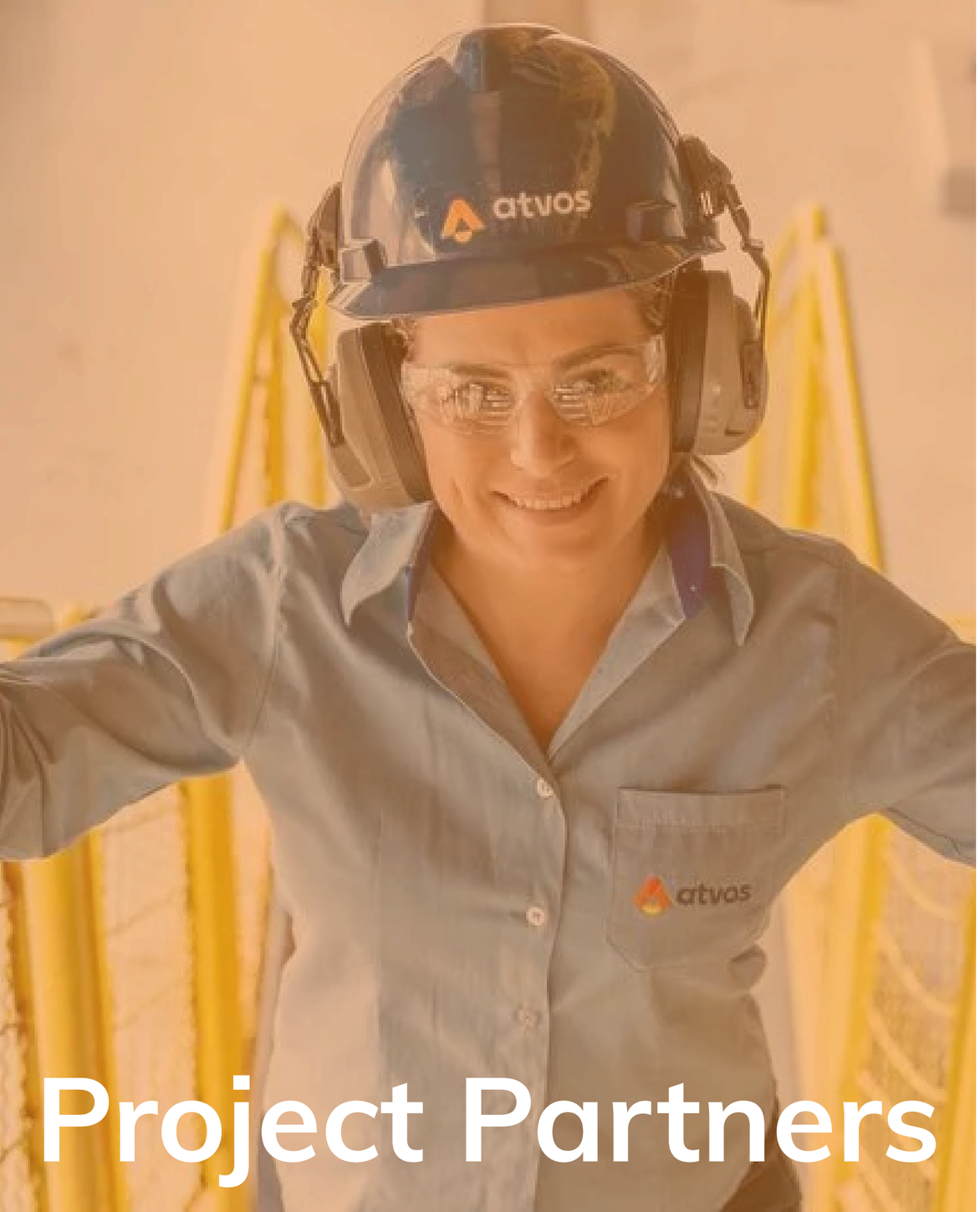
Project:
S.I.M.P.A.T.I.A

System for Identification and Monitoring for Assured Protection of Workers using AI

By: Jean Lucas Rothstein Machado

Roadmap

- Project Partner
- Problem Recapitulation
- Pain Validation
- Solution
- Impact and Value Proposition
- Architecture
- Roadmap and Strategic Decision
- Demonstration and Closure



Project Partners

- One of Brazil's largest producers of ethanol and clean energy, with 8 agro-industrial units across 4 states and over 10 thousand employees;
- Investments in technology to enhance operational safety and efficiency - SIMPATIA.
- Working as a Data Analytics Intern in the Data area of Atvos, directly reporting to Diego Antonio Freire Dias.

Problem Recapitulation

- Manual monitoring of PPE use in factories is complex, reactive, and prone to errors.
- Searching for a proactive solution to minimize risks and create a safer work environment.

Pain Validation

Seeking to reduce the costs and risks of non-compliance - Accident Frequency Rate and Approaches Due to the Risk of failure to use PPEs.

Solution

Technological Integration in Plants

Automatic PPE Detection

- The system automatically identifies helmets, safety glasses, gloves, and vests.
- Records images when PPE is not detected.

Notifications and Reports

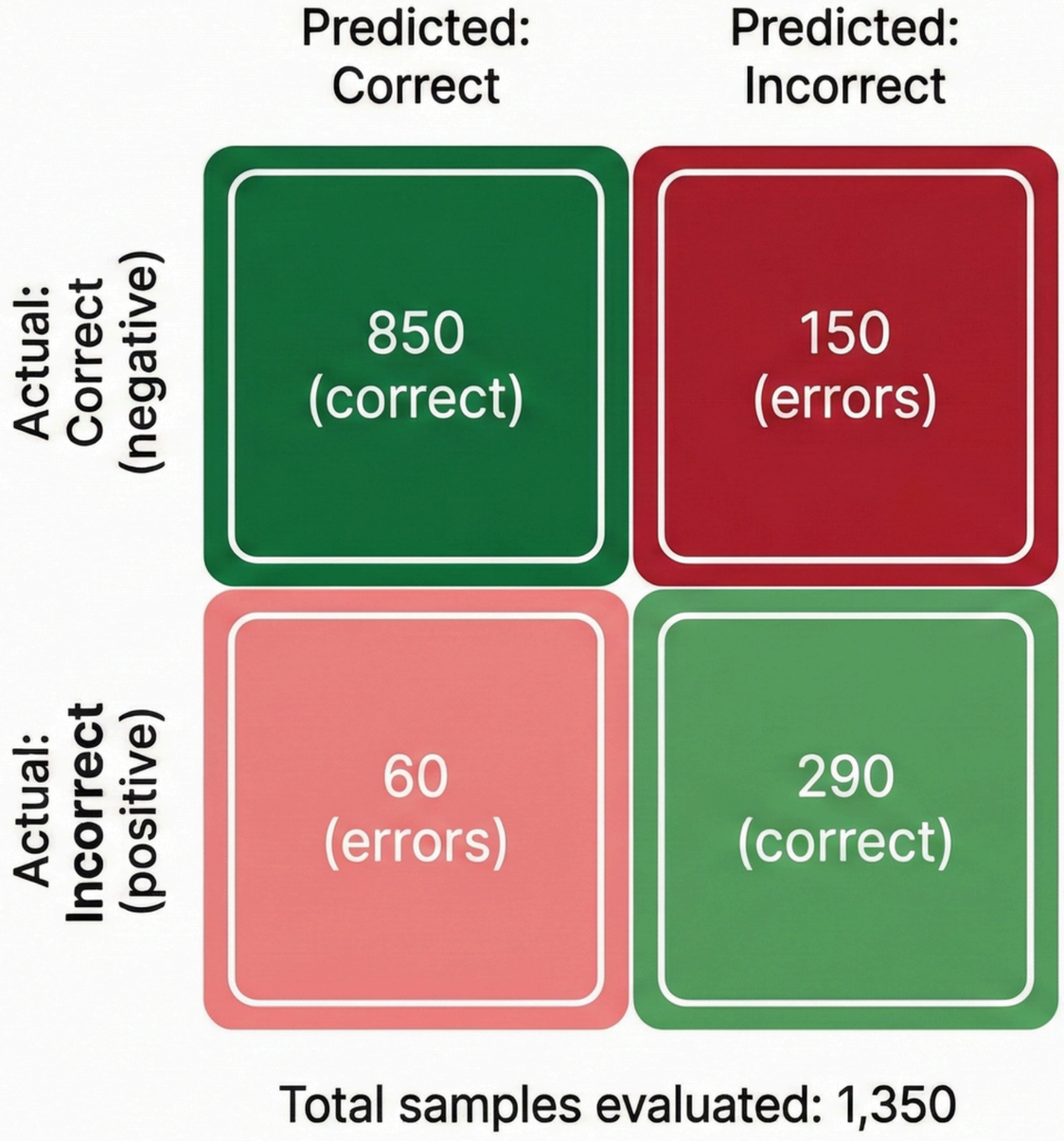
- Sends real-time alerts.
- Generates daily reports for compliance analysis.

Integration with Plant Systems

- Ability to detect PPEs in various conditions using camera image processing from the plants.

Use of Artificial Intelligence

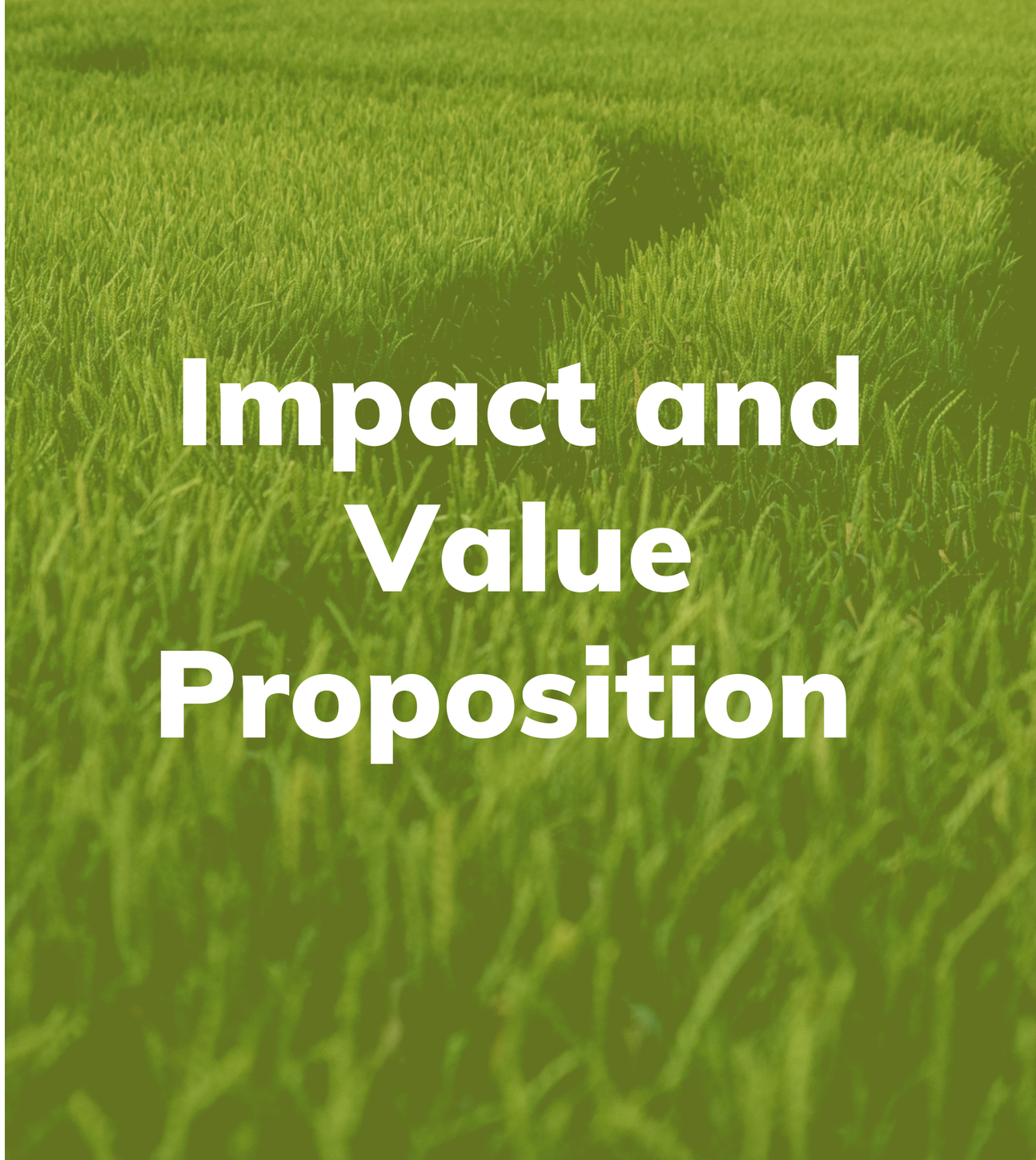
- Generic Computer Vision Model by using generic dataset and Atvos dataset augmented on training pipeline



Metrics Interpretation

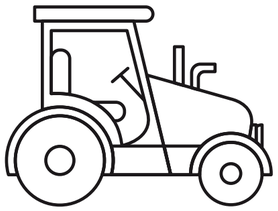
Metric	Value	Interpretation
Accuracy	84%	Total proportion of correct classifications among all inferences performed.
Precision	66%	Among all detections indicated as 'Incorrect EPI', 66% actually belonged to that class.
Recall	83%	The model correctly identified 83% of cases where the EPI was actually incorrect.
F1-Score	73%	Harmonic mean between Precision and Recall, indicating balance between avoiding false alarms and not missing irregular cases.

- Proactive Safety and Risk Reduction.
- Reliable and Consistent Monitoring.
- Intelligent Data-Driven Management.
- Mitigating accident costs.



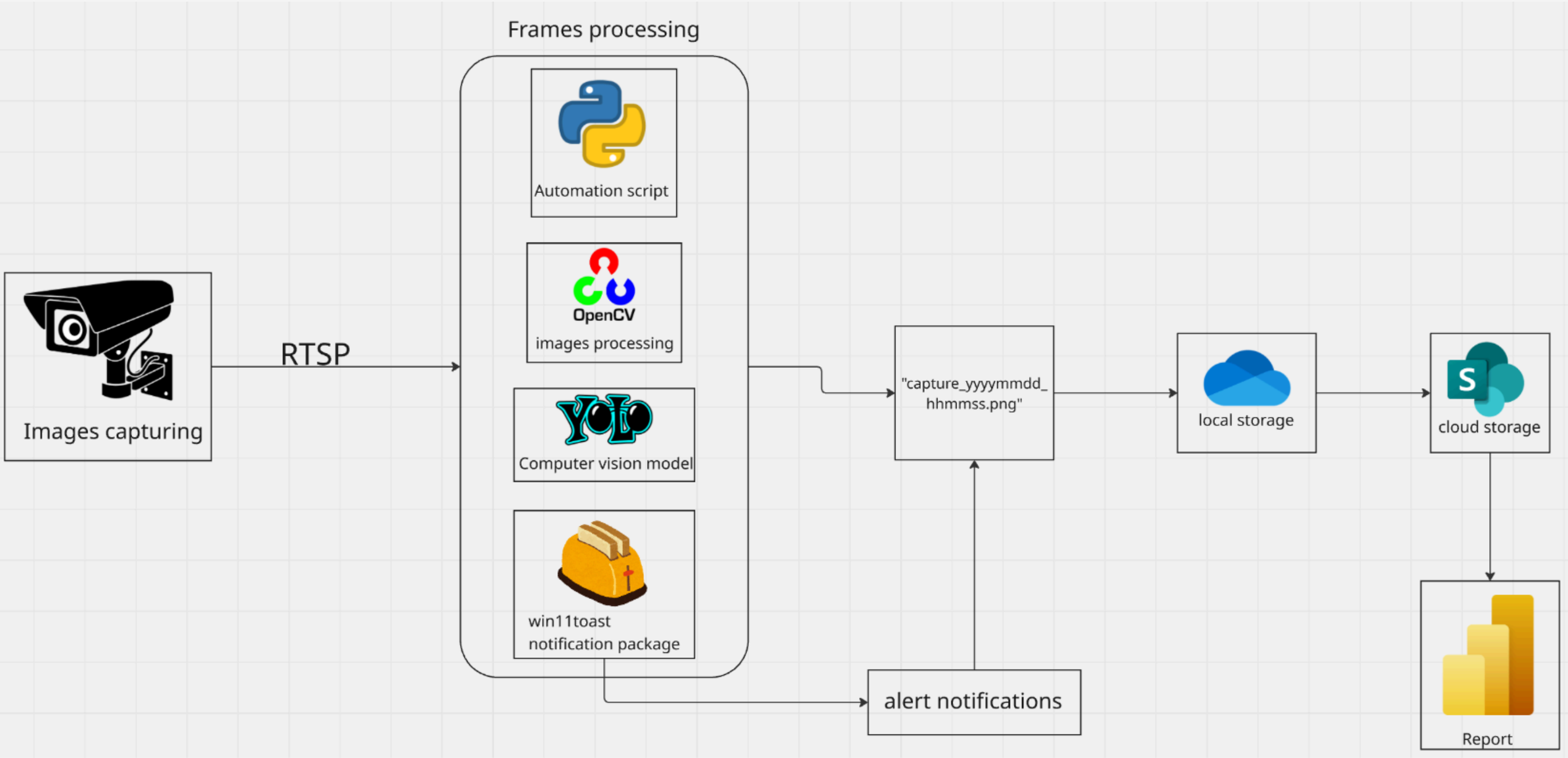
Impact and Value Proposition

Roadmap and Strategic Decision

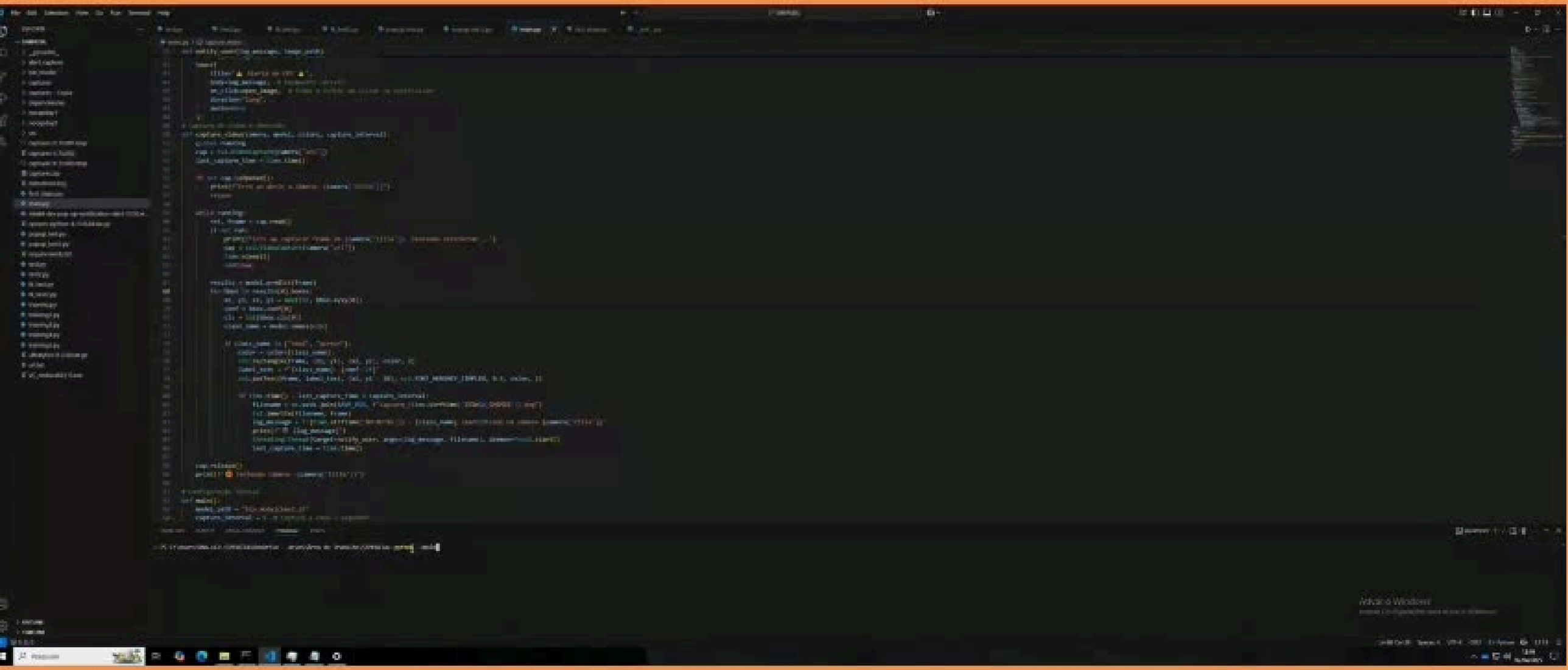


- The project successfully validated the PPE monitoring solution and served as a basis for a strategic analysis of more comprehensive market solutions.
- Prioritization of the evaluation of commercial solutions, which already include other functionalities (such as fire detection) and require a longer investment cycle.
- Knowledge asset and technical/financial benchmark.
- The development cycle will be completed with the delivery of all documentation and a fully functional prototype.

Project Architecture


Frames processing
Automation script
OpenCV
images processing
Computer vision model
win11toast
notification package
Images capturing
RTSP
"capture_yyyymmdd_
hhmmss.png"
local storage
cloud storage
alert notifications
Report

Demonstration and Closure



Thank you!!

Special Thanks to:
Diego Antonio Freire Dias, Atvos Data Analytics team, Rodrigo Nicola (Teacher), Kizzy Terra, Family and Friends