

**National University of Computer &
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People Counting System

Project Report

Deep Learning

Section: H

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- **Introduction:**

This report presents an object detection and tracking system using YOLO (You Only Look Once) and OpenCV. The system detects people entering and exiting a designated area and counts them. The system consists of a Streamlit application for user input and video processing, and the object detection and tracking logic using YOLO and OpenCV.

- **Problem Statement:**

The problem is to detect and track people in a video stream and count those entering and exiting a designated area. The area is defined by two polygons (area1 and area2). The system should be able to handle real-time video processing and provide accurate detection and tracking results.

- **IDEA:**

The IDEA is to use YOLO for object detection and OpenCV for video processing and tracking. The system will use a Streamlit application for user input and video processing. The Tracker class will be used to track detected objects across frames. The system will count people entering and exiting the designated areas.

- **Proposed Model Implementation:**

The proposed model implementation consists of the following steps:

1. User uploads a video file or selects a webcam feed.
2. User defines the area coordinates (area1 and area2).
3. The system processes the video frame by frame.
4. The system detects people using YOLO.
5. The system tracks detected people using the Tracker class.
6. The system counts people entering and exiting the designated areas.
7. The system displays the counting results.

- **Code Structure**

The code consists of two main parts:

1. **Streamlit Application:** This part creates a web interface using Streamlit, allowing users to upload a video file and define the coordinates of two areas (area1 and area2).
2. **Object Detection and Tracking:** This part contains the `track_people` function, which uses YOLO to detect objects (people) in the video and tracks them using the Tracker class.

- **Key Functions**

1. **track_people:** This function takes a video file, YOLO model, and area coordinates as input. It processes the video frame by frame, detecting people and tracking them using the Tracker class.
2. **Tracker:** This class keeps track of object IDs and their center points. It updates the center points and assigns new IDs to new objects.

- **Key Features**

1. **Object Detection:** The code uses YOLO to detect people in the video.
2. **Object Tracking:** The code uses the Tracker class to track detected objects across frames.
3. **Area Definition:** The code allows users to define two areas (area1 and area2) using coordinates.
4. **Counting:** The code counts people entering and exiting the designated areas.

- **Conclusion:**

The proposed object detection and tracking system using YOLO and OpenCV is a functional and efficient system for detecting and tracking people in a video stream. The system has a clear structure and is easy to read. The key functions and features are well-implemented, and the system meets the requirements of detecting and tracking people entering and exiting a designated area. The system can be further improved by refactoring the code, adding more robust error handling, and optimizing performance.

- **Recommendations:**

1. Refactor the code to improve readability and maintainability.
2. Add more robust error handling to handle errors during video processing and tracking.
3. Optimize the code for performance, especially for large videos or high-resolution images.
4. Add additional comments and documentation for better understanding and maintainability.