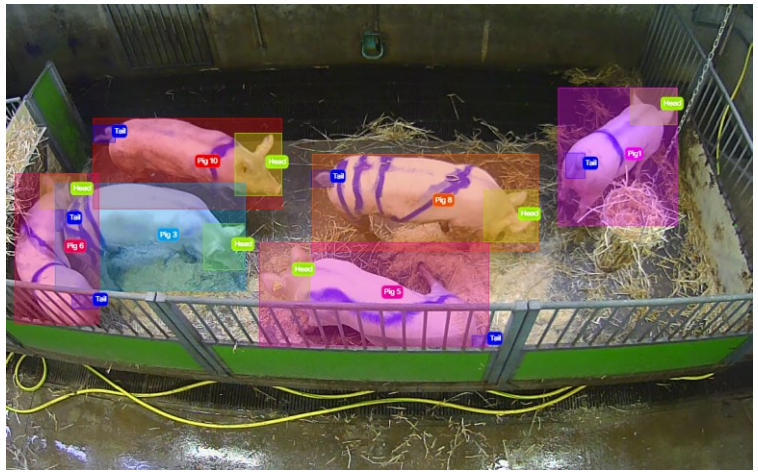
Pig 4

Classification ➔

Determine the class of the image. In this case, the pig ID.

Computer Vision with Deep Learning

- Using artificial neural networks to automatically analyze and understand images or videos, e.g., classification, **object detection**, segmentation or key points detection.



Object Detection ➔
determine the class and positions of objects in an image. Pig IDs, birds, weeds, …

Computer Vision with Deep Learning

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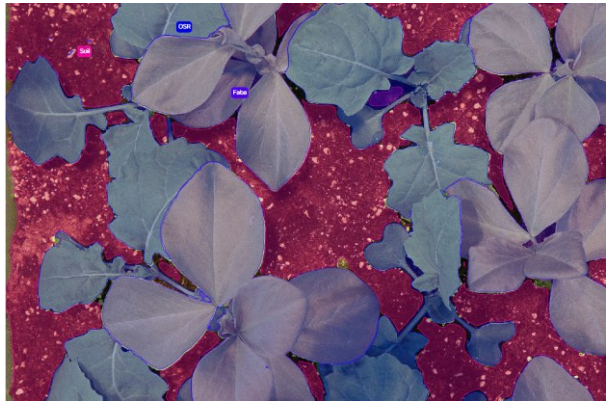


Segmentation➔

determine the class of each pixels / masks for objects.
Soil, plants, …

Agroscope

Computer Vision with Deep Learning

- Using artificial neural networks to automatically analyze and understand images or videos, e.g., classification, object detection, segmentation or key **points detection**.

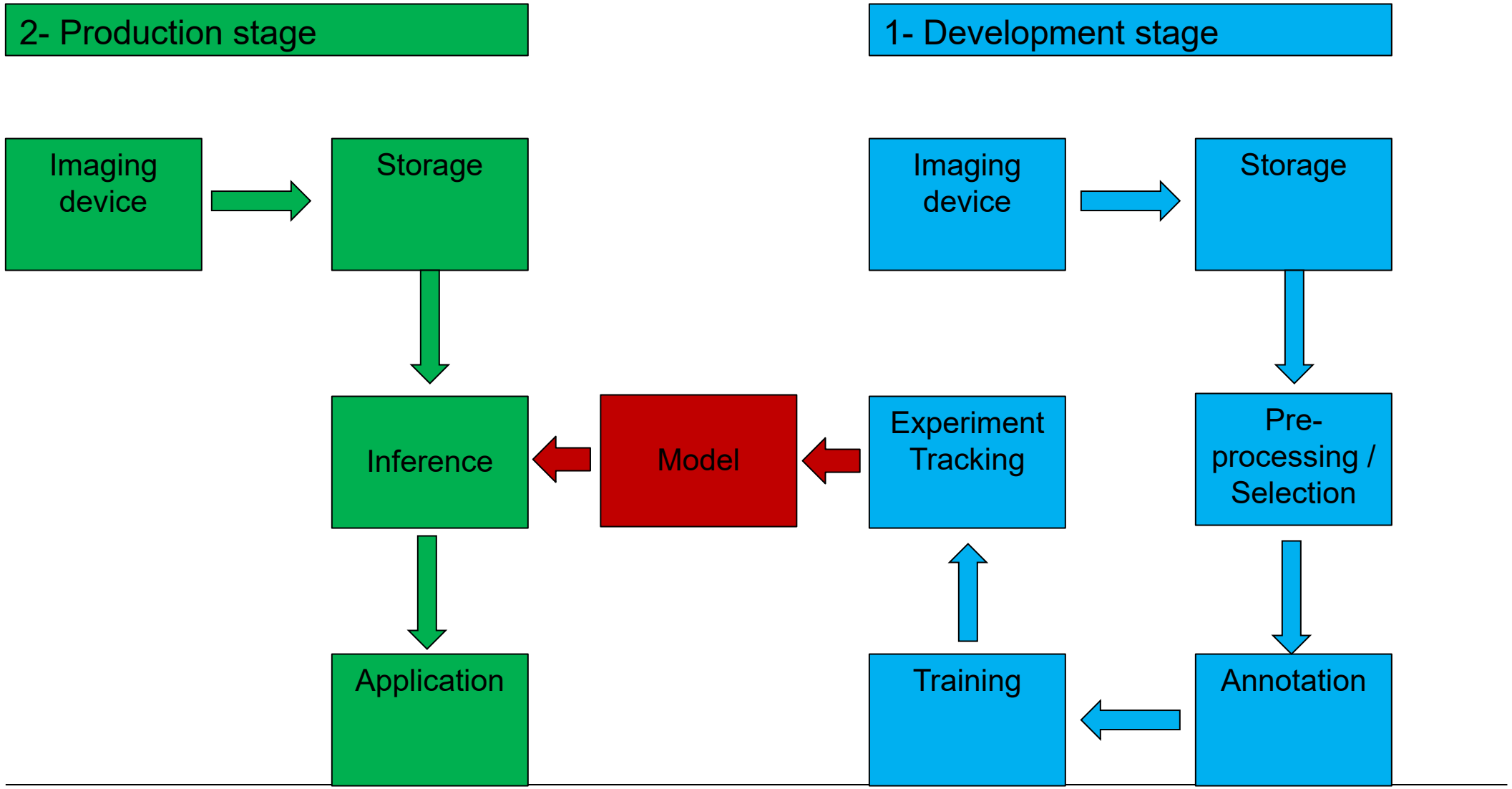
Key points detection➔

Determine point-positions for specific landmarks.
Pig nose, pigs ears, pig tail, joints, …

What can we do with all these models?

- Pigs: studies on behavior (Aggression, social, …) …
- Birds: Detecting presence to design deterrence systems …
- Rumex: map with Rumex positions for farmers (or weeding robots) …
- Automation, Scalability, Standardization, …

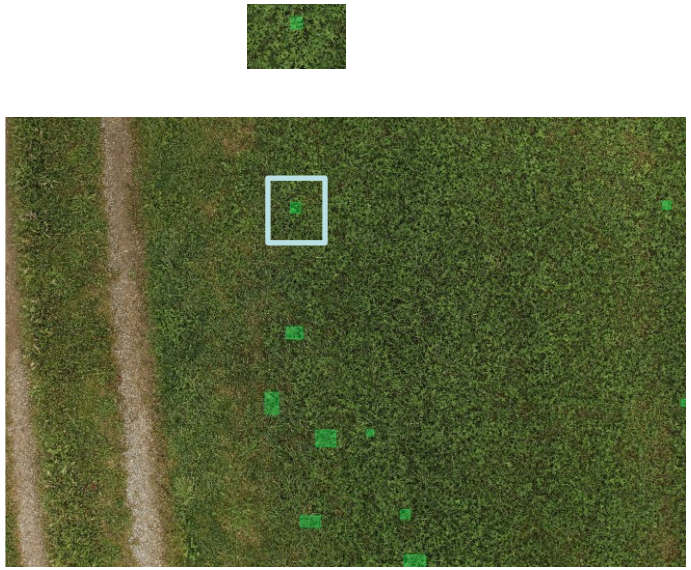
How do we do it?

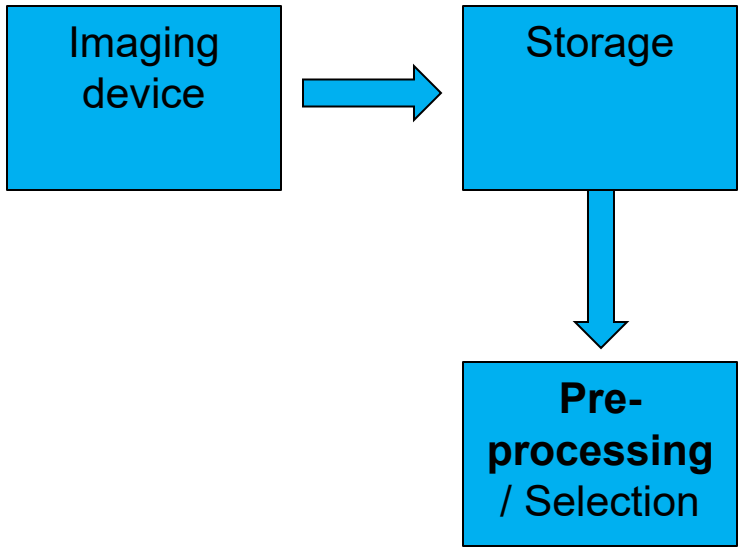


1- Development stage

Preprocessing:

- Splitting a video into frames.
- Cropping images to the region of interest.
- Tiling drone images.

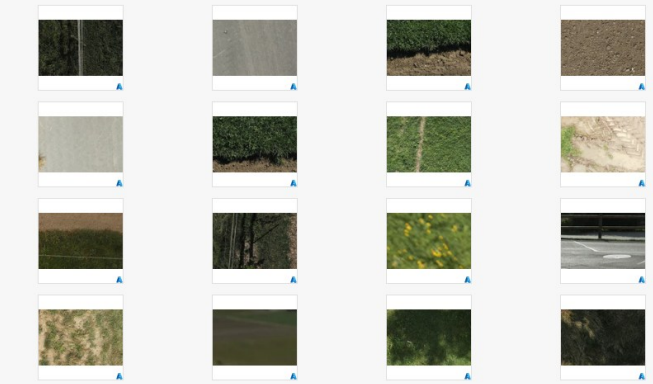




SUMMARY OF FULL DATASET

Type	Images
Total samples	50,000
Total size	316.53 GB
Dataset Id	64a879435841bac2dfd98fbc
Created at	Fri, 07.07.2023 22:44:51
Last modified at	Wed, 15.11.2023 15:49:59

SAMPLE IMAGES FROM THE DATASET



1- Development stage

Imaging device → Storage → Pre-processing / **Selection** → Annotation

Masks

Bounding boxes

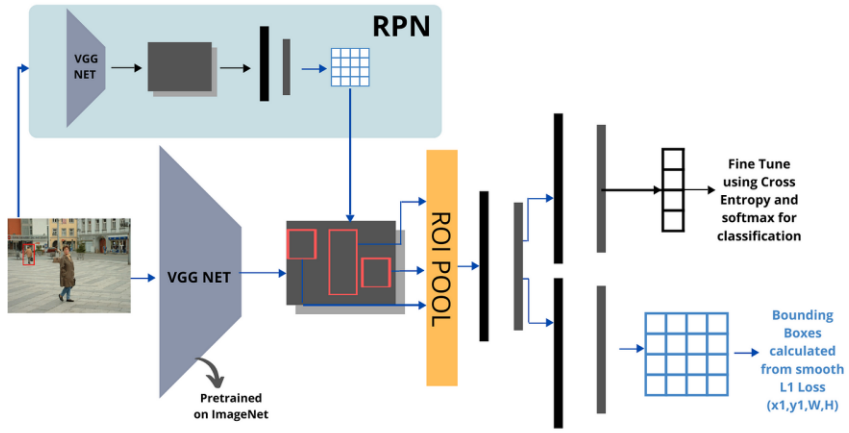
Key points

1- Development stage

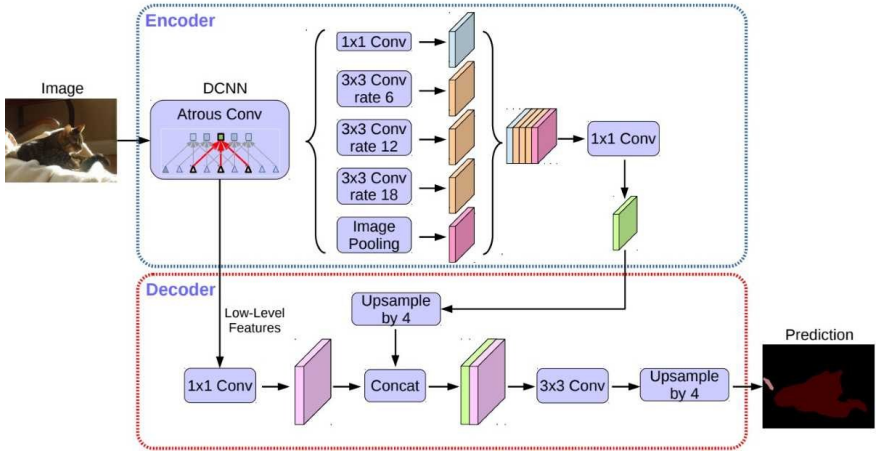
Imaging device → Storage

Pre-processing / **Selection**

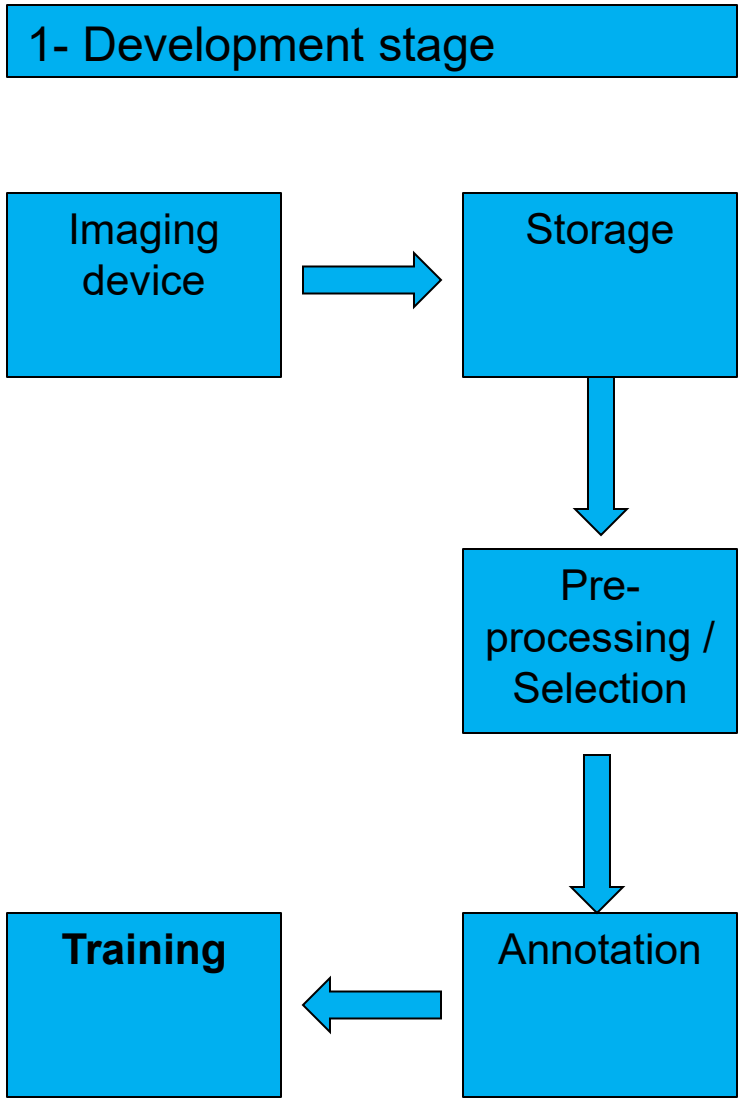
Annotation

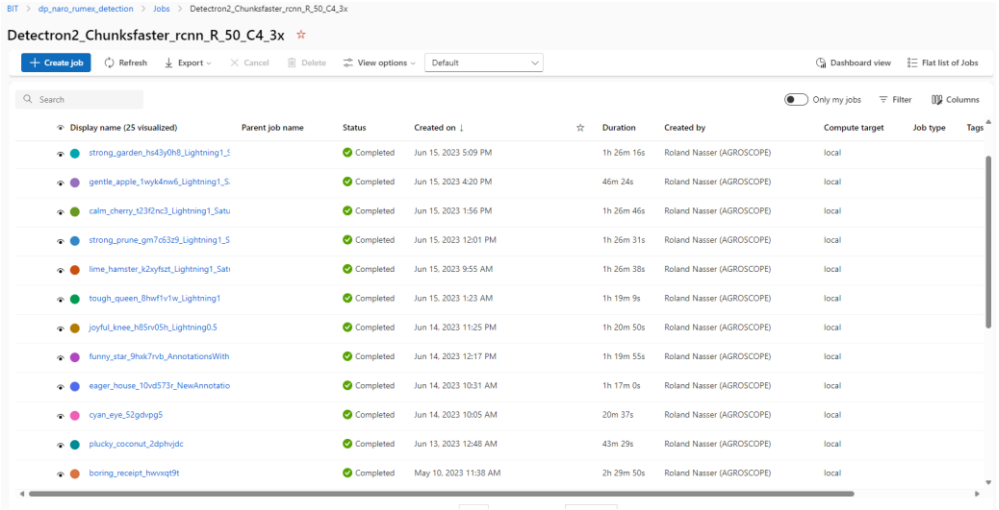


FasteRCNN, Object detection



DeepLabV3, Mask segmentation




Detectron2_Chunksfaster_rcnn_R_50_C4_3x
Create job
Refresh
Export
Cancel
Delete
View options
Default
Dashboard view
Flat list of Jobs
Search
Only my jobs
Filter
Columns
Display name (25 visualized)
Parent job name
Status
Created on
Duration
Created by
Compute target
Job type
Tags
strong_garden_hs43y0h8_Lightning1_S
gentle_apple_1wyk4nw6_Lightning1_S
calm_cherry_t23f2nc3_Lightning1_Satu
strong_prune_gm7c63z9_Lightning1_S
lime_hamster_k2xyfszt_Lightning1_Sat
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funny_star_9hxk7rvb_AnnotationsWith
eager_house_10vd573r_NewAnnotatio
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Jun 14, 2023 11:25 PM
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May 10, 2023 11:38 AM
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46m 24s
1h 26m 46s
1h 26m 31s
1h 26m 38s
1h 19m 9s
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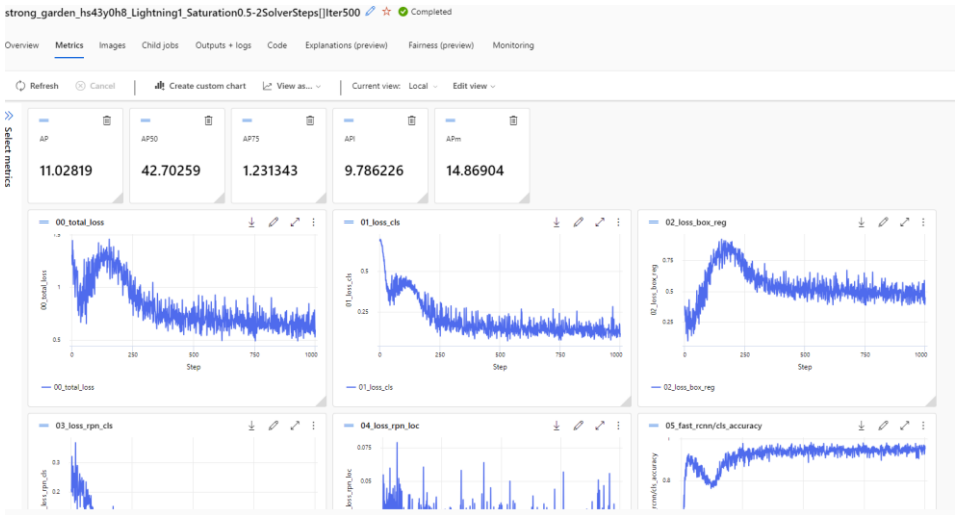
1h 19m 55s
1h 17m 0s
20m 37s
43m 29s
2h 29m 50s
Roland Nasser (AGROSCOPE)
local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Completed
Overview
Metrics
Images
Child jobs
Outputs + logs
Code
Explanations (preview)
Fairness (preview)
Monitoring
Refresh
Cancel
Create custom chart
View as...
Current view: Local
Edit view
Select metrics
AP
AP50
AP75
APl
APm
11.02819
42.70259
1.231343
9.786226
14.86904
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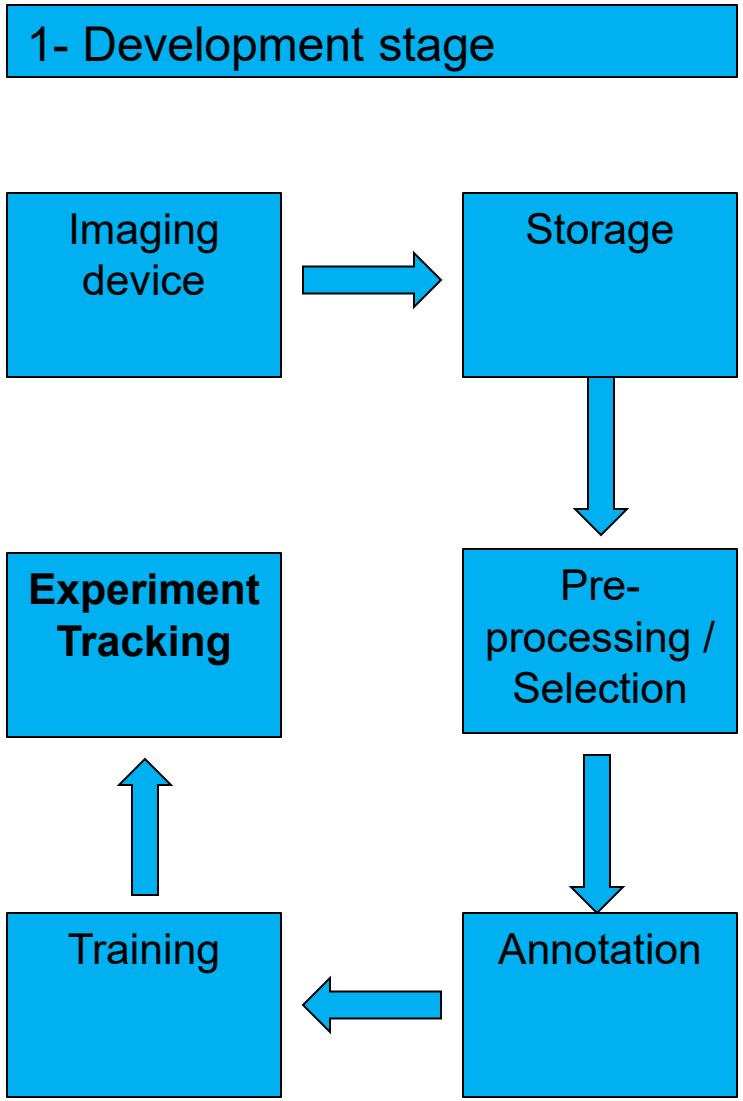
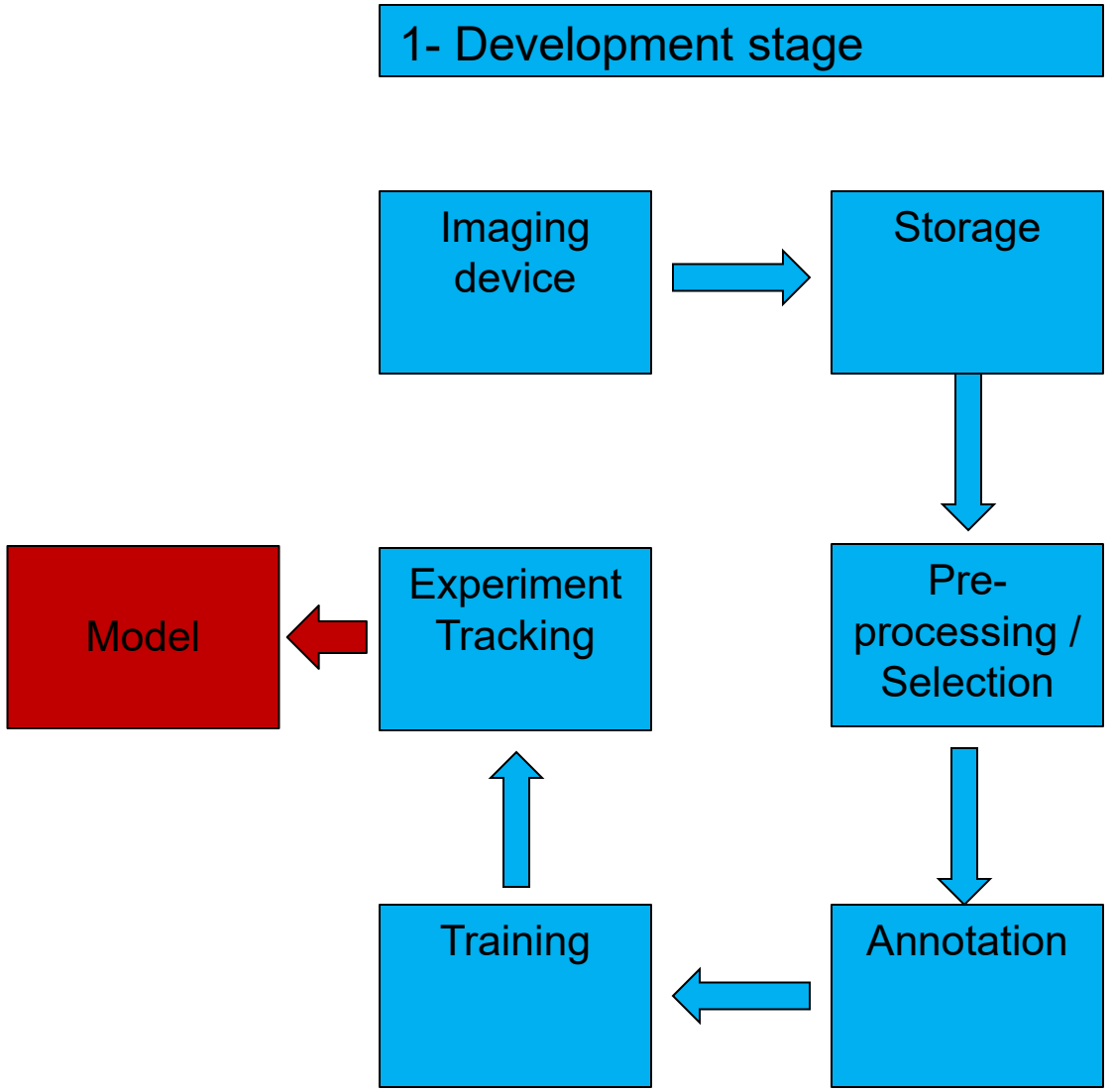
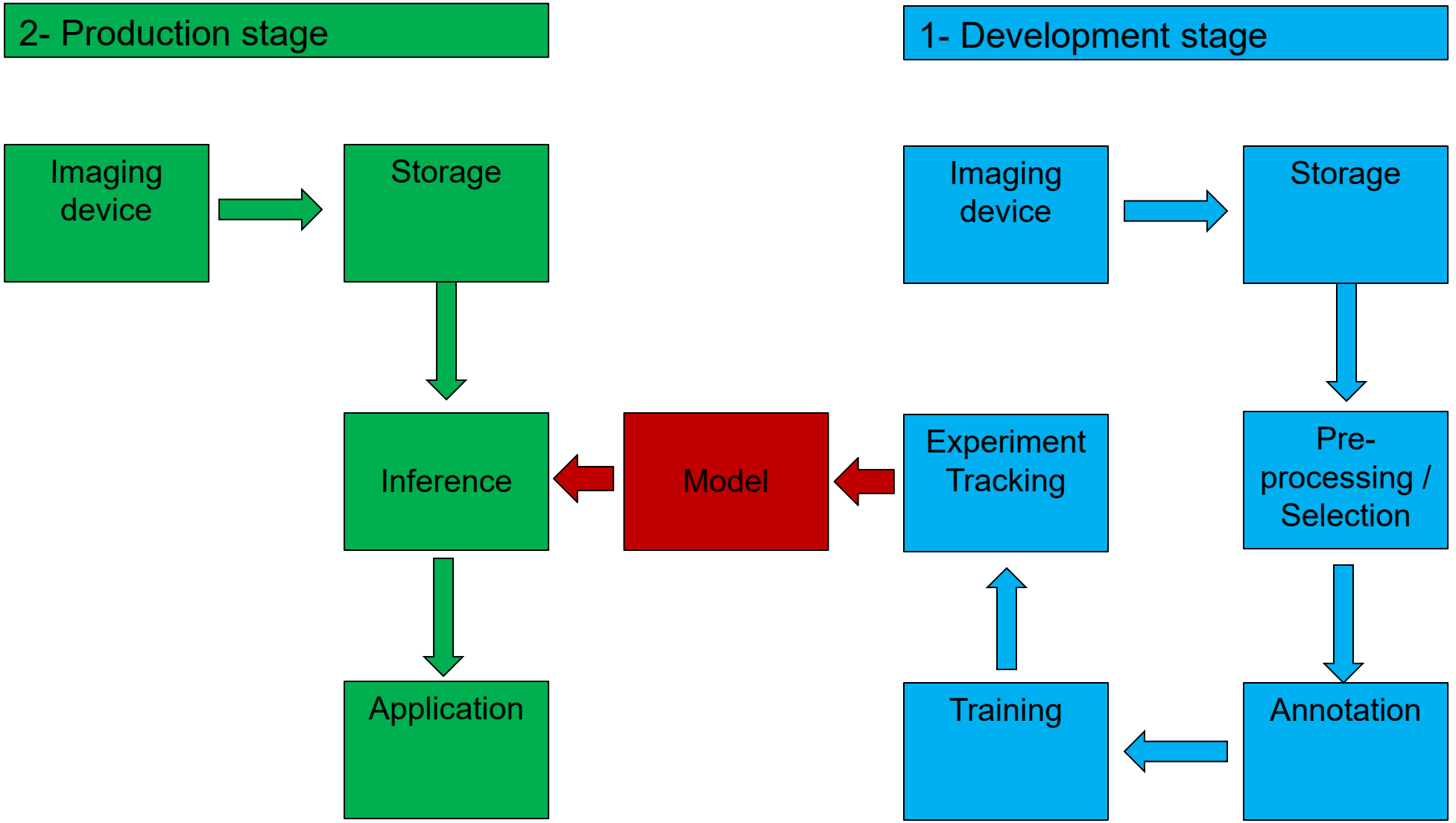
01_loss_cls
02_loss_box_reg
03_loss_rpn_cls
04_loss_rpn_loc
05_fast_rcnn/cls_accuracy
Step


1- Development stage
Imaging device
Storage
Pre-processing / Selection
Annotation
Training
Experiment Tracking


1- Development stage
Imaging device
Storage
Pre-processing / Selection
Annotation
Training
Experiment Tracking
Model


2- Production stage
1- Development stage
Imaging device
Storage
Inference
Model
Application
Imaging device
Storage
Experiment Tracking
Pre-processing / Selection
Training
Annotation

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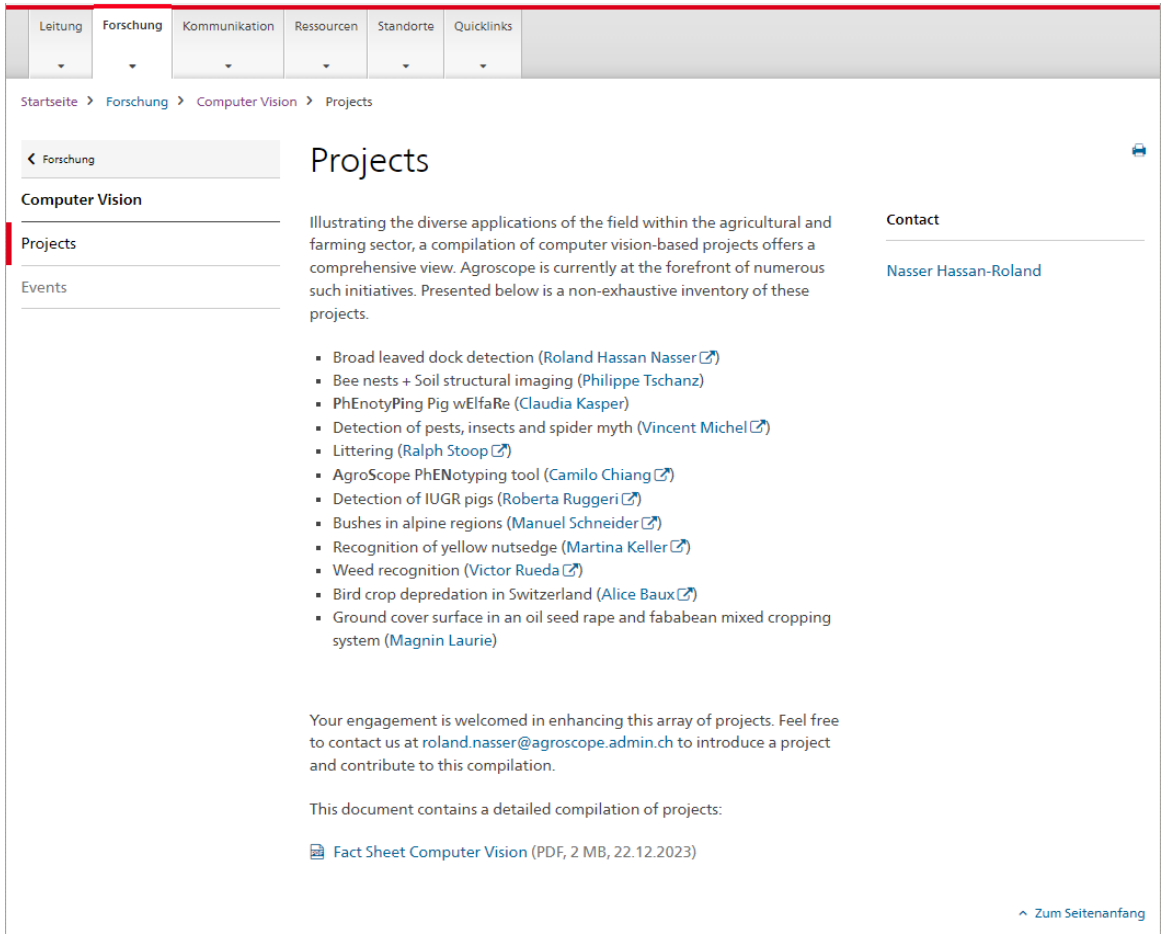
The Seeds

SFF11: Computer vision coordination project

Coordinating and harmonizing computer vision (CV) related activities within AGROSCOPE, through:

- **Sharing experience and exchanging knowledge** about the implementation of CV projects at the technical level as well as finding research consortium with the needed competences.
- Coordinating a collaborative effort across AGROSCOPE to **craft guidelines and best practices** regarding computer vision applications in the agricultural sector.
- Networking with **external research partners with expert knowledge in CV**.
- Creating a requirement document regarding the resources needed to implement CV at a larger scale and determine how these **requirements can be satisfied with the IT Department**.
- **Supporting upcoming projects** by finding the knowledge and resources needed, be it AGROSCOPE or externally.
- **Coordinate the provision of expertise towards cantons** and other external bodies with expertise regarding CV in agriculture.

A portfolio of 12 projects



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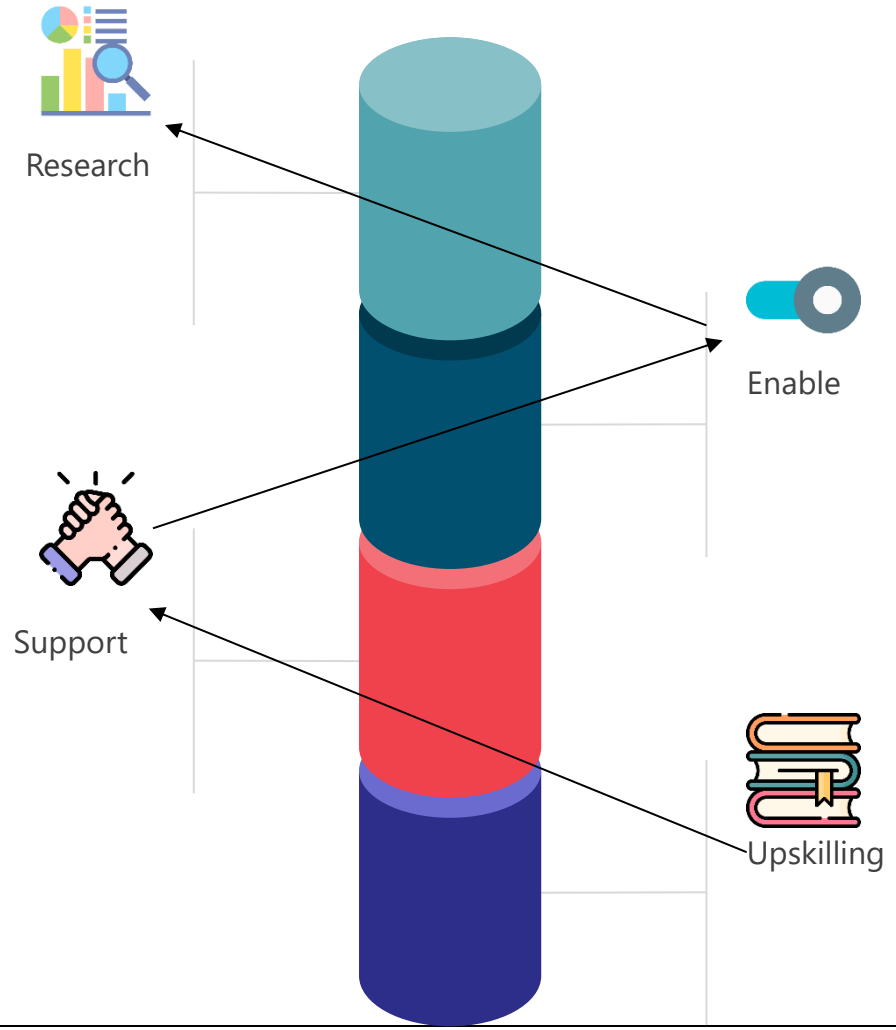
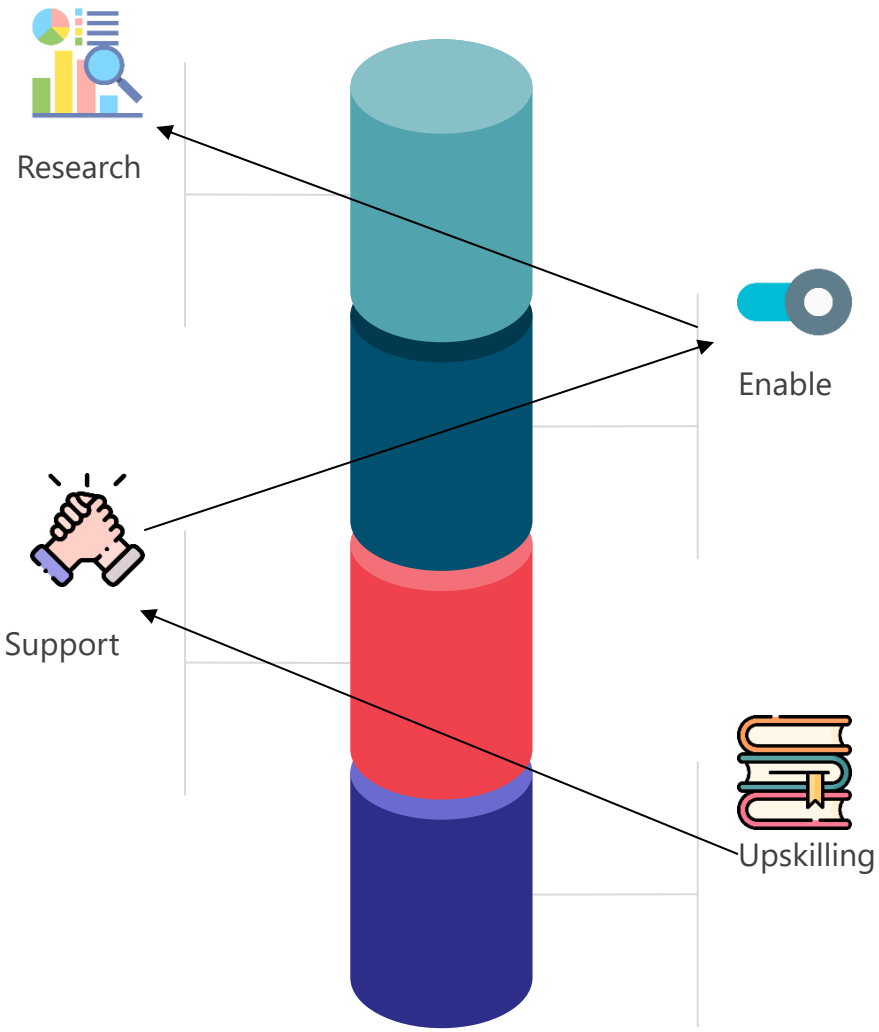
The USER framework



USER - Upskilling

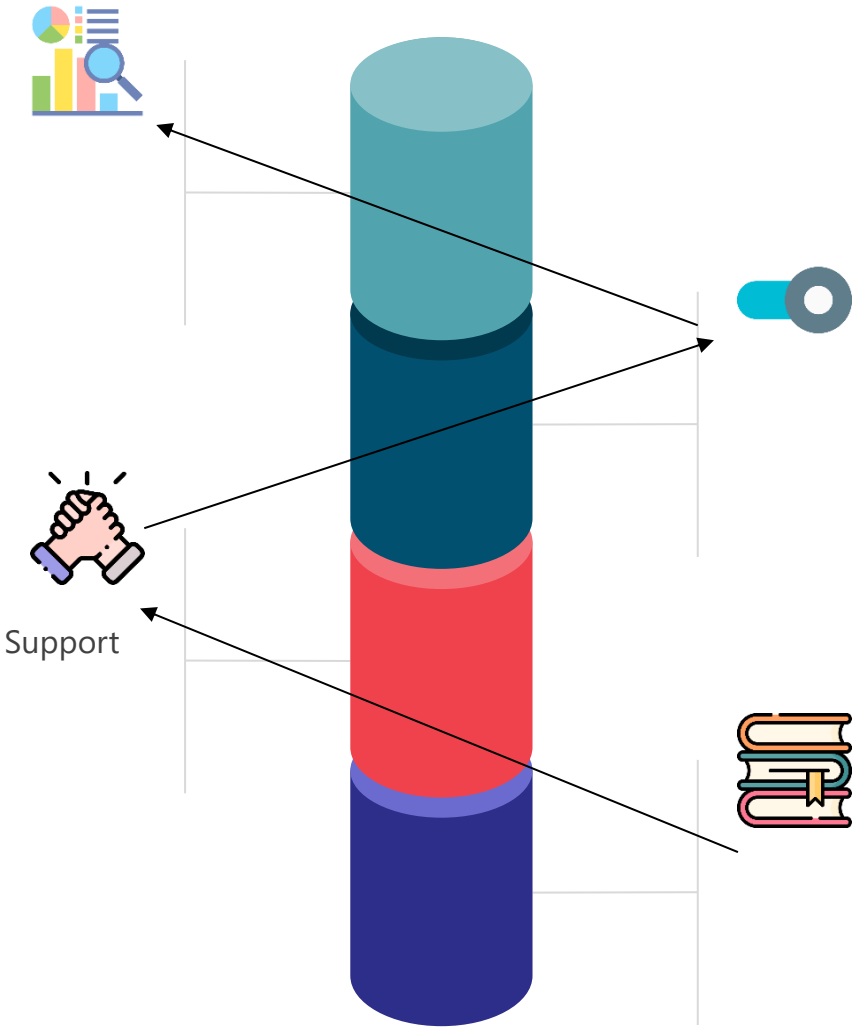


2022: Image analysis bootcamp

2023: Computer vision with Azure

2024: DataDay on computer vision for Agriculture

USER - Support



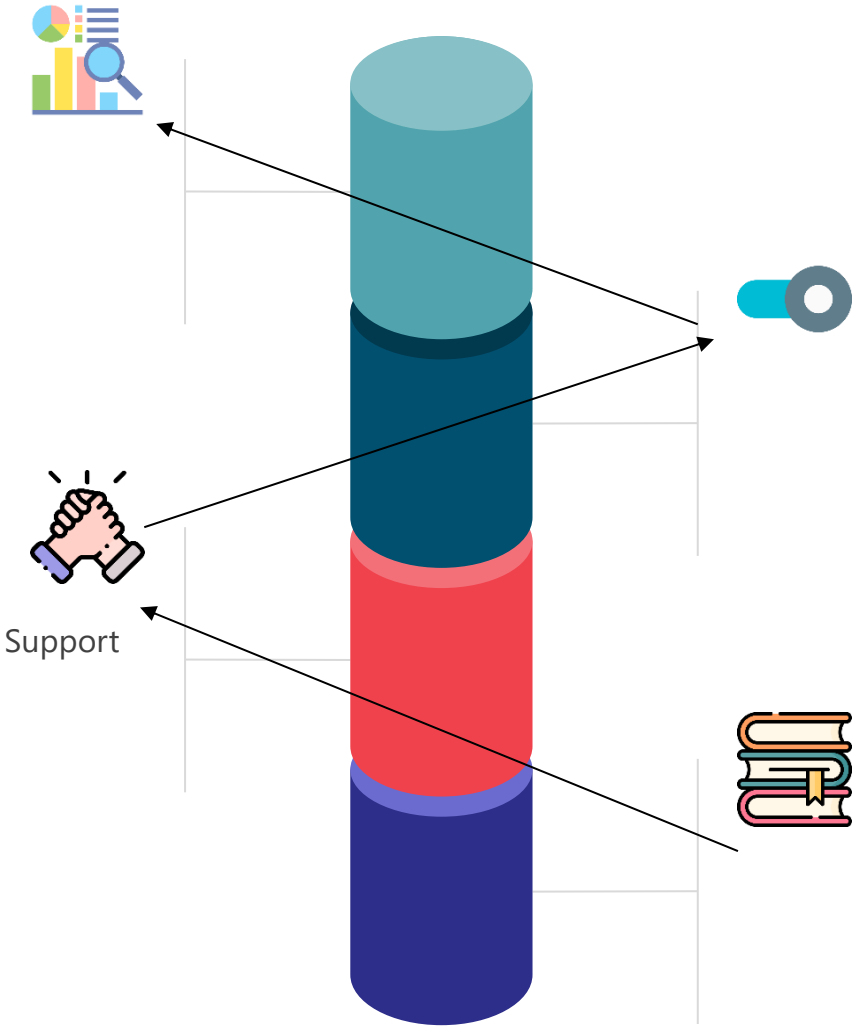
Corvid attack sunflower plantations

4 years x 60 days x 8 cameras

Or

~5 years of total camera-days

USER - Support



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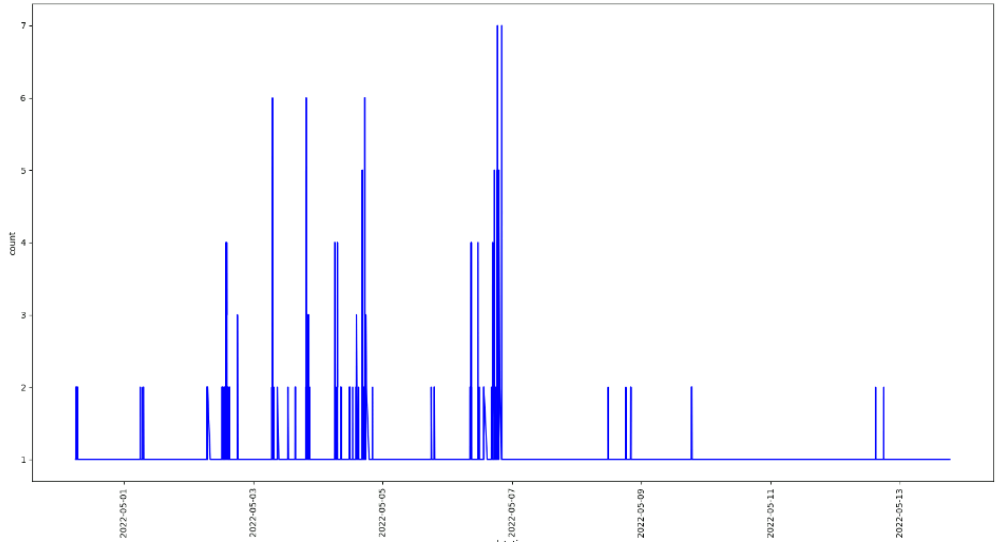

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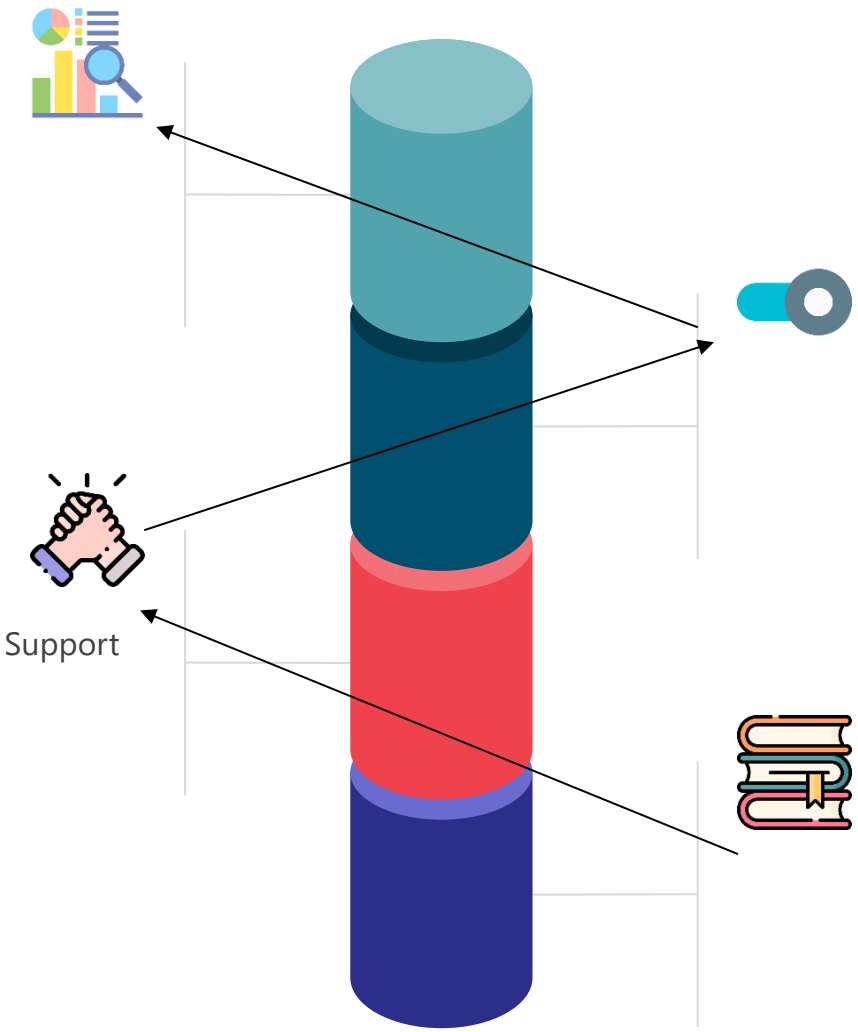
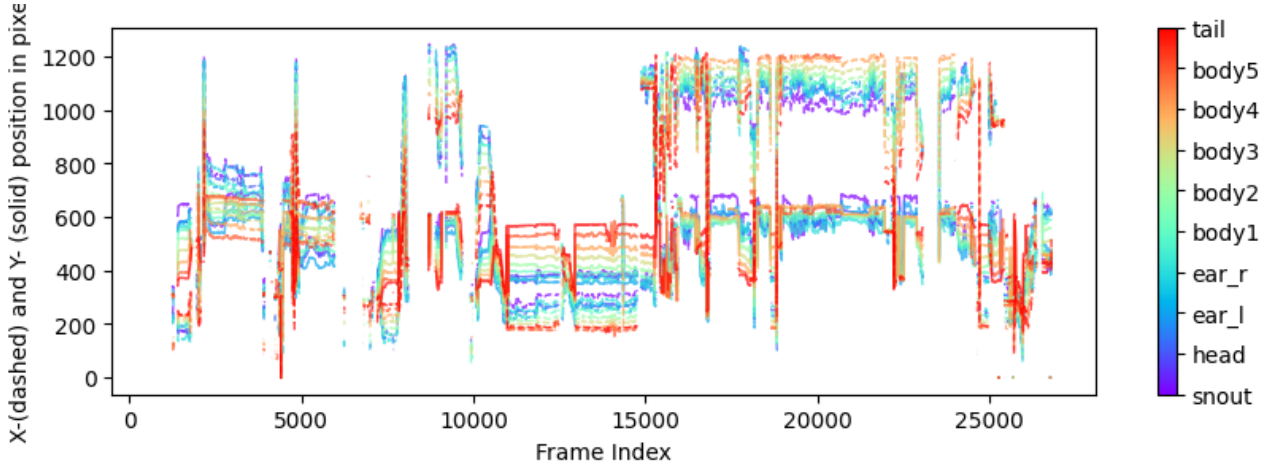
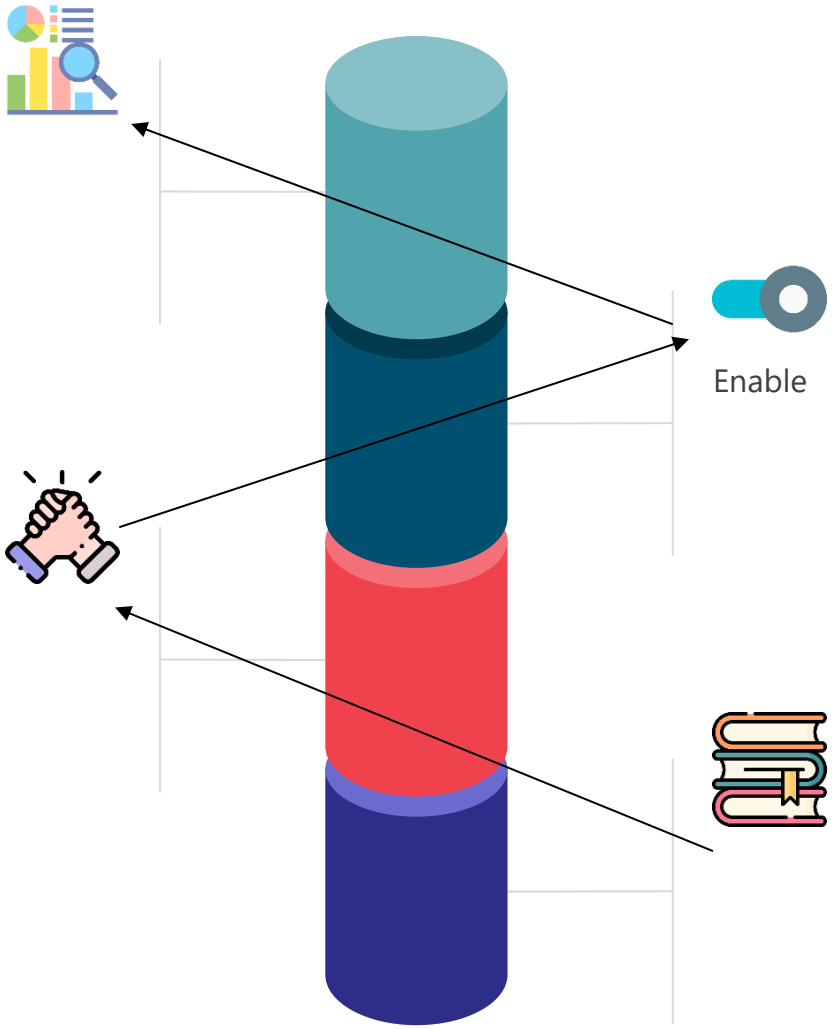


Pigs surveillance for aggressive behavior

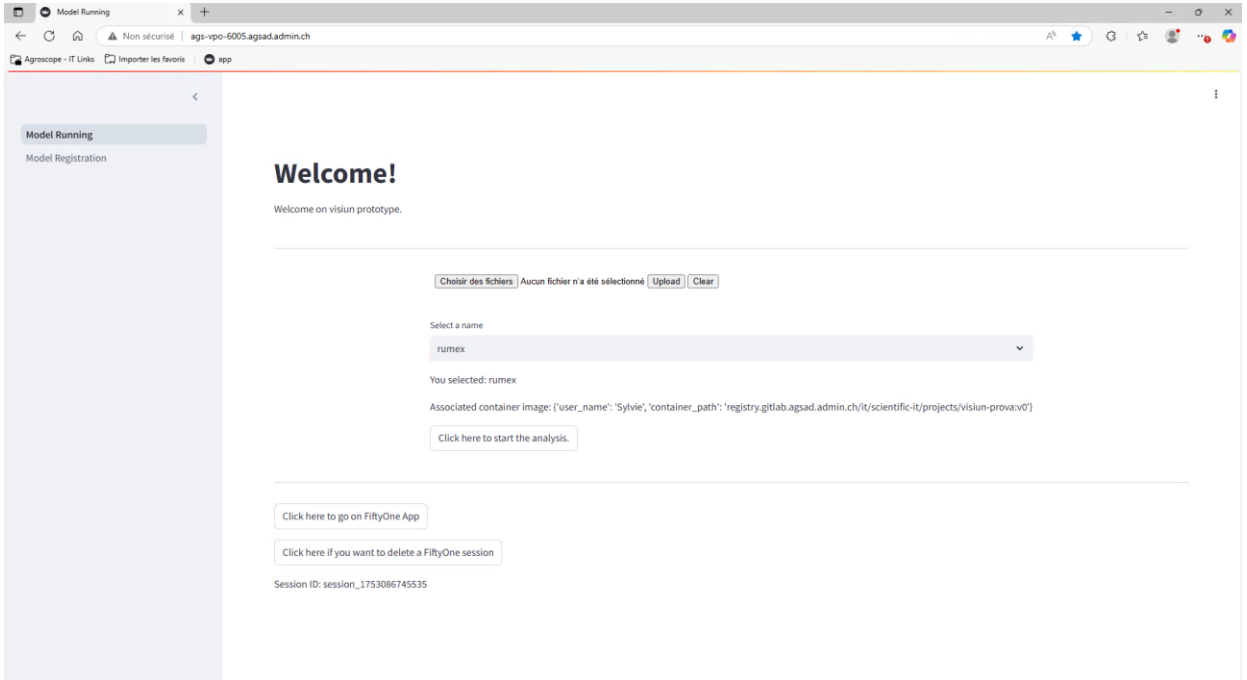


USER - Enable



Inference Server

How can we make these computer vision models available for non programmers?



USER - Enable

A suite of projects to accelerate computer vision based applications

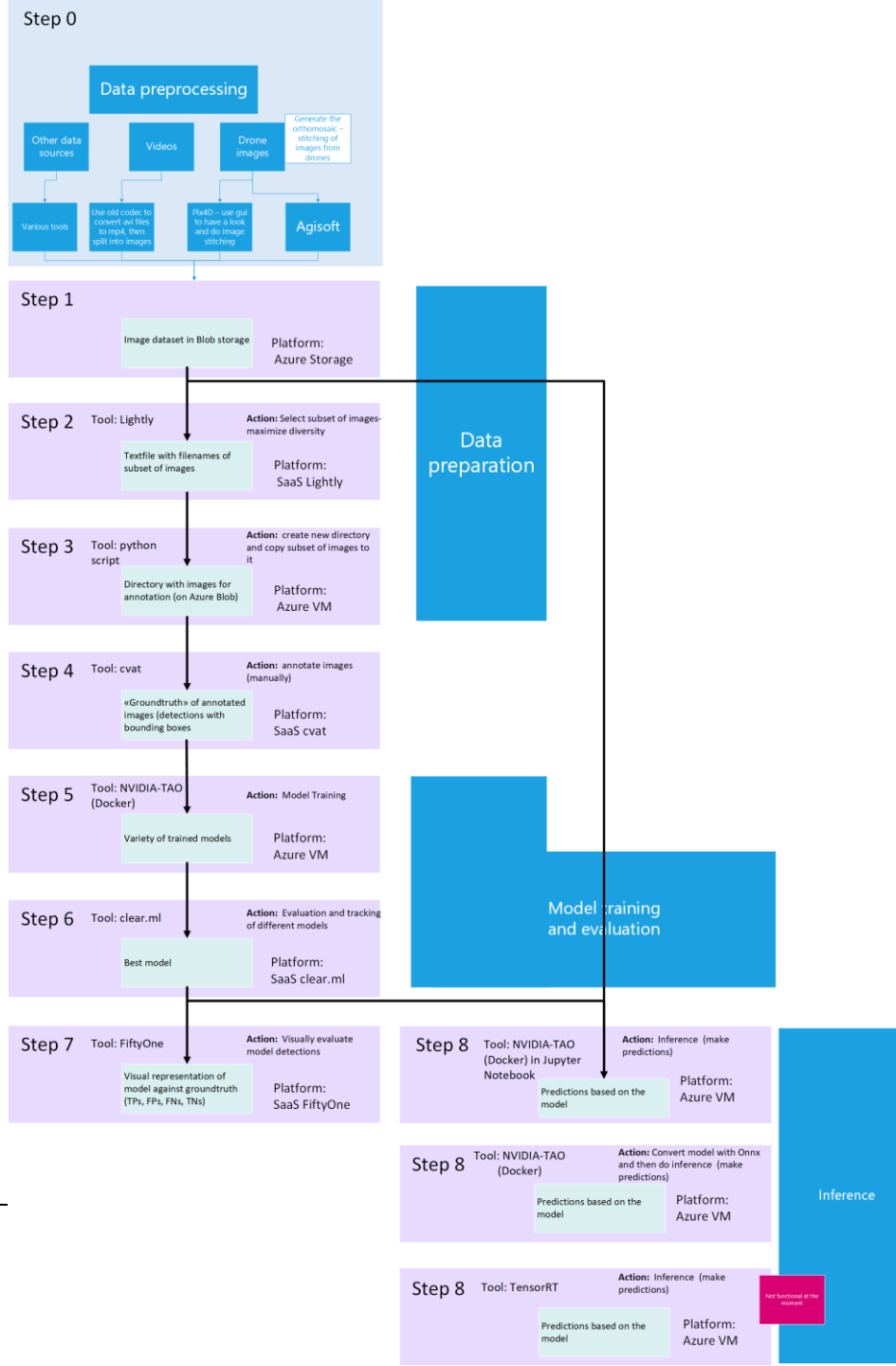
Visiun: Prova (Prototype)

Visiun: Iniziun (Data Preparation)

Visiun: Flum (Model Training)

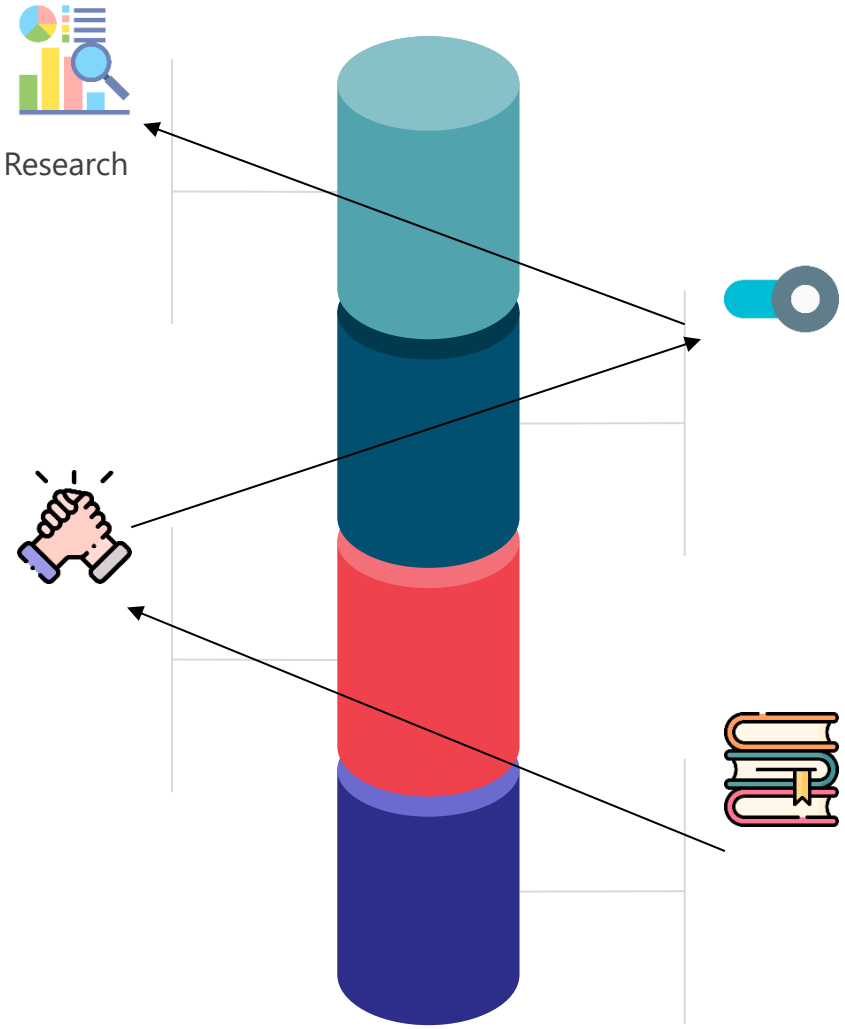
Visiun: Bloc (Infrastructure)

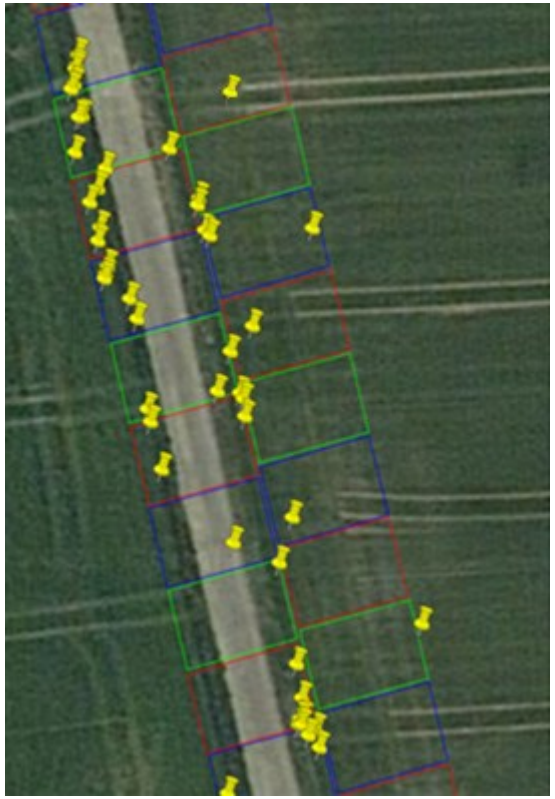
Visiun: Porta (Internal Deployment)

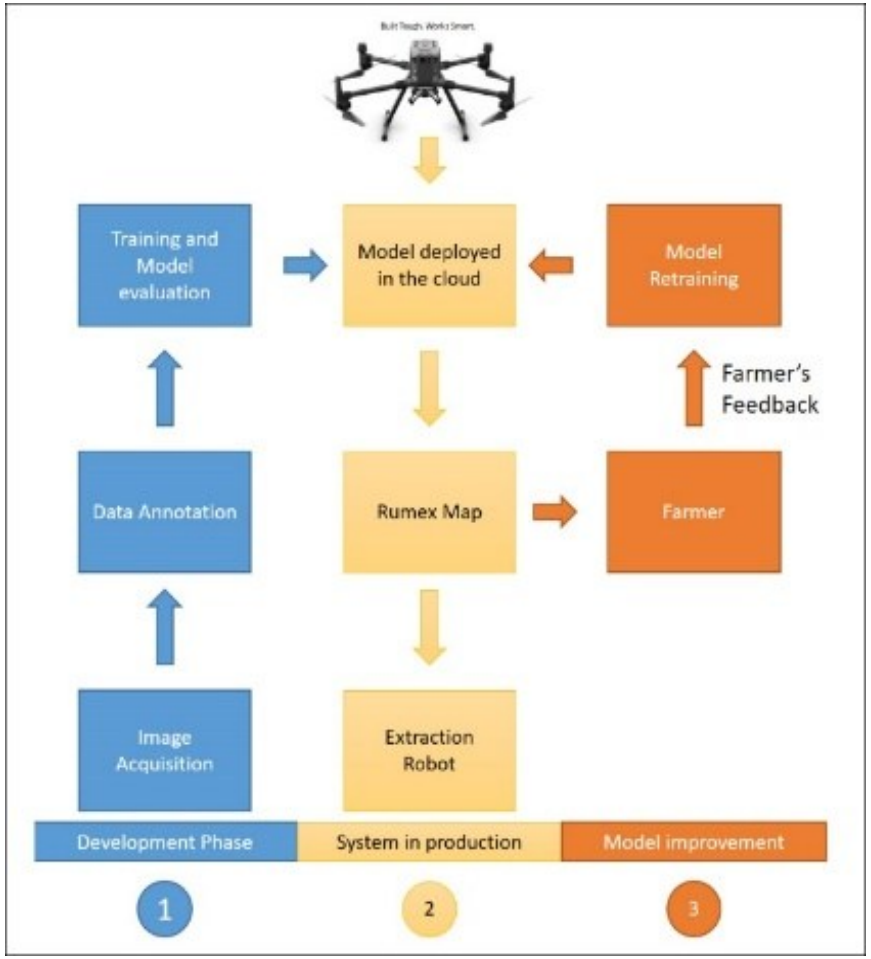


USER - Research

Rumex detection and mapping from drones

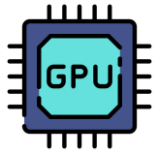




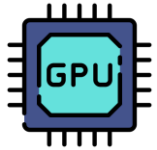


Current infrastructure options

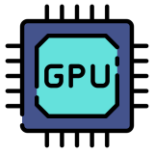
O-Drive



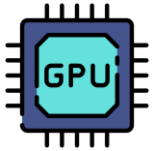
Microsoft Azure



EO Server at Reckenholz



Gamarello



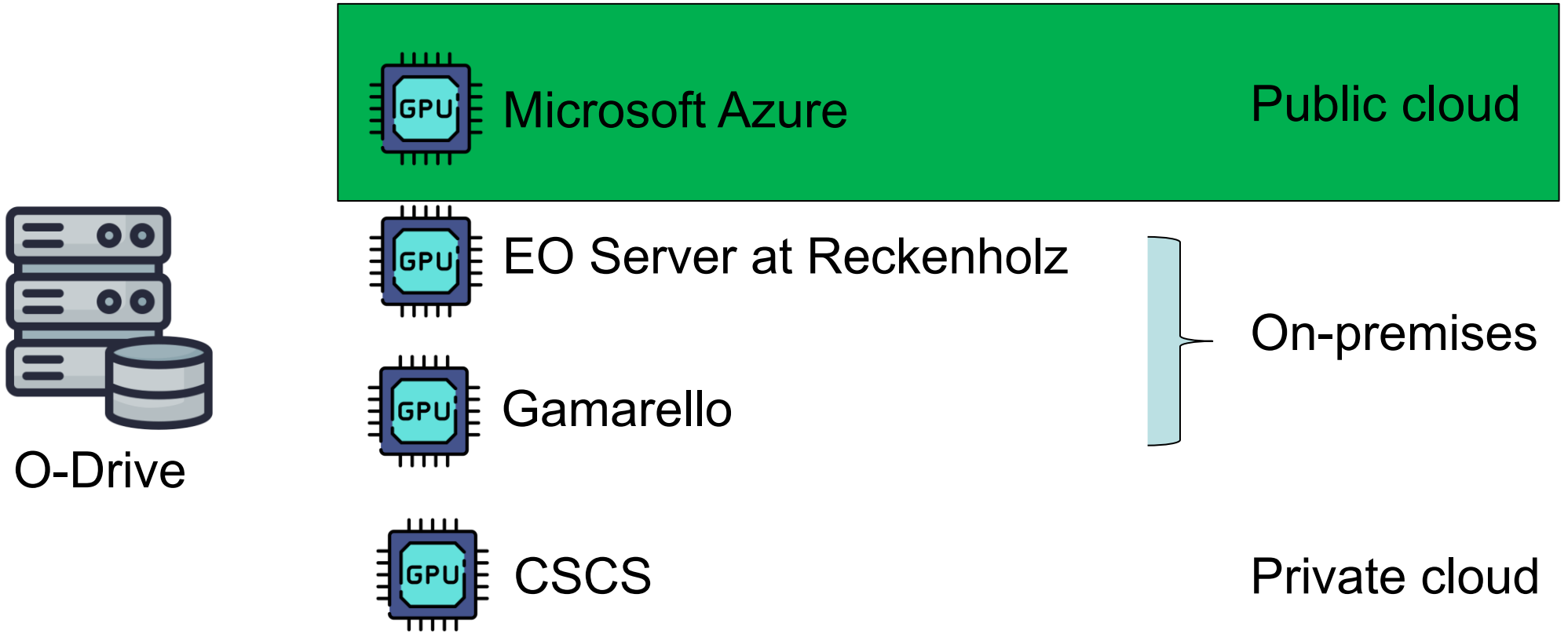
CSCS

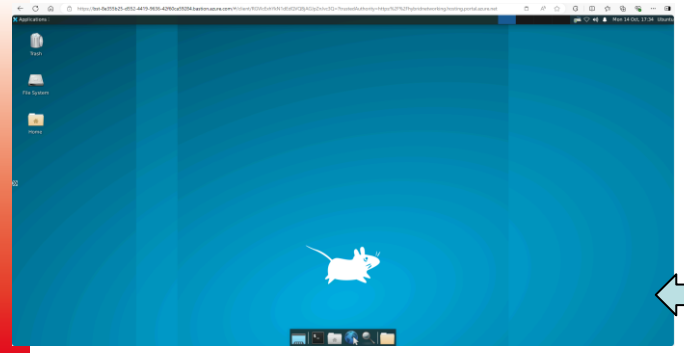
Public cloud

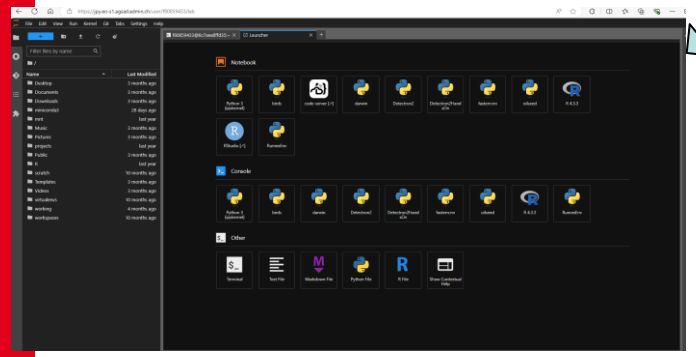
On-premises

Private cloud

Current infrastructure options







	Data transfer	Third party services can access storage?	Jupyter Lab	SSH	XRDP	GPUs available	Admin access	Cost ($/h)
Azure	Via AZcopy	✓	✓	✓	✓	>>> 4	✓	~1.5
Server Reckenholz	Direct endpoint	X	✓	✓	X (Qgis)	4	X	-
Gamarello	Direct endpoint	X	✓	✓	X (Expected soon)	4	X	-
CSCS	Via Globus	X	✓	✓	X	>>> 4	X	~1

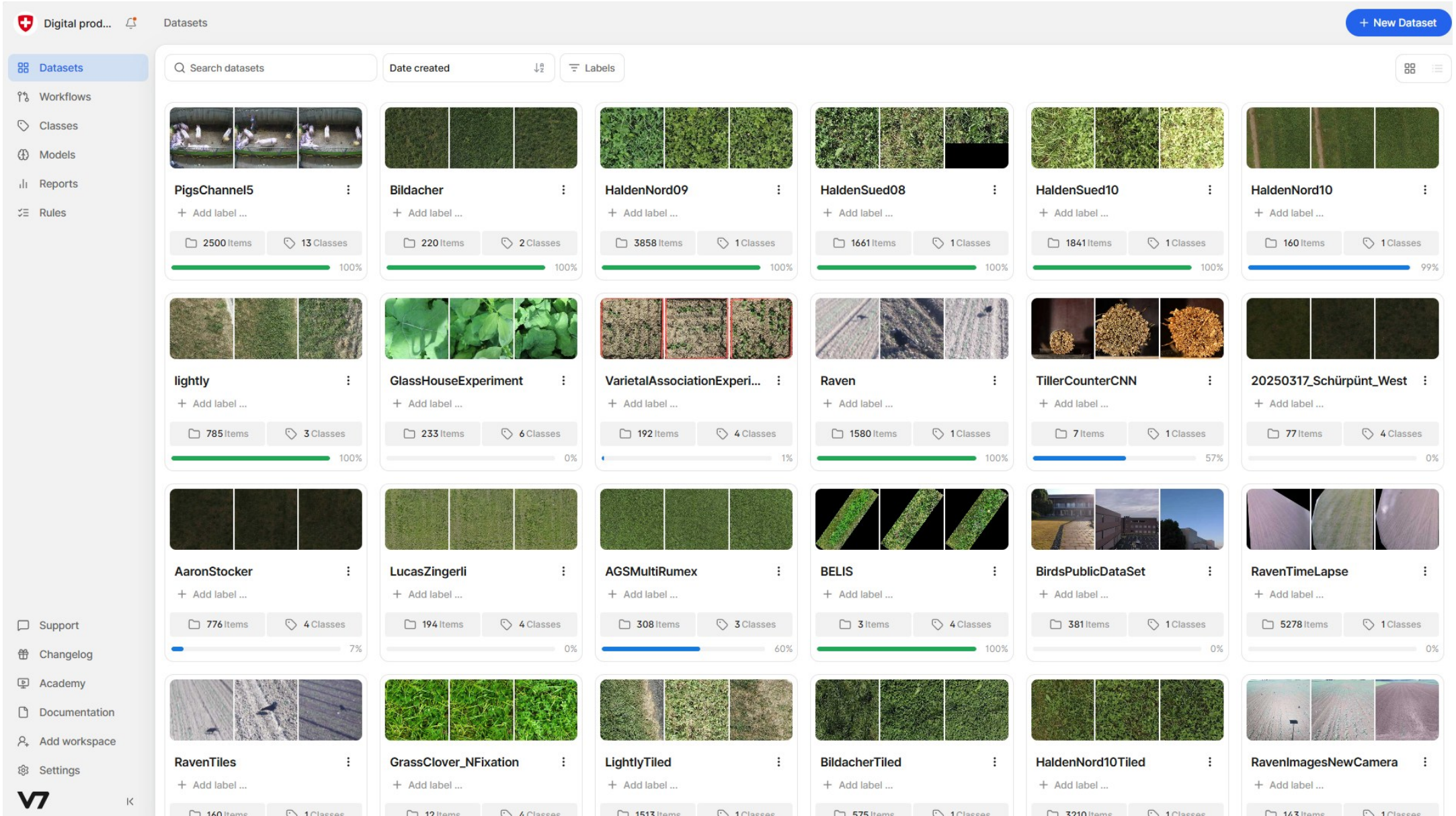
Microsoft Azure Nomenclature standards

- Creating rule to name computing ressources on a shared Azure subscription.

Microsoft Azure Nomenclature standards

bot	···	p01d-agroscope-1	Switzerland North
DefaultResourceGroup-CHN	···	p01d-agroscope-1	Switzerland North
DefaultResourceGroup-switzerlandnorth	···	p01d-agroscope-1	Switzerland North
DefaultResourceGroup-westeurope	···	p01d-agroscope-1	West Europe
DefaultResourceGroup-WEU	···	p01d-agroscope-1	West Europe
iot-conthey	···	p01d-agroscope-1	Switzerland North
IT-infra	···	p01d-agroscope-1	West Europe
NetworkWatcherRG	···	p01d-agroscope-1	West Europe
NextflowListeriaTest	···	p01d-agroscope-1	Switzerland North
ResourceMoverRG-switzerlandnorth-westeurope-ne	···	p01d-agroscope-1	North Europe
rg-a4018-terraform-formation	···	p01d-agroscope-1	West Europe
rg-a4801-hub	···	p01d-agroscope-1	Switzerland North
rg-a4802-iot-agroscope	···	p01d-agroscope-1	Switzerland North
RG-A4812-education-docker	···	p01d-agroscope-1	Switzerland North
rg-a4901-backup	···	p01d-agroscope-1	Switzerland North
rg-a4902-backup	···	p01d-agroscope-1	Switzerland North
rg-a4903-terraform	···	p01d-agroscope-1	Switzerland North
rg-a5801-computervision	···	p01d-agroscope-1	West Europe
rg-a5802-EffNMilk	···	p01d-agroscope-1	West Europe
rg-a5803-Exploitation1725	···	p01d-agroscope-1	Switzerland North
rg-brjl-example	···	p01d-agroscope-1	Switzerland North

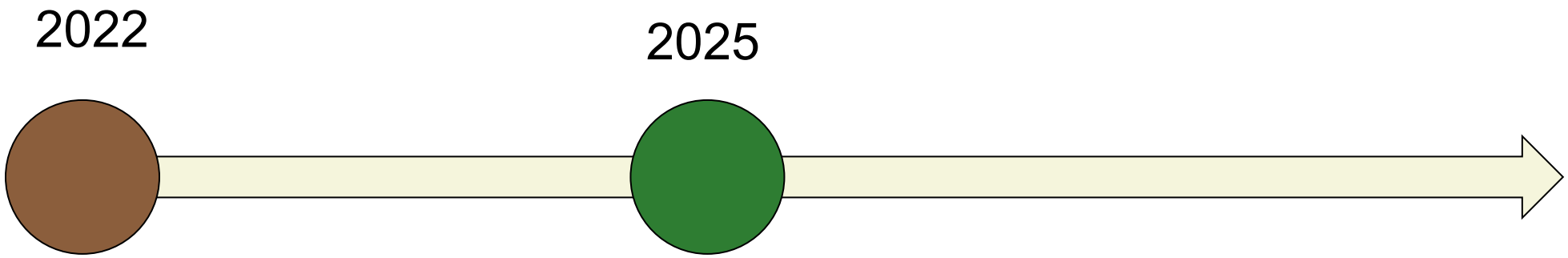
Darwin annotation tool – V7labs



Plan of the talk

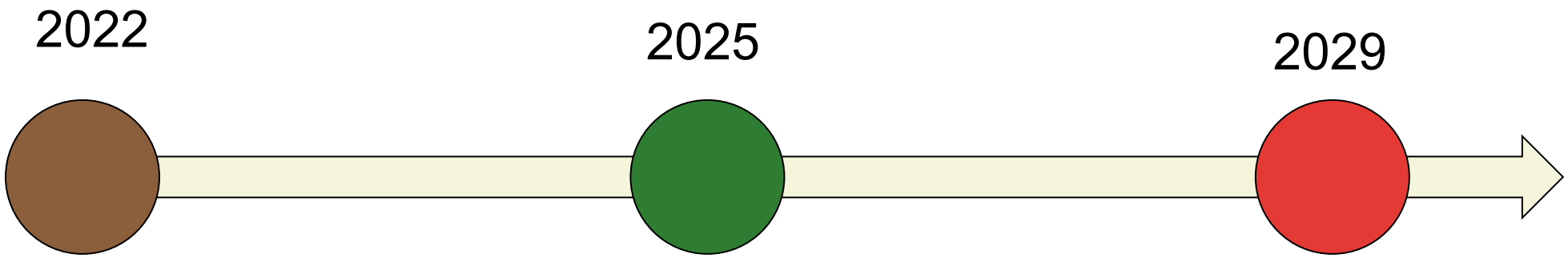
Part	Goal
How do we do computer vision	A non deep technical overview
The seeds: Computer vision Coordination project	How we got started
The roots: What we achieved in SFF11	Highlight the agroscope-wide collaboration for getting things done.
	Highlight the transformation journey
The Fruits: AP26	**Where are we heading next, together.**

From AP22 to AP26: A journey of transformation



An initiative	Recognized Discipline
nearly un-existent Ressources	Ressources (Techstack, human, tools, IT-support)
Coordination	USER (Upskill, support, enable, research)

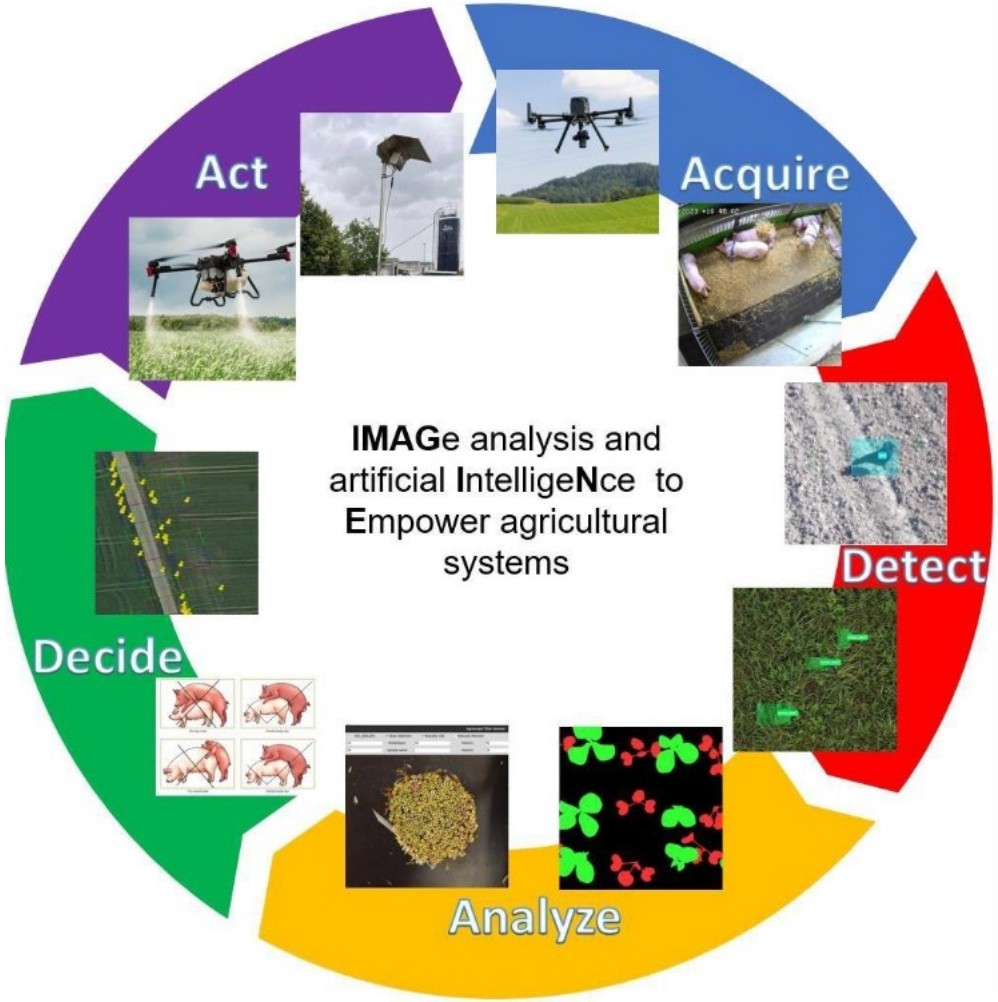
From AP22 to AP26



2022	2025	2029
An initiative	Recognized Discipline	Closing the full cycle (decide, Act)
nearly un-existent Ressources	Ressources (Techstack, human, tools, IT-support)	Filling research gap
		Larger AI and data spectrum, beyond CV
Coordination	USER (Upskill, support, enable, research)	
		Highly collaborative

A glimpse on IMAGINE (AP26)

- **Closing the full cycle (decide, Act).**



A glimpse on IMAGINE (AP26)

- Closing the full cycle (decide, Act).
- **Filling research gap.**

Animal Behavior

Plant Breeding and weeds

Pests management

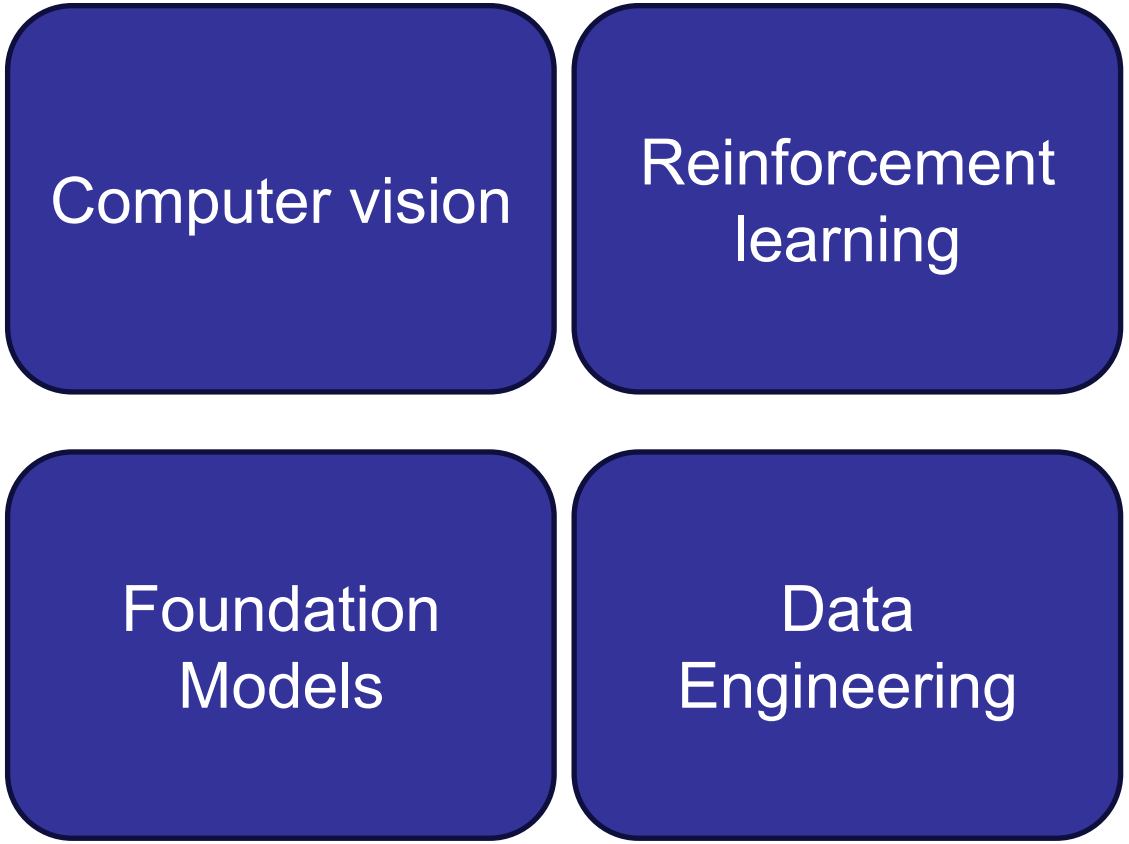
Birds' Deterrence

Biodiversity

Drone data and pipeline standardization

A glimpse on IMAGINE (AP26)

- Closing the full cycle (decide, Act).
- Filling research gap.
- **Larger AI and data spectrum, beyond CV.**



A glimpse on IMAGINE (AP26)

- Closing the full cycle (decide, Act).
- Filling research gap.
- Larger AI and data spectrum, beyond CV.
- **Highly collaborative.**

10
Proposals

4
sites

5
disciplines

12
teams

13
subdisciplines

Agroscope
















Thank you for being part of this journey

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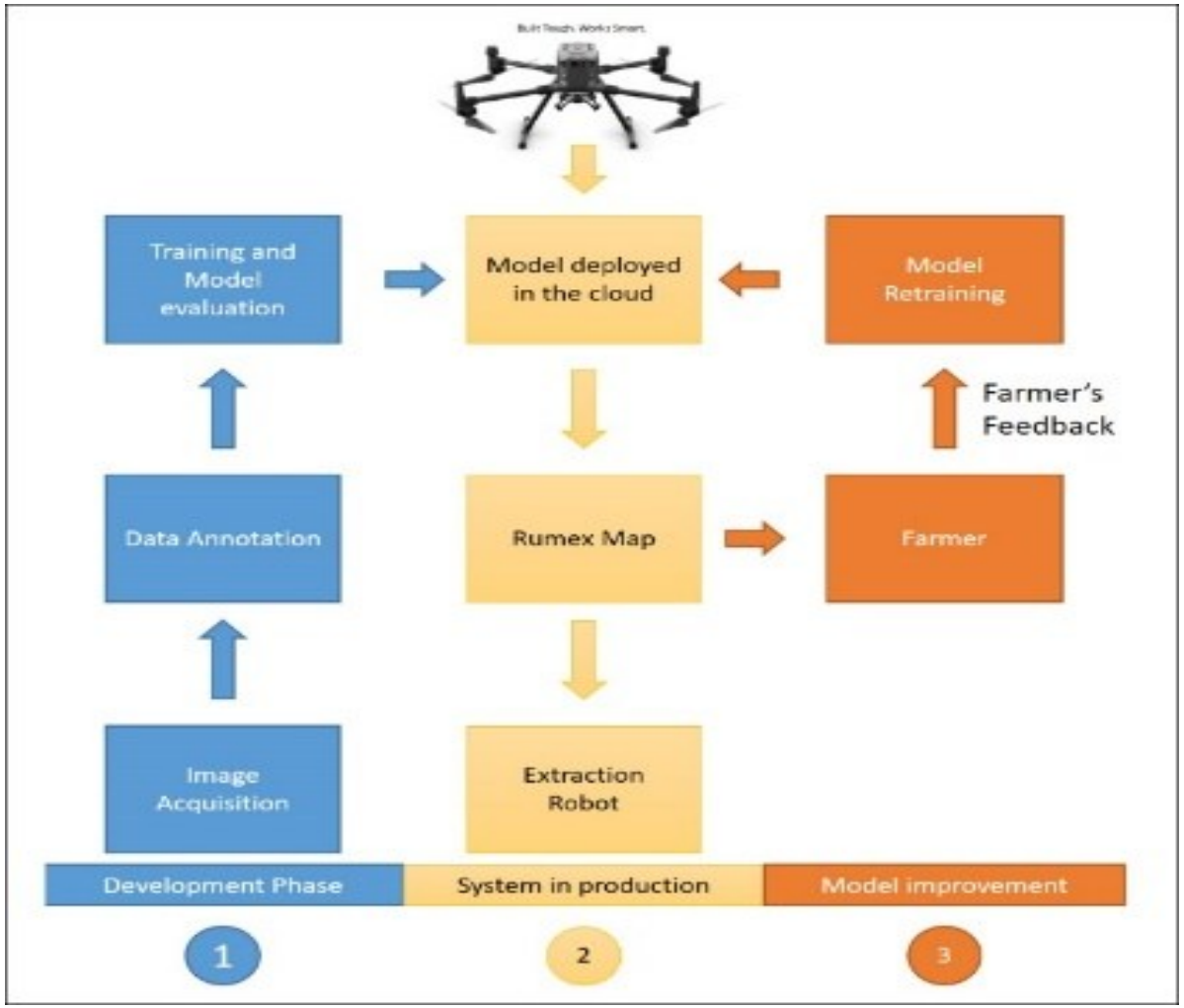
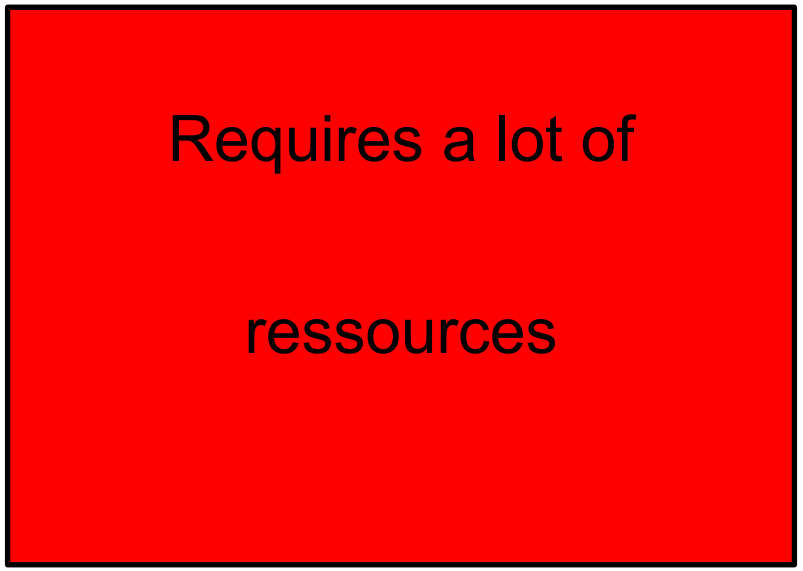
Agroscope


Training and Model evaluation
Model deployed in the cloud
Model Retraining
Farmer's Feedback
Data Annotation
Rumex Map
Farmer
Image Acquisition
Extraction Robot
Development Phase
System in production
Model improvement
1
2
3

From AP22 to AP26

Computer vision coordination project



IMAGINE

Minimum bare requirements

AP22/SFF11

Computer vision coordination project

Human Ressources

- Computer vision
- Programming

IT Infrastructure

- Compute GPUs
- Storage

Specific Tools

- Annotation tools
- Experiment Tracking

AP26/IMAGINE

Beyond CV
Larger Impact
In-house tools

Most used version currently (Change IT)