

A Bike Parking Management System

Based on Object Detection and Tracking

ISDN 6830B Course Project | LIANG, Yuchen Eric

Bike parking on campus



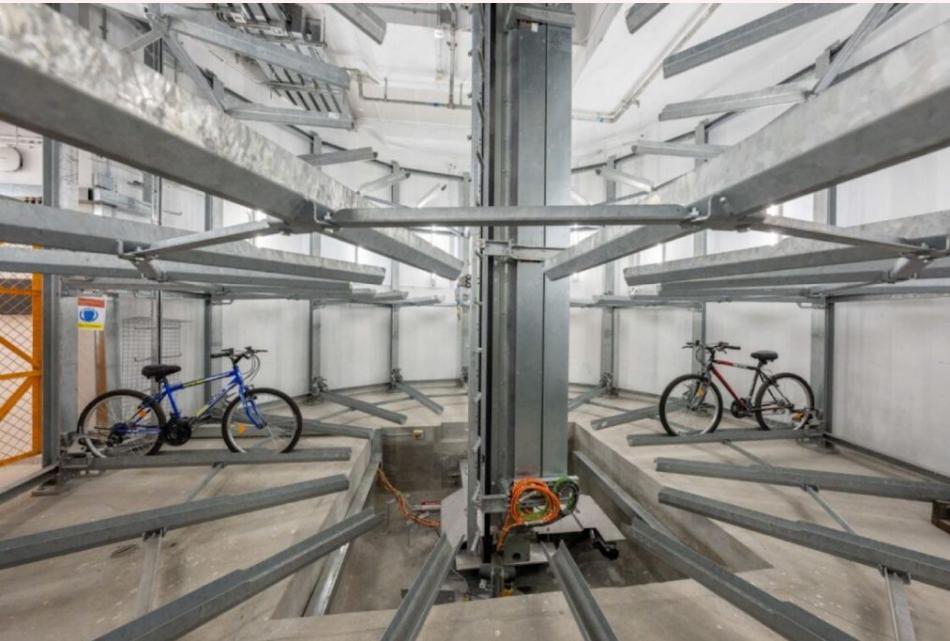
HKUST Bike Parking Facilities

A review on bike parking



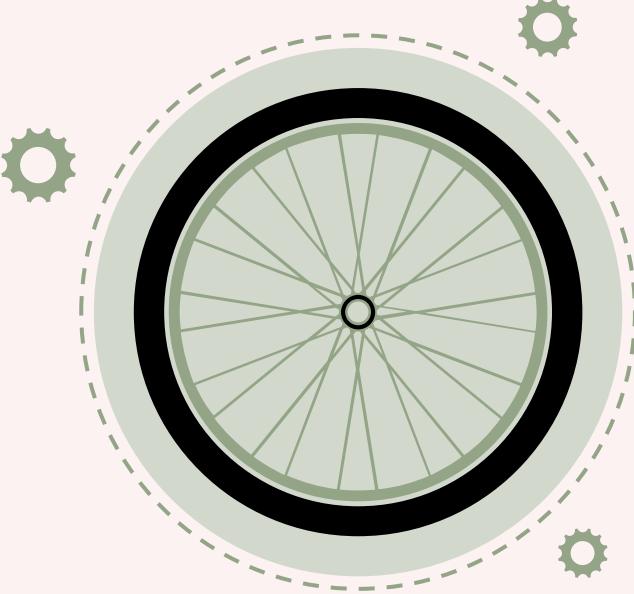
Hong Kong Public Bike Parking Facilities

A review on bike parking



Kai Tak AIRSIDE Shopping Mall Bike Parking Facilities

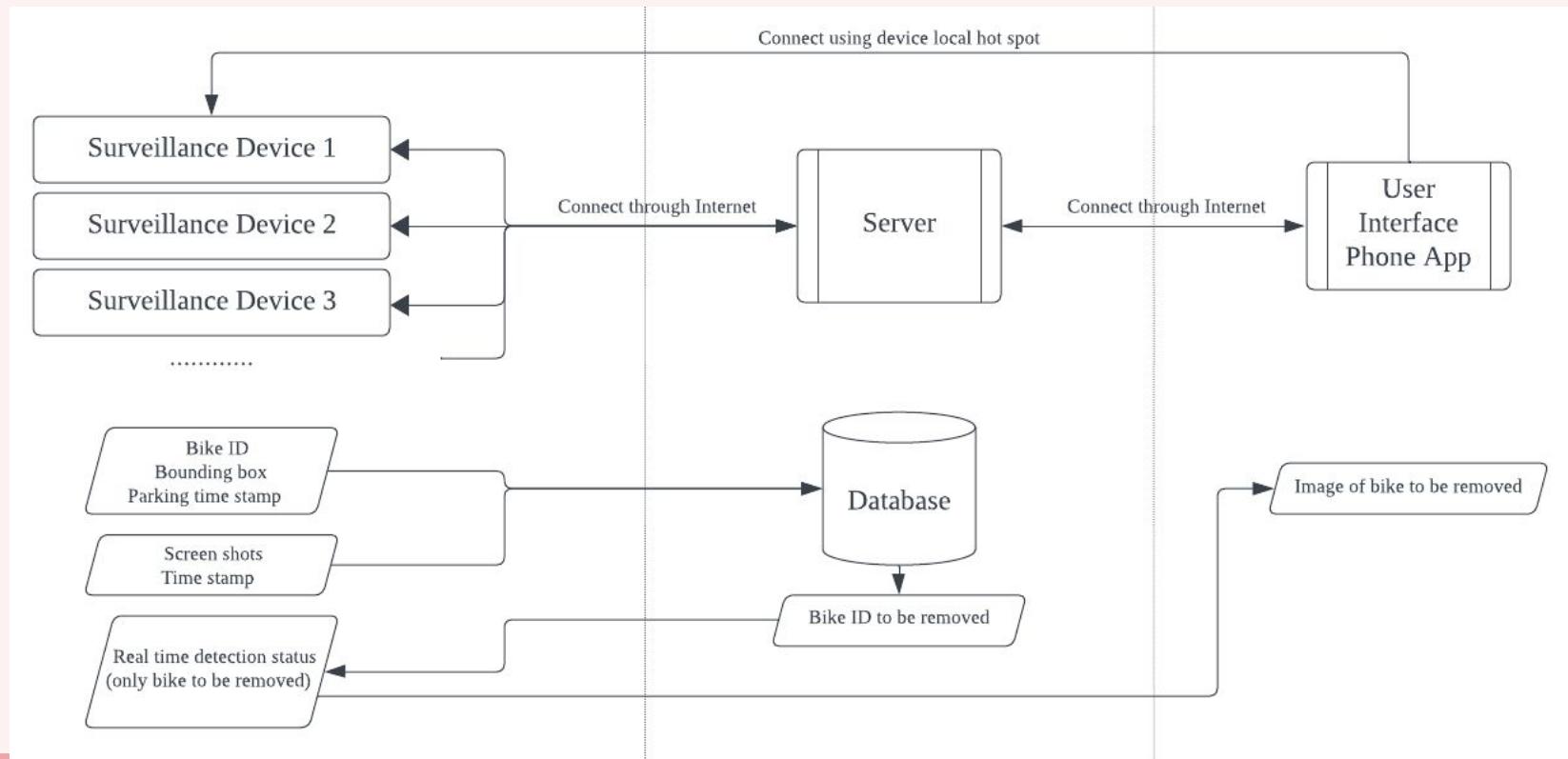




Problem Definition

- How Might We make the public bike parking lot clean and tidy without abandoned bike
- How Might We distinguish new bikes and old bikes in a parking lot
- How Might We make bike parking lot management easier and cheap

The system



Implementation & Design

Consideration

Data Collection

The system used a Raspberry Pi and camera to collect data from the HKUST bike parking lot. Data on website is also used

Model Training

The project utilized the YOLOv8 object detection model to accurately identify and classify bikes in the parking lot.

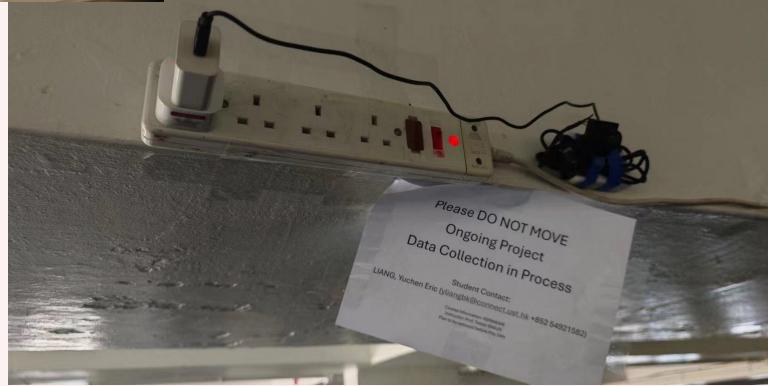
SORT Algorithm

The SORT algorithm was implemented for object tracking to enhance the robustness of the bike detection.

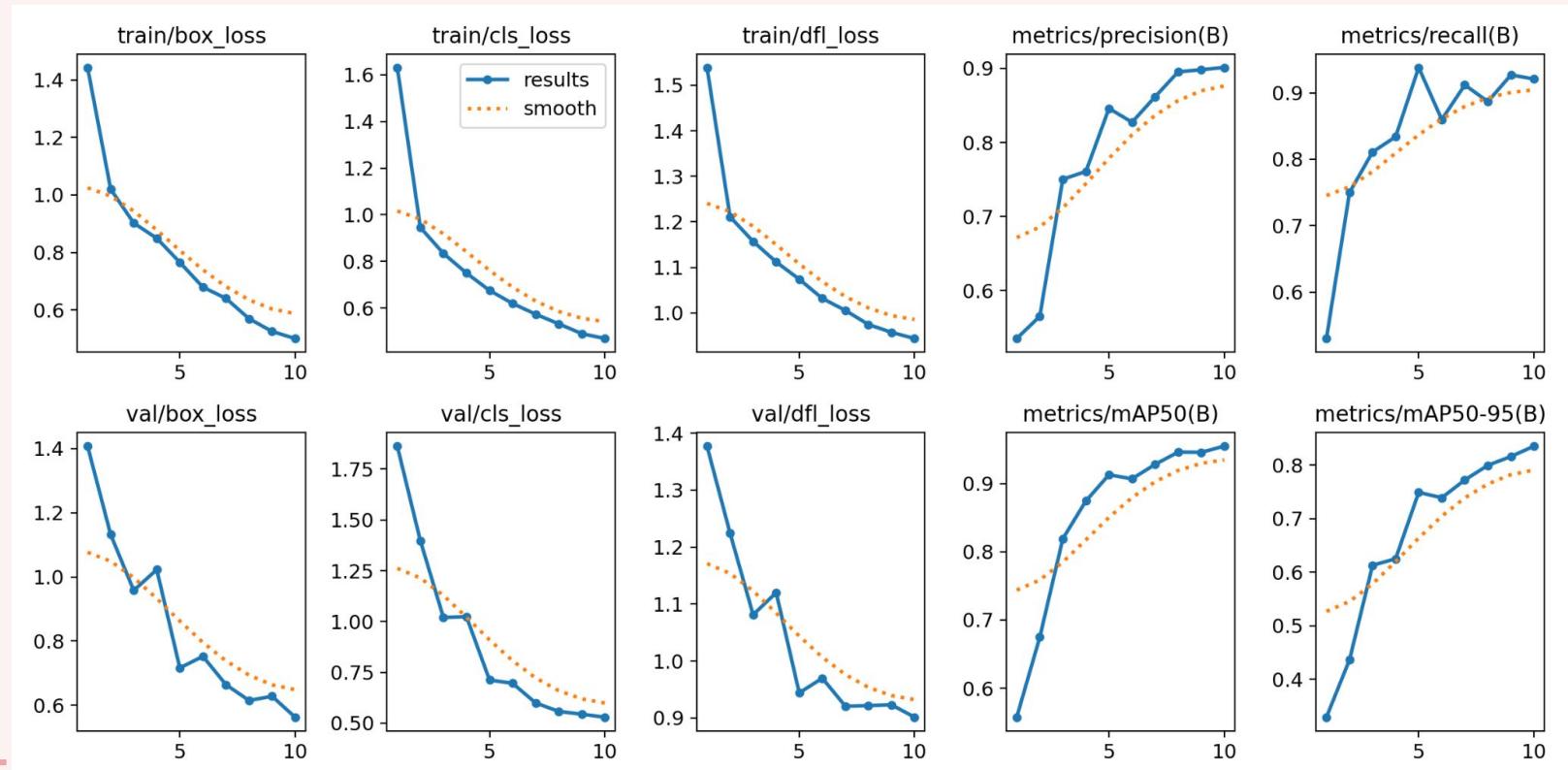
2.5D bounding box

Fake AR implementation to make identifying bikes easier using vanishing point.

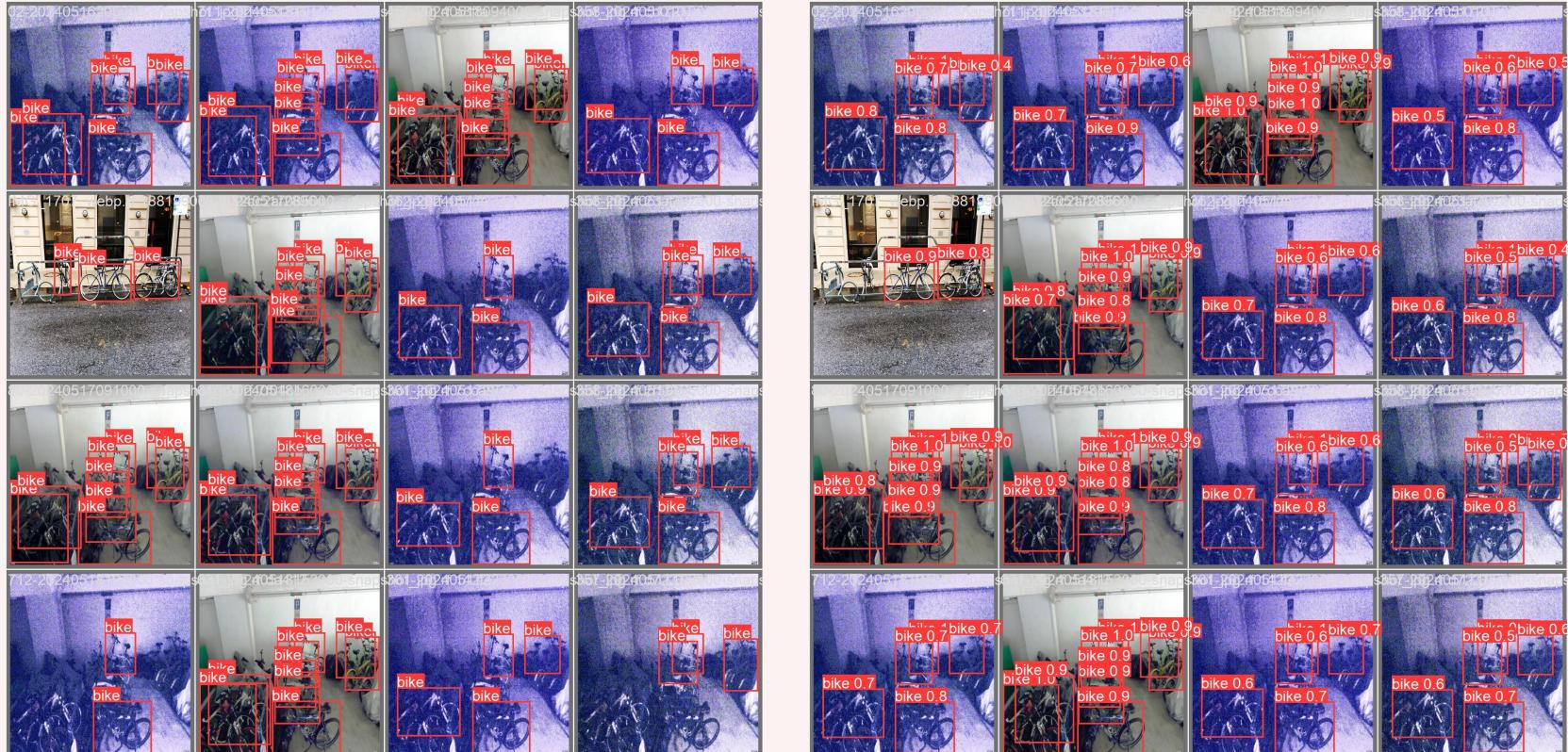
Data Collection



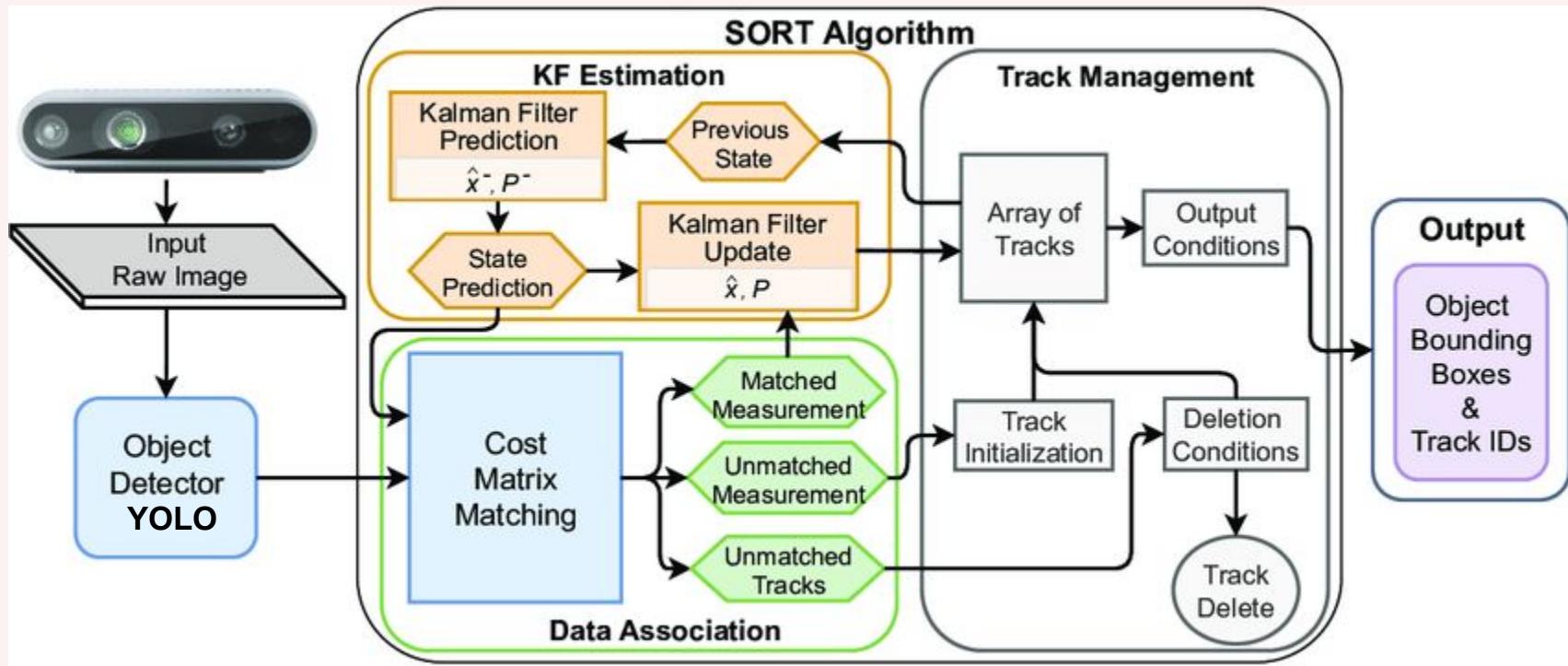
Model Training



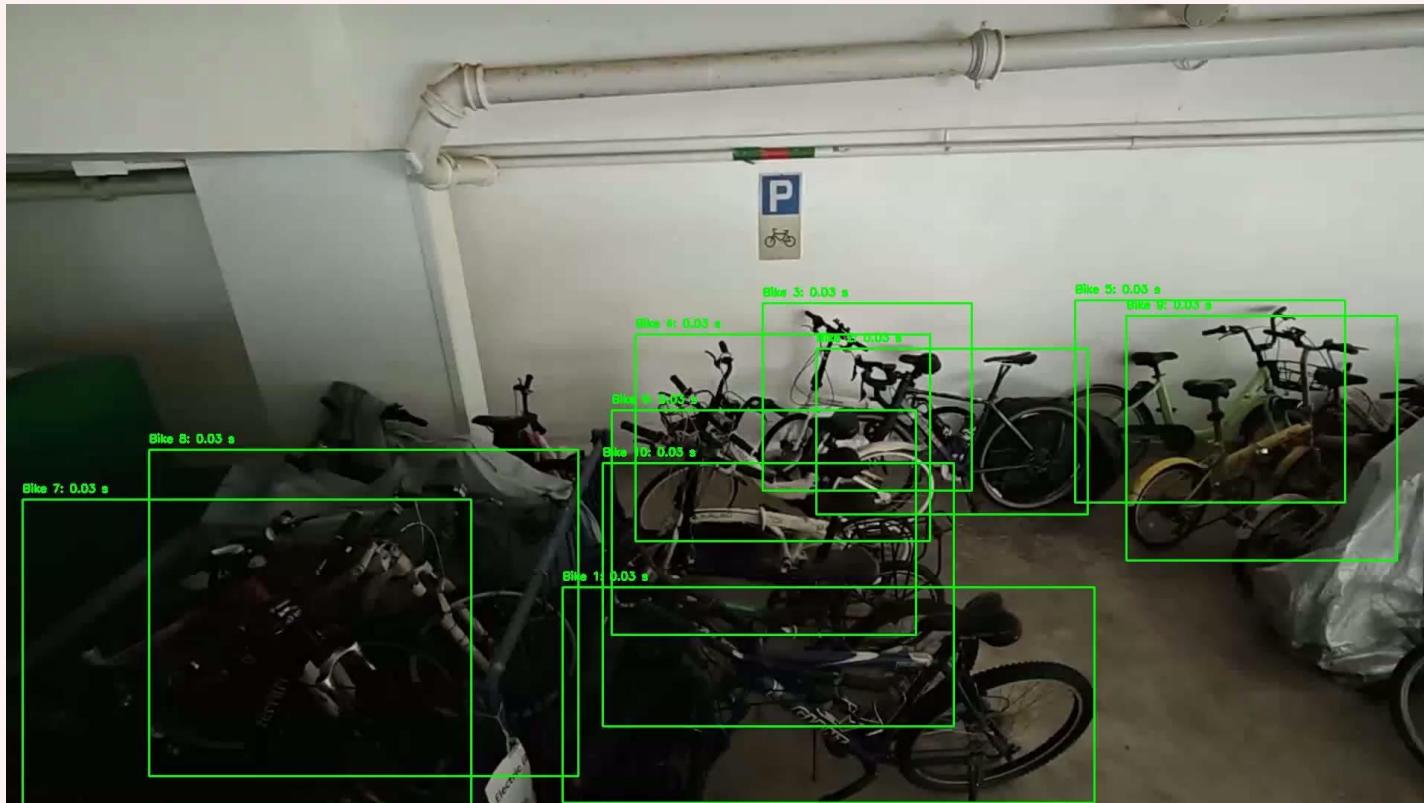
Model Training



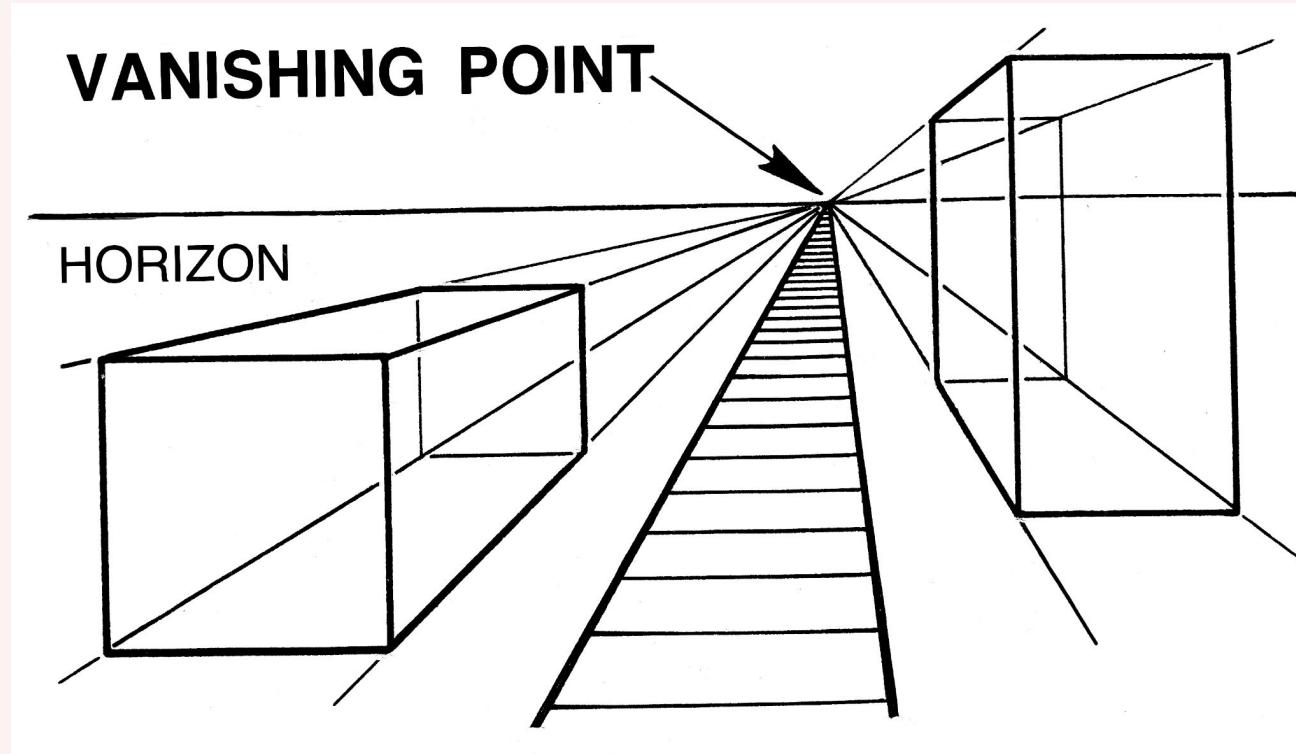
Simple Online and Realtime Tracking (SORT)



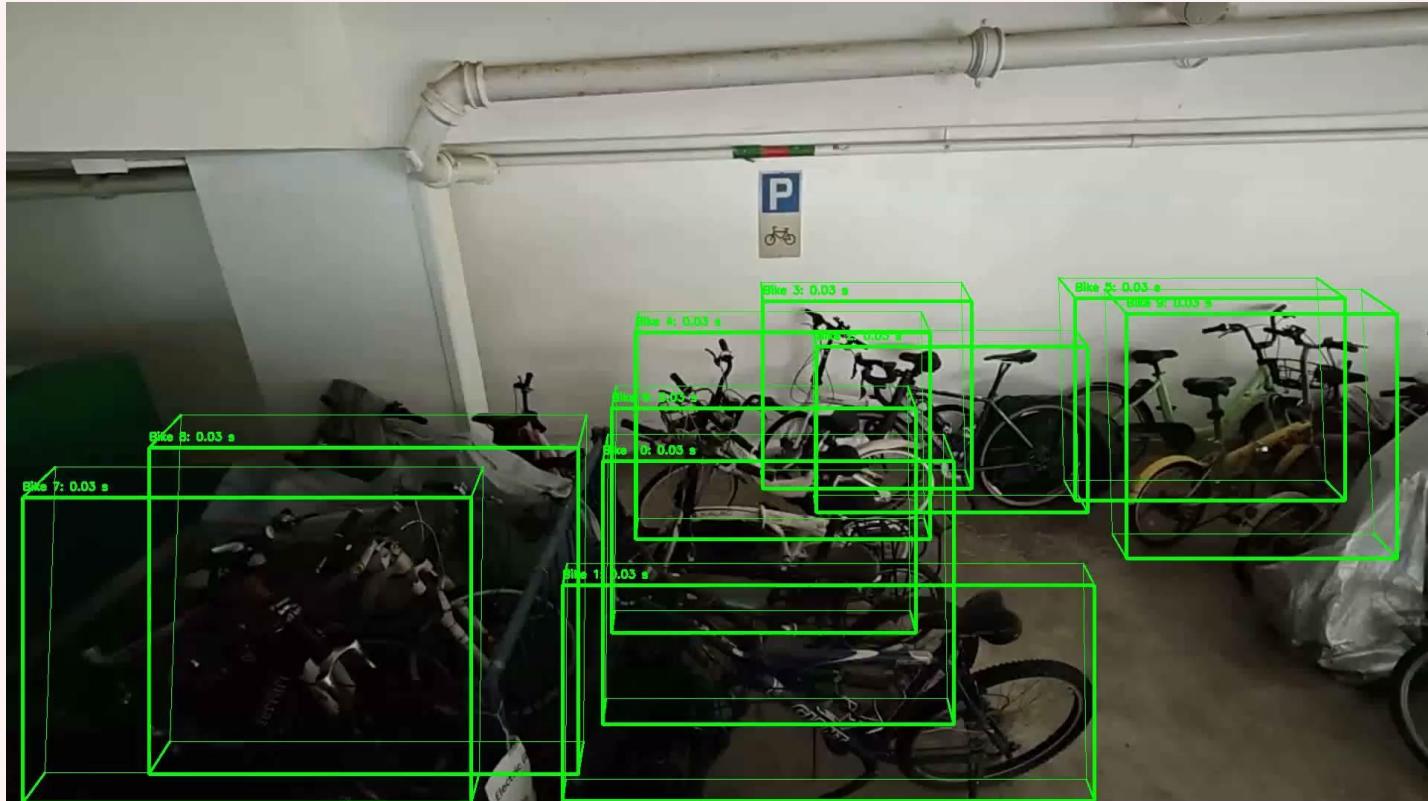
Simple Online and Realtime Tracking (SORT)



2.5D bounding box



2.5D bounding box

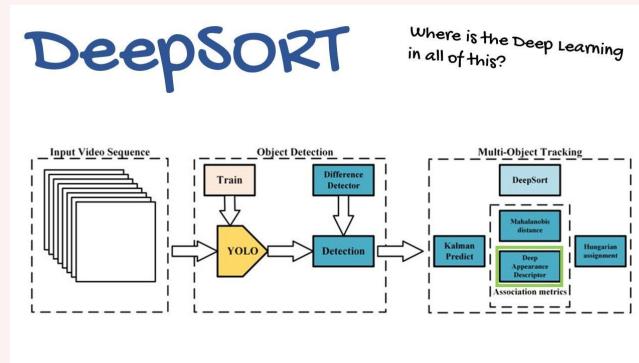
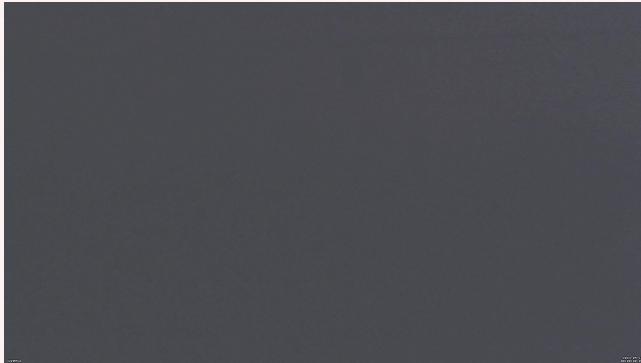


Optimize for user workflow



- A. Wait for the system to send him a bike removal message on the phone app.
- B. Received the removal message but decided to wait for more.
- C. Received several messages and decided to arrange a removal.
- D. Check the app for how many bikes need to be removed to arrange the necessary logistics.
- E. Check the app for the screenshot to look at the current situation of the parking lot.
- F. Arrived at the parking lot and connect the phone app to the surveillance device and start the removal procedure,
- G. The phone app will guide the manager to remove the bikes one by one by showing one bounding box one time on the phone app.
- H. Finish the removal and go back to step A.

Discussion and Future Work



Thanks!

Do you have any questions?

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