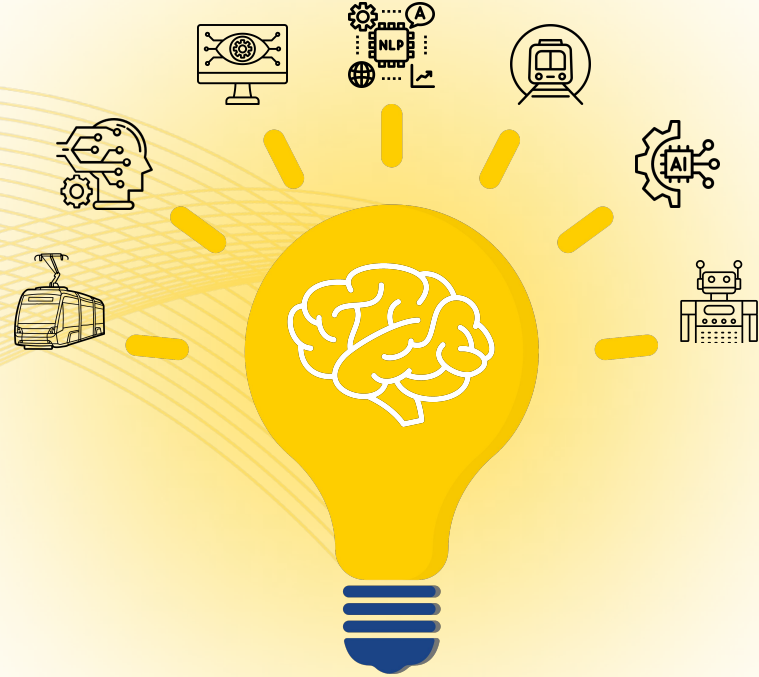# Video Analytics Hackathon 2024

by Maharashtra Metro Rail Corporation Limited

in collaboration with

MIT-WPU, Pune

MetroMinds

Shah and Anchor Kutchhi Engineering College

Team members

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Proposed use case(s) to be developed

Sr. No	Video Use Case	Problem Statement
1	Passengers fall on the escalators	The fall of passengers on escalators is observed. This causes safety concerns for the passengers.
2	Passengers crossing the platform edge	The fall of passengers on the track is observed wherein passengers used to look for the train entering the platform by crossing platform edge (accidental fall). This causes major safety concerns for the passengers.
3	The ticketing line passenger count exceeds a predefined threshold	During peak hours, huge ticketing lines are observed at the metro station unpaid areas near TOM. This causes inconvenience to the passengers as they have to wait for the tickets for a long duration
4	Left Object/ Baggage Detection	Many times passengers forget their belongings at the station premises which can sometimes cause a security challenge. It is necessary for the metro to identify such unattended/left objects

Proposed solution

1st Use Case : Passengers fall on the escalators

1. **Pose Detection Algorithm**: Develop and train a pose detection algorithm to accurately recognize human poses, particularly focusing on leg position. Train the algorithm to identify the typical stance of individuals on escalators.

2. **Check Alignment Of Leg Keypoints:** Check if all three points on leg (hips, knee and ankle) are in line on both legs. If they are not in line then it can be assumed that the person is not standing.

3. **Alert Triggering Mechanism**: If its detected that the person is not standing then it can be assumed that the person has fallen and hence an alert can be raised.
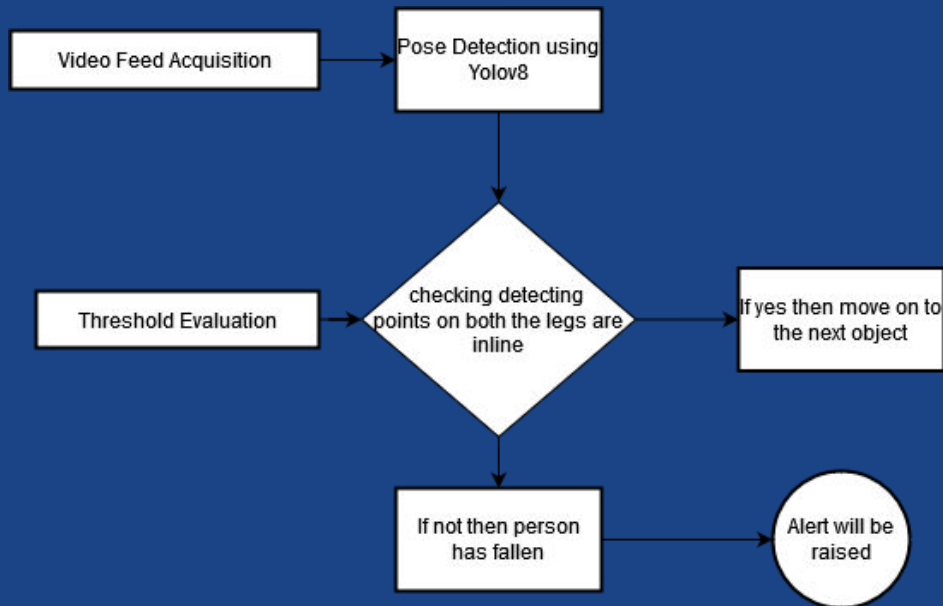
Technical Details

We will utilize YOLO v8 key pose detection model for detecting the leg keypoints of people in the video feed.

After the points on both the legs are detected we check if they are in line.

If the points are not in line it means that the person is not standing.

If its detected that the person is not detected we can raise an alert.

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Technical flowchart of the solution

Video Feed Acquisition → Pose Detection using Yolov8

Threshold Evaluation → checking detecting points on both the legs are inline → If yes then move on to the next object

If not then person has fallen → Alert will be raised

Challenges faced

- In certain videos, lighting was not enough.

- The camera angle was not proper and thus the individual's visibility was insufficient for pose detection.

Proposed solution

2nd Use Case : Passengers crossing the platform edge

1. **Platform Segmentation and Pose Detection Algorithm**: Use a segmentation model to get platform dimensions and get ankle points of each passenger.

2. **Detect Passenger Crossing Platform Edge:** If the ankle points of passengers are outside of the platform dimensions it can be assumed that the passenger has fallen off the platform.

3. **Alert Triggering Mechanism:** If the passenger has fallen off the platform then an alert can be raised.

Technical Details

Train a segmentation model to detect the platform edges and get platform dimensions. (yellow lines)

Use yolo v8 pose detection model to get ankle points of passengers, this algorithm will be run on each frame.

If the ankle points are outside the detected platform then it can be assumed that the person has fallen off the platform and an alert can be raised.

Technical flowchart of the solution
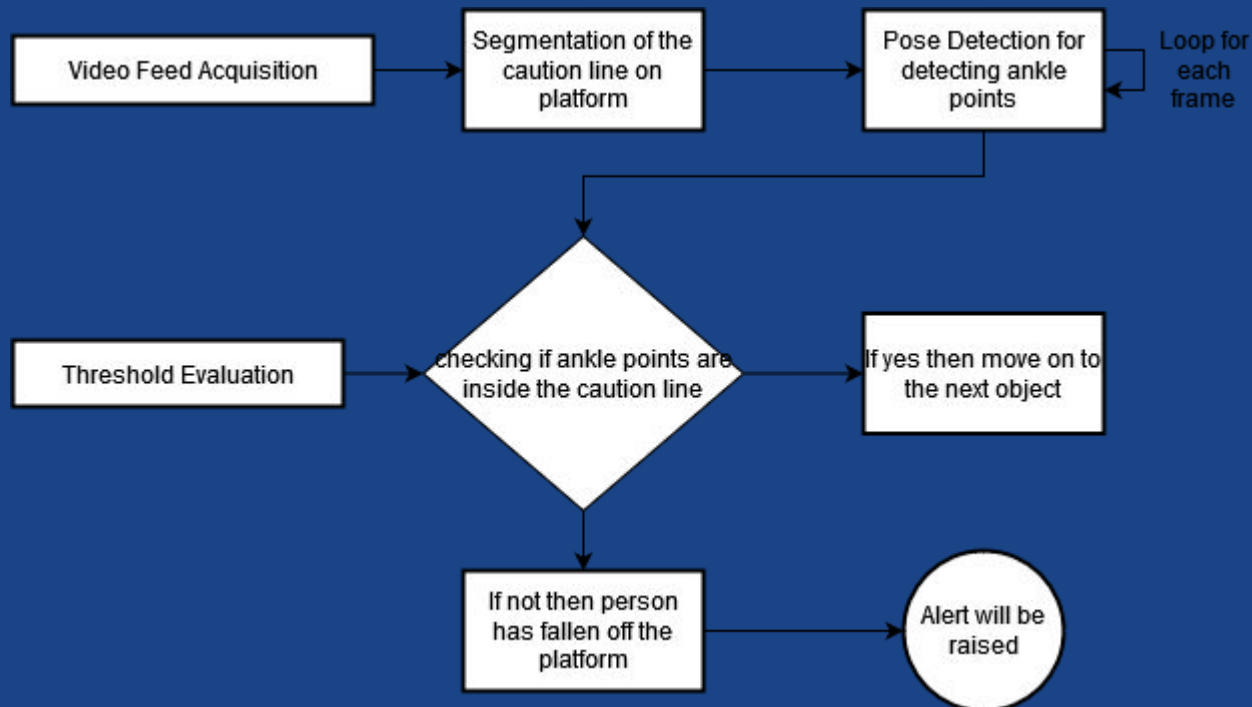
Challenges faced

- The size of the passengers on the platform in the video was significantly small, which created problem in detection.

- Thus, we used slicing aiding hyper inference(SAHI)
  SAHI is an open-source framework that was designed to address this issue. SAHI provides a generic pipeline for small object detection, including inference and fine-tuning capabilities.

- Small object detection is essential for identifying and tracking passengers on the platform.

3rd Use Case : The ticketing line passenger count exceeds a predefined Threshold

1. **Pose Detection Algorithm**: Use a pose detection algorithm to get head key points of each passenger inline.

2. **Count number of passengers in queue:** If the number of passengers in the ticketing queue area crosses over a certain amount raise an alert
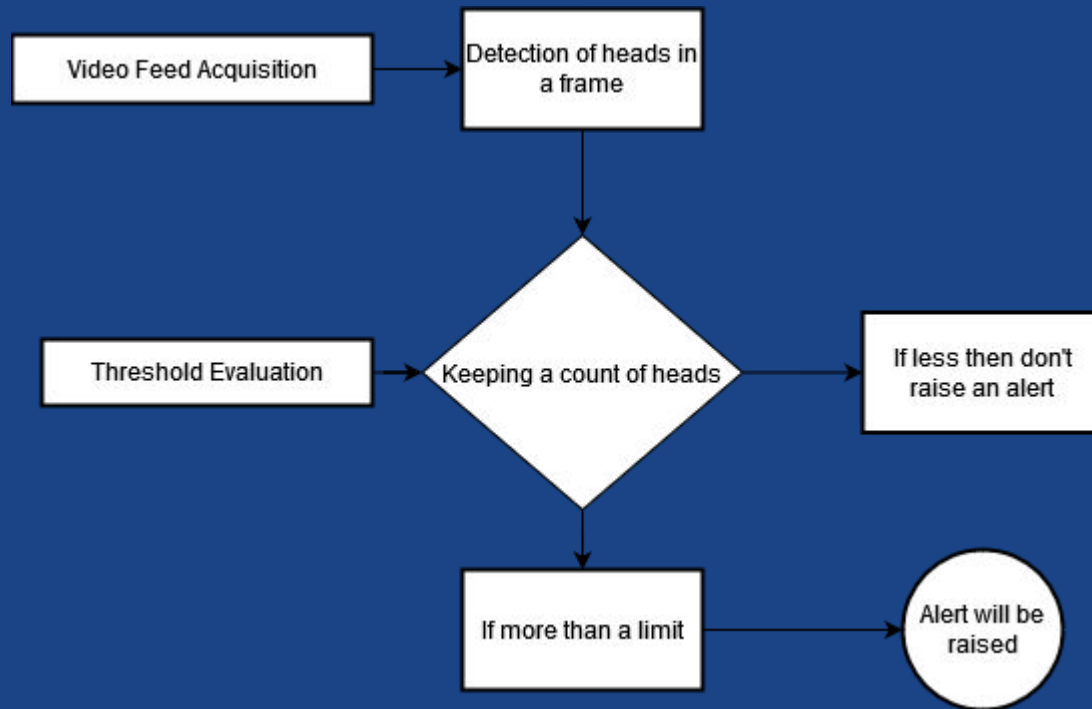
Technical Details

Use a pose detection algorithm to get head key points of each passenger inline.

Use head key points to count the number of passengers in queue.

If the number of passengers in the ticketing queue area crosses over a certain amount raise an alert.

Video Feed Acquisition → Detection of heads in a frame

Threshold Evaluation → Keeping a count of heads → If less then don't raise an alert

If more than a limit → Alert will be raised

Challenges faced

- During queue identification, we encountered an issue with the presence of dual queues.

- The model was not able to identify the queue behind the another which created problem while counting the maximum number of people in a queue

Proposed solution

4th Use Case : Left Object / Baggage detection

1. **Real-time Object Detection**: Use Yolo v8 object detection to track objects like bags and other objects over time.

2. **Threshold Time Setting**: Define a threshold for determining when an object is considered unattended or left behind. If the bag is tracked at a location for longer duration than the threshold then it can be assumed that the object is abandoned.

3. **Alert Triggering Mechanism**: If the object detection algorithm identifies an unattended object that meets the predefined threshold, trigger an alert.
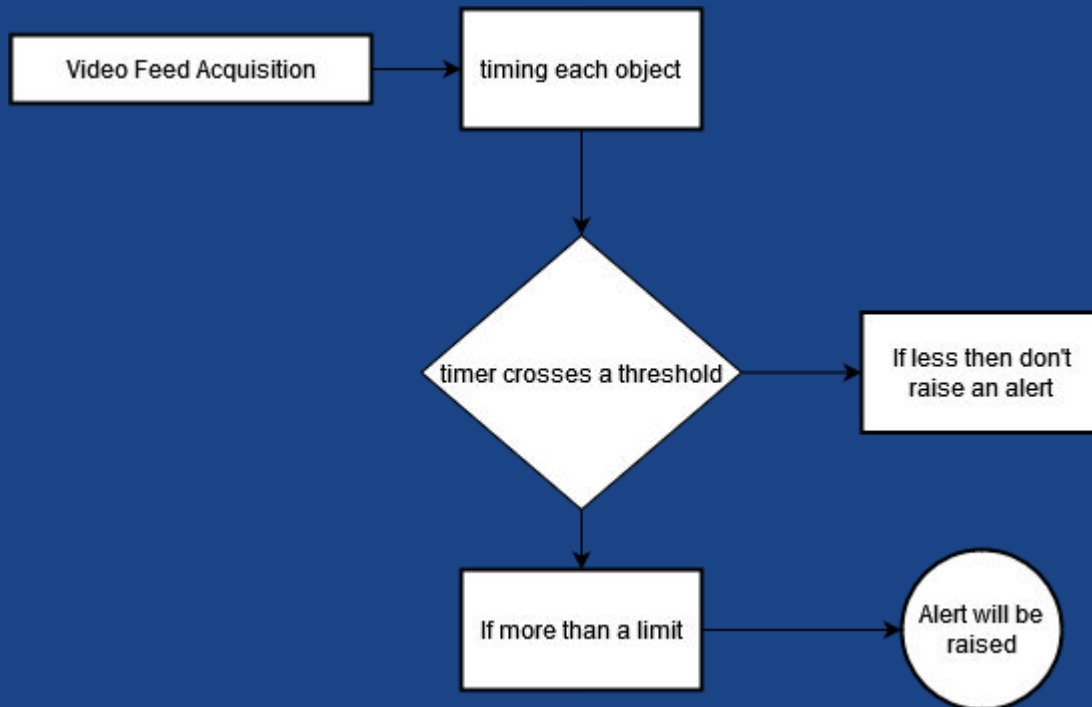
Technical Details

Use an object detection algorithm to track bags and other objects over time.

If the bag is present in the same region over a set threshold time then it can be assumed that the bag is unattended.

If its detected that the bag is unattended then an alert can be raised.

Technical flowchart of the solution

Any past relevant project(s)

1. **AI Amplify Hackathon 2nd runner up:** Object Detection to detect types of flowers.

2. **Facial Recognition System:** Detect face and the person's name from cctv footage.

3. **Yoga Pose Detection:** Detect yoga pose of a person by detecting keypoints.

Contact Details

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