ESSEC BUSINESS SCHOOL

CentraleSupélec

Clean R
Methane Emissions

DETECT. ENGAGE. SAVE.

QUANTUMBLACK
A MCKINSEY COMPANY

BY

Leonardo Basili, Antoine Cloute, Karim El Hage, Yasmina Hobeika, Annabelle Luo, Ali Najem, Amine Zaamoun

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AGENDA

- Product and Business Proposition: Intitiation ➔ Maturity
- Scientific Research
- Application Demo
- Appendix

Our Product and Business Proposition

Fugitive Emissions in Energy industry

> Leak detection and repair **(LDAR) programmes are the key mechanism to mitigate fugitive emissions** from the production, transmission or distribution segments of the value chain.
>
> Global Methane Tracker - Documentation

In 2022, fugitive methane emission in the global energy sector accounts for around **1 million kt of CO2 eq** even tough they represent around **3.5%** of the total emissions.

979160

kt of CO_2 eq

Source: Our elaboration from Methane Tracker Database – IEA and Understanding Global Warming Potentials – EPA

Use cases and product growth

V0

Operational excellence

Clients
Oil & Gas companies

Application
Leaks detection helps plants owners to prioritize the maintenance on detected plants reducing the amount of methane leaked

V1

Aided maintenance

Clients
Oil & Gas Companies

Application
Semantic segmentation feature and higher resolution images speeds up process repairing identifying the specific area of the leakage

V2

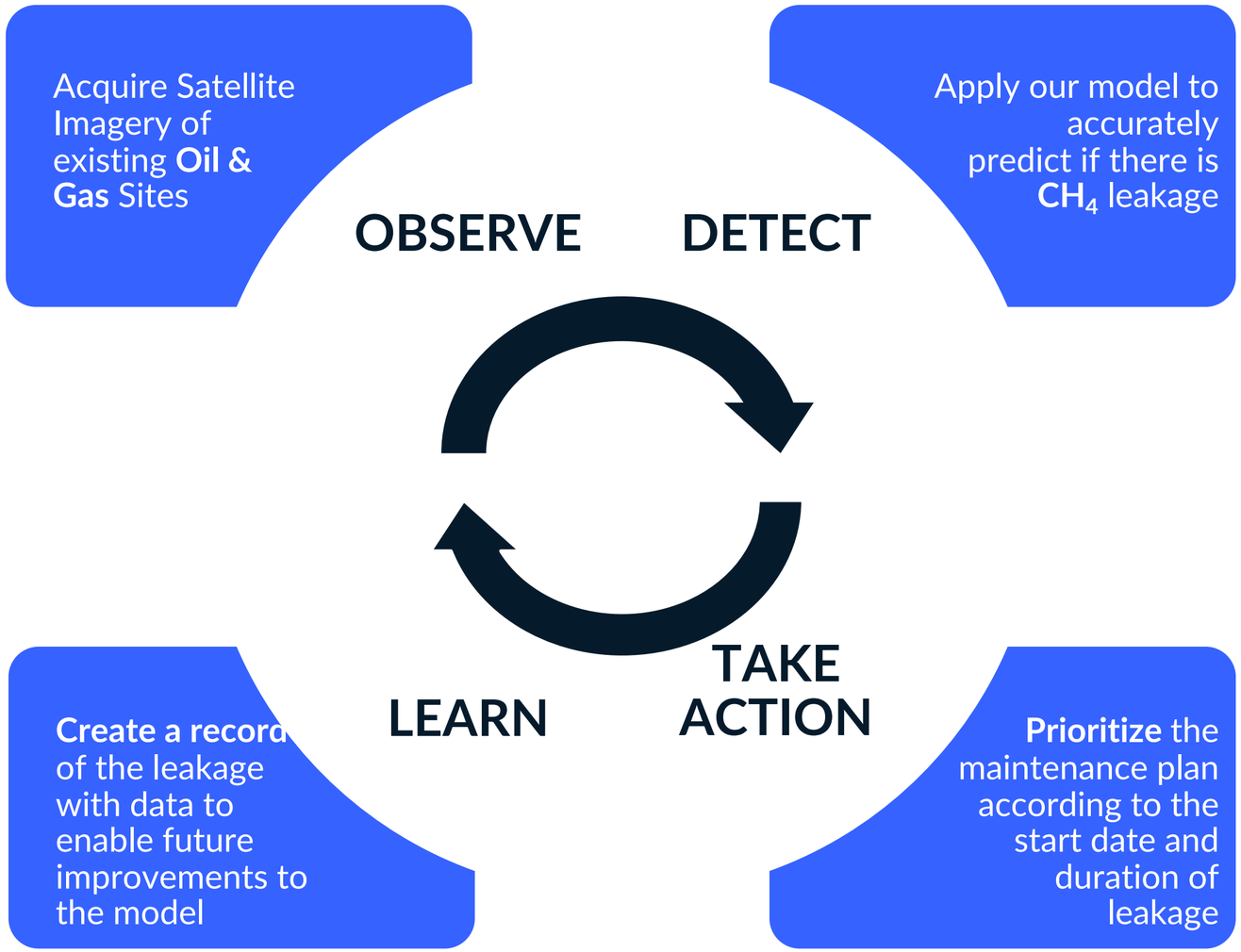
Emissions measurements

Clients
Governments and public agencies

Application
Quantity measurement feature enables better decisions on energy policy, monitoring quantity of methane leaked from images

Minimal Viable Product

V0 V1 V2



Client Features

➔ Explainability of predictions

➔ Daily alert system to track leakage and reduce losses

If the oil and gas companies had used our service initially, we would have been able **to reduce impact** over this number of people living in areas near **leakage sites**:

60+M

Aided Maintenance

V0 V1 V2

Live tracking: deploying drones at site for leakage alerts + Check site history

Semantic Segmentation: Companies can identify leakage location

Process Enhancement

Faster intervention time to limit leakages.

➔ Accurate location of leakages

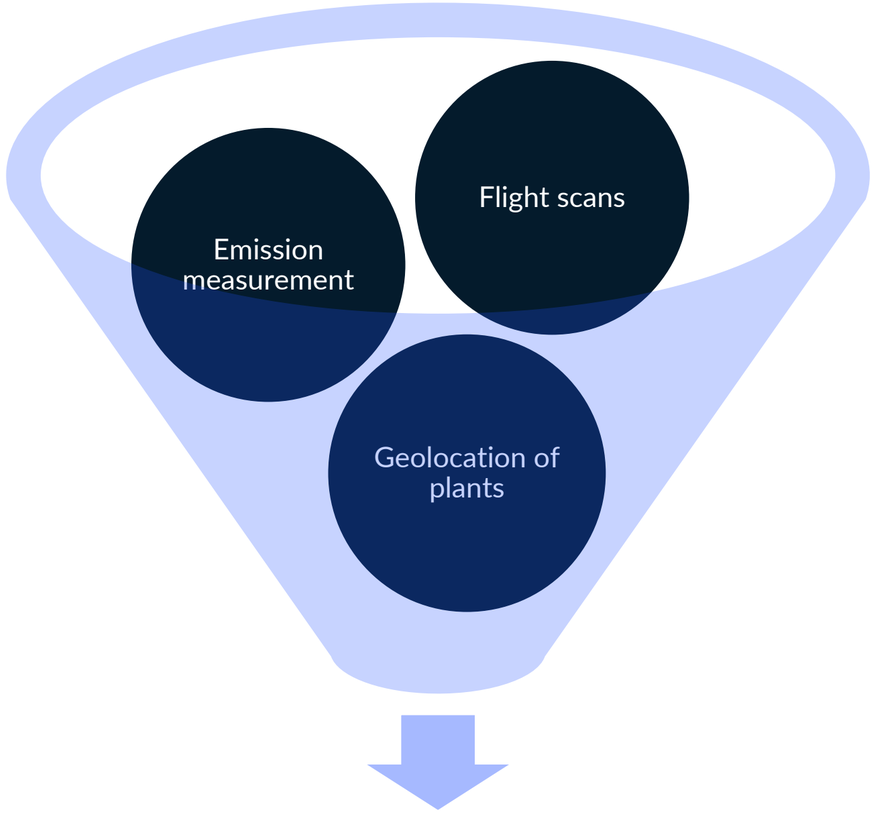
➔ Frequent reporting

Emissions monitoring

V0 V1 V2

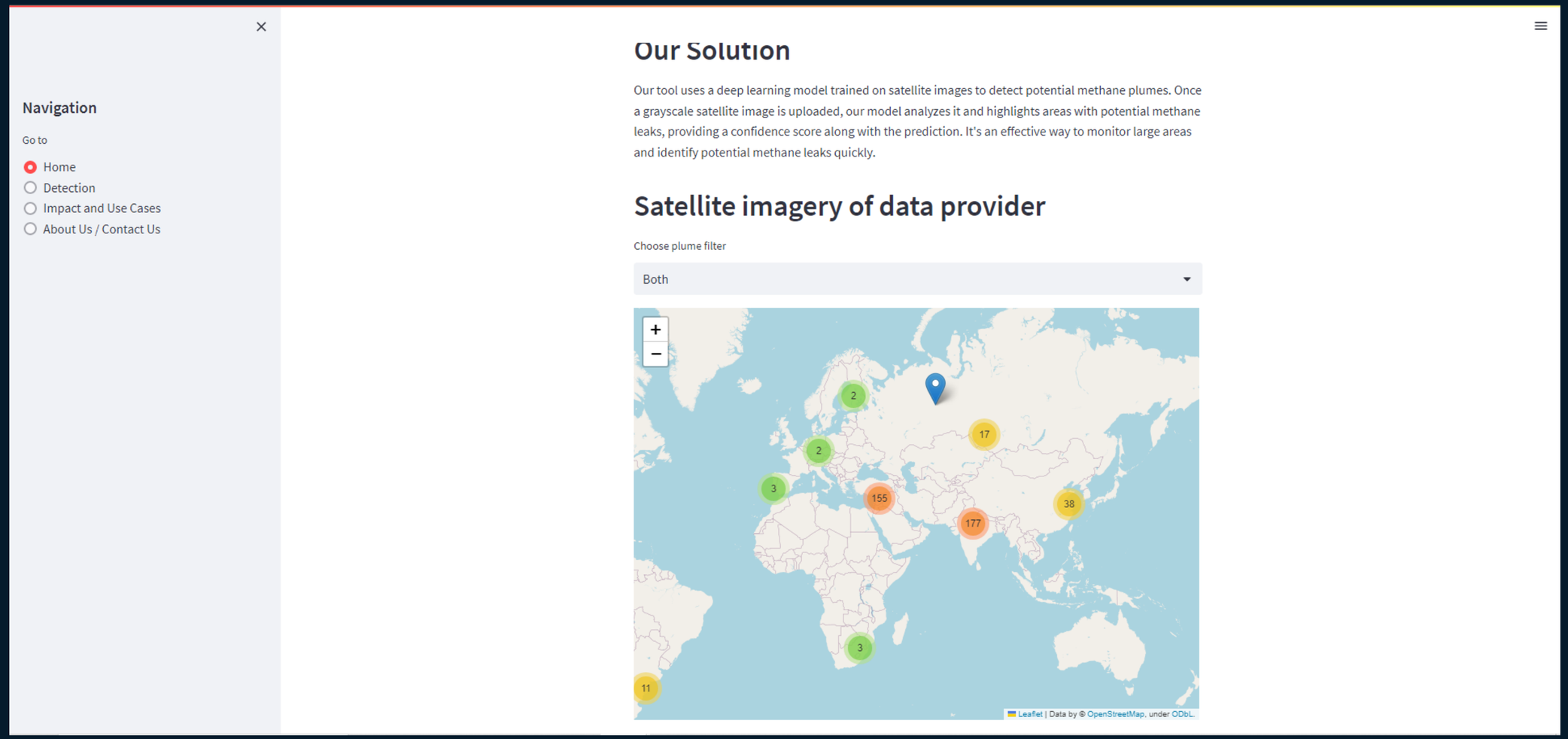
> **Regulations calibrated to each jurisdiction's specific goals will be critical to ensuring that companies undertake the appropriate abatement actions alongside voluntary action by companies.**

IEA (2021), Driving Down Methane Leaks from the Oil and Gas Industry



Our Scientific Proposition

Introducing GasPal V0



Problem Statement

Scope of Study

Satellite images in greyscale of different locations, labeled with Plume and No Plume

Data in a Glance

428 IMAGES: Balanced Plume Vs. No Plume – 214 per category
101 Locations: 67 sites for Plume Vs. 34 sites for No Plume
90 Days: from 2023/01/01 to 2023/04/06

Research Question

Binary Image Classification to correctly identify the Plume

01
10

Data Preparation

WHAT

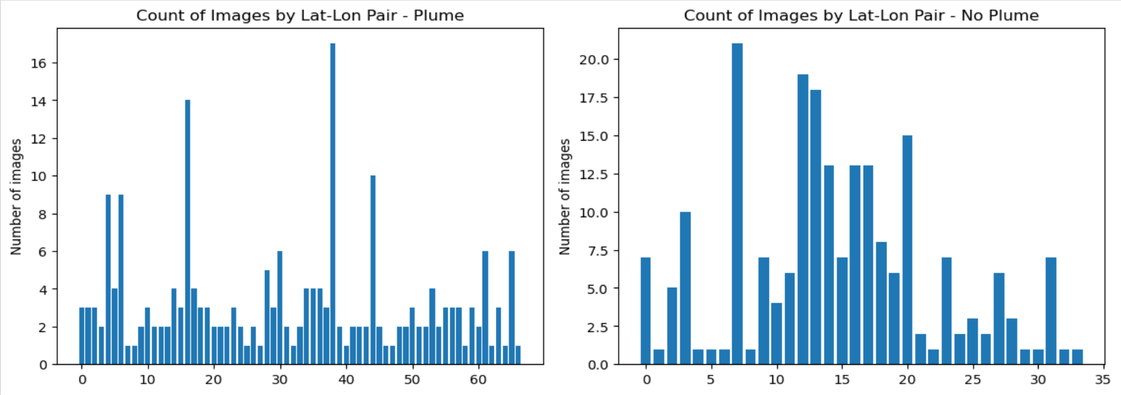
- Prepare holdout Validation set
- Image augmentation

HOW

WHY

- Need to select images as validation set for performance measuring, possibility of data leakage if random split

  i.e. multiple images taken in different days for the same location



67 unique locations

34 unique locations

- Images augmented on Training set and remain unchanged in Validation set

- To avoid data leaking, we split the data by choosing a validation set representing 20% of the locations
- To deal with the imbalanced number of locations, enable same number of images for both categories in both Training and Validation set
- Vertical flip and horizontal flip in Training set, no augmentation in Validation set

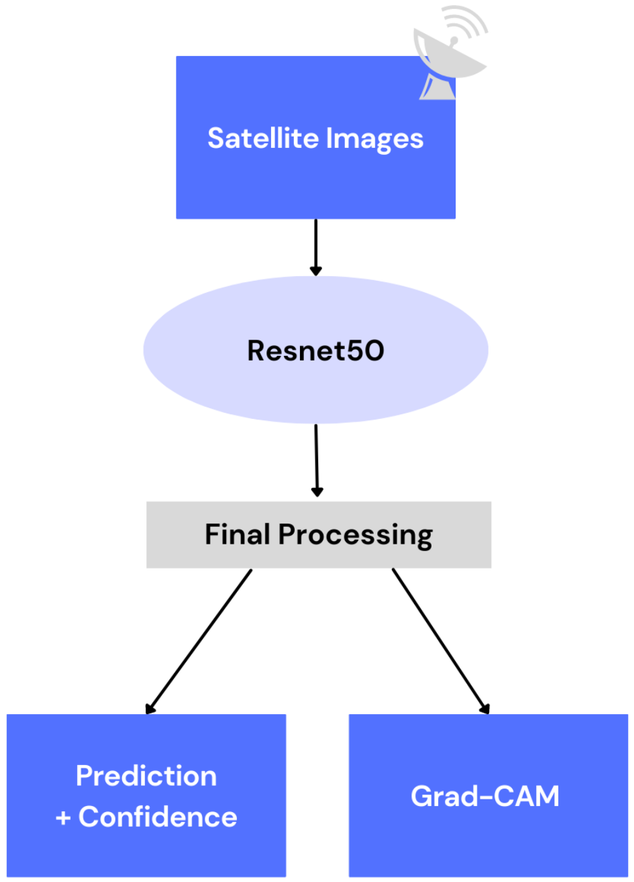
Modeling

Architecture

Input

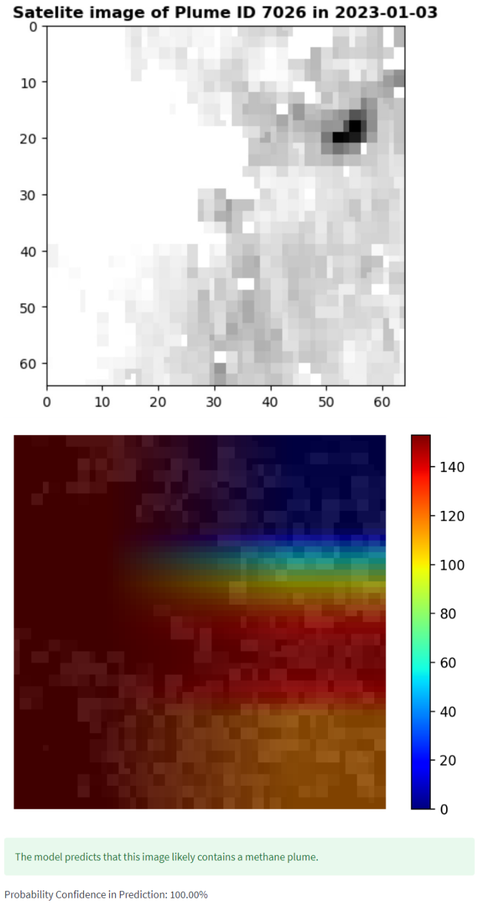
Model

Output

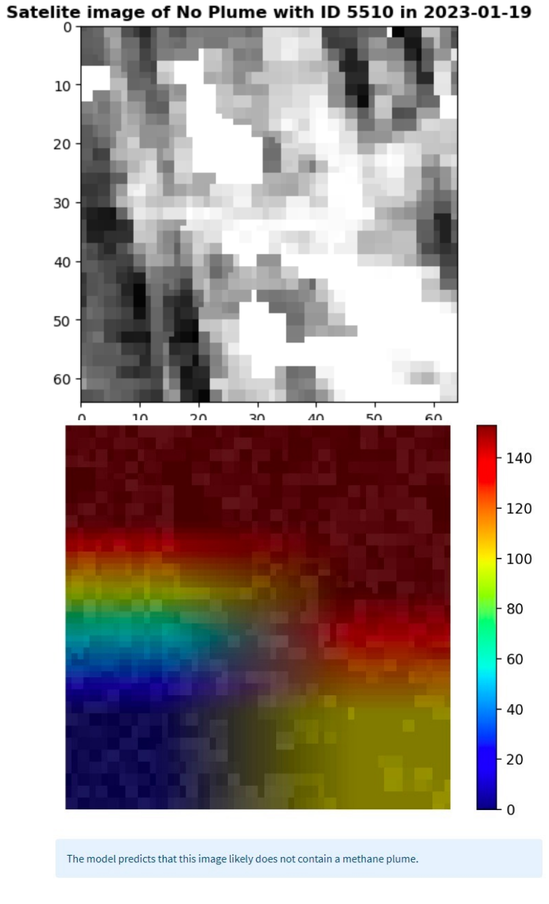


Performance

Plume



No Plume



6% Better!

Score

Validation Accuracy: 0.83
Validation F1 Score: 0.84

AUC - 0.9268

Product Demo Time!

Thank you!

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Appendix

Business Lean Canvas Model

KEY PARTNERSHIPS
- Satellite imaging companies for data supply.
- Environmental regulatory bodies for regulatory compliance and certifications.
- Industry partners for field validation and refinement of the model.

KEY ACTIVITIES
- Developing and refining the AI algorithm for methane leak detection.
- Continual gathering and analysis of satellite images.
- Building and maintaining the online platform for real-time monitoring and reporting.
- Customer support and training.

KEY RESOURCES
- Data science team for AI model development.
- Satellite images and related infrastructure.
- Sales and customer support team.
- IT infrastructure for data storage, processing, and the online platform.

VALUE PROPOSITIONS
- Detecting and localizing methane leaks using AI and satellite imaging, aiding in the reduction of greenhouse gas emissions.
- Prioritizing maintenance runs based on leak detection, potentially saving time and costs.
- Ensuring regulatory compliance by providing accurate reporting and verification of methane emissions.
- Enhancing reputation by showcasing commitment to sustainability and environmental protection.

CUSTOMER RELATIONSHIPS
- Subscription-based services for continuous monitoring and reporting.
- Customized solutions for specific customer needs.
- Strong customer support and training for using the platform.

CHANNELS
- Direct sales team targeting the industries with high methane emissions.
- Partnerships with environmental regulatory bodies and sustainability consultants.
- Online platform for real-time monitoring and reporting of methane leaks.

CUSTOMER SEGMENTS
- Oil and gas companies
- Coal mines
- Agriculture sector (livestock farms, rice paddies)
- Waste management facilities
- Environmental regulatory bodies
- Sustainability consulting firms

COST STRUCTURE
- Costs related to data acquisition (satellite images).
- Research and development costs for AI model development.
- Operational costs of the online platform.
- Sales and marketing costs.
- Customer support and training costs.

REVENUE STREAMS
- Subscription fees for the use of the AI-based satellite imaging platform.
- Service fees for custom solutions and consulting.
- Data licensing for third-party applications.

Growth pipeline