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# Computer Vision Pipeline: Vehicle and Pedestrian Segmentation & Tracking

## Objective

The objective of this project is to build an end-to-end computer vision pipeline that performs segmentation and tracking of vehicles and pedestrians. The focus is on demonstrating the workflow using modern tools rather than achieving state-of-the-art accuracy.

## Dataset

A custom dataset of approximately 100 images was collected and annotated using Labellerr. The annotations provided pixel-wise segmentation masks for vehicles and pedestrians, which were then used to train the segmentation model.

## Methodology

1. Annotation: Labellerr was used to generate high-quality segmentation masks for the dataset.  
2. Segmentation Model: YOLOv8-seg was employed for training on the annotated dataset. The model was fine-tuned to detect and segment vehicles and pedestrians.  
3. Tracking: ByteTrack was integrated with the segmentation output to enable multi-object tracking across video frames.

## Key Results & Observations

The pipeline successfully segmented vehicles and pedestrians and tracked their movement across frames. Although the dataset size was limited, the system demonstrated the feasibility of combining annotation tools, segmentation models, and tracking algorithms into a unified workflow.

## Conclusion & Future Work

This project highlights the potential of an end-to-end segmentation and tracking pipeline. Future improvements could include:  
- Expanding the dataset size for better model generalization.  
- Experimenting with advanced segmentation models.  
- Optimizing tracking for crowded or occluded scenarios.