au service de l'agriculture

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csem

# Machine Learning au service de l'agriculture

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**Head Robotics & Automation**

Löwenberg Murten, 30.01.2018

# Close to industry, leveraging Swiss academic research

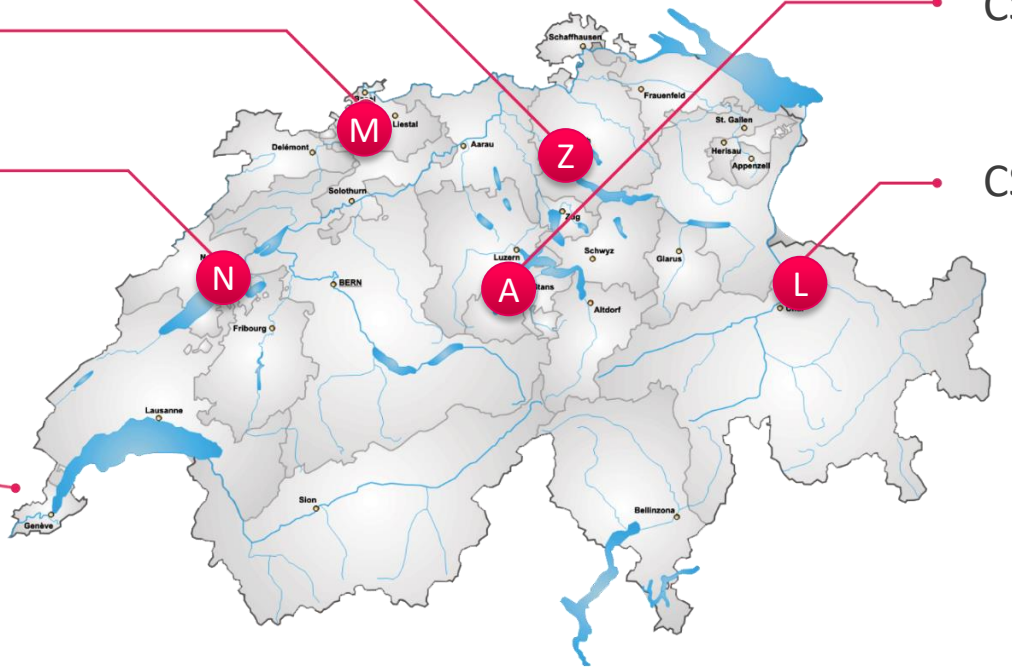
CSEM Zürich

CSEM Muttenz

CSEM Neuchâtel

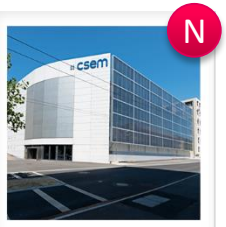
CSEM Alpnach

CSEM Landquart

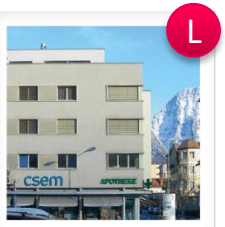



CSEM Brasil

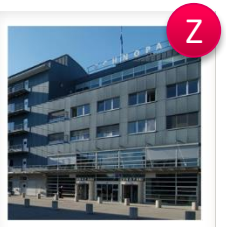












# CSEM at a glance

79.3

Turnover (mio CHF)

40

Nationalities

437

Persons

43

New ventures

190

Industrial clients

196

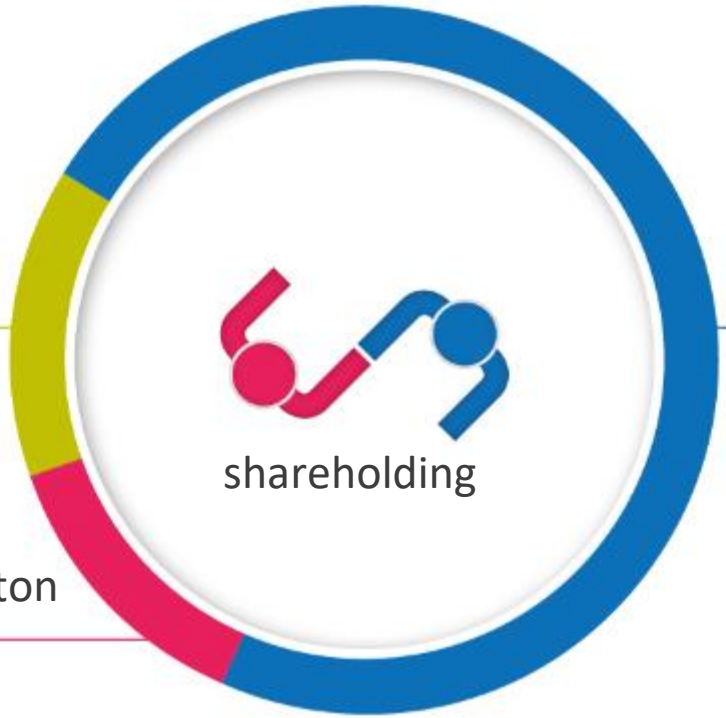
Patent families

62

European projects

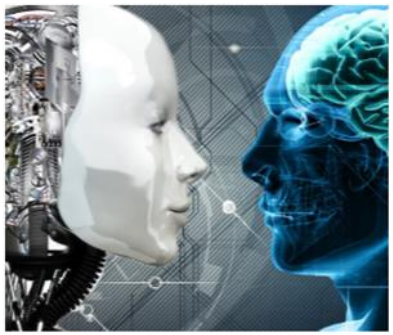
# A public-private partnership

- Flexible and professional
- Industry friendly IP approach



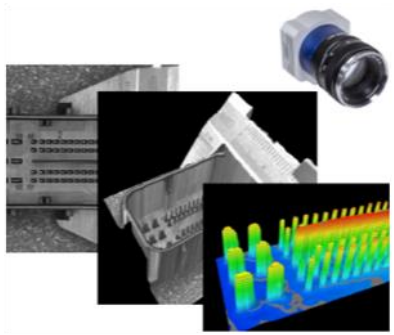
# Robotics and Automation

## Machine Learning



- Neural networks for data analysis
- Deep belief algorithms
- Data filtering and fitting

## Industrial Vision



- Industrial vision hardware
- Advanced image processing and classification
- 3D light field camera and 3D measurement

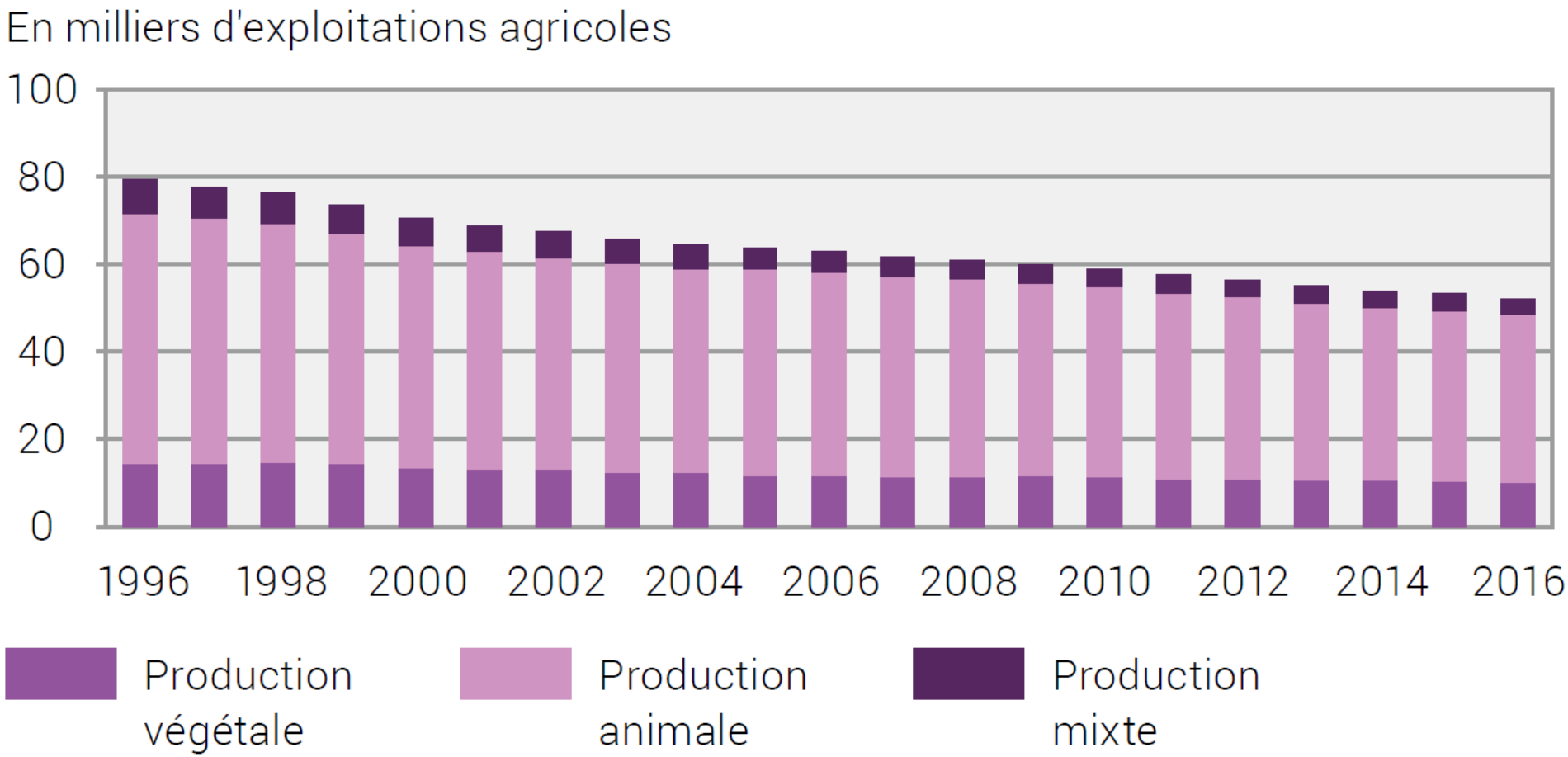
## Robotics

- Robot system design and integration
- Tool and process design for automation
- Low- and high-level software integration

## Control


- Sensor fusion for complex systems
- Efficient implementation of control algorithms

# Changements structurels




Source: BFS 2017

# Agriculture en transition

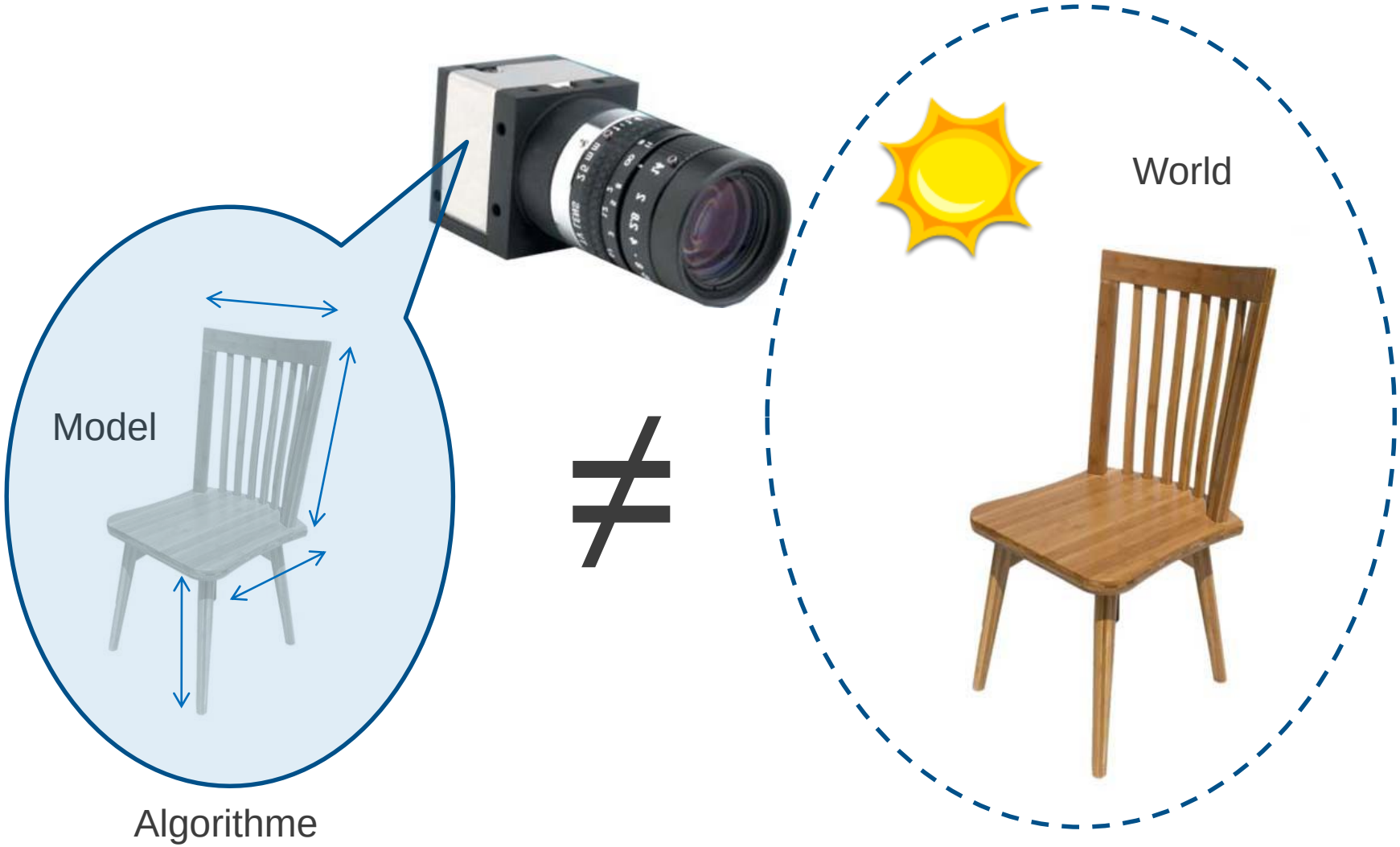
BIOSUISSE

naturaplan BIO

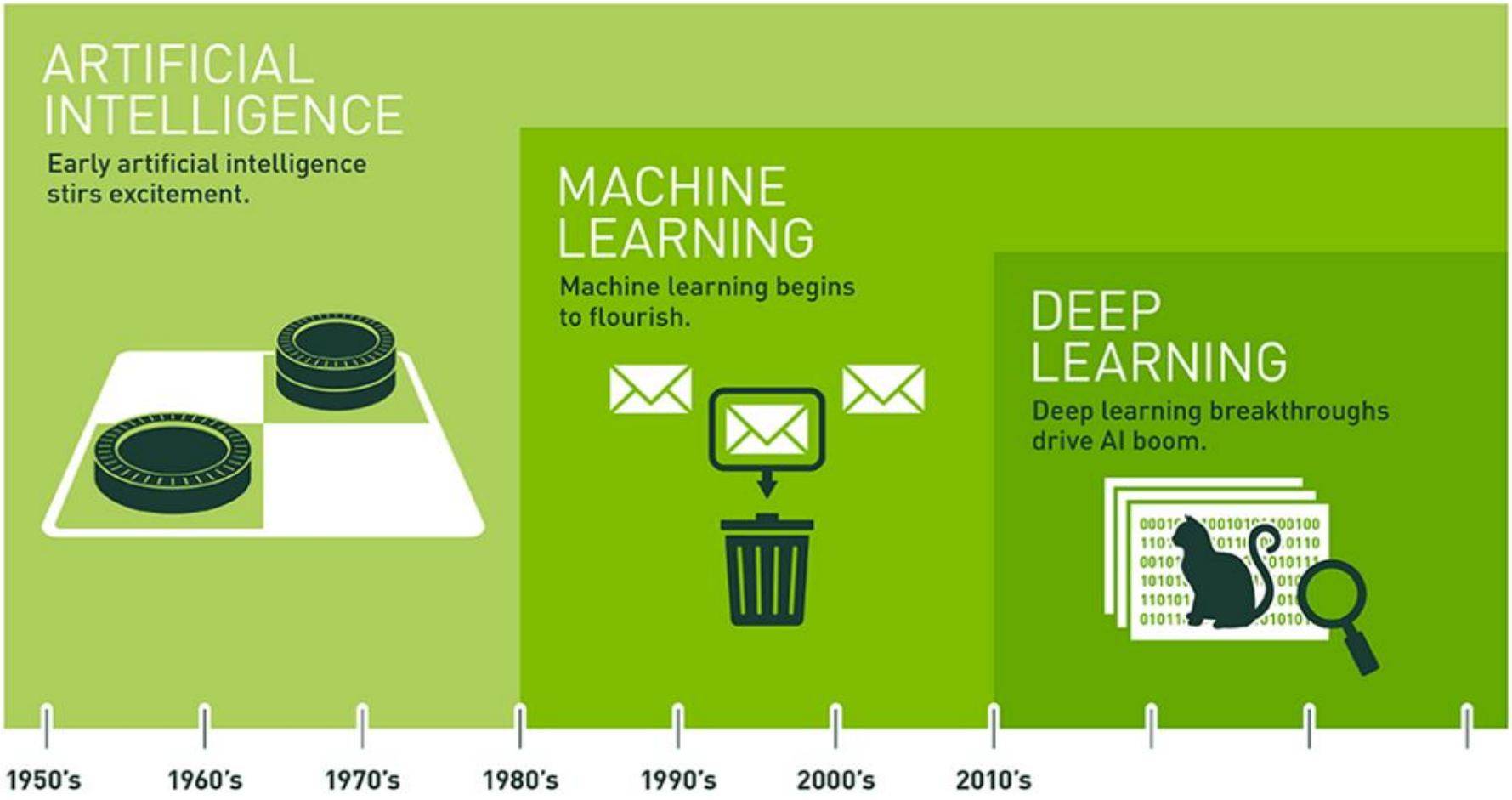
MIGROS BIO

# Robotique en agriculture

# Comment fonctionne le traitement d'image classique?



# Terminologie…



# Machine Learning – Catégories d'apprentissage

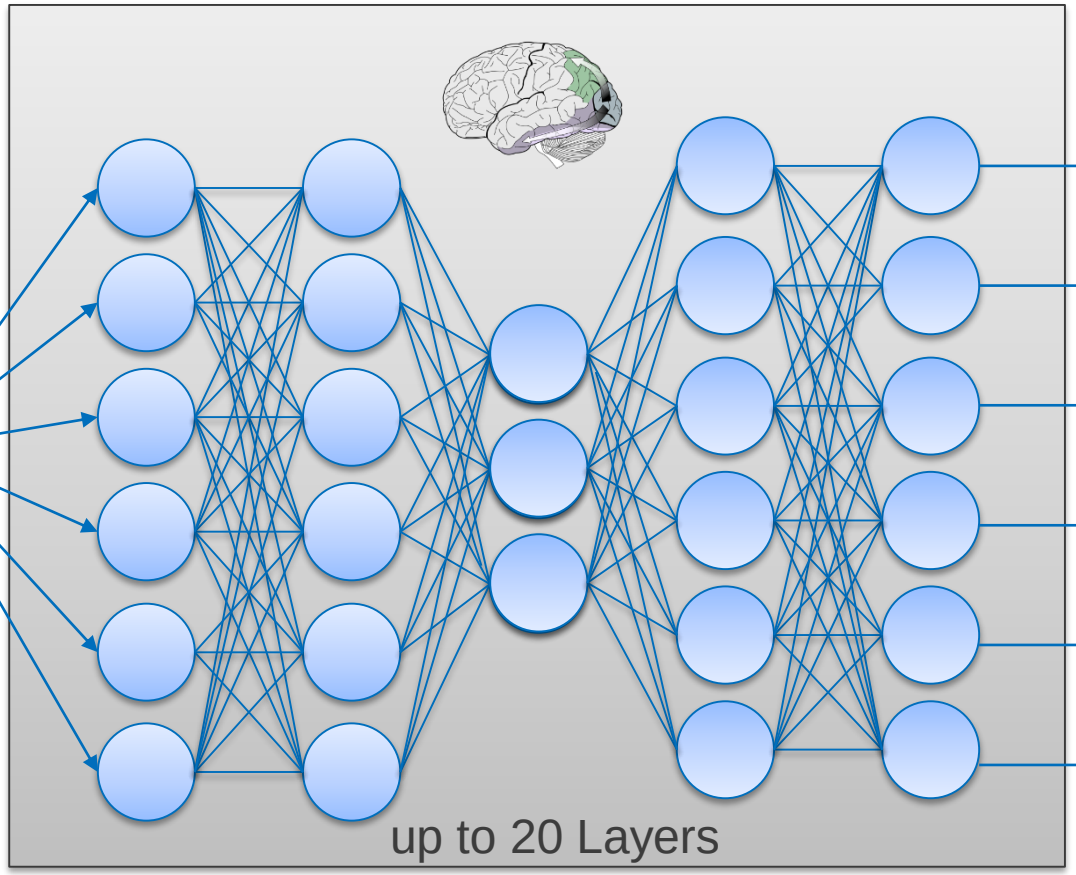
Supervised Learning

Reinforcement Learning

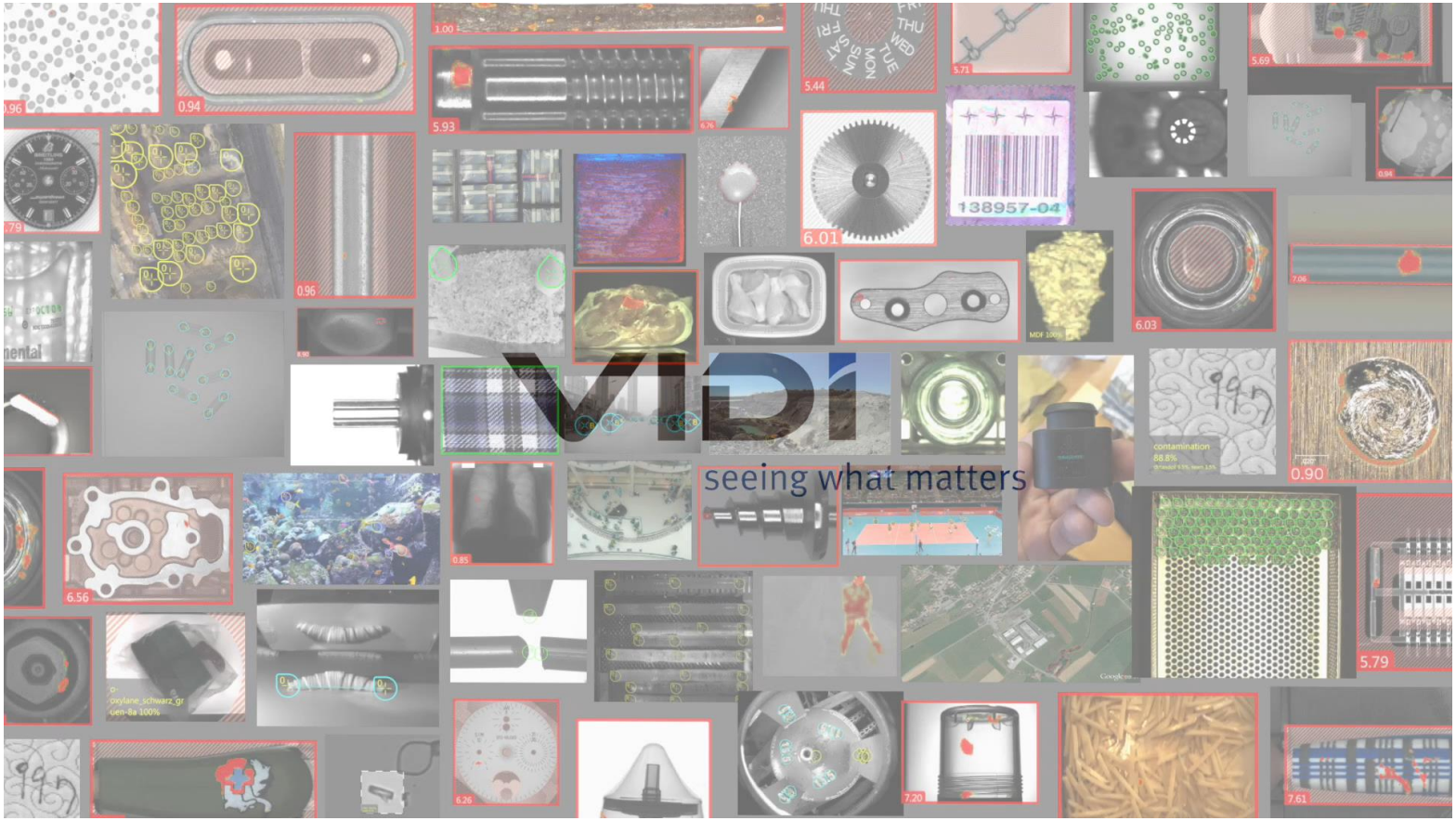
Unsupervised Learning

# Comment fonctionne notre cerveau?

# Cerveau artificiel


# Deep Learning depuis 2008

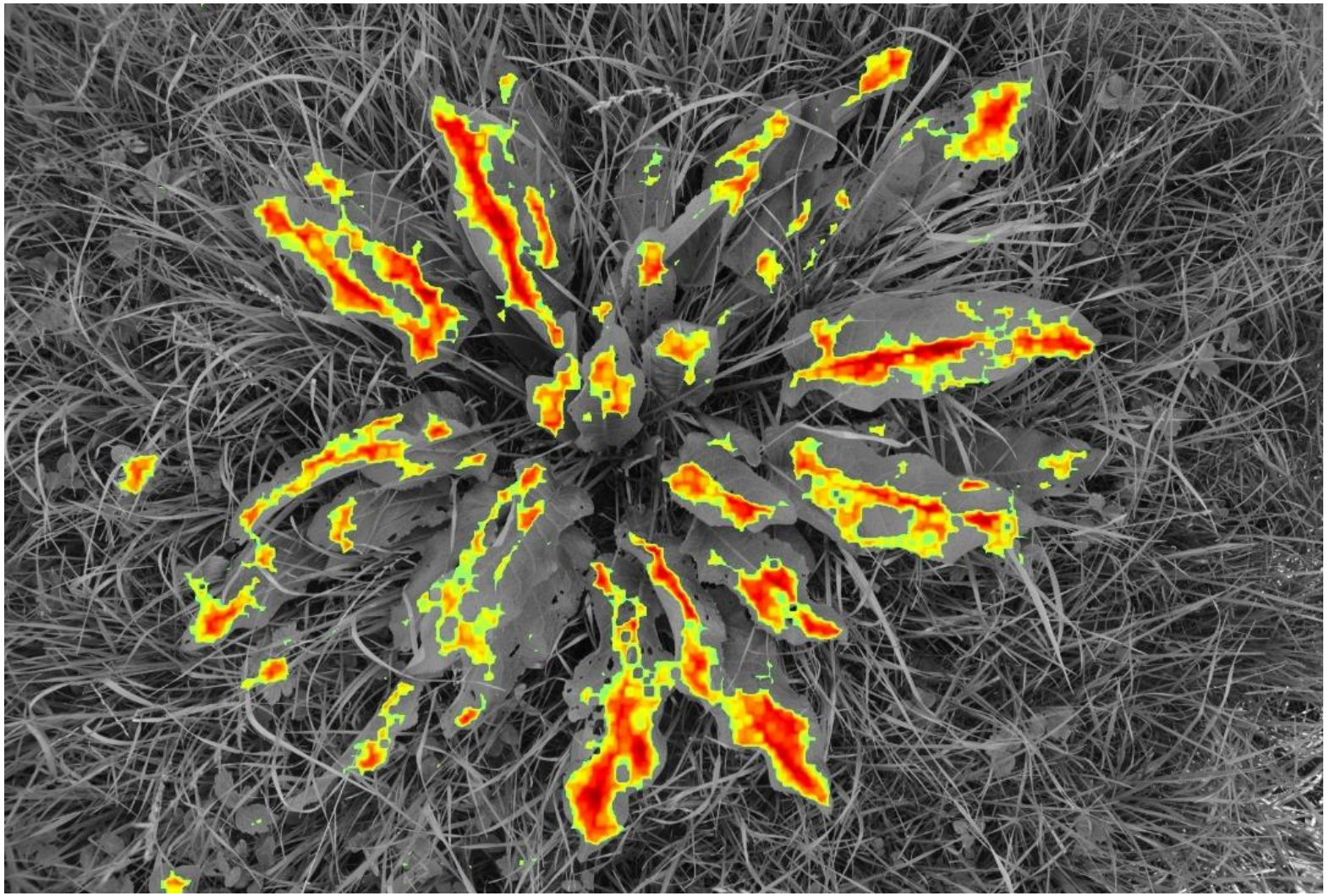



VIDI
seeing what matters

COGNEX

# Oseille – Rumex

# Oseille – Rumex



# Oseille – Rumex

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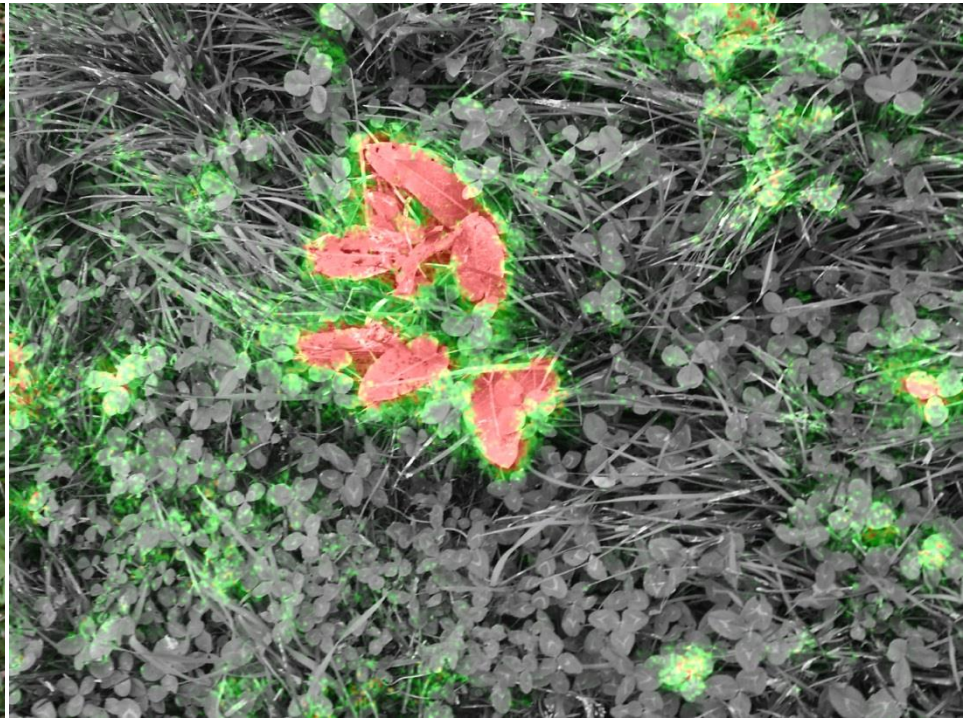
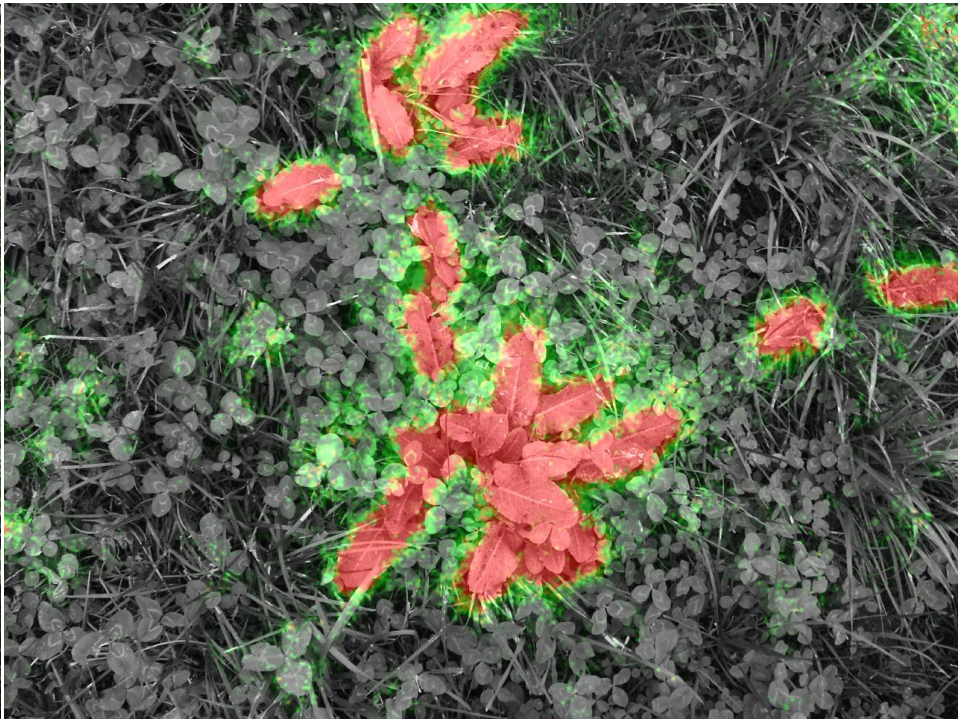


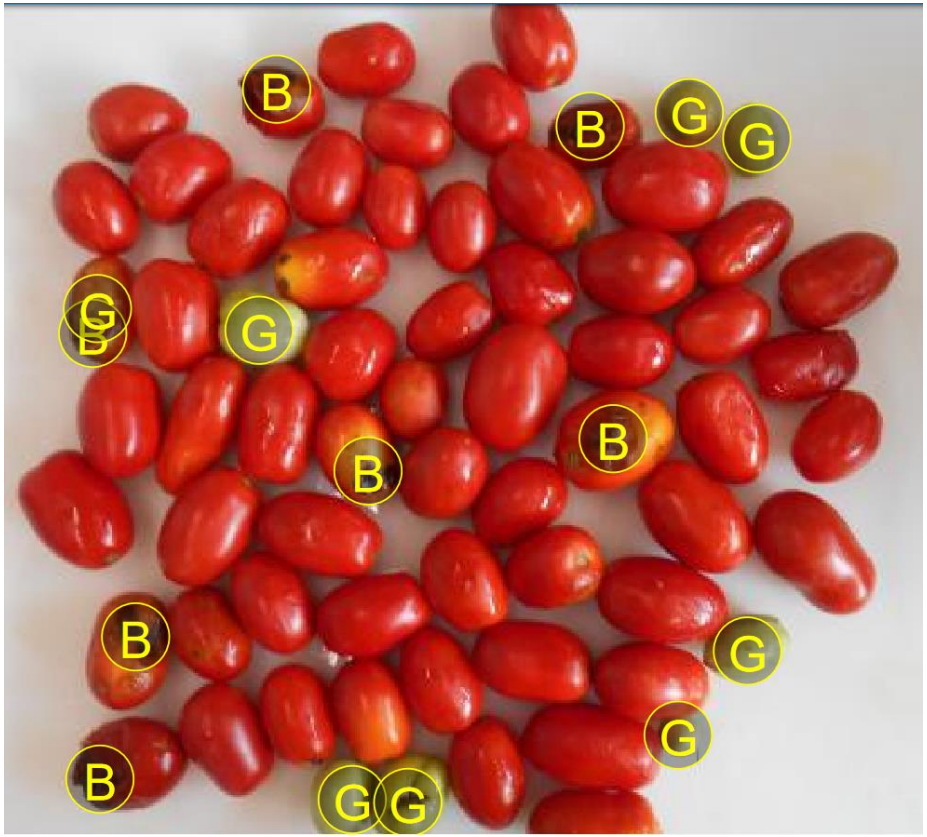
# Oseille – Rumex



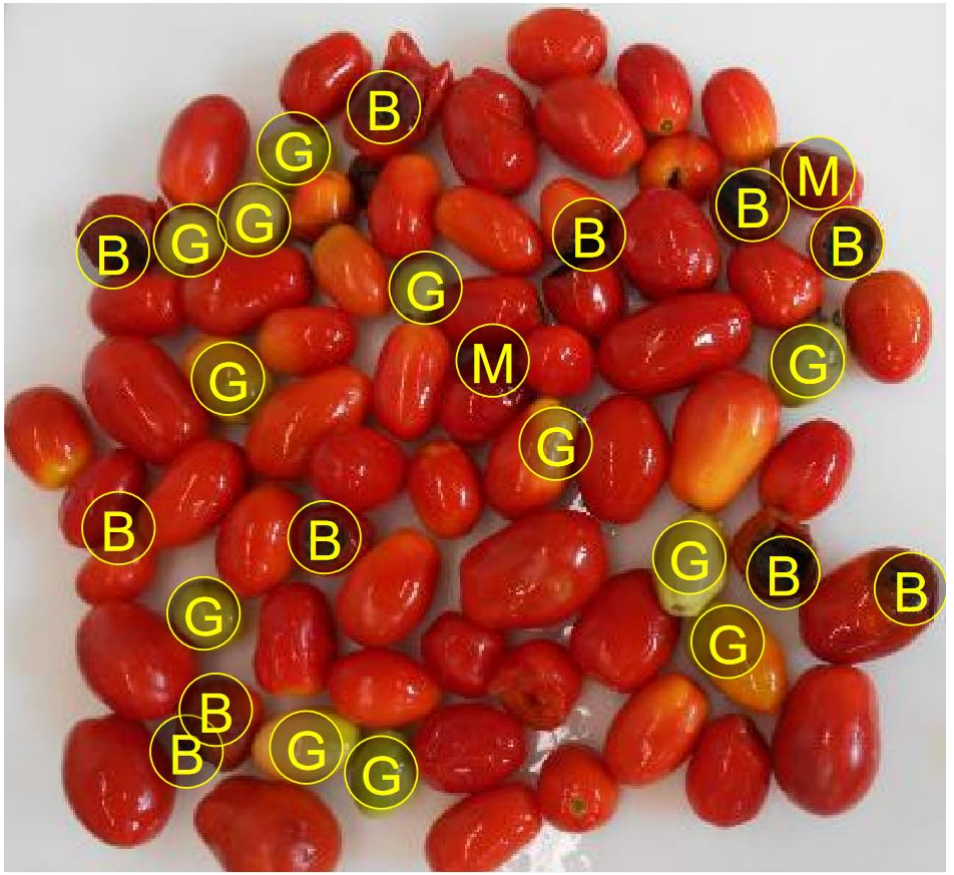
# Tomates

# Sortiermaschine

# Tomates

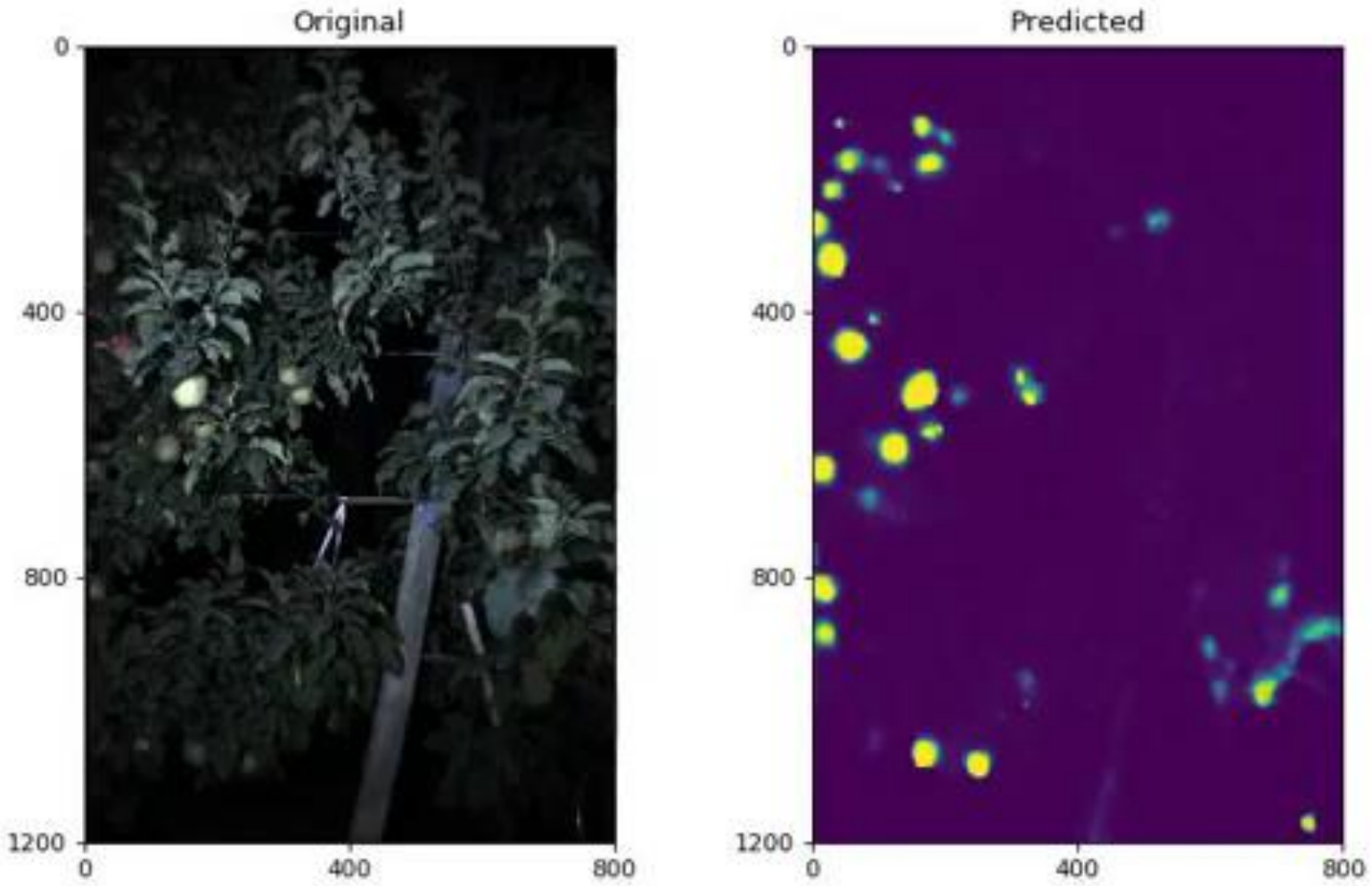


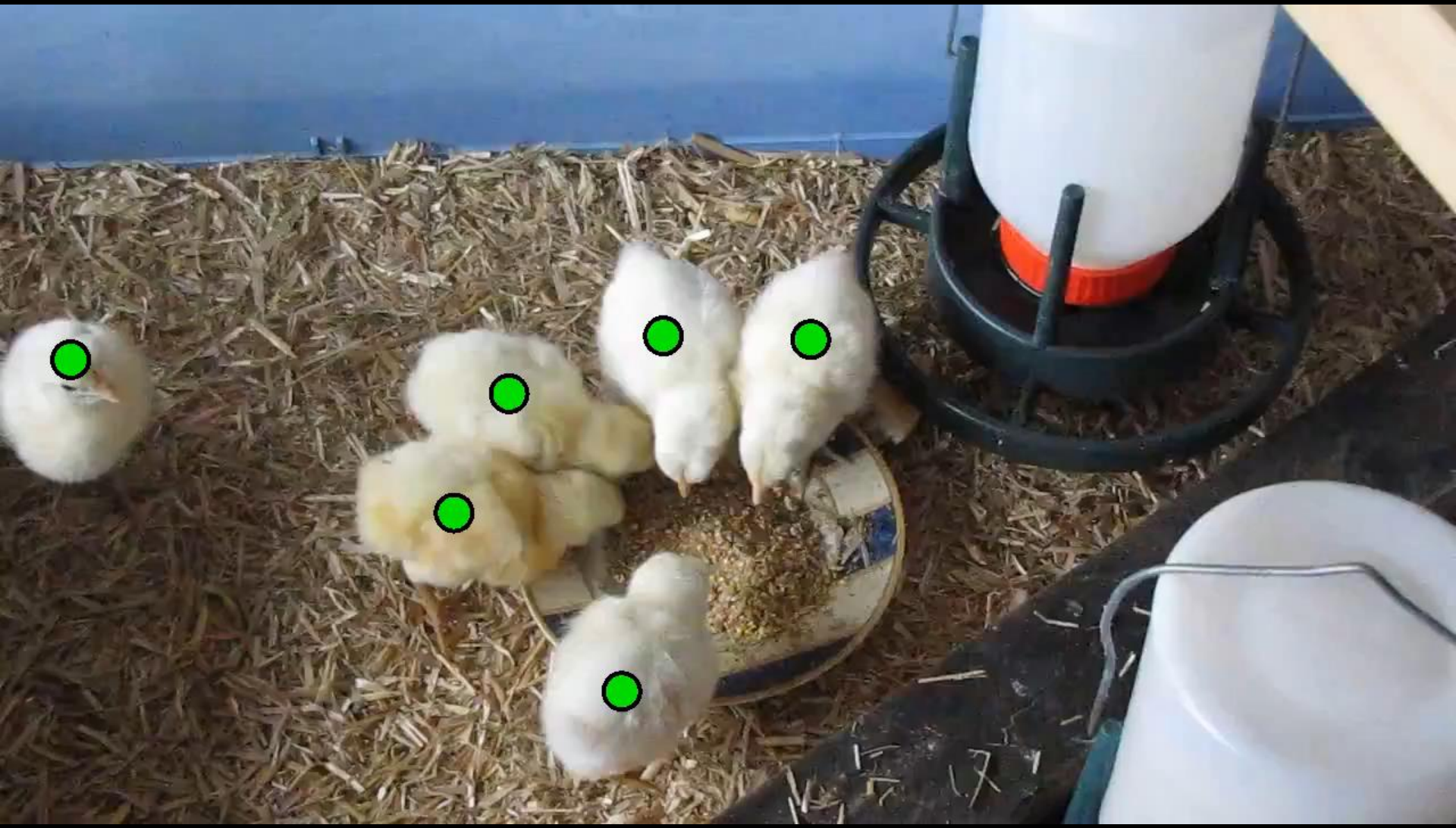
# Tomates



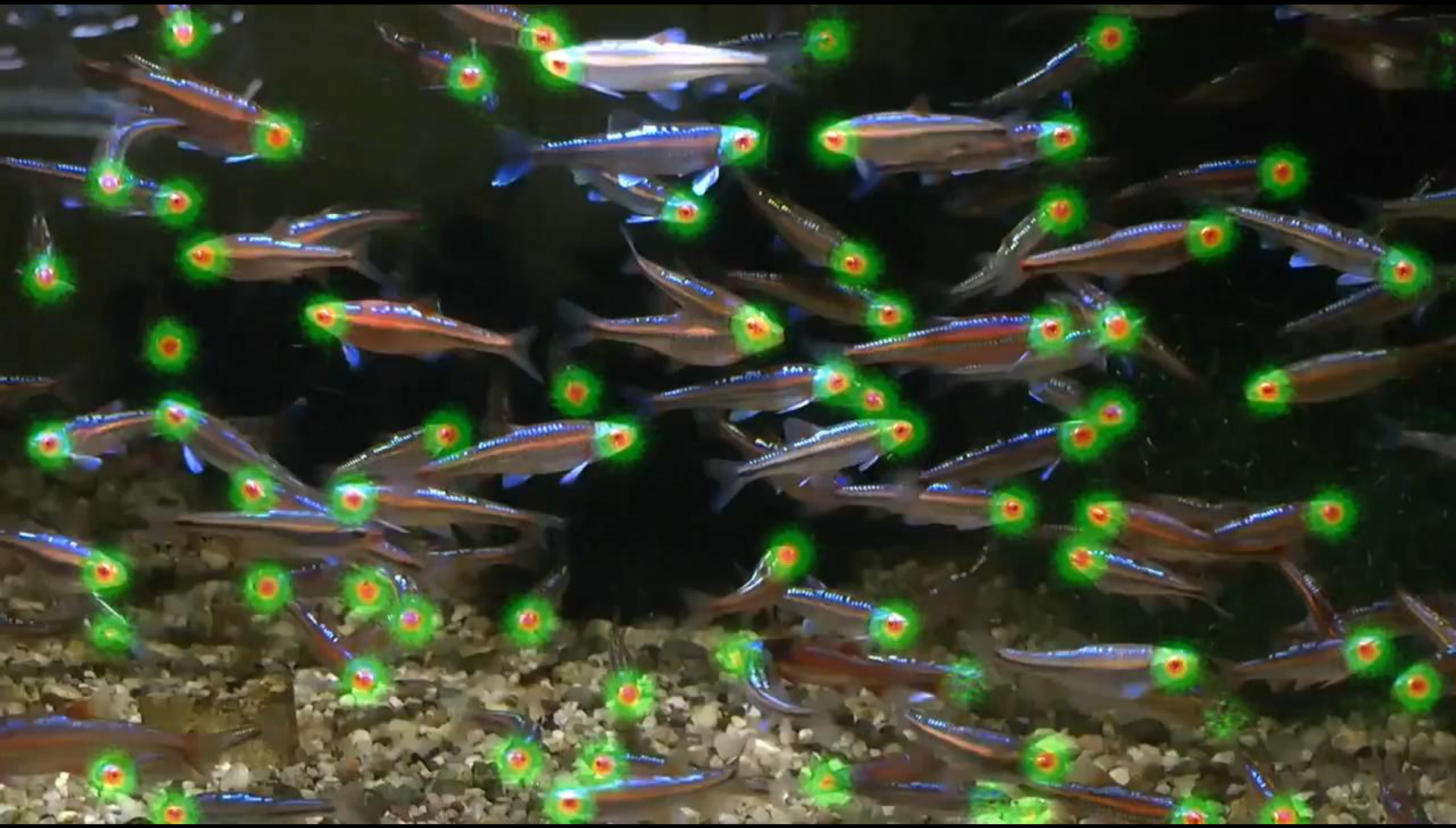
# Récolte des pommes

# Deep Learning pour reconnaissance pomme



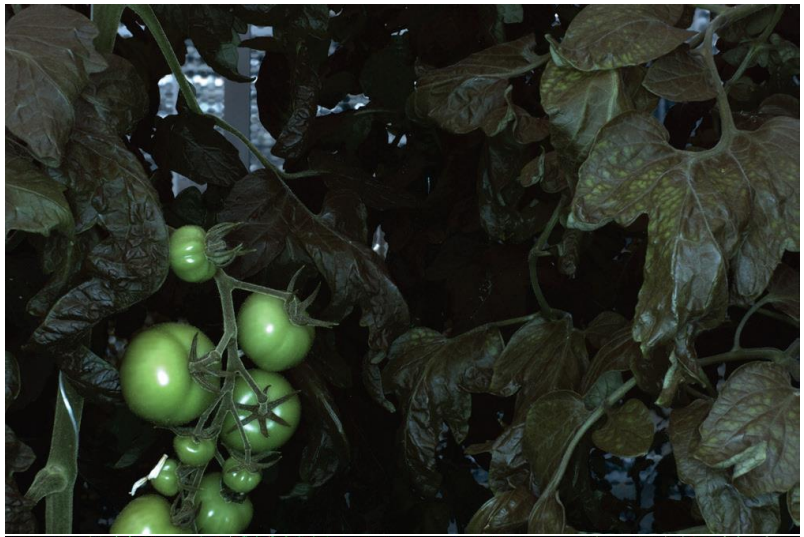


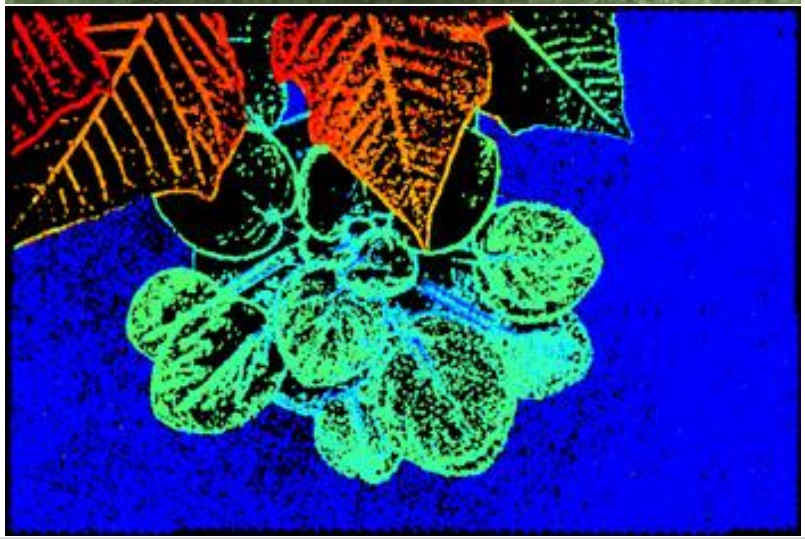
«Bio Tracker – Poussins»



«Bio Tracker – Poisson»

# 3D basé du champ lumineux

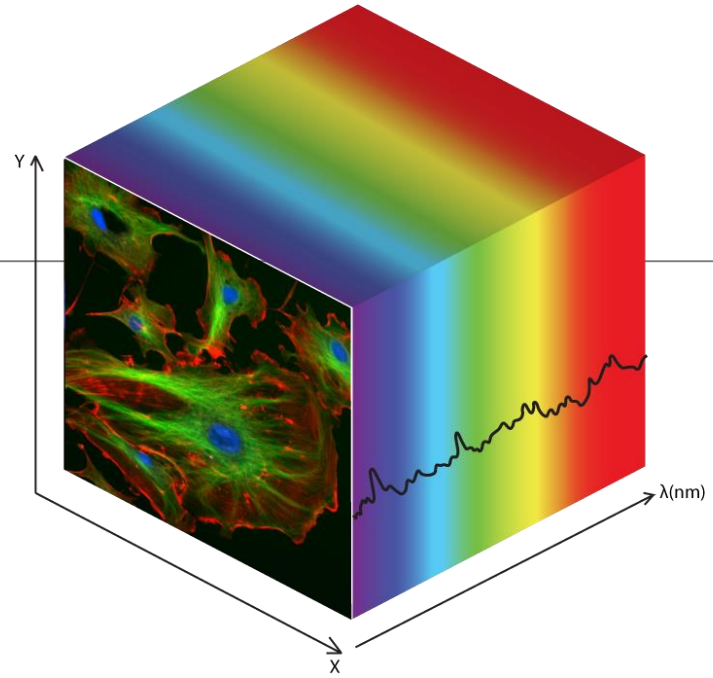


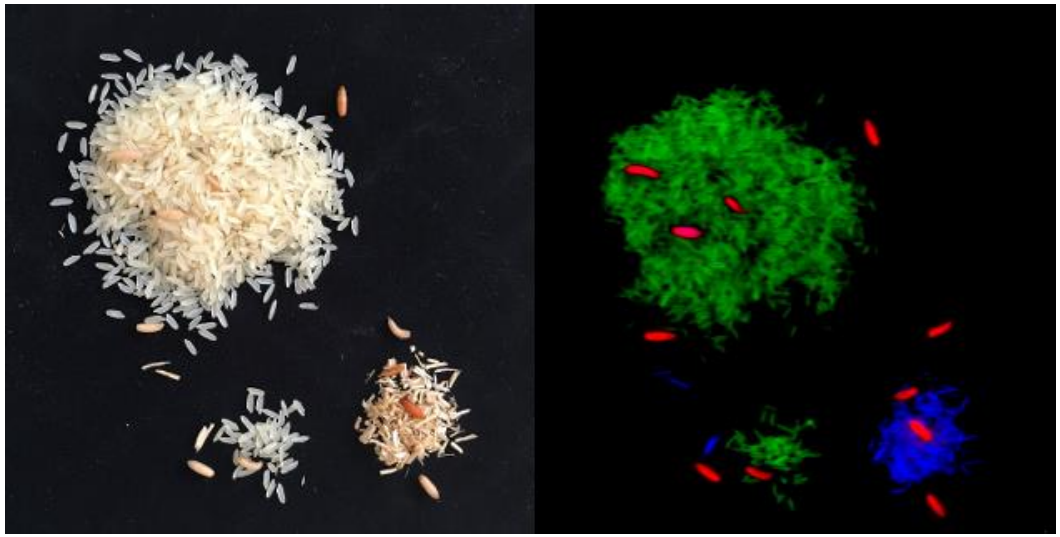


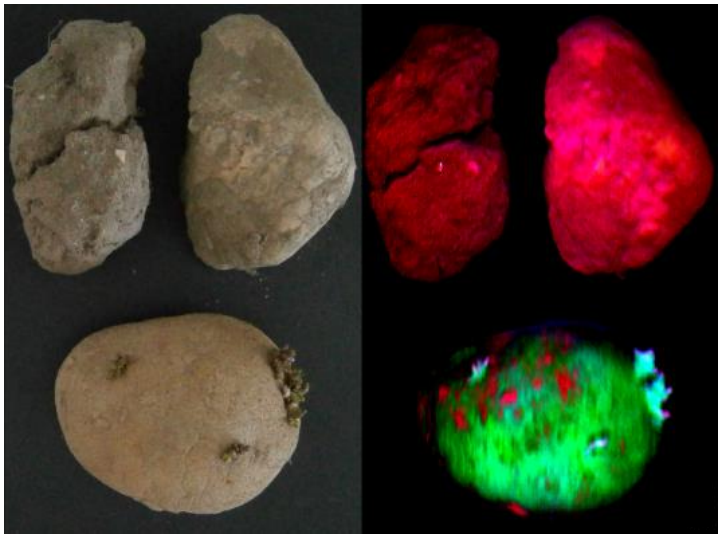
# 3D basé du champ lumineux

# Hyperspectrale

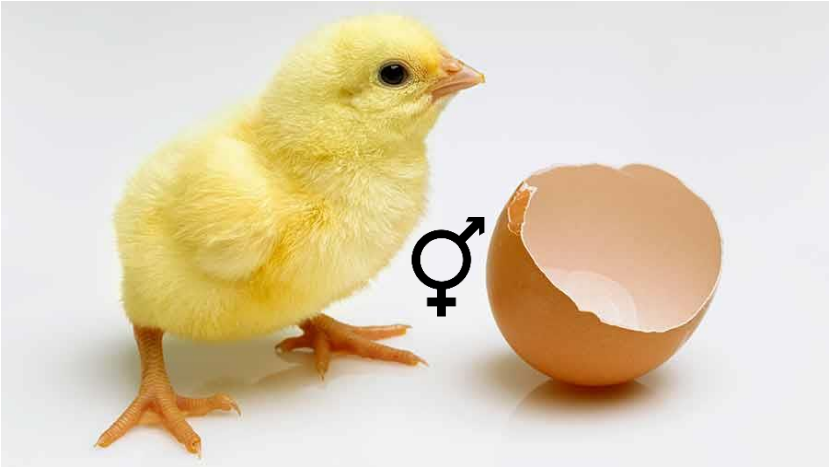
150 Bandes:
470 – 900nm (VNIR)
3650 x 2048px



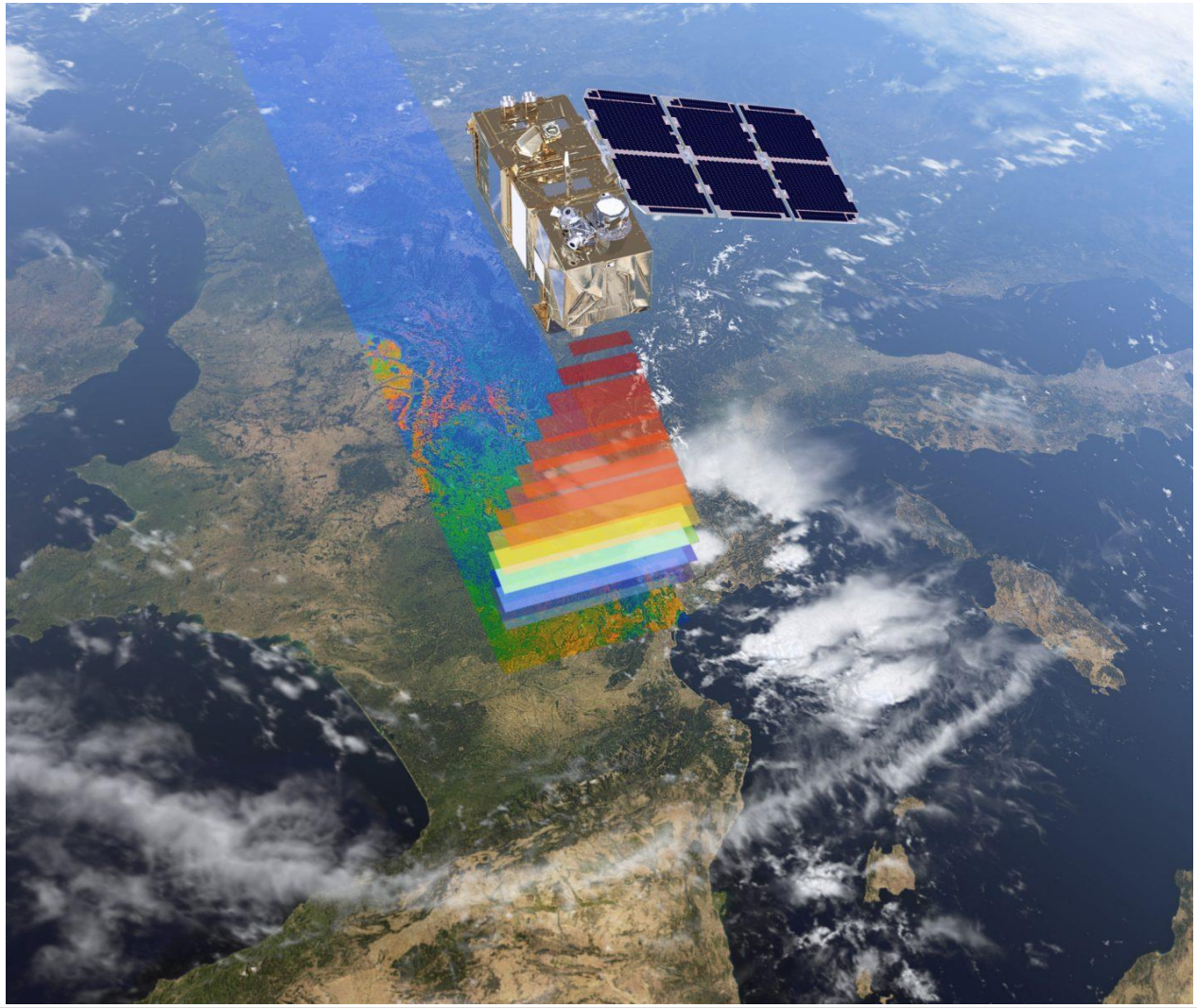


# In-Ovo sexage des poussins





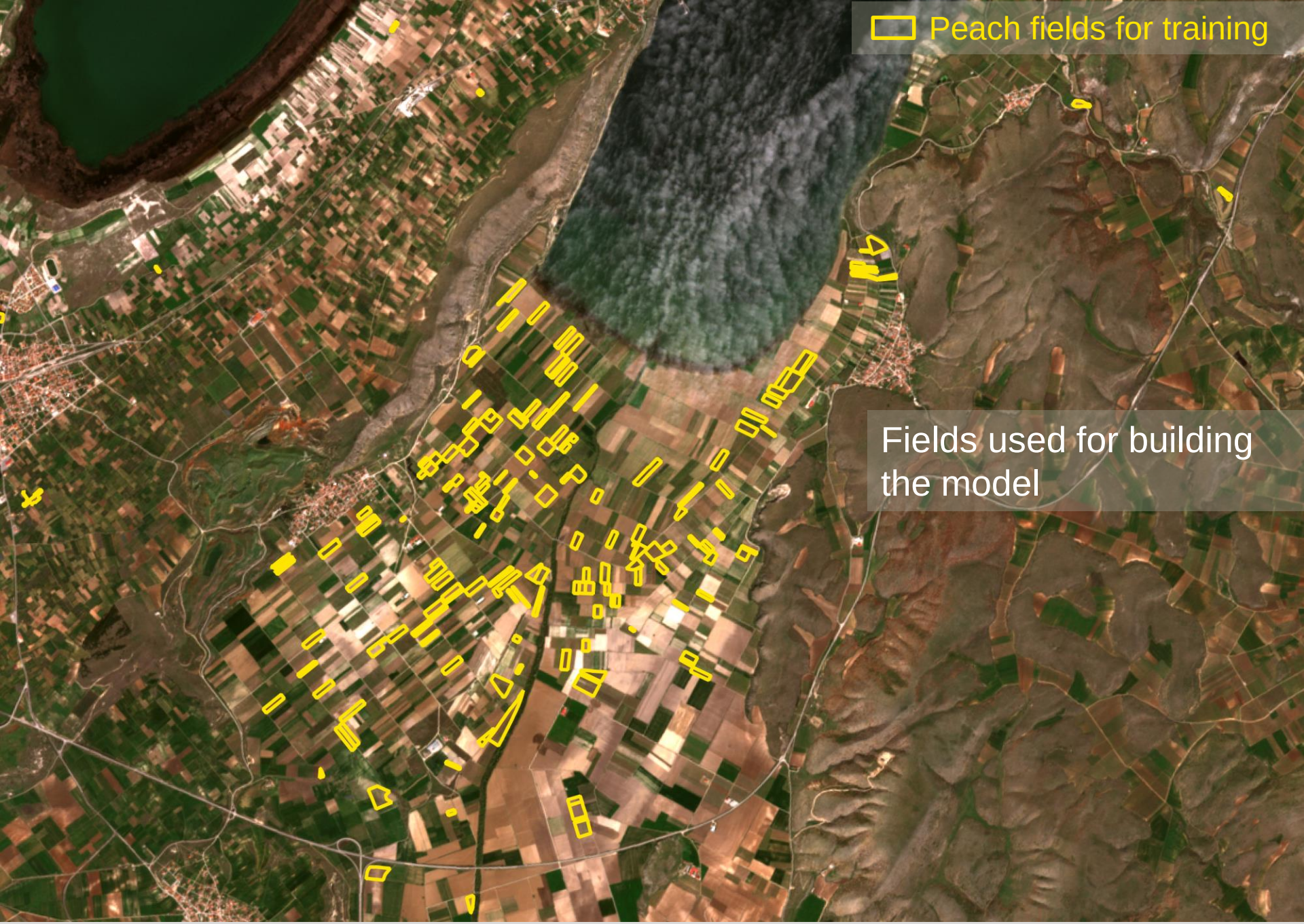
# Satellites d'observation de la Terre – Copernicus

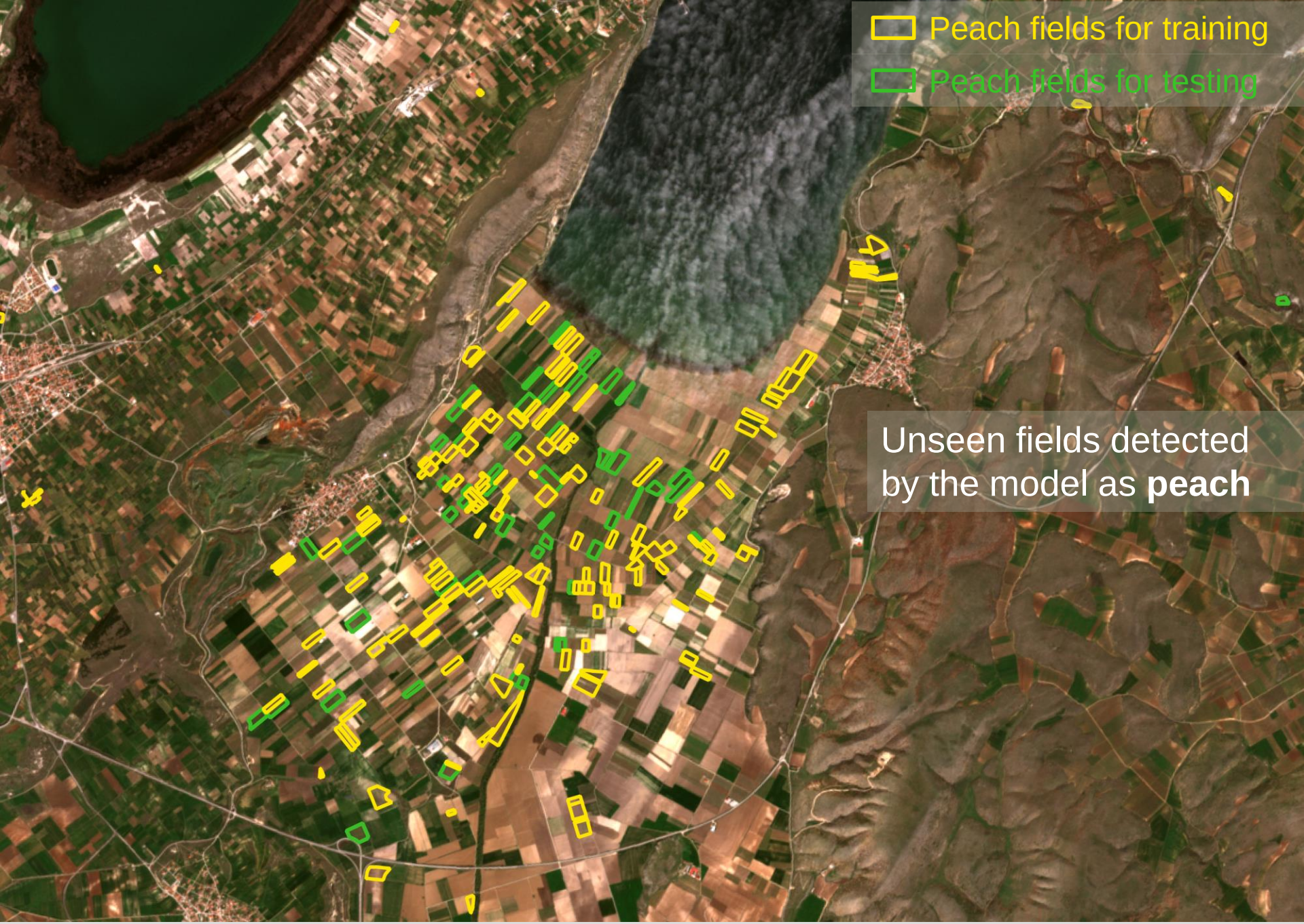


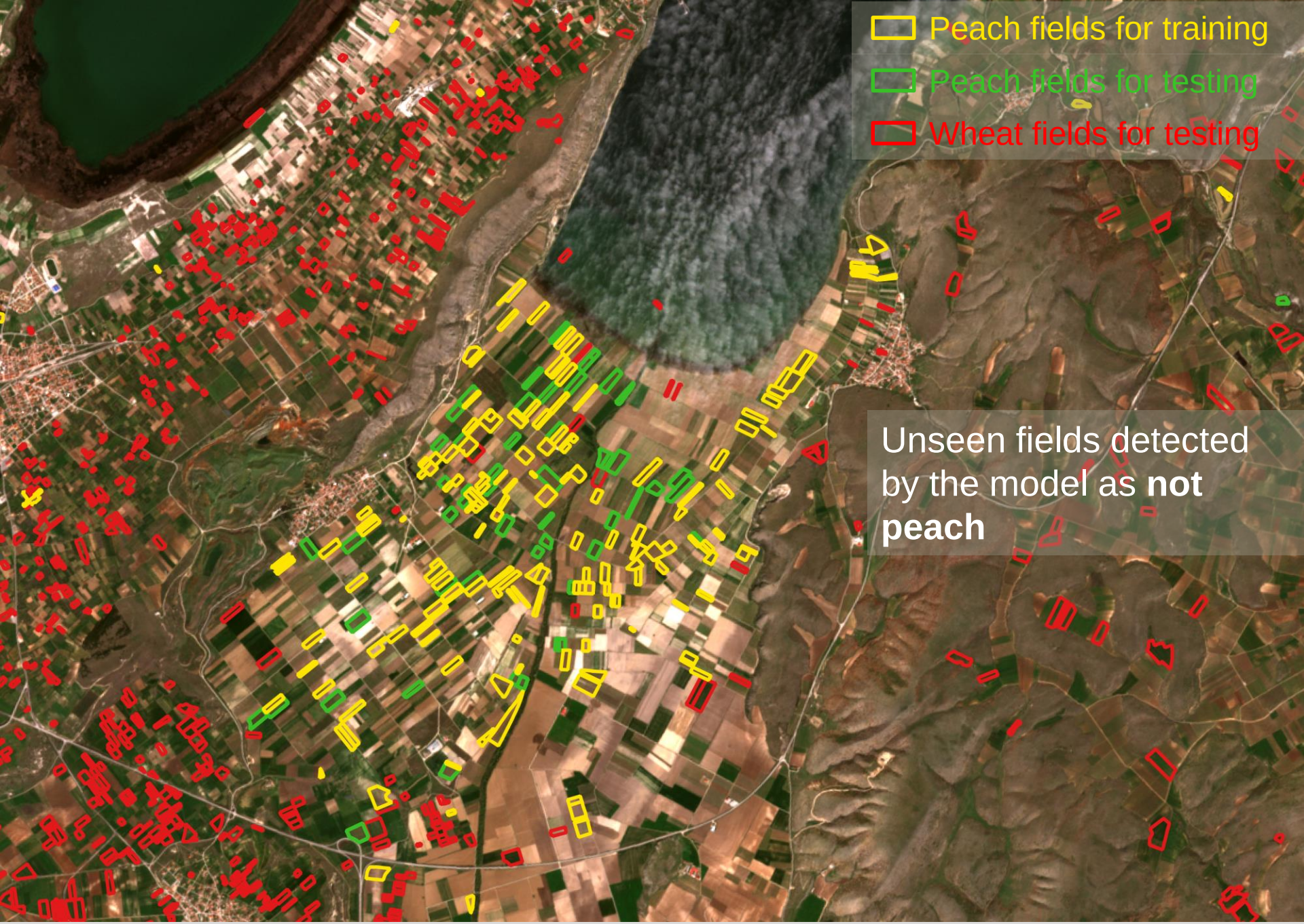
- 6 Satellites opérationnels
- Sentinel-2 résolution: 10m
- 12 spectral
- Couverture tous les 5 jours

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 732064


Image from Sentinel-2


Peach fields for training
Fields used for building the model


Peach fields for training
Peach fields for testing
Unseen fields detected by the model as **peach**


Peach fields for training
Peach fields for testing
Wheat fields for testing
Unseen fields detected by the model as **not peach**

# CTI-project (2016-2019) – IoT tool for precision farming

- Manage crops -> showcases: apple & cocoa
- Wireless sensors
- Cloud connection
- Machine Learning algorithms

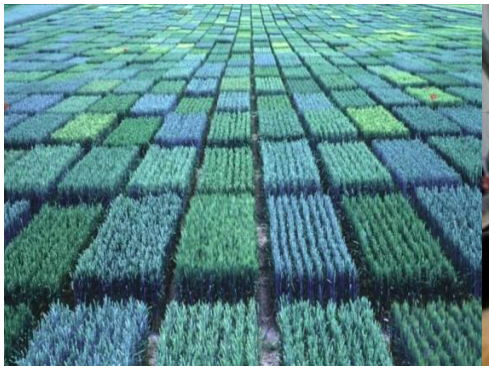
## -> Based on Swiss agronomic excellence

agrisensbox ENVEVE Agroscope csem Nestlé syngenta NETWORK inartis SWISSLIFESCIENCESCOMMUNITY



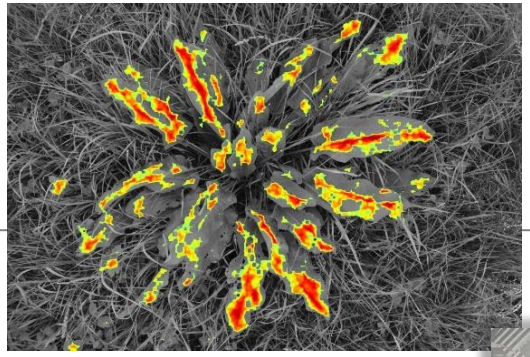
 

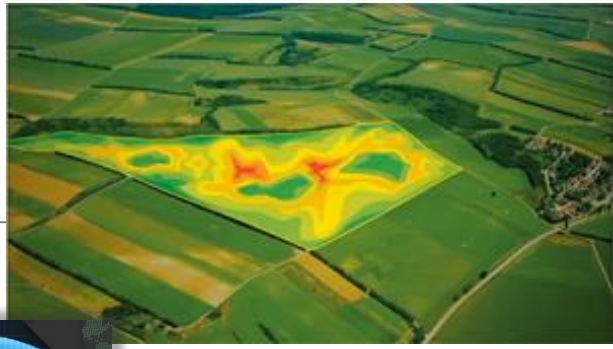
# From Farm to Table value chain

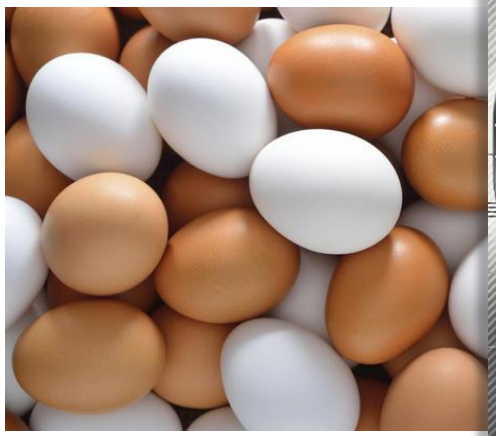


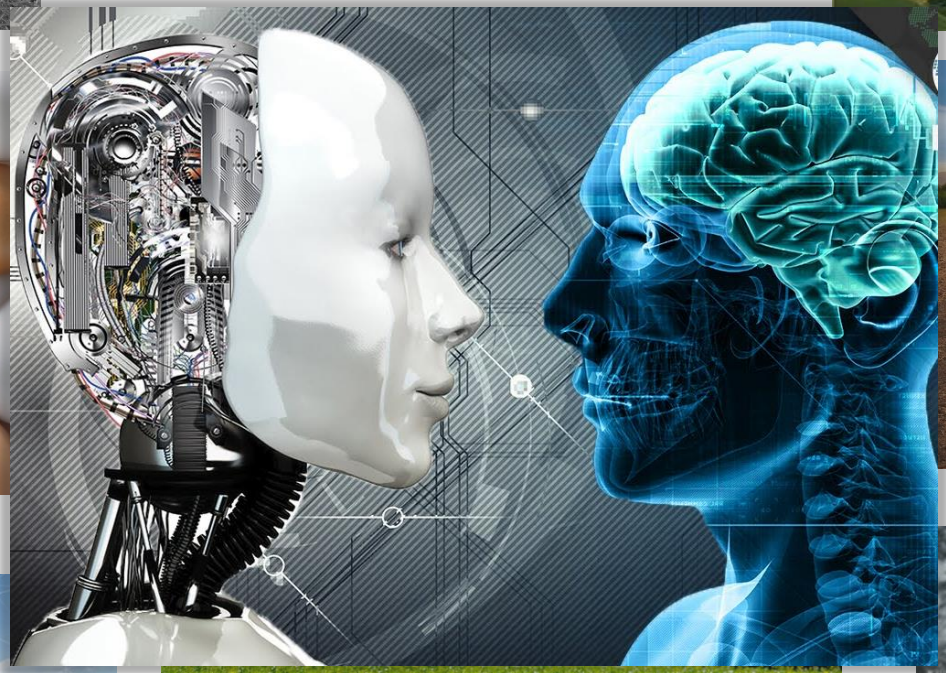

| Inputs | Farmers - Production | Transport | Processing | Packaging | Distribution | Retail | Consumer |
|---|---|---|---|---|---|---|---|
| Seeds | Crops | Ship | Aggregators | Plastic | Distributors | Retailers | Metabolism |
| Pesticides | Meat | Air | Processors | Carton | Importers | Supermarkets | Personalized |
| AgBiotech | Dairy | Truck | Manufacturers | Glass | Exporters | Restaurant | Microbiota |
| Fertilizers | Fish | | Beverages | Alu | | | |
| Water | | | | | | | |

**Machine Learning**










AMAZONE
BoniRob
BOSCH

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