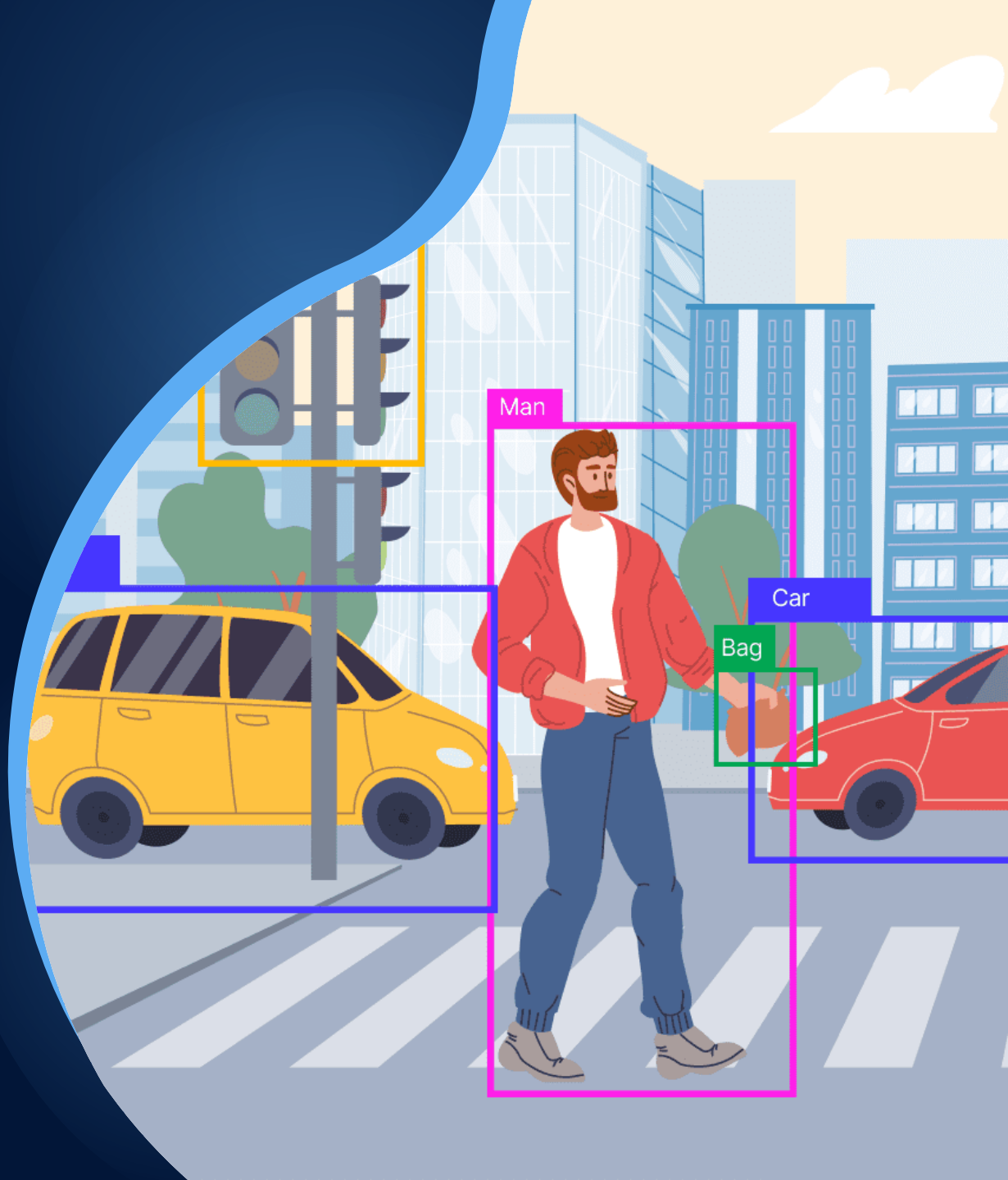


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# Helmet and Number Plate Detection

Using YOLOv8



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# Introduction

## **Project Goal:**

To detect helmets and number plates using the YOLOv8 model.

## **Why YOLOv8?**

YOLO (You Only Look Once) is a state-of-the-art model for real-time object detection, widely known for its speed and accuracy.



# Environment Setup

## System Configuration:

The NVIDIA GPU which is crucial for efficiently running deep learning models like YOLO.

## Example setup:

Tesla T4 GPU on Google Colab.



# Model Overview

## About YOLOv8:

- Developed by Ultralytics, YOLOv8 introduces new features and improvements for enhanced performance, flexibility, and efficiency.
- Supports multiple vision AI tasks: detection, segmentation, pose estimation, tracking, and classification.



### Why Ultralytics?

**Mission:** Simplifying AI model development and deployment.

**Versatility:** YOLOv8's adaptability across various applications and domains.



### ➔ Why Use Roboflow?

**Dataset Management:** Streamline the process of organizing, labeling, and versioning datasets.

**Preprocessing:** Automatically handle tasks like resizing, augmentation, and format conversion.

**Seamless YOLOv8 Integration:** Easily export datasets in YOLOv8 format for quick model training.

**How It's Used in This Project:** API integration to fetch and download the dataset.

# Roboflow Integration

## What is Roboflow?

Roboflow is a powerful tool for managing computer vision datasets, training models, and deploying projects.

It simplifies the workflow by providing an interface for labeling, preprocessing, and exporting datasets compatible with various models.





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# Implementation Details

## Key Points:

### Basic commands:

"Here, we load the YOLOv8 nano model and perform predictions on sample images."

Emphasize dataset integration with Roboflow.

### Training setup:

"We trained the model with 25 epochs and image size of 640x640 for optimal accuracy."

# Model Evaluation and Results

## Performance Metrics:

**F1 Score Curve:** Shows confidence vs. F1 score.

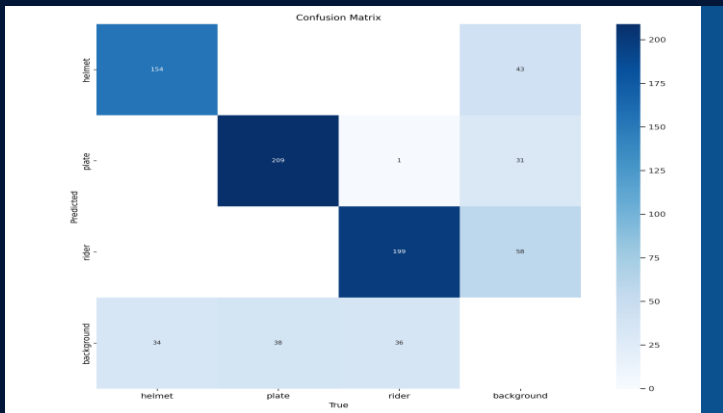
**PR Curve:** Precision-recall performance.

**Recall Curve:** Sensitivity of the model across classes.

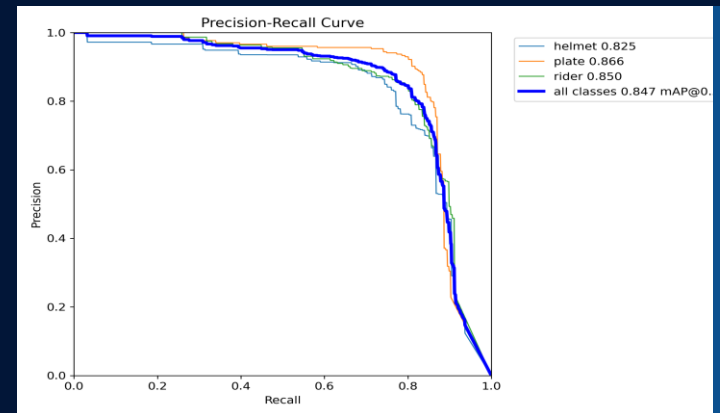
**Confusion Matrix:** Visualization of classification performance (e.g., correct vs. misclassified predictions).

**Sample Predictions:** Visualization of predictions on test images.

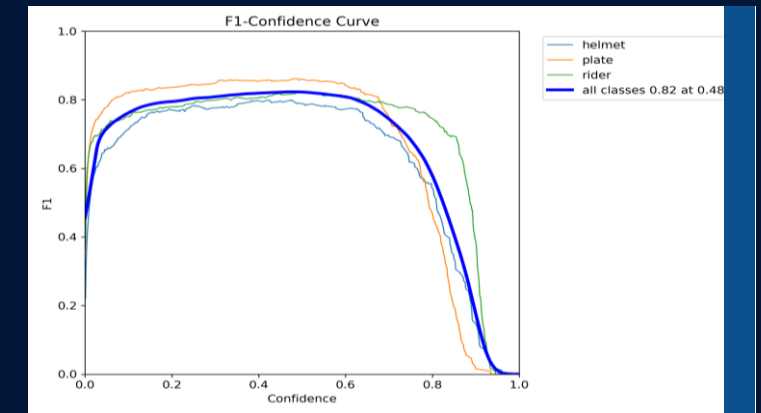
## ➔ Confusion Matrix



## ➔ PR Curve



## ➔ F1 Score Curve



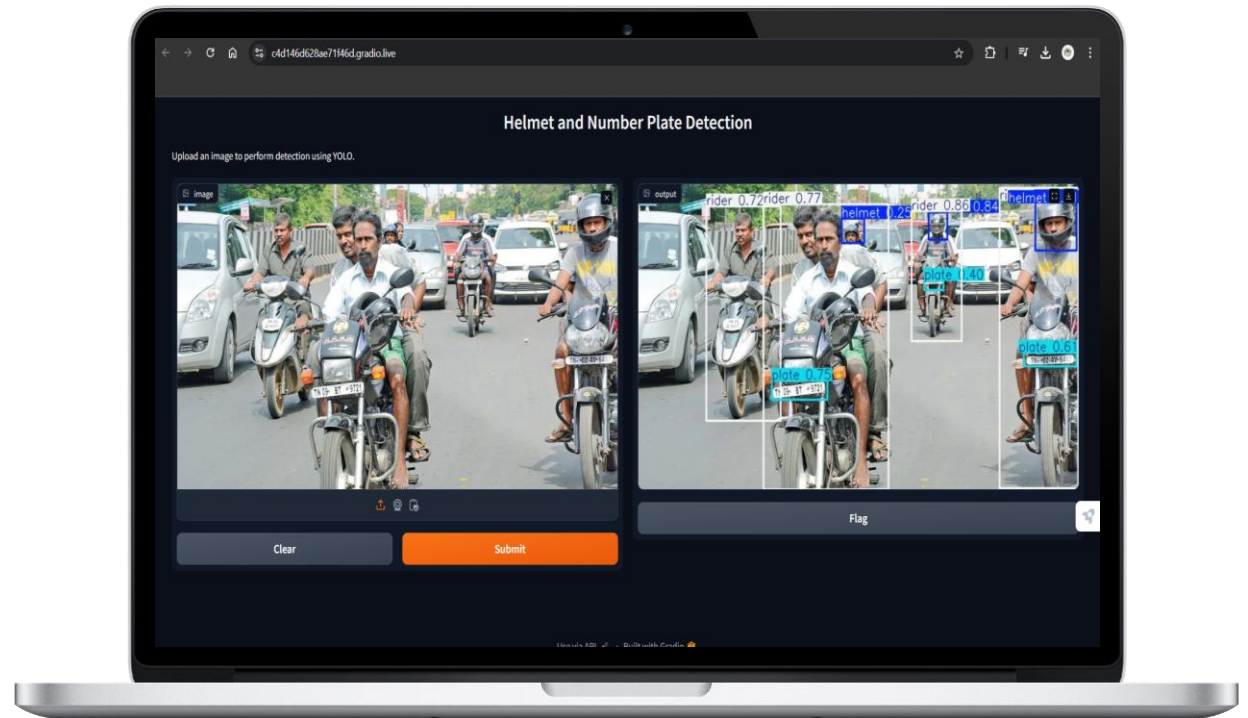
# Gradio Interface Setup

## Objective:

Create a user-friendly interface for uploading images and receiving predictions.

## How it Works:

Users upload images via the interface. YOLOv8 processes the images, and results are displayed instantly.







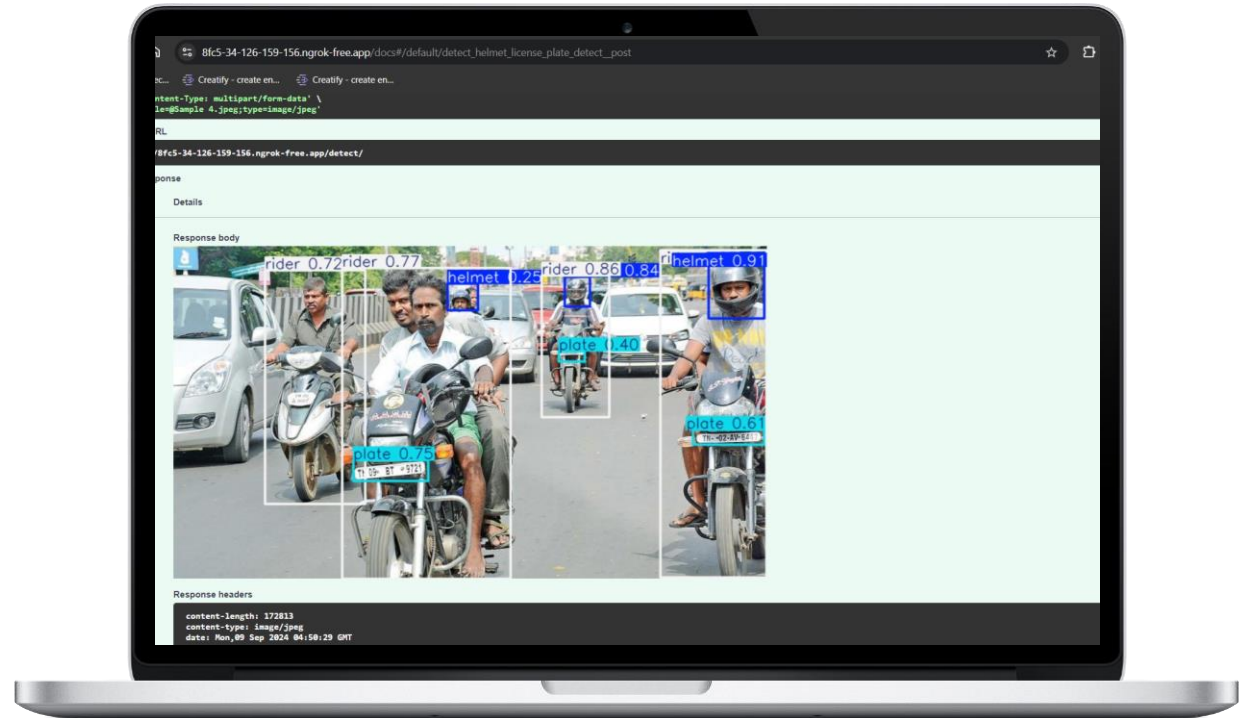
# Fast Api Interface Setup

## Objective:

Create a user-friendly interface for uploading images and receiving predictions.

## How it Works:

Users upload images via the interface. YOLOv8 processes the images, and results are displayed instantly.



# Key Insights and Conclusion

Overall, YOLOv8 provided reliable detection of helmets and number plates with strong accuracy. The integration with Gradio and Roboflow made the process smooth and user-friendly. This solution could be integrated into real-world systems for road safety, automated monitoring, and compliance enforcement.

## Model Performance:

The model provides accurate detection of helmets and number plates, with detailed visualizations to evaluate its performance.

## Ease of Use:

With Gradio, the project becomes accessible to non-technical users, offering real-time interaction with the detection model.



# Thanks

— Jazak Allah Khair