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

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

G34 - Final Sprint Review - Module 15

Roadmap

- Project Objective
- Module Timeline (Sprint Summary)
- Model training pipelines and datasets
- Results and evaluation
- Conclusion and Next Steps

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.

Project Objective

Objective:

Automate the identification and monitoring of Personal Protective Equipment (PPE) usage through computer vision and real-time video processing.

Expected Benefits::

- Enhance operational safety
- Reduce manual supervision efforts
- Provide structured and traceable compliance reports

Project Project Timeline (Sprint Summary)

Sprint	Main Focus
Sprint 1	Planning and roadmap definition
Sprint 2	First Atvos model training
Sprint 3	Comparison between Atvos and Roboflow datasets
Sprint 4	First dataset merge to model generalization
Sprint 5	First general model optimization

Models pipelines

Datasets from Atvos and Roboflow

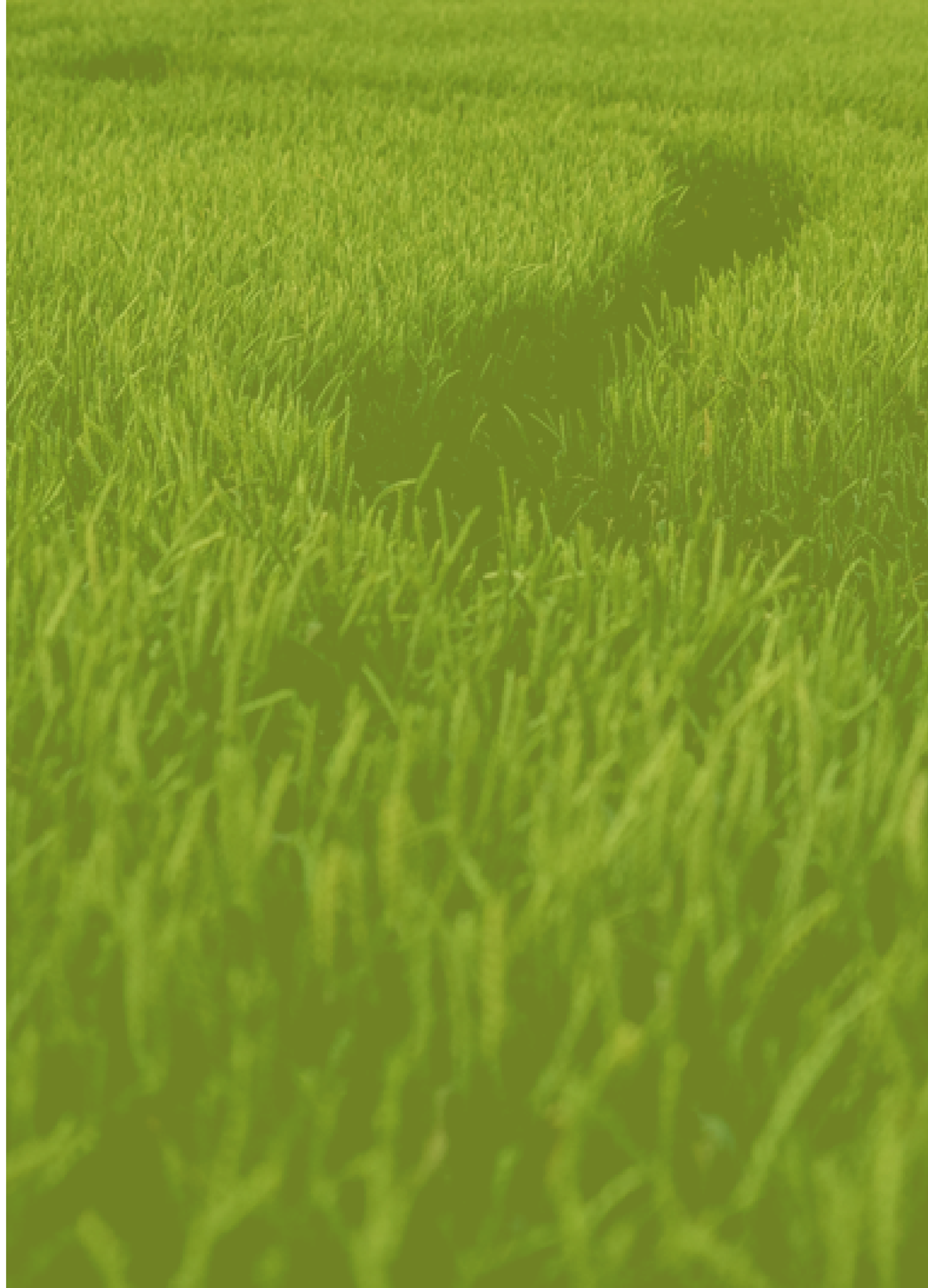
- Environment Setup: The training was conducted in an environment with a GPU to accelerate processing.

- **Datasets**
  - Two datasets were used for training: one from Roboflow ("BAC_HIEN_CONSTRUCTION_SAFETY_2024") and a local one ("final_atvos_dataset_yolo").
  - The datasets were pre-processed and unified to focus on detecting the "no-helmet" class.

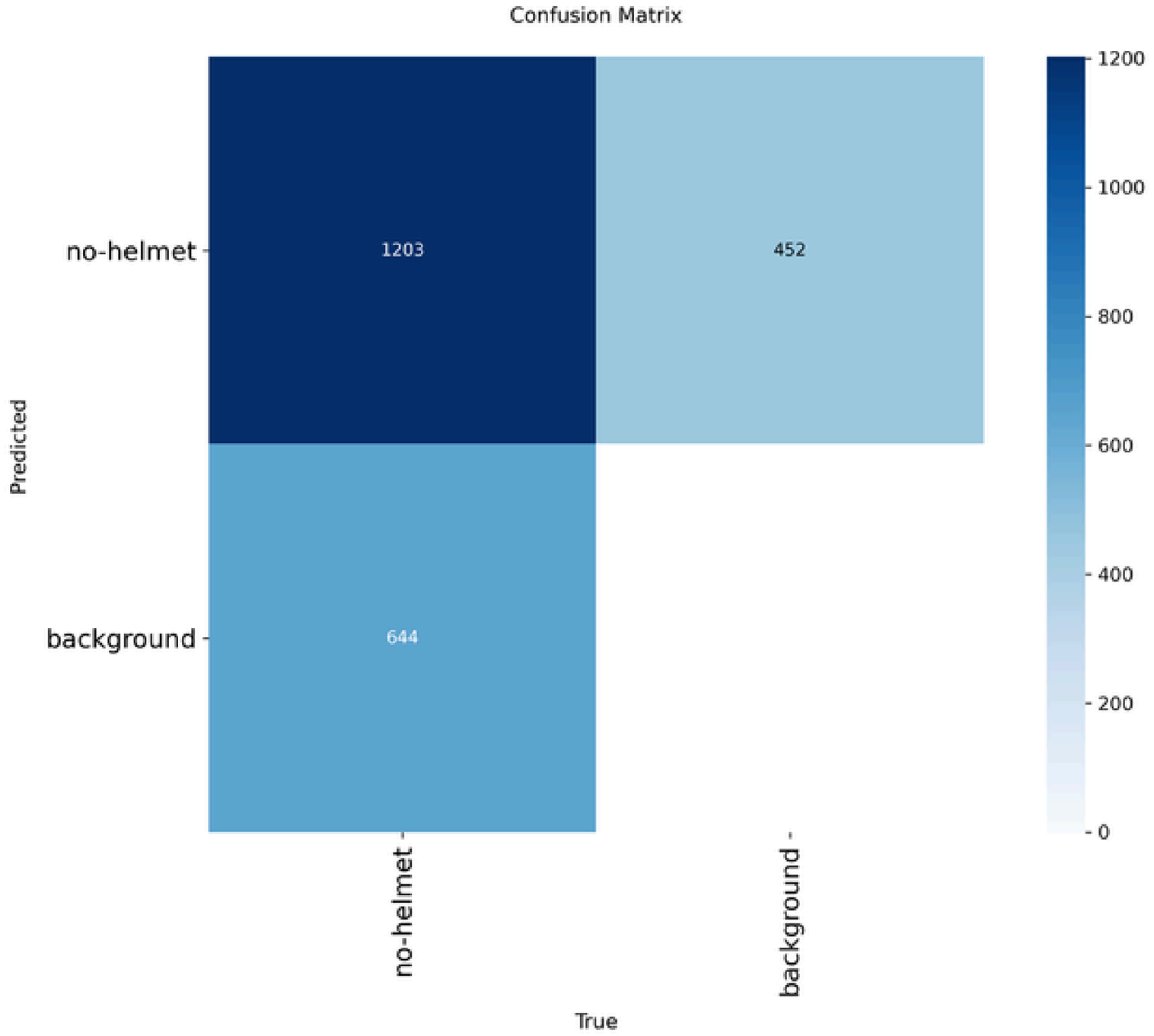
- Technologies Used:
  - YOLOv8: For training the detection model.
  - OpenCV: For image manipulation.
  - Roboflow: For downloading and integrating labeled datasets.

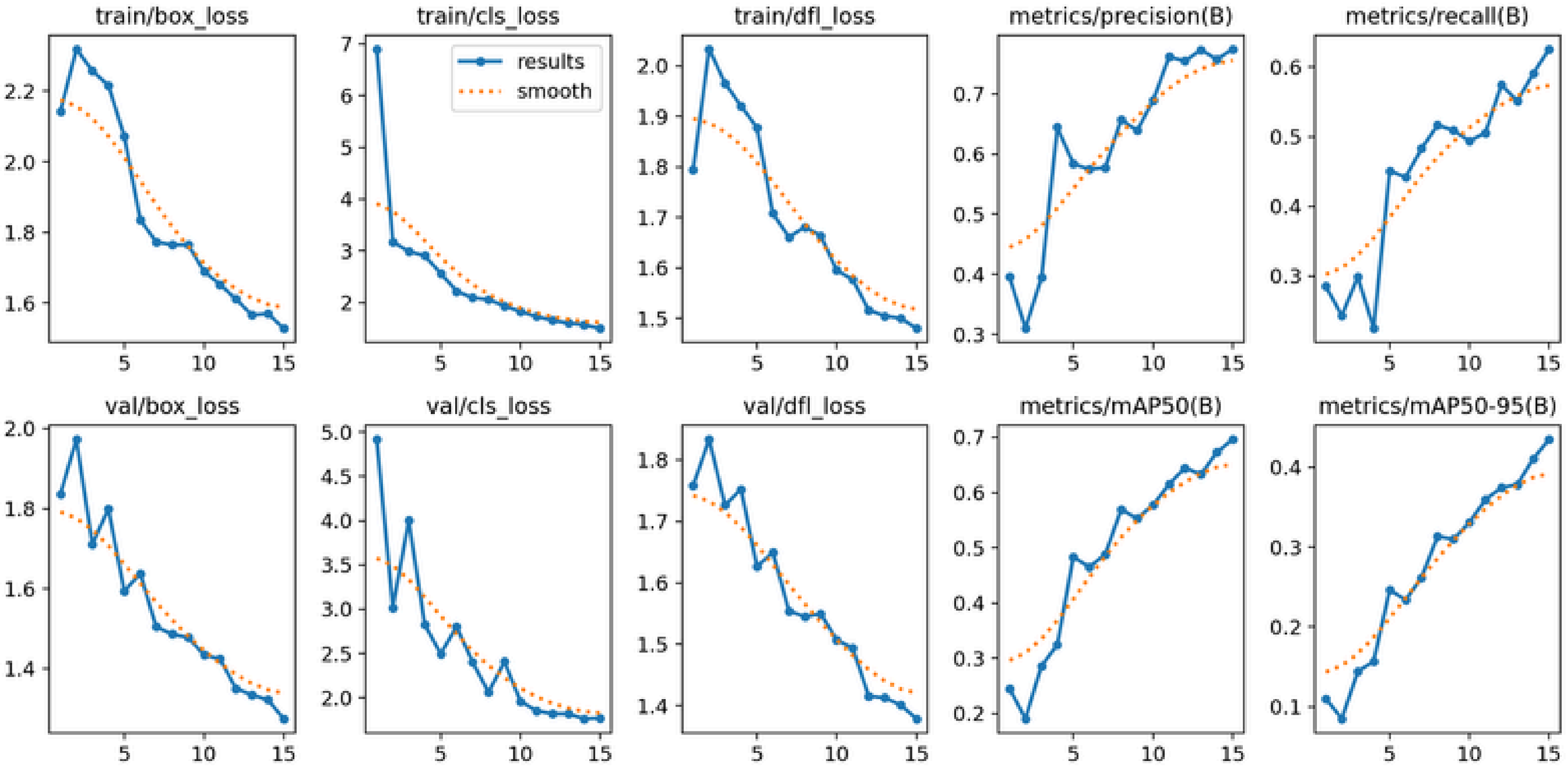
Results and Evaluation

- The trained model showed high accuracy in detecting the "no-helmet" class.
- The evaluation was performed with the help of a confusion matrix, which demonstrated the model's effectiveness in correctly distinguishing the classes.
- Precision and recall graphs (P, R, PR, and F1 curves) were also generated to analyze the model's detailed performance.

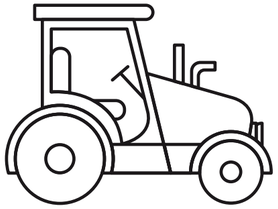


Confusion Matrix and performance graphs


Confusion Matrix
no-helmet
background
Predicted
1203
452
644
no-helmet
background
True
1200
1000
800
600
400
200
0


train/box_loss
train/cls_loss
results
smooth
train/dfl_loss
metrics/precision(B)
metrics/recall(B)
val/box_loss
val/cls_loss
val/dfl_loss
metrics/mAP50(B)
metrics/mAP50-95(B)

Conclusion and Next Steps



- This work demonstrates the feasibility of training an efficient computer vision model for identifying improper PPE use.
- The solution is scalable and can be integrated into real-time monitoring systems, contributing to workplace safety.
- The use of YOLOv8 ensures high accuracy and fast, reliable detections.
- Next steps: Improve the model's generalization with more optimization methods to model training and implement tests.

Thank you!!

Se o Implementarmos, Melhorará a Proteção e Aumentará a Tolerância com IA!!!