**PROJECT REPORT**

This project focuses on tracking and counting individuals in video streams using object detection and tracking algorithms. The current implementation integrates **YOLOv8** for object detection and **DeepSort** for object tracking. The primary goal is to accurately count unique individuals throughout the video while ensuring efficient processing.

**Object Detection:**

* **Model Used:** YOLOv8
* **Purpose:** Detect persons in the video frames.
* **Configuration:** The model is configured with a confidence threshold of **0.8** to ensure accurate detection of persons.

**Object Tracking:**

* **Model Used:** DeepSort
* **Purpose:** Track detected persons across frames and assign unique IDs for each individual.
* **Configuration:** The max\_age parameter is set to **70**, meaning a track can persist for up to 70 frames without a new detection before being considered lost.

**Frame Skipping for Faster Processing:**

* **Technique Used:** Frame skipping has been implemented to process every **n-th frame** instead of every frame, significantly reducing the computational load and improving video processing speed without sacrificing too much accuracy.

**Counting Logic:**

* Tracks are updated **frame-by-frame** (with frame skipping considered).
* A person is counted as "unique" only if they have been consistently visible for a specified duration (**visible\_duration**).

**Output:**

* Video frames are resized to enhance processing efficiency.
* The count of unique persons detected is displayed on each frame and saved in the output video file.

**Improvements and Future Work:**

**1. Enhancing Detection Accuracy for Children:**

* **Current Limitation:** The YOLOv8 model is primarily trained for general person detection and may not be optimized for distinguishing between children and adults.
* **Proposed Solution:** Fine-tuning the YOLOv8 model using a dataset that contains a significant number of child images. This will improve detection accuracy for children, particularly useful in settings like therapy sessions where distinguishing children from adults is crucial.

**2. Improving Tracking and Counting Accuracy:**

* **Current Limitation:** The current setup may occasionally miscount individuals if tracking IDs are incorrectly assigned or managed, especially in cases of occlusion or rapid movement.
* **Proposed Solution:** Further fine-tuning of the DeepSort model and adjustments to parameters such as max\_age and n\_init can improve tracking stability. This would reduce the likelihood of miscounting the same individual multiple times. Additionally, enhancing the tracking algorithm to handle occlusions and complex interactions more effectively would contribute to greater accuracy in both tracking and counting.