LES ORRES 9 JANUARY 2023

Smart Mountain for tomorrow

19th OCOVA FORUM

ARTIFICIAL INTELLIGENCE (AI) FOR TERRITORIAL MANAGEMENT

Use cases show principles and benefits of AI for optimizing the management of environmental infrastructures: energy, water, mobility, waste.

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CRÉDIT AGRICOLE

Atos

We are an **international leader** in **secured** and **decarbonized digital technologies**.

Driven by the talent and diversity of our **112 000 employees** across **71 countries**, we generate an annual revenue of **€ 11 billion.**

We offer our clients a range of state-of-the-art **digital solutions and products** as well as **consulting**, **cybersecurity** and **decarbonization** services.

ARTIFICIAL INTELLIGENCE (AI): AREAS OF APPLICATION

Data science

Data analysis, prediction and decision

DS

Robotics

Interaction with environment and sensors

Ro

NLP

Natural language processing

Language comprehension, human interaction

CV

Computer vision

Detect and extract information from images

ARTIFICIAL INTELLIGENCE (AI): APPROACHES

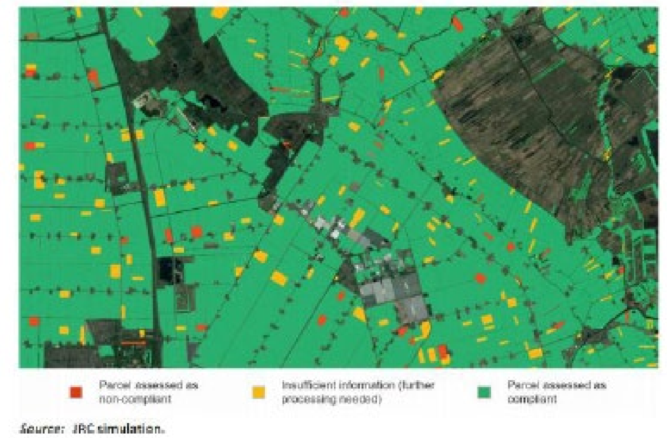
Supervised learning

(Input, Output) ❯ ❯ Output

Predict

Classification: is it A or B?
Regression: How much ? What will be the value?

Plots of land classification



Non supervised learning

Input ❯ ❯ Output

Identify

Clustering: Which organisation?
Association: Who is close?
Outlier detection: who is different?

Fraud detection

Reinforcement learning

Reward

Input ❯ ❯ Output

Learn from mistakes

Decision: What do I have to do now?
Recommendation: What can I offer you?

USE CASE PRESENTATION: AI FOR THE ENVIRONMENT

- Energy: digital twins of wind farms

- Water: prediction of ground waters level
- Water: prevention of environmental pollution

- Mobility: IOT platform

- Waste: detection of public disorders

ENERGY: PREDICTIVE MAINTENANCE

Digital twins of wind farms

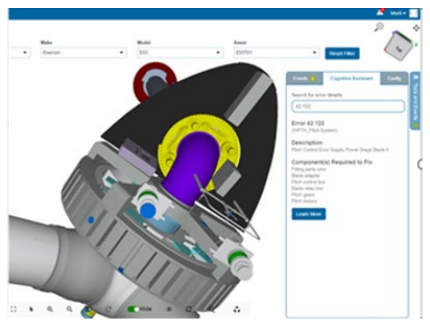
Context

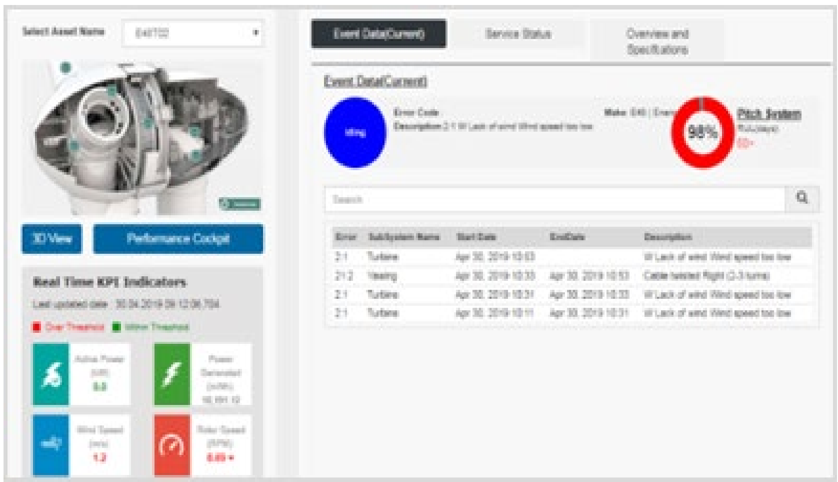
PARK OF 10 FARMS

83 WIND TURBINES (3 TYPES)

2 YEARS SCADA HISTORY

107 SENSORS PER TURBINE





Challenges

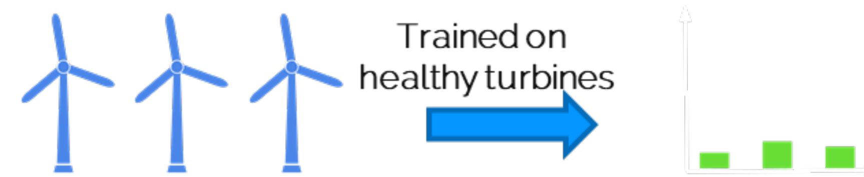
It is complex to **prevent the appearance of a malfunction**. In most cases the flaws are handled at the most critical moment, which leads to important expenses and a substantial shutdown duration of the wind turbine.

This is related to the **lack of knowledge** on the evolution of the deterioration that leads to the breakdown: where does it come from? And when to activate a maintenance operation?

Approach

Proposal of **anomaly detection** based on prediction error:

1/ The model is trained only on healthy asset data (data collected long before/after the anomalies) :



2/ The systel analyses the discrepency towards a healthy asset prediction to identify the risky behaviors:

WATER : THE ENKI PROJECT

Prediction of ground waters level

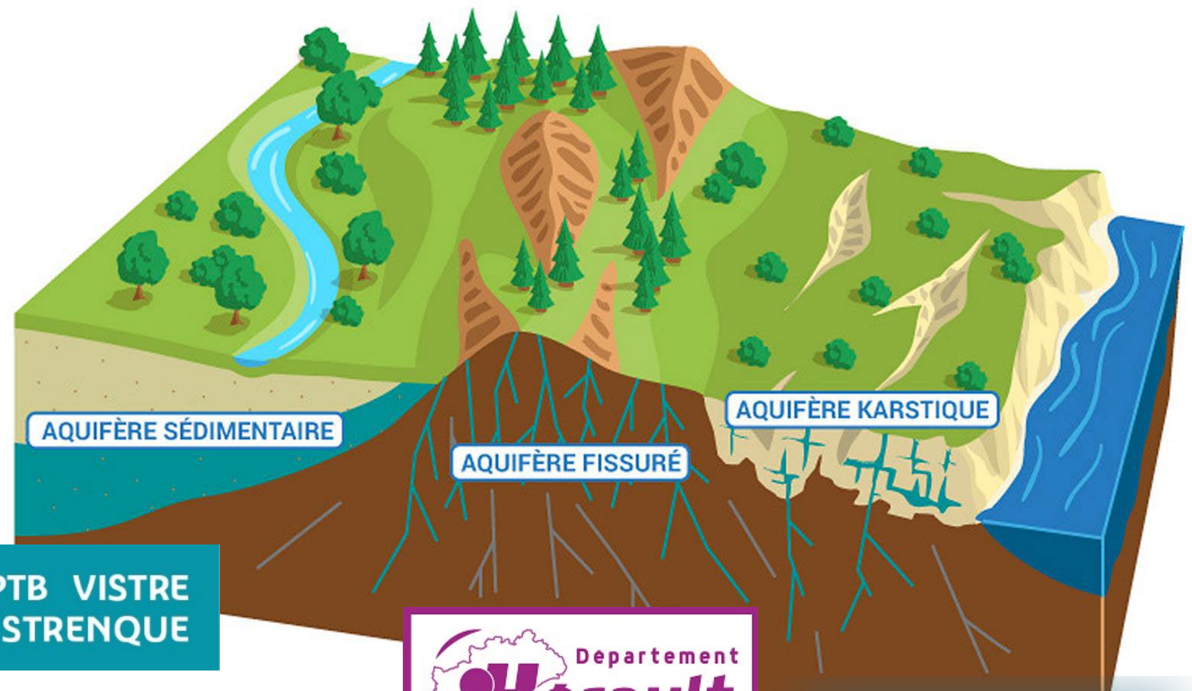
Context

Climate change threatens our water resources and their uses (food, agriculture...). **Forward-looking management** has become necessary for our territories.

Approach

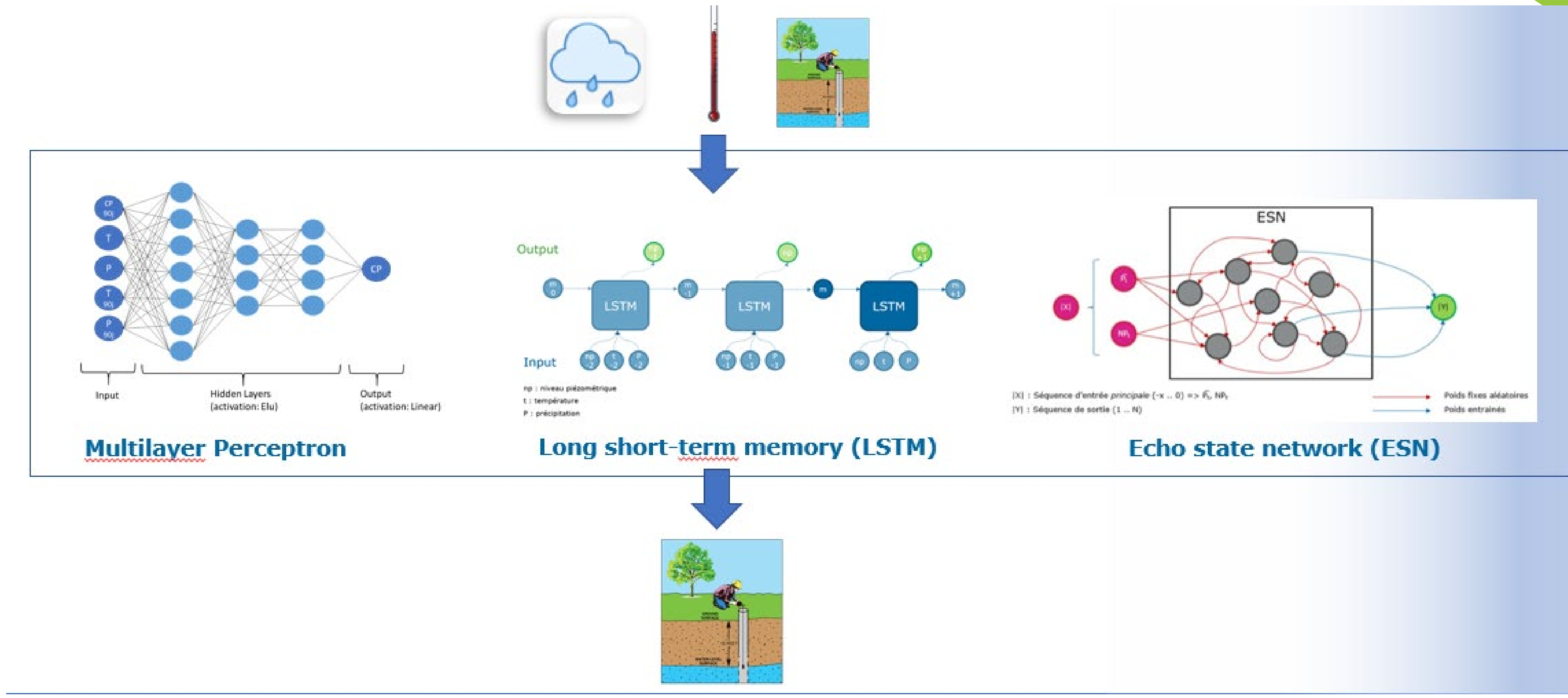
A scoping phase of the project in agile methodology made it possible to identify the needs of twenty partners.

A roadmap has been established to develop **a predictive management tool**.

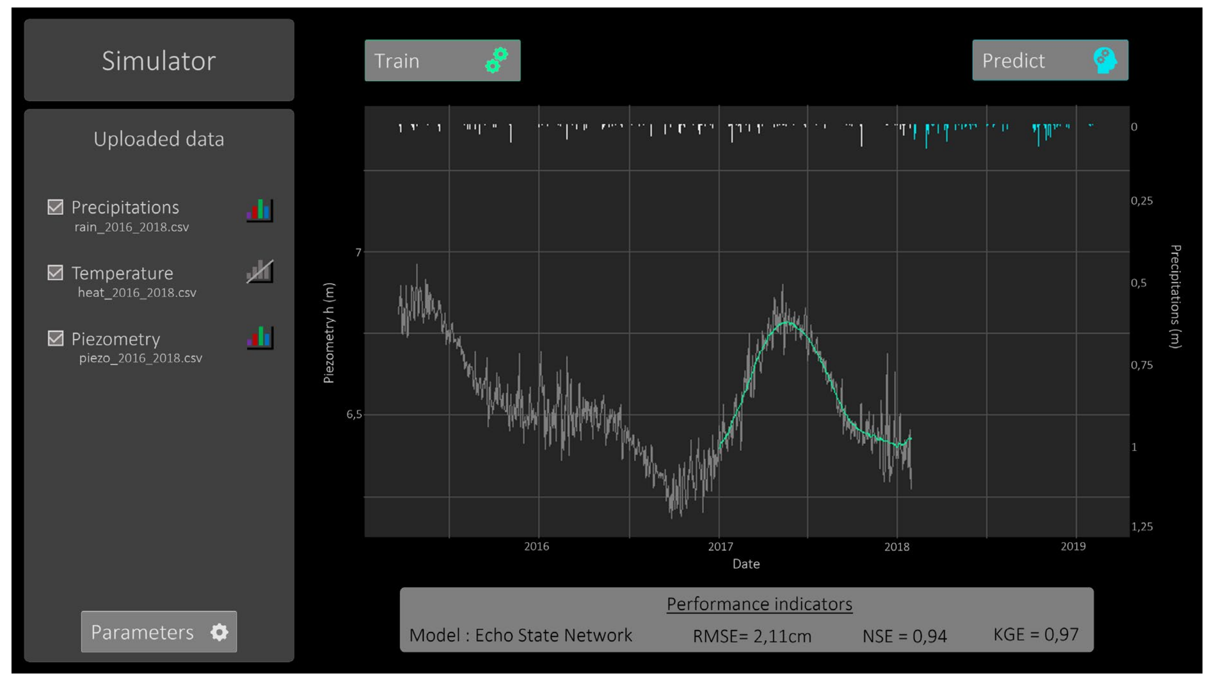


Solution

Machine learning models to predict piezometry in the short and medium term, based on **climate models**.



Prototype developped during the project

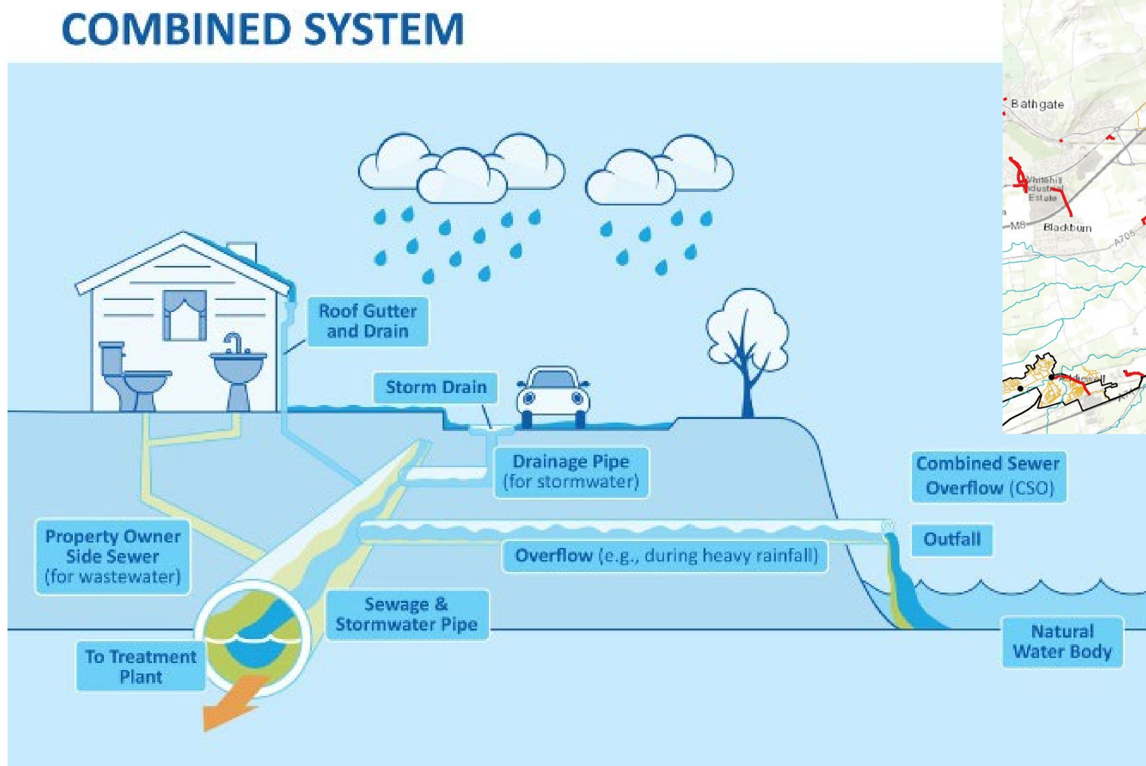


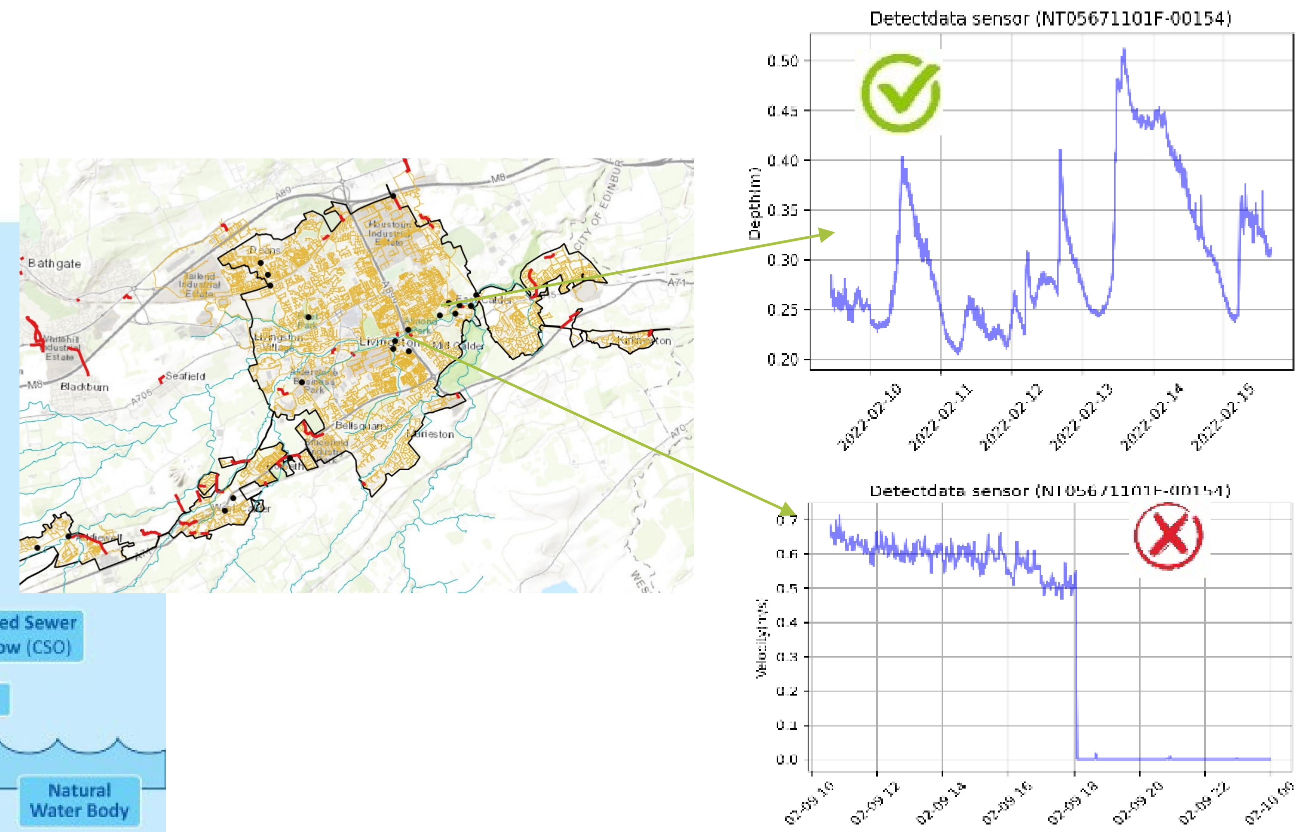
THE SCOTTISH WATER PROJECT

Prevention of environmental pollution

Context

- Wastewater systems can cause **environmental pollution or surface flooding**.
- For this, an **IoT platform** has been set up to monitor the wastewater network in real time.
- **Machine learning algorithms** are able to validate the data quality and to predict levels in the network.





Challenges

- Real-time knowledge of system operation
- Securing the sensor network and data quality
- Improving protection of surface waters

Approach

Step 1: Data collection and cleaning

Step 2: Tests of different algorithms as needed (Recursive PCA, MLPNN, RBFNN or random forest approaches)

Step 3: Towards a solution in production

MOBILITY : IOT PLATFORM

A Fiware platform serving a Smart City

Context

With a view to **interoperability and standardization**, Montpellier Méditerranée Métropole wanted to **integrate the FIWARE platform into the Intelligent City information system**.

The objective of this Smart City platform is to **ingest and standardize data from IoT and other sensors**.

Results

Provision of an **Open Data API portal** publicly available.

Implementation of **data format validation** pipeline.

Set up a platform to **monitor services** in production (alerts, reports).

Implementation of a **comprehensive DevOps approach** with Continuous Integration and Deployment (CI/CD) automation chains.

Solution

The first cases of use concern:

- Management of underground parking lots
- The prediction of free disabled people parking lots
- Optimisation of bicycle parking stations

The architecture allows to easily process data with **AI solutions**

WASTE: THE FIDAMIA PROJECT

Detection of public disorders

Context

To **enable all citizens to report public disorder**, the FIDAMIA project consists in **automating the detection of the type of disorder** taken in photo through AI.

The project must have an operational vision from the start and allow for **regular updating of the model and possible typologies**.

Results

Greater than **80% AI model accuracy** commitment across more than 30 classes to be identified.

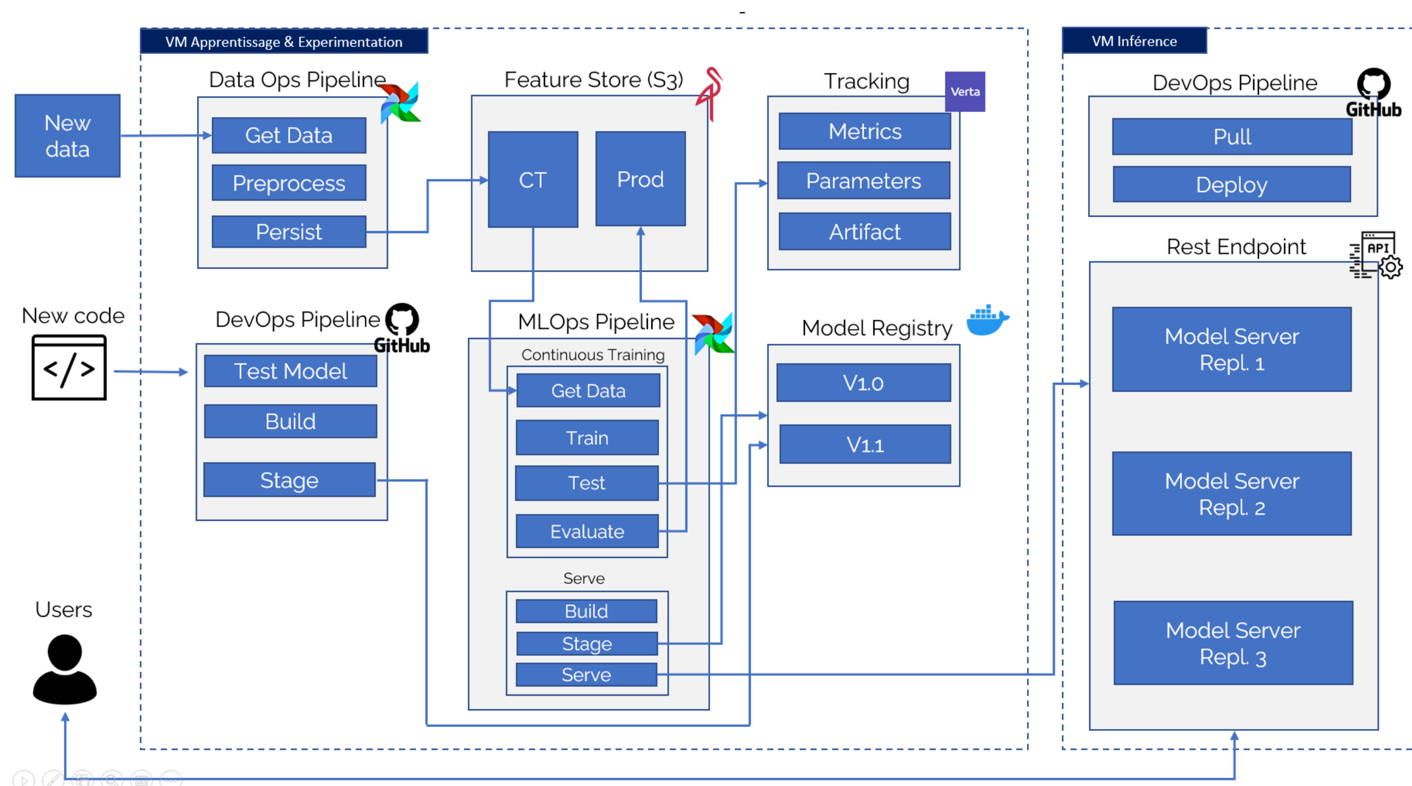
Processing requests in less than 1 second (image processing and inference).

Permanent and automated relearning using MLOps architecture to manage continuous data flow from an initial volume of 500,000 images.

Approach

MLOps Architecture to enable **industrialization and automation** of the entire data science pipeline: data preprocessing, training, non-regression testing.

Deployment of **computer vision** models:



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MERCI POUR VOTRE ATTENTION
THANK YOU FOR YOUR ATTENTION

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