

DETECT AND RECOGNIZE COCA COLA PRODUCTS.

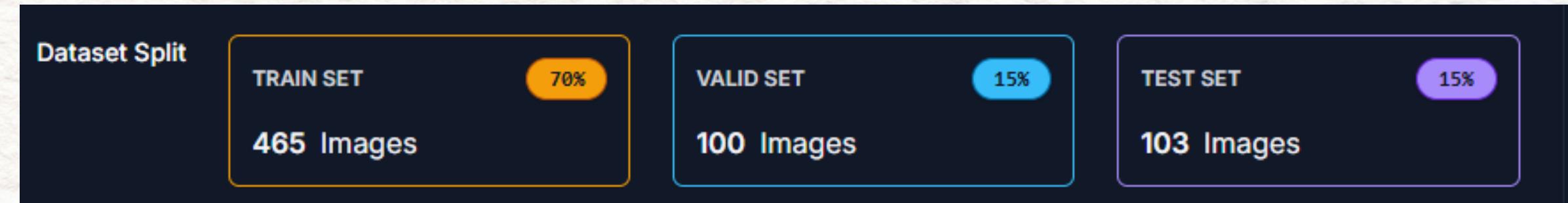
Presented By : Razane Marref

1.The dataset:

- This dataset was curated specifically to train and evaluate a computer vision model for detecting Coca-Cola products in images.
- This versioned dataset contains 668 images annotated with bounding boxes for Coca-Cola products.

Dataset Splits:

- Training Set: 465 images (70%)
- Validation Set: 100 images (15%)
- Test Set: 103 images (15%)



1.The dataset:

- **dataset Export: YOLOv8 Format**
- **Why YOLOv8?**

YOLOv8 offers a streamlined workflow, balancing speed and accuracy. It is well-recognized for its real-time object detection performance and modern architecture, which makes training and deployment more efficient than older YOLO versions.

2.The PreProcessing step:

- preprocessing the data image for training, validation, and testing. traverse each subset (train, valid, and test), resize all images to a target size, optionally normalize pixel values, and then save them in a specified output folder.
- By standardizing image dimensions and scaling pixel intensities to 0,1, the script ensures consistent input for the model, leading to more stable training and better performance.

3.The Model :

Model Creation:

- use **Ultralytics YOLO** This module provides the YOLO class, which is the core component for creating and using YOLOv8 models (including detection, segmentation, and classification).

Function Advantages:

- Reusability: A single function (`create_yolo_model()`) can easily switch to different tasks or weights.
- Simplicity: Keeps the rest of the codebase clean—just call the function whenever you need a new YOLO model.

4.The training step :

- Train a YOLOv8 detection model to accurately detect the target objects (Coca-Cola products)with 50 epochs on a preprocessed dataset.

Why “yolov8n”?

It's lightweight and runs fast, suitable for both prototyping and edge deployment. Though smaller, it's still effective for many real-world scenarios.

5.The evaluation step :

- Creates a YOLOv8 model instance, initializing it with the best checkpoint from a previous training run.
- measure how well your YOLOv8 model can detect Coca-Cola products (or other target objects) on both validation and test data.

Significance:

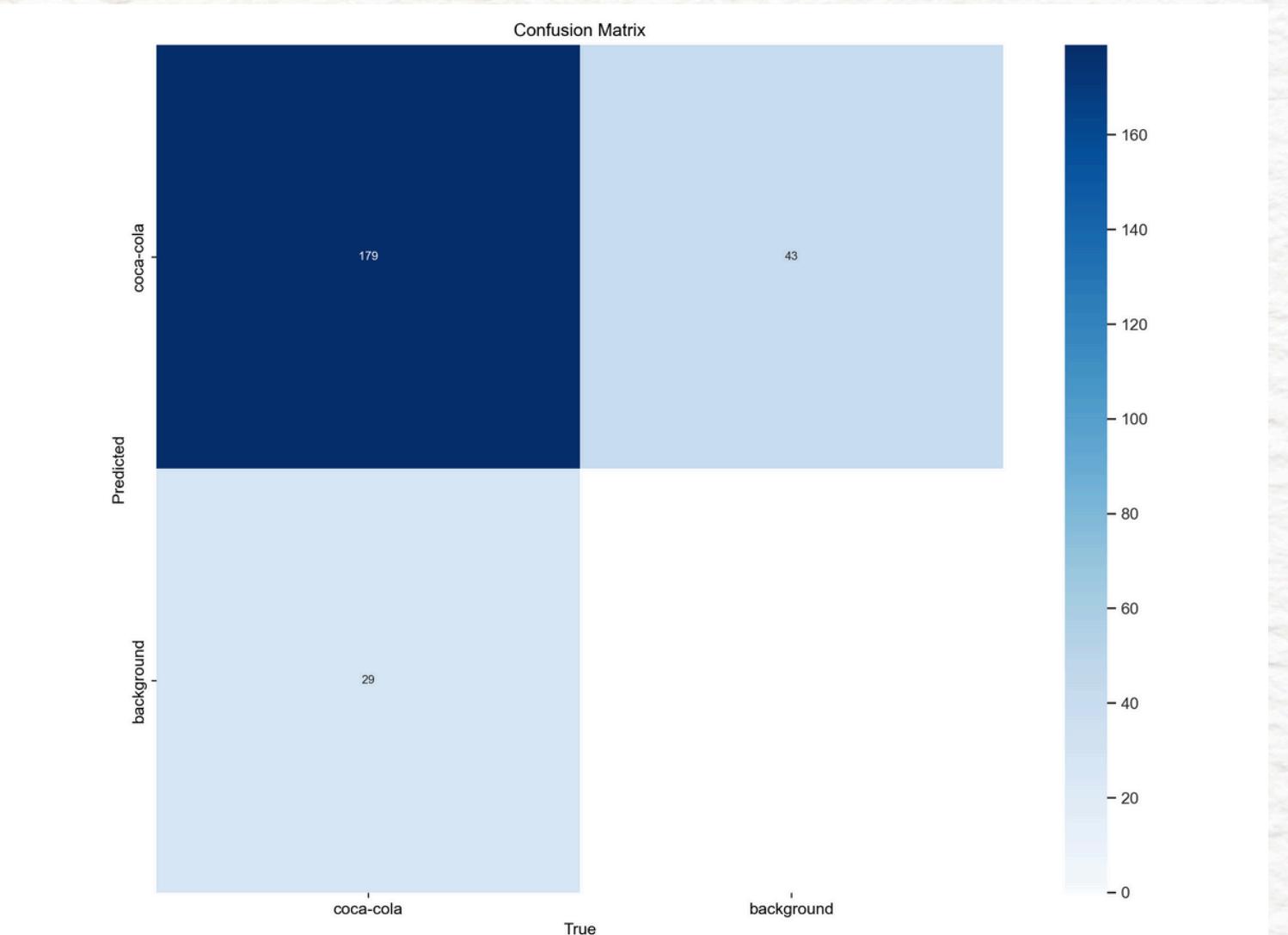
- Confidence in Deployment: Good results on unseen test data indicate the model is reliable for real-world use.
- Performance Tracking: we can compare these metrics across multiple training runs or model configurations to guide iterative improvements.

5.1 performance metrics

5.1.1 Confusion Matrix (Non-Normalized)

From the matrix:

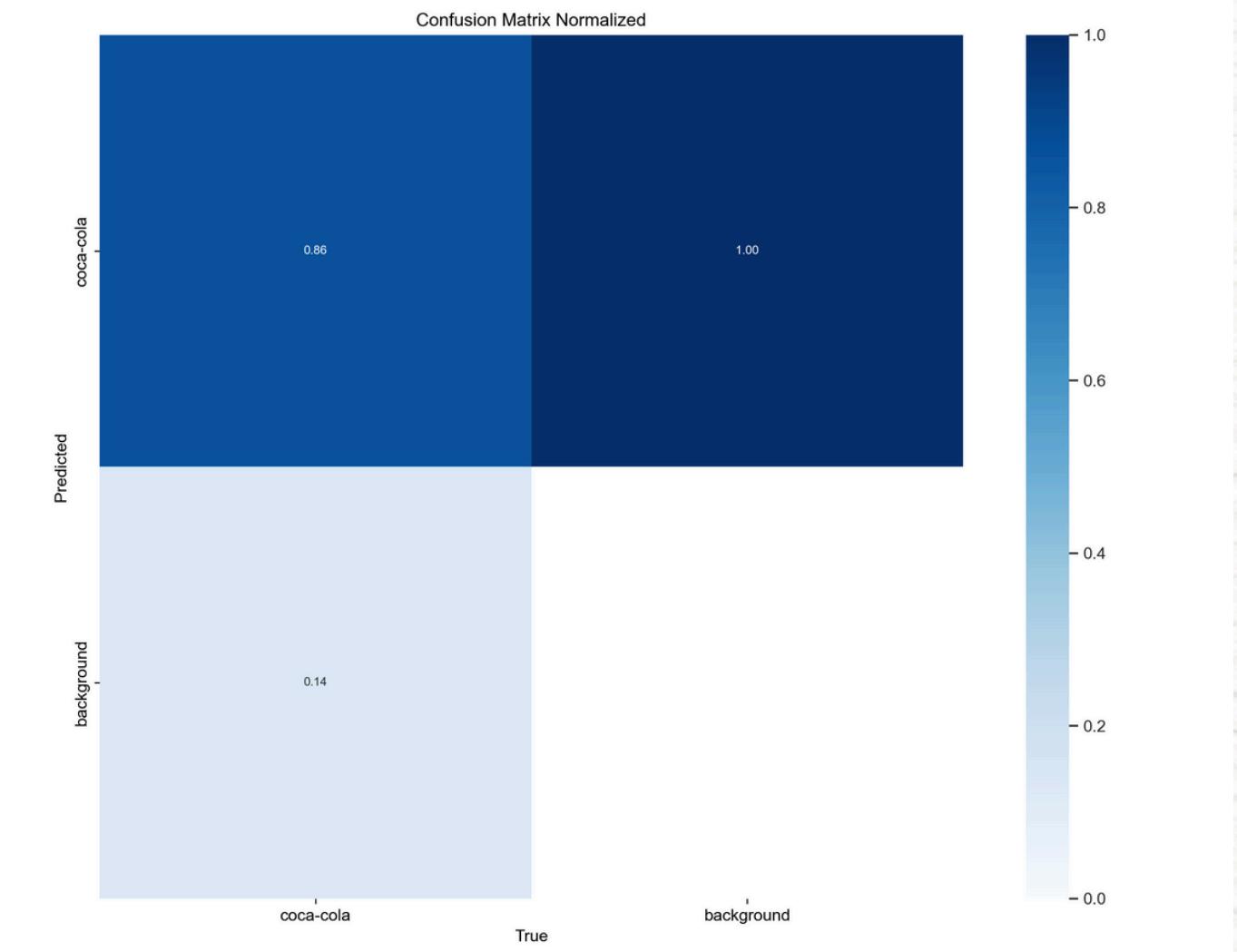
- 119 are correct Coca-Cola detections (TP).
- 43 are background images mislabeled as Coca-Cola (FP).
- 29 are Coca-Cola images missed by the model (FN).
- The bottom-right cell is large enough (not fully shown) to represent correct background predictions (TN).
- the model is catching the majority of Coca-Cola items (**119 vs. 29 missed**).



5.1 performance metrics

5.1.2 Confusion Matrix (Normalized)

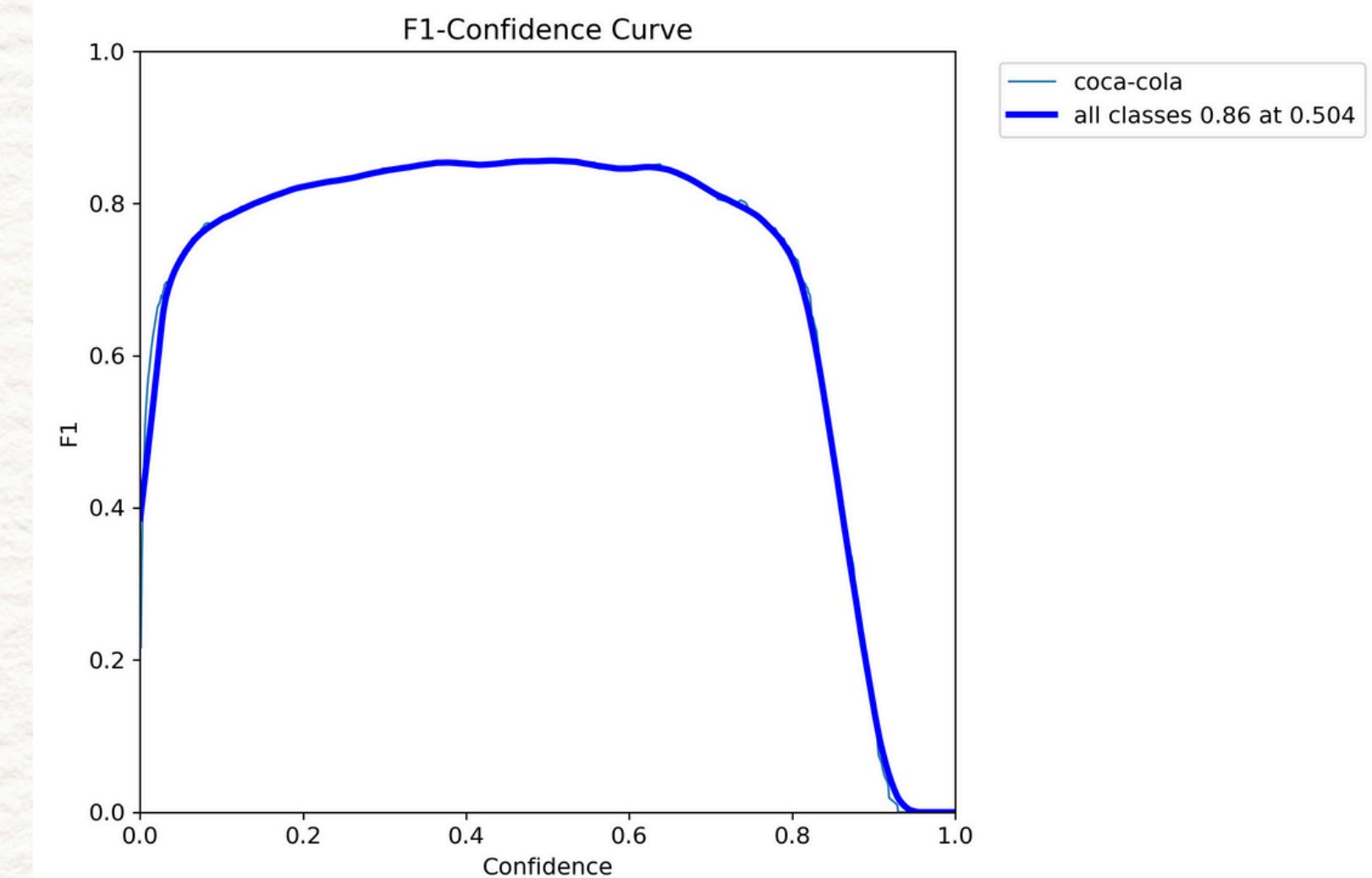
- The normalized confusion matrix highlights the ratio of correct vs. incorrect predictions.
- 86% of actual Coca-Cola instances were correctly identified by the model.
- 14% of Coca-Cola instances were missed, which suggests some false negatives that need improvement.
- The background class has 100% accuracy, indicating strong differentiation from non-object regions.



5.1 performance metrics

5.1.3 F1-Confidence Curve

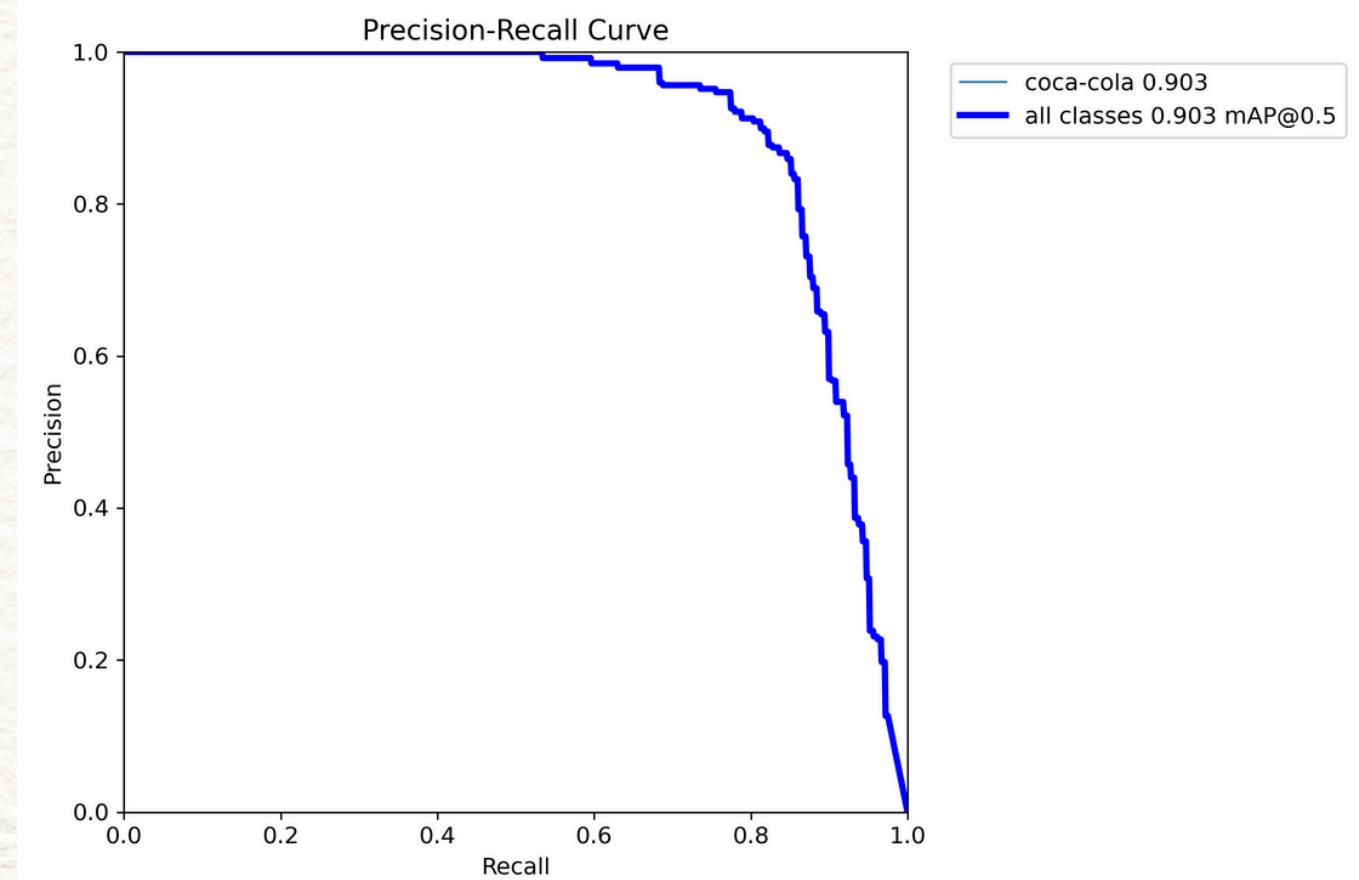
- The optimal confidence threshold for best performance is around 0.5.
- If false positives are a concern, a higher threshold (~0.7-0.8) can be used to improve precision.



5.1 performance metrics

5.1.4 Precision-Recall Curve

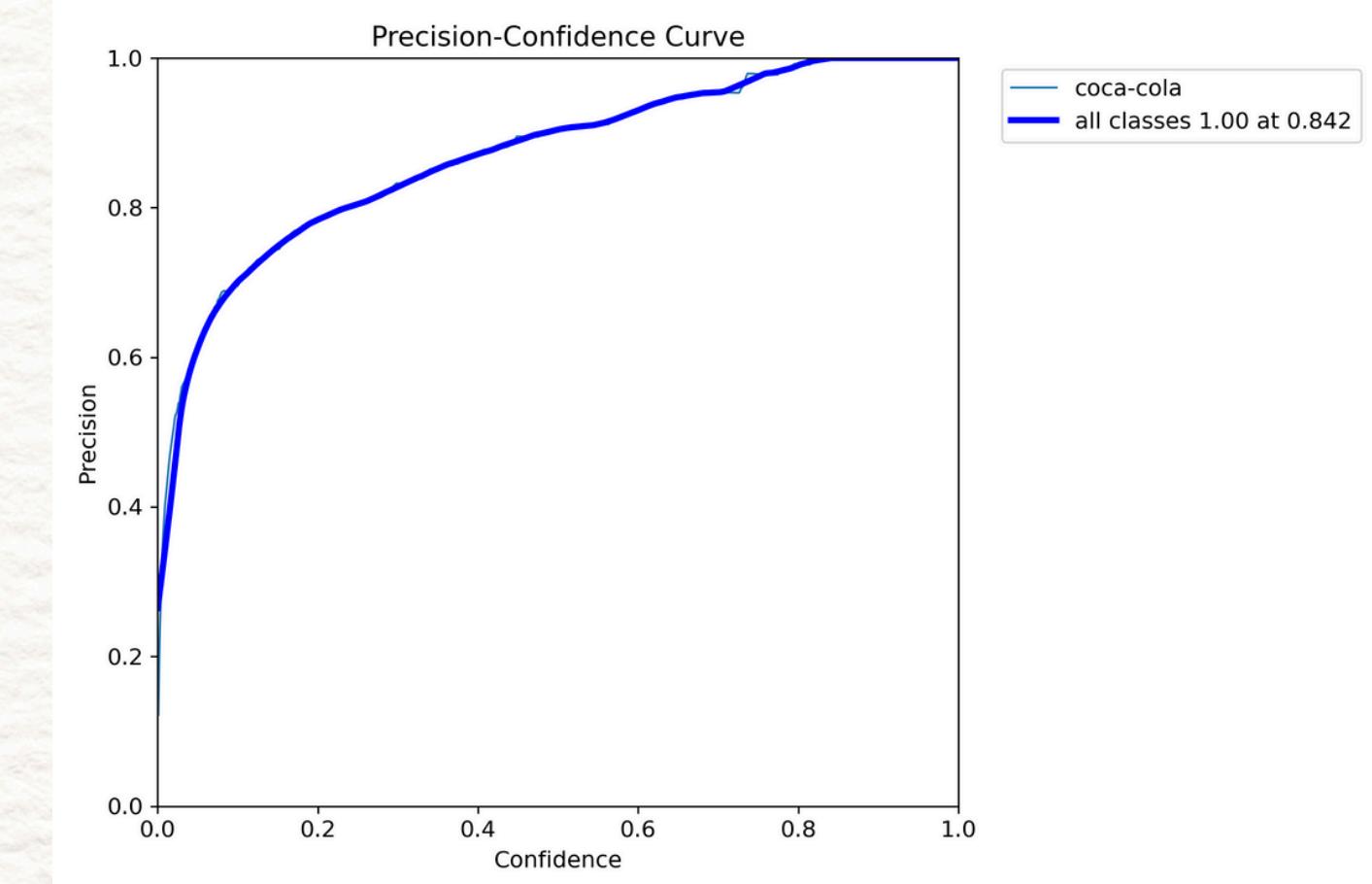
- A high area under the curve (AUC) suggests that the model performs well in differentiating Coca-Cola from the background.
- At the optimal confidence threshold (~0.5), precision and recall balance effectively for real-world deployment.



5.1 performance metrics

5.1.5 Precision-Confidence Curve

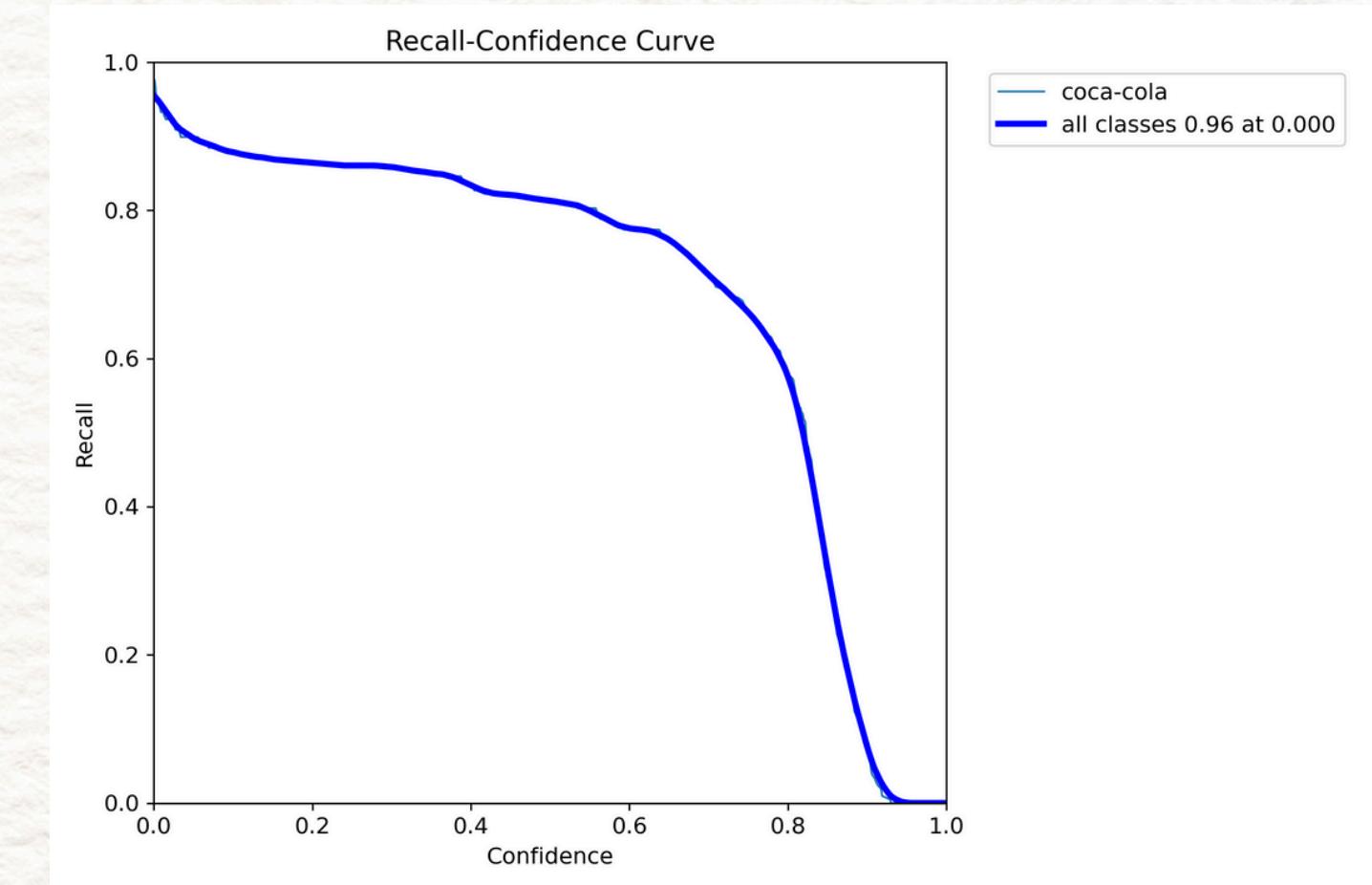
- At confidence 0.84, the model achieves 100% precision, meaning no false positives at that threshold.
- However, recall drops significantly at higher confidence levels, which must be considered for production use.



5.1 performance metrics

5.1.6 Recall-Confidence Curve

- The model reaches a recall of 96% at low confidence thresholds, meaning it captures nearly all true Coca-Cola objects.
- However, at confidence levels above 0.8, recall drops significantly, meaning the model only retains the most certain predictions.



5.The predecture step :

5.1 images

Goal: Leverage your fine-tuned YOLOv8 model to detect Coca-Cola products in new images.



5.The predecture step :

5.2 videos



6.Analysing the result :

- particularly the mAP@0.5:0.95 appears to be at or near 100% which is a **very high metric**.
- the dataset is small, the model may simply be memorizing it. This can lead to near-perfect results on the validation.
- More training samples, or more diverse conditions, can boost recall and precision.
- we can try Larger YOLO Variants yolov8s.pt, yolov8m.pt, or yolov8l.pt might improve accuracy at the cost of higher computation.but with large dataset

ANY QUESTION

THANK YOU