CROWDCOUNT : PEOPLE COUNTING USING VIDEO ANALYTICS

Tools used:
Flask, YOLOv8, OpenCV, Flask-JWT Authentication, SQLite/PostgreSQL, NumPy, Pandas, JavaScript, HTML, CSS

**Mentor Name:** Umme Asma

Batch – 3 Details:

Start Date: 22-09-2025
End Date: 21-11-2025

Presented by:
Veer Pratap Yadav

Introduction

This project is an **AI-Based Crowd Monitoring and People Counting System** that automates real-time detection, tracking, and counting of individuals in video feeds using **YOLOv8** and **Flask**. It eliminates the limitations of manual crowd supervision by intelligently identifying people, assigning unique tracking IDs, and monitoring their movement across user-defined zones. The system measures how long each person stays in sensitive or restricted areas, triggers alerts for overcrowding or threshold violations, and displays all insights through a live, interactive dashboard. A secure role-based admin panel enables configuration of system settings, user management, and alert history review, while exportable **PDF/CSV reports** support data-driven safety and operational decision-making.
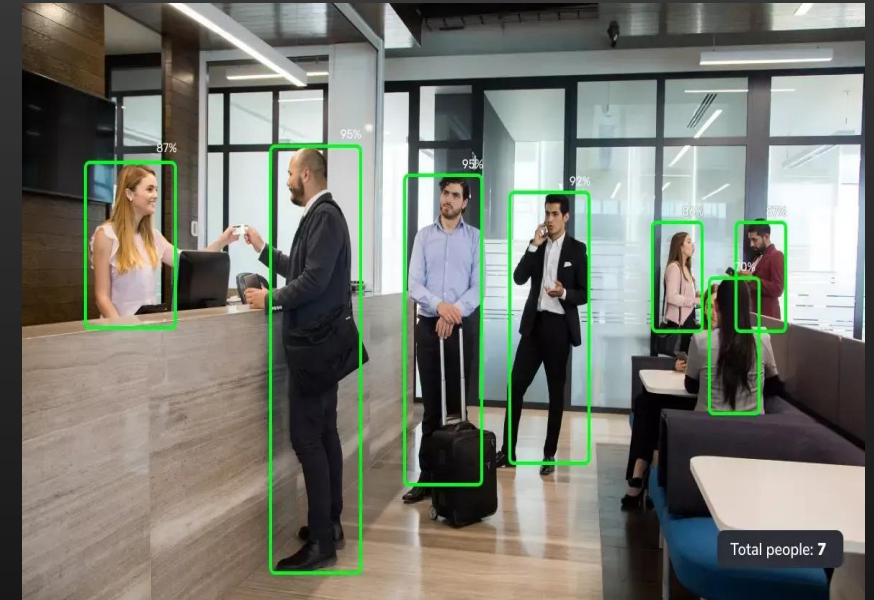
Problem Statement

Traditional crowd monitoring in public spaces such as malls, airports, colleges, and events relies heavily on manual supervision, which is slow, inconsistent, and prone to human error. Security teams often struggle to accurately detect overcrowding, track individuals, and identify risky behavior in real time. Existing CCTV systems only record footage but do not provide intelligent insights, making it difficult to respond quickly during emergencies or manage crowd flow efficiently. There is a need for an automated, AI-driven system that can **detect, track, and count people in real time**, monitor movement across **user-defined zones**, and automatically trigger alerts when safety thresholds are breached. This project addresses these limitations by providing accurate real-time analytics, reducing response time, and improving overall operational safety.

Objectives

The primary objective of this project is to build an intelligent, automated system capable of **detecting, tracking, and counting people in real time** using computer vision. The system aims to enable users to draw and manage custom zones, monitor occupancy levels, and trigger alerts when predefined thresholds are exceeded. Additionally, it seeks to provide a **live analytics dashboard** that visualizes crowd density, movement patterns, and zone-wise statistics to improve situational awareness. The project also focuses on offering a secure, role-based admin panel for user management, system settings, and historical data analysis, ultimately delivering a scalable solution for crowd safety, monitoring, and operational decision-making.
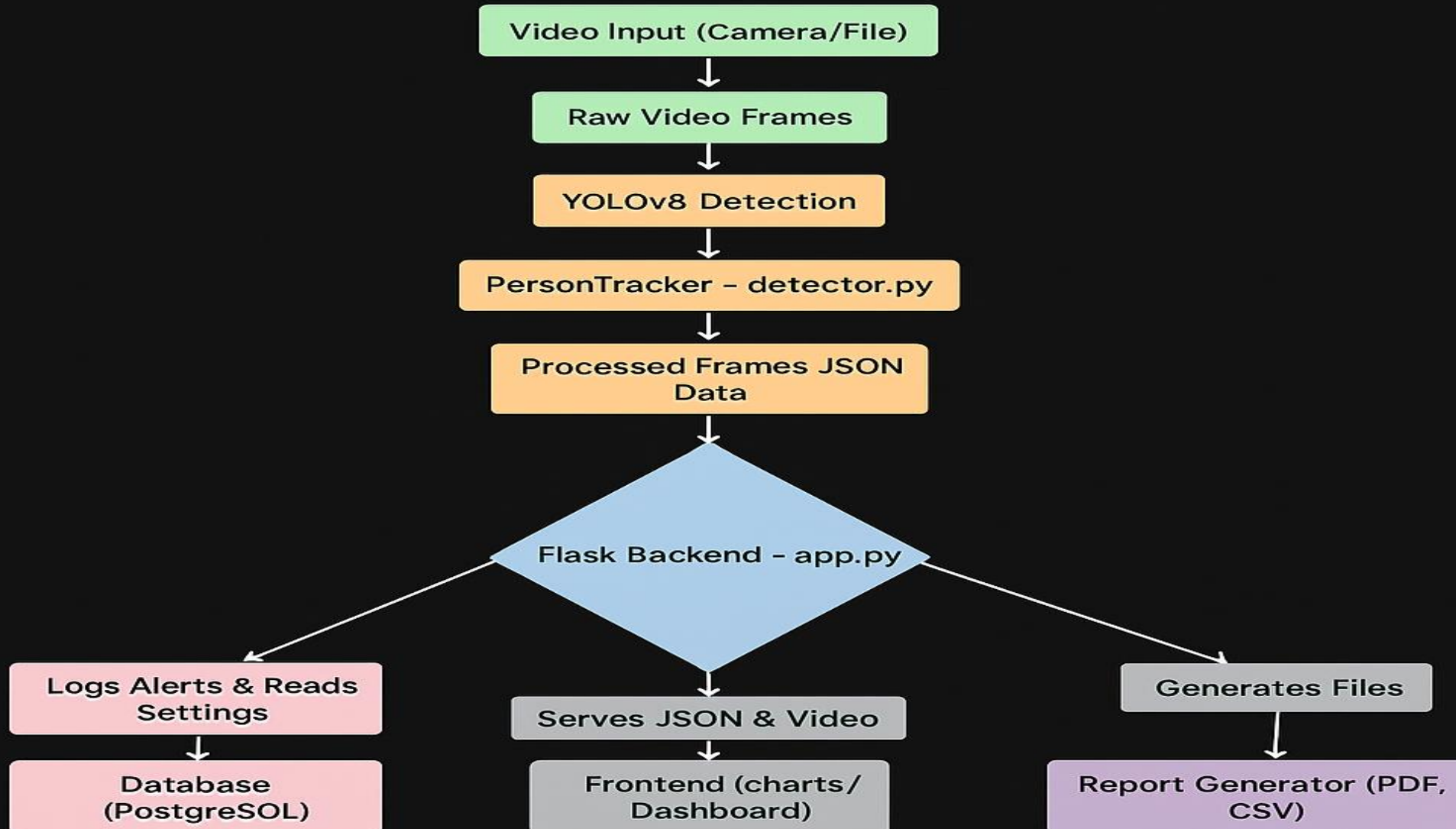
Core Components of the CrowdCount System

Component	Function	Module
Camera Feed	Captures raw video stream for processing	Live camera feed
Zone Editor	Allows users to define danger zones and safe zones within FoV (FoV)	Zone editor interface
YOLOv8 + Tracking	Detect individuals in video stream using Track individuals across video frames	YOLOv8 Persontracker.py
Live Dashboard	Displays analytics and real-time alerts on person and zone states	Bar, scatter, line charts, table displays
Admin Panel Reports (PDF, OV)	Secure administrator access, provides user and alert management	Admin panel Alert management

Detection & Tracking

The system uses YOLOv8 to detect all individuals in each frame and assigns a unique ID to every person, ensuring accurate tracking as they move across the scene. Each person is followed consistently without duplication, enabling reliable movement analysis. Zones drawn on the interface help determine entry and exit events, dynamically updating bounding box colors and people counts in real time. This integrated detection-tracking workflow ensures stable identification, continuous monitoring, and accurate zone-wise crowd analytics.
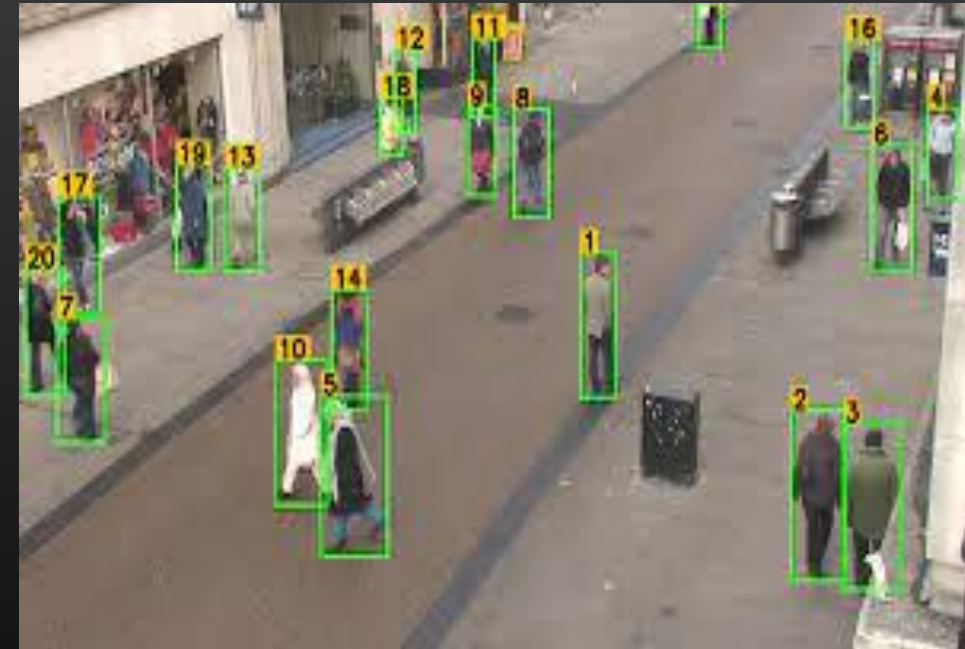
Register

👤 Username

✉ Email

🔒 Password 👁

Sign Up

Already have an account? Login

Login

✉ Email

🔒 Password 👁

Login

Don't have an account? Register

Crowd Count

- 📊 Dashboard
- 📹 Video Analytics
- 👤 Profile
- 📷 Camera Management
- 🗂 System Logs
- 📄 Reports
- 📙 Logout

Welcome, Veer Pratap Yadav 🙋‍♂️

Dashboard Overview 📑

Interactive dashboard with real-time analytics, visualizations, and alert system.

Video Controls 🎛

▶ Start Camera

⬛ Stop Camera

📁 Choose Video

🎬 Use Video

🖼 Choose Image

🖼 Use Image

*Camera or uploaded video/image will display below.

Milestone 2

Zone Creation & Management

In this milestone, we implemented a complete system for creating and managing custom polygonal zones on the video feed. Users can draw zones manually, assign names, edit shapes, highlight them on demand, and delete them when needed. All zone coordinates are saved in the database and automatically synced with the detection engine, allowing accurate tracking of people entering each defined area. This milestone established the foundation for zone-wise counting, alerts, and advanced analytics used in later phases of the project.
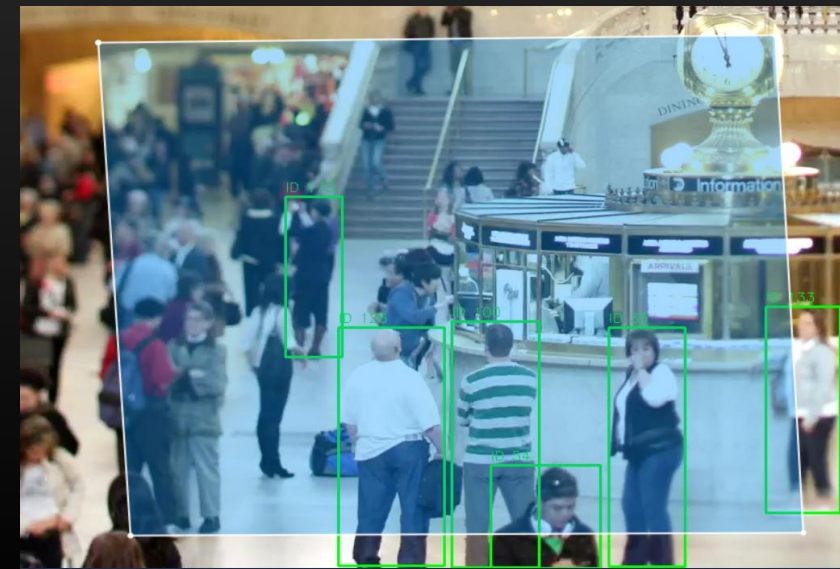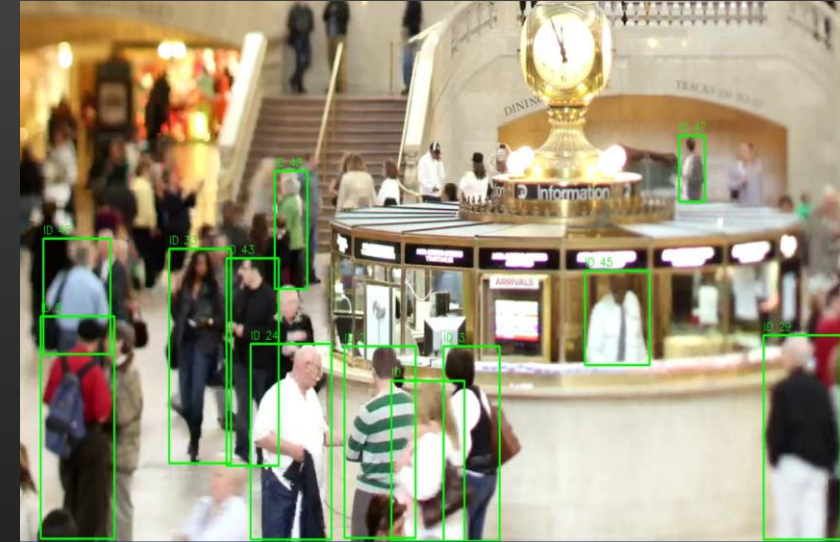
Milestone 3

Live Dashboard, Real-Time Analytics & Alert System

Milestone 3 focused on transforming the system into a fully interactive live analytics dashboard. This included real-time people counting, zone-based occupancy tracking, heatmap visualization, and live line charts that update continuously as detection occurs. The milestone also introduced the alert system, which triggers notifications whenever the crowd count exceeds a predefined threshold in any zone. This milestone delivered the core analytical intelligence of the project by combining live detection outputs with dynamic visual insights.

Live Analytics — People Over Time
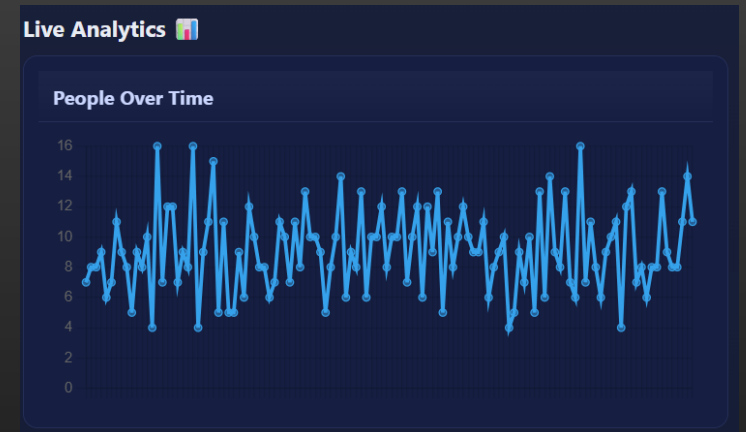
Density Heatmap
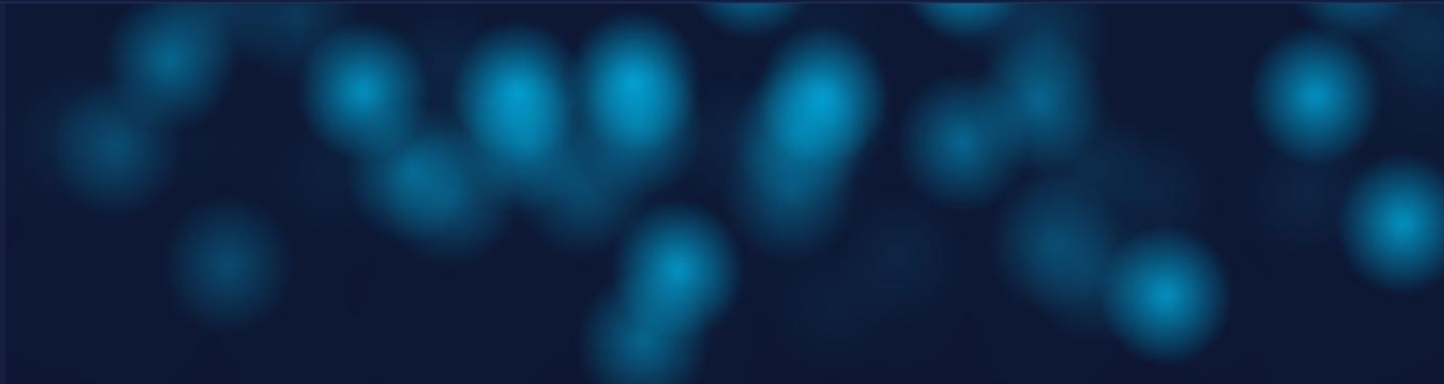
Zone Occupancy
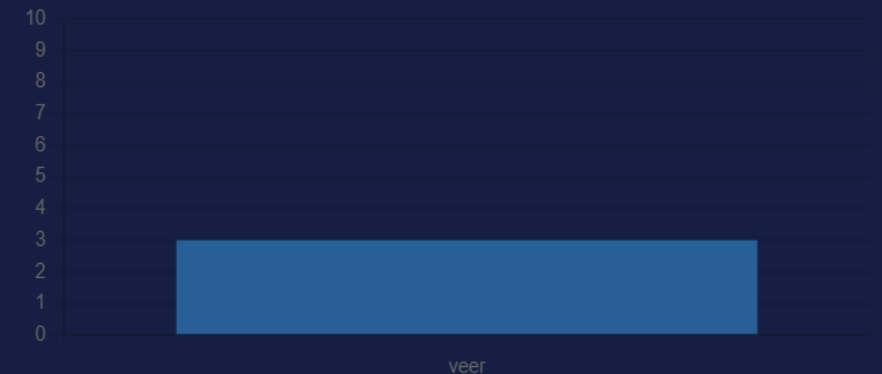
Milestone 4

Admin Panel & Reports

Milestone 4 delivers a secure **Admin Panel** for managing users, adjusting alert thresholds, and reviewing system alerts. It also adds **PDF and CSV reporting**, allowing admins to download person summaries and complete alert histories. This milestone provides full system control, configuration, and reporting in one dashboard.

System & User Logs

All levels

Search action/meta/email

dd-mm-yyyy --:--

dd-mm-yyyy --:--

Filter

ID	Time	Level	Actor	Action	Meta
180	2025-11-18 14:32:21	INFO		login_success	{"email": "yadavveerpratap79@gmail.com"}
179	2025-11-18 13:44:12	INFO	yadavveerpratap79@gmail.com	camera_stop	{}
178	2025-11-18 13:43:37	INFO	yadavveerpratap79@gmail.com	zone_create	{"name": "veer", "points_len": 6}
177	2025-11-18 13:40:13	INFO	yadavveerpratap79@gmail.com	settings_update	{"alert_threshold": 9}

Reports Library

Export CSV (15m)

Export PDF (15m)

ID	Time Window	Kind	File	Actions
14	11/18/2025, 6:42:24 PM → 11/18/2025, 6:57:24 PM	CSV	C:\Users\veer2\OneDrive\Desktop\project\uploads\reports\crowdcount...	Download / Delete
13	11/18/2025, 3:43:25 PM → 11/18/2025, 3:58:25 PM	CSV	C:\Users\veer2\OneDrive\Desktop\project\uploads\reports\crowdcount...	Download / Delete
12	11/18/2025, 3:43:25 PM → 11/18/2025, 3:58:25 PM	CSV	C:\Users\veer2\OneDrive\Desktop\project\uploads\reports\crowdcount...	Download / Delete
11	11/18/2025, 3:42:45 PM → 11/18/2025, 3:57:45 PM	CSV	C:\Users\veer2\OneDrive\Desktop\project\uploads\reports\crowdcount...	Download

Database Schema

User

Purpose

Stores all user accounts.
authentication details, and
access levels.

Key Fields ad Details

- **id (PK):** Unique identifier for
  each user.
- **username,** password, hash:
  login credentials.
- **profile_pic:** Path to user's
  profile image, to control
  dashboard and admm pand
  access.

AlertHistory

Purpose

Maintains a permanent log of
all alerts generated by the AI
detector.

Key Fields and Details

- **id (PK):** Unique alert record
- **user_id (FK):** Links alert to the
  active **user**
- **timestamp:** Exact date & time
  of alert
- **alert_type:** Type of alert
  (Per-Person / Zone / Querall)
- **message:** Full alert description

SystemSettings

Purpose

Stores dynanic, editable
system-wide settings
controlled by admin

Key Fields and Detiis

- key: Name of setting
  (e.g., person_threshold)
- **value:** Current value of the
  setting
- **Advantage:** Updates apply
  instantiy; app py reloads
  detector without
  server restart

Conclusion

This project successfully delivers an **AI-Based Crowd Monitoring and Safety Management System** capable of detecting, tracking, and counting people in real time using **YOLOv8**, **OpenCV**, and a robust **Flask backend.** By integrating zone-based monitoring, intelligent alert mechanisms, and a secure role-based admin panel, the system replaces manual supervision with a faster, more accurate, and automated solution.

The platform provides **live analytics**, including population trends, zone statistics, and alert logs, supported by downloadable **PDF and CSV reports**. With its scalable architecture, the system can be deployed across public safety, retail analytics, workplace safety, and smart-city environments.

Overall, this project demonstrates how modern AI and web technologies can work together to create a **smart, reliable, and scalable crowd monitoring solution** that enhances safety, improves operational efficiency, and supports data-driven decision-making.