

# Step-by-Step Guide for the Assignment

This guide explains exactly what we need to do to complete the AI Software Engineer Internship Assignment. It covers all steps from data collection to final deliverables. Follow the workflow step by step to finish the project successfully.

## Step 1: Collect Data

- Search and download 150–200 images that contain vehicles and pedestrians from permissible sources.
- Make sure to include challenging images (crowded streets, occlusions, different lighting).
- Record all image sources in a `sources.md` file with proper license notes.

## Step 2: Annotate Data on Labellerr

- Create a new project in Labellerr (via UI or SDK).
- Manually annotate ~100 images using polygon masks for vehicles and pedestrians.
- Export the annotations in YOLO format for training.

## Step 3: Split Dataset

- Divide your dataset into three parts: Train (~70%), Validation (~20%), and Test (~ 10%).
- Ensure test set has  $\leq 50$  images and is completely unseen during training.

## Step 4: Train YOLO-Seg Model

- Use Ultralytics YOLOv8-seg on Google Colab with GPU.
- Train the model for around 100 epochs with the annotated training data.
- Track metrics such as mAP and IoU during training.
- Fix at least two issues (e.g., incorrect annotations, data imbalance, or training errors).

## Step 5: Test the Model

- Run inference on your test images and save the predictions.
- Evaluate results with metrics like IoU, confusion matrix, and PR curve.

## Step 6: Review with Labellerr

- Create a separate test project on Labellerr.
- Upload your model's predictions as pre-annotations via the SDK.
- Check the predictions visually in the Labellerr UI and verify accuracy.

## **Step 7: Implement Video Tracking**

- Build a small web app that lets you upload a video.
- Run YOLO-Seg + ByteTrack on the video to detect and track objects.
- Export the tracking output as results.json with IDs, class, bounding box, and frame number.
- Make the UI simple and user-friendly.

## **Step 8: Prepare Deliverables**

- Push your code, configs, and README to GitHub and submit a PR to the Labellerr Campus Hiring repo.
- Host a live demo link of your video tracking app.
- Write a PDF report that includes: dataset details, annotation process, model training, evaluation, debugging, video tracking results, and a summary.

By following these steps carefully, we can complete the full workflow required for the assignment, demonstrating our ability to handle data collection, annotation, model training, debugging, and deployment.