

REPORT

Introduction:

This project aims to develop an object detection system capable of accurately identifying persons and personal protective equipment (PPE) within images. The primary objectives are:

- To convert annotations from PascalVOC format to YOLOv8 format for efficient model training.
- To train a YOLOv8 model to detect persons within images.
- To train a YOLOv8 model to detect PPE items on cropped person images.

Dataset Description

Dataset Size:

- Total number of images: 416
- Number of images with annotations: 416

Image Resolution:

- Image dimensions: 640 X 640 pixels

Data Split:

- Training set: 80% of images
 - Validation set: 10% of images
 - Test set: 10% of images
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Methodology

Annotation Conversion

PascalVOC annotations were converted to YOLOv8 format using a Python script. The conversion involved mapping bounding box coordinates and class labels to the YOLOv8 format.

Image Cropping

For PPE detection, images containing persons were cropped based on the person bounding boxes generated by the person detection model. These cropped images were then used to train the PPE detection model.

Training

Both models were trained using the Adam optimizer with a learning rate of 0.001. The models were trained for 100 epochs with a batch size of 16.

Inference

The inference pipeline involved the following steps:

1. Load the pre-trained person detection model.
2. Detects persons in the input image.
3. Crop person regions from the image.
4. Load the pre-trained PPE detection model.
5. Detect PPE items in the cropped person images.
6. Map PPE detections back to the original image coordinates.
7. Draw bounding boxes and labels on the original image.

Model Performance

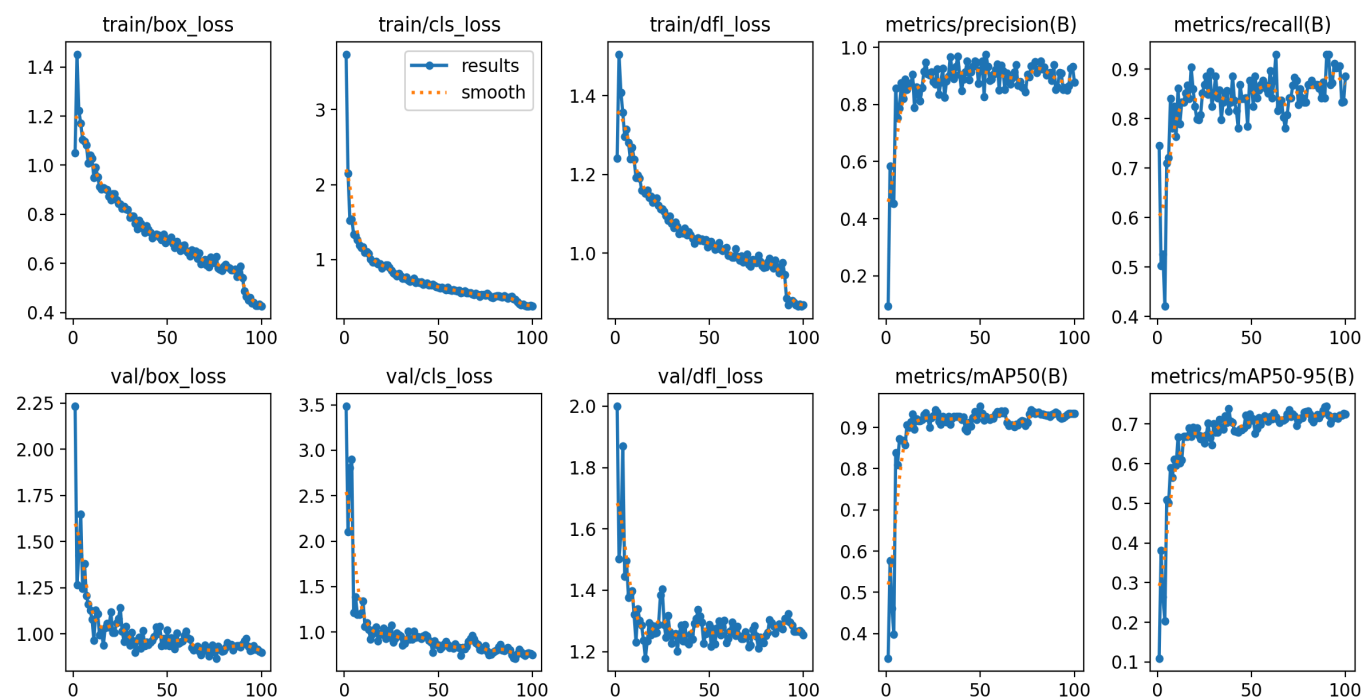
Person Detection

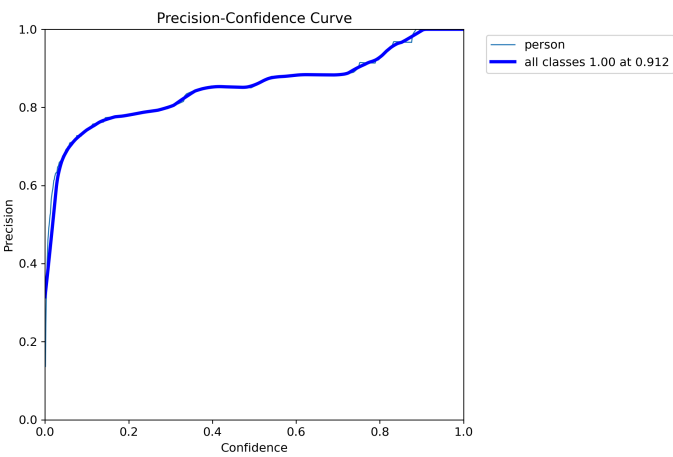
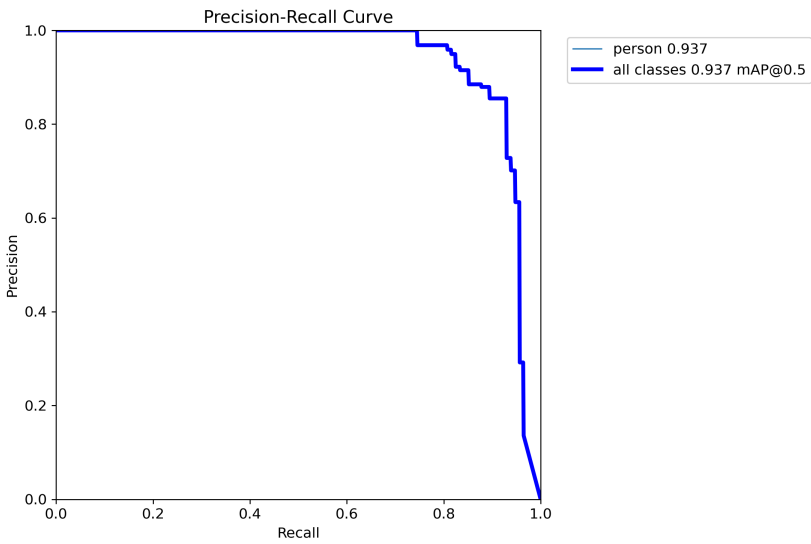
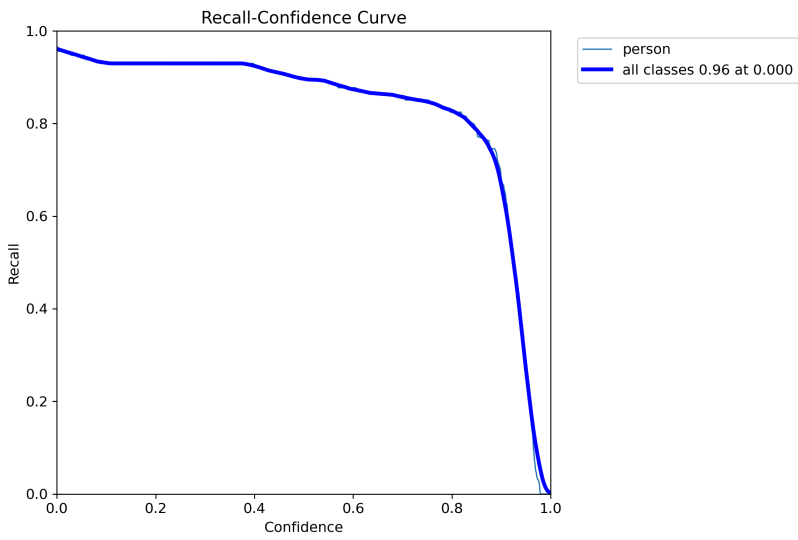
- **Precision:** 0.9
- **Recall:** 0.86
- **F1-score:** 0.89 at 0.388 confidence
- **mAP:** 0.92

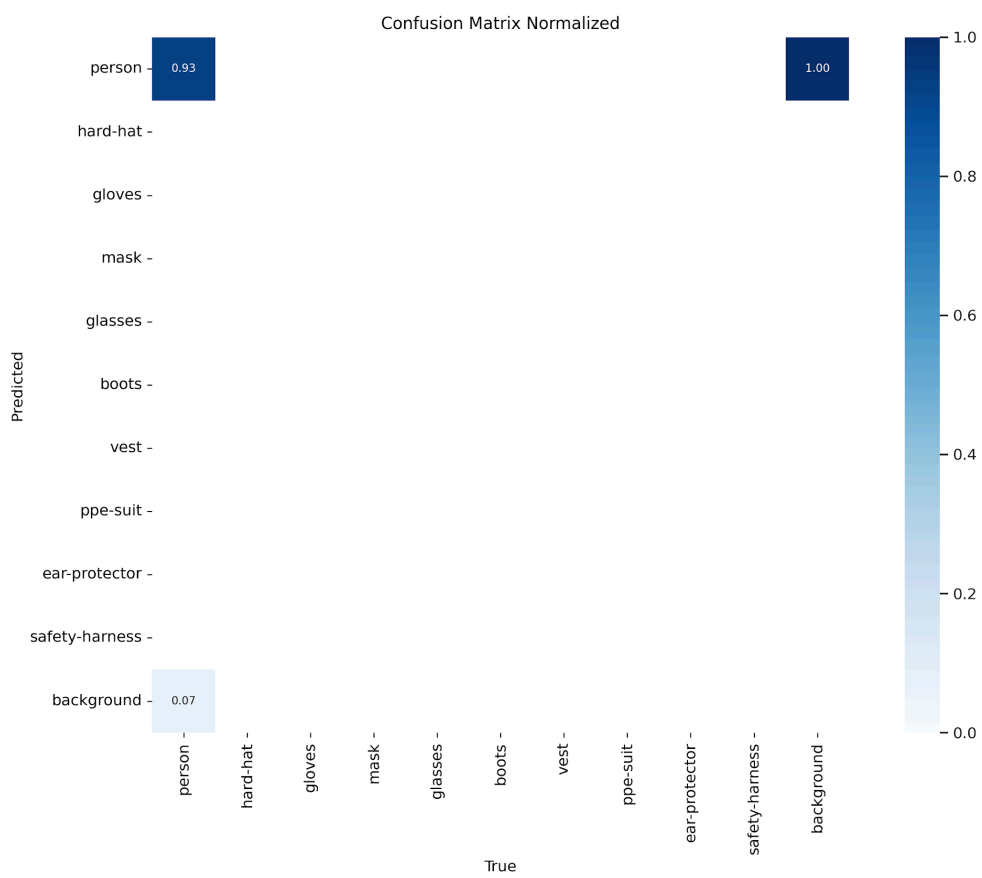
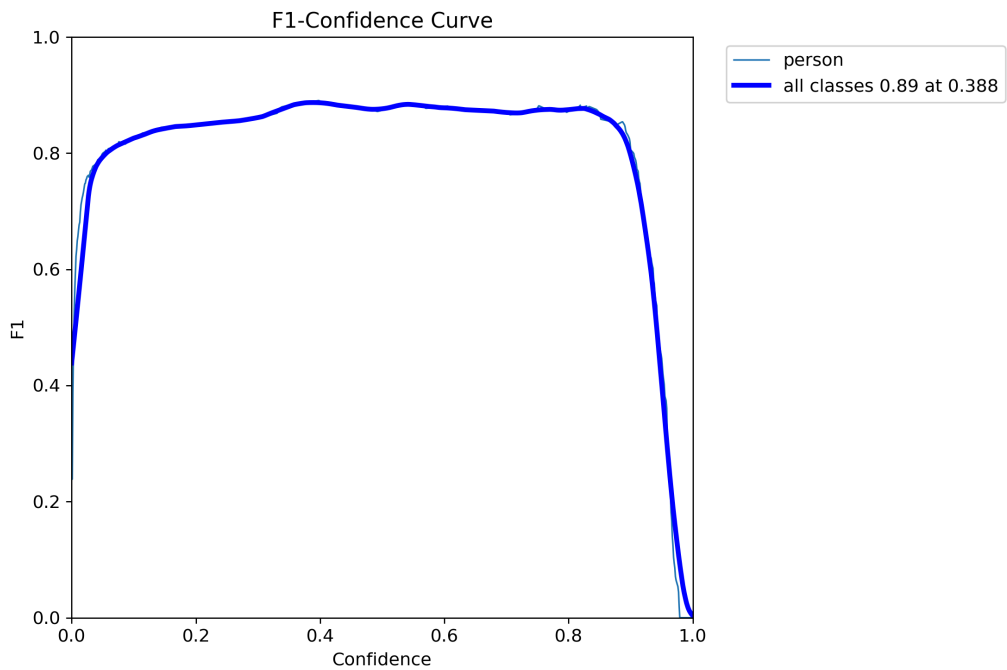
PPE Detection

- **Precision:** 0.8
- **Recall:** 0.53
- **F1-score:** 0.57 at 0.418 confidence
- **mAP:** 0.59

Graphs of person_detection_model:







The person detection model results are attached in the below link of d1 folder.

The ppe detection model results are attached in the below link of d2 folder.

<https://drive.google.com/drive/folders/1o6d9fgZO6xSo4qmGZSWNMUNIXfo5OleT?usp=sharing>

Below is the colab link where model is trained,

<https://colab.research.google.com/drive/1SL4JI4TqgHqwBuSFPoL0vgUQTc6QR7OZ?usp=sharing>