APPLICATION TO VEHICLE (Car) COUNTING

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Introduction

- **Context:** Video data is vital for traffic analysis, relying on temporal continuity.
- **Problem:** Occlusions and high density often cause double-counting or missed targets.
- **Solution:** Applying **ByteTrack (MOT)** to maintain consistent IDs for accurate counting.

Target

- **Research:** Evaluate MOT logic within a scientific methodology framework.
- **Development:** Implement a robust pipeline handling low-confidence detections.
- **Validation:** Ensure high accuracy and stability in complex traffic scenarios.

Overview

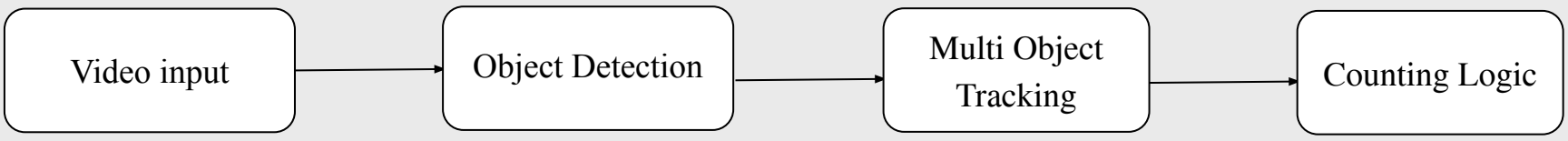

Fig1: system Architecture

SYSTEM PIPELINE

- **Detection:** Identify vehicle bounding boxes.
- **Tracking:** Assign persistent IDs across frames.
- **Counting:** Increment (+1) when an ID crosses the virtual boundary.

EXPECTED RESULTS

- **Stability:** Significant reduction in ID switches during occlusions.
- **Precision:** Improved counting accuracy in high-density traffic.
- **Contribution:** A validated MOT-based framework for intelligent traffic monitoring.

Description

1. Vehicle Detection

- A deep learning–based object detector is used to detect vehicles in each video frame.
- Detection provides bounding boxes and confidence scores for vehicle candidates.
- Detection results are treated as input for the tracking stage, not as final counting results.

2. Vehicle -Track Extraction

- Multi-object tracking is performed to associate detected vehicles across consecutive frames.
- ByteTrack is applied to link detections by using both high-confidence and low-confidence bounding boxes.
- This strategy helps maintain consistent vehicle identities under occlusion and crowded traffic scenes.
- As a result, each vehicle is represented as a continuous trajectory over time.

3. Vehicle Counting

- A virtual line is defined in the video scene.
- When a tracked vehicle with a unique ID crosses the line, a counting event is triggered.
- Each vehicle is counted once based on its trajectory, reducing double counting and missed vehicles.

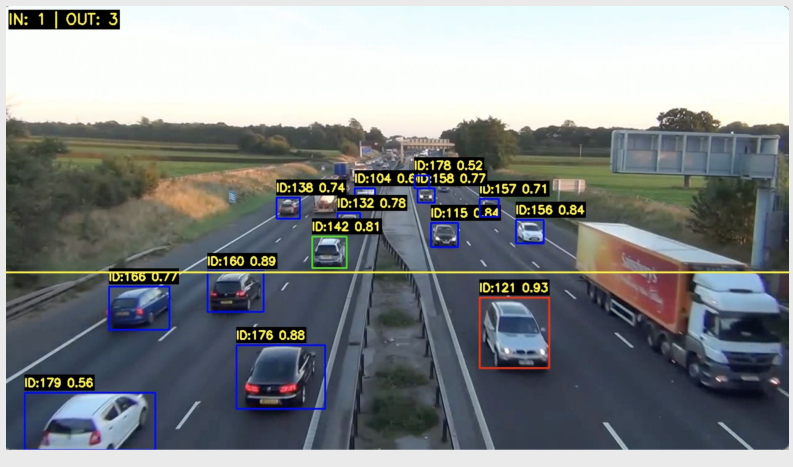

Figure 1. Vehicle Counting Output

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