

People Counting and Zone Management System

Tools Used: Flask, YOLO v8,
OpenCV, SQLite, JWT

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Batch : C

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Problem Statement

Public spaces like malls, airports, and parks often require real-time people counting for security, analytics, and operational efficiency. This project aims to automate people counting using a live camera feed, leveraging computer vision and deep learning. The system will detect and count people in a video stream with high accuracy and provide live analytics through an interactive dashboard. It will support multiple zones and ensure smooth performance with real-time processing.

Objective

- Develop an automated **real-time people counting system** using live camera feeds.
- Detect and count people accurately using **computer vision and deep learning**.
- Provide **live analytics** through an interactive dashboard.
- Support **multi-zone** monitoring for different areas.
- Ensure **high performance** with low-latency real-time processing.
- Offer **alerts** for crowd density and unusual activity.
- Maintain a **secure, reliable, and user-friendly** system for public spaces.

Tools and Libraries

Programming & Frameworks

- **Python** – Core programming language
- **Flask** – Backend web framework
- **HTML, CSS, JavaScript** – Frontend development
- **Bootstrap** – UI styling

Computer Vision & Deep Learning

- **OpenCV** – Video processing & frame handling
- **YOLOv8** – Person detection model
- **NumPy** – Numerical operations

Data & Storage

- **SQLite / MySQL** – Database for storing analytics
- **Pandas** – Data analysis & reports

Visualization & Dashboard

- **Chart.js / Plotly** – Live graphs and analytics
- **Bootstrap Icons** – UI icons
- **AJAX / Fetch API** – Real-time updates

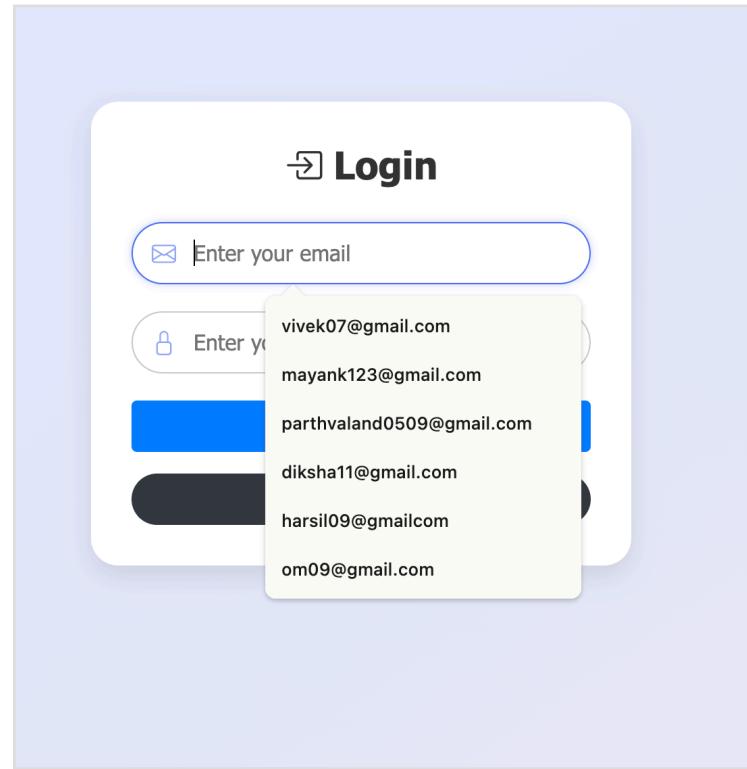
Development & Deployment

- **VS Code** – Development environment

Milestone 1: Login , Registration page, Dashboard Security & JWT implementation For user login created in

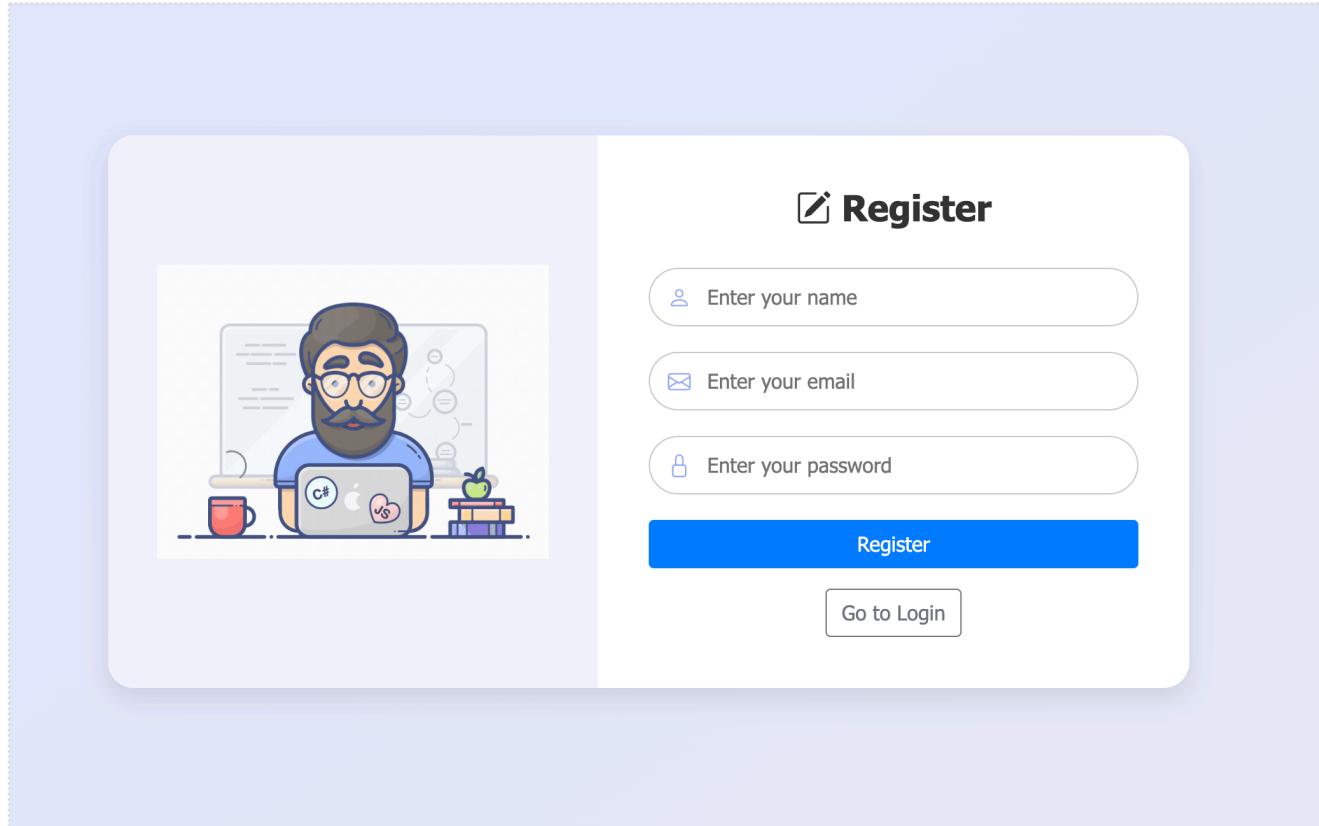
Crowd Monitoring System - UI
Development Flask Backend + JWT
authentication + Database

Login Page



- Secure user authentication interface.
- Email suggestions for quick access.

Registration Page



- User details input like Enter your name, Enter your Email and Enter your password Click Register button.
- Also Include Go to login button Clean and user-friendly design.

Dashboard Page

The screenshot shows a dashboard interface. At the top, there is a blue header bar with the text "Crowd Count" on the left and "Welcome, vivek" along with "Logout" on the right. Below the header is a sidebar on the left containing the following items:

- Welcome** (selected, highlighted in light blue)
- Home**
- Profile
- Logout

The main content area is currently empty, represented by a large white space.

- Sidebar navigation with Home , profile and Logout options.

Milestone 2

- Integrated YOLOv8 model for people detection use OpenCv.
- Implemented 3 Image/Video input modes (Webcam, Image & Video Upload).
- Frontend dashboard UI implemented with Bootstrap.

Live Webcam

Crowd Count

Welcome, vivek [Logout](#)

Welcome

- Home
- Live Webcam**
- Upload Image
- Upload Video
- Profile
- Logout

Live Webcam Feed

Start Stop Capture



Detected Objects (Live)

person: 1

People Count

1

Status: ●

- Shows live bounding boxes around detected individuals
- Ideal for live monitoring and crowd analysis

Upload Image

Crowd Count

Welcome, vivek [Logout](#)

Welcome

- Home
- Live Webcam
- Upload Image**
- Upload Video
- Profile
- Logout

Upload Image for Detection

Choose File WhatsApp I...6.37.42.jpeg

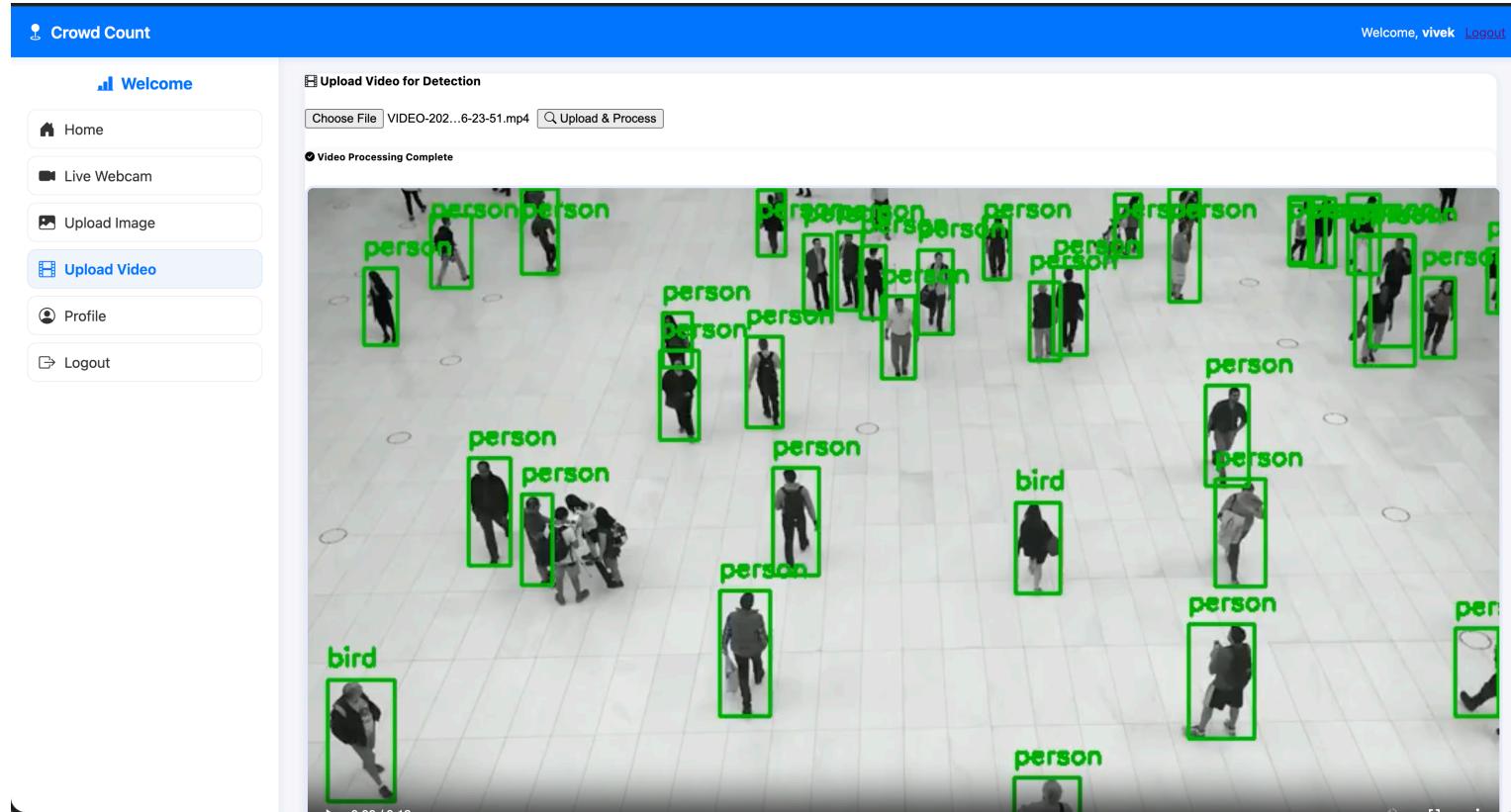
Detection Complete

person

kite

- User can upload any image from computer
- System processes image and detects number of Objects.
- Displays count and highlights detected Objects.

Upload Video

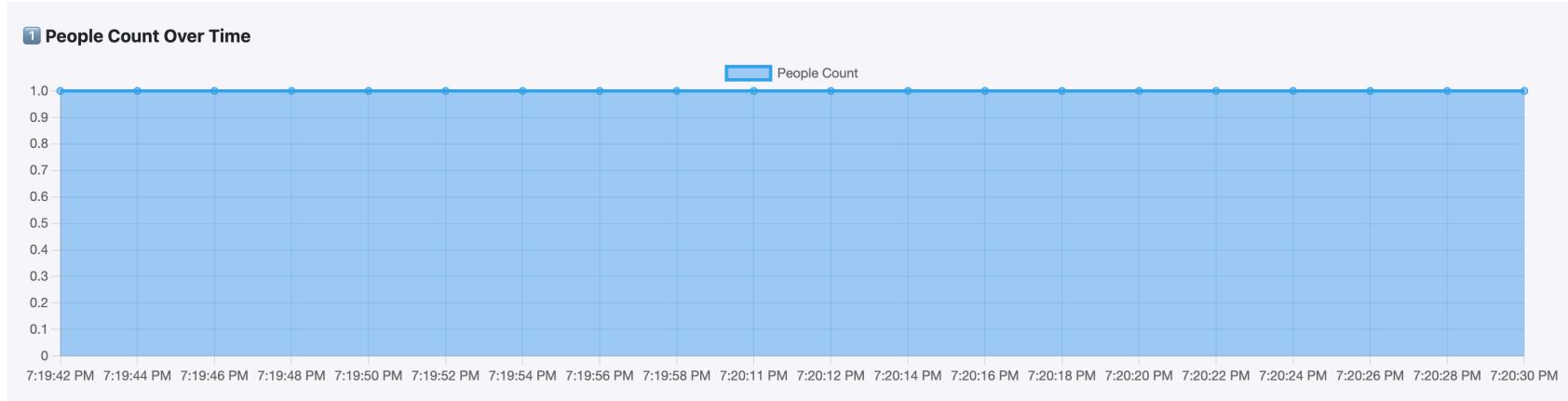


- Supports video file upload (.mp4 etc.)
- Detects crowd in each frame.
- Generates people count continuously during video playback.

Milestone 3 LIVE Dashboard

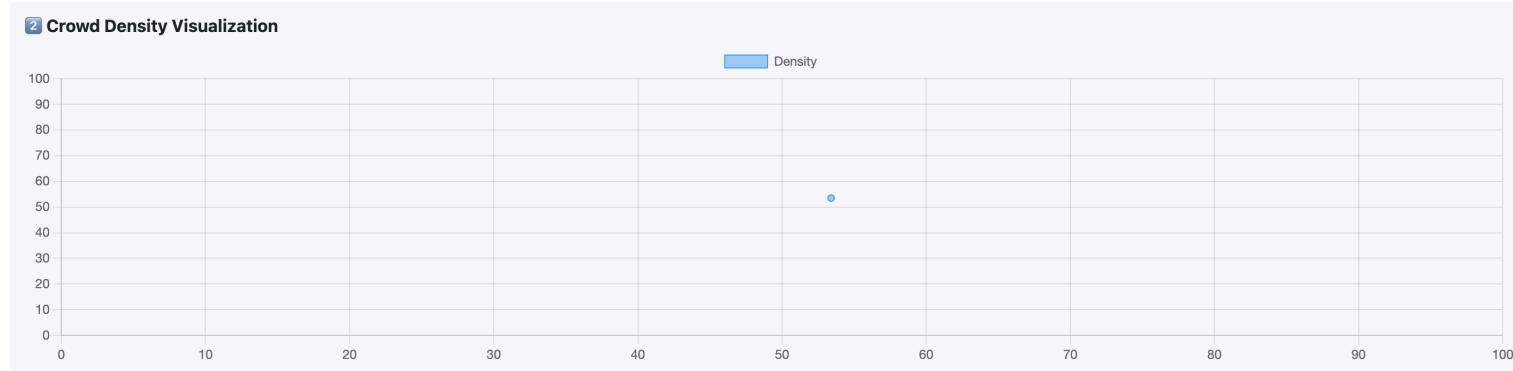
Interactive Dashboard with Real-Time
Crowd Analytics

People Count Over Time (Line Plot)



- Input: Live/Uploaded Video from Entrance, Retail Area, Food Court.
- Output: Line plot showing real-time count trends with Every 2 Second Update.

Crowd Density Visualisation (HeatMap/Scatter Plot)



Crowd density represents **how many people (or detections)** are present **per unit area** (e.g., per square meter, per frame zone, etc.)

$$\text{Crowd Density} = \frac{\text{Number of People Detected}}{\text{Area of the Zone}}$$

- Input: Processed frame detections.
- Output: Density Visualisation to identify high-crowd zones.

ZONE OCCUPANCY DISTRIBUTION(BAR PLOT)



- Input: People detected in each zone.
- Output: Bar chart showing occupancy per zone.

Alert System - People Count Threshold

Automatic Normal & Alert Status Notifications

- Normal Status (Below Threshold)

🔔 Alert System Status

Threshold: **50 people**

Current Status: ✓ Normal

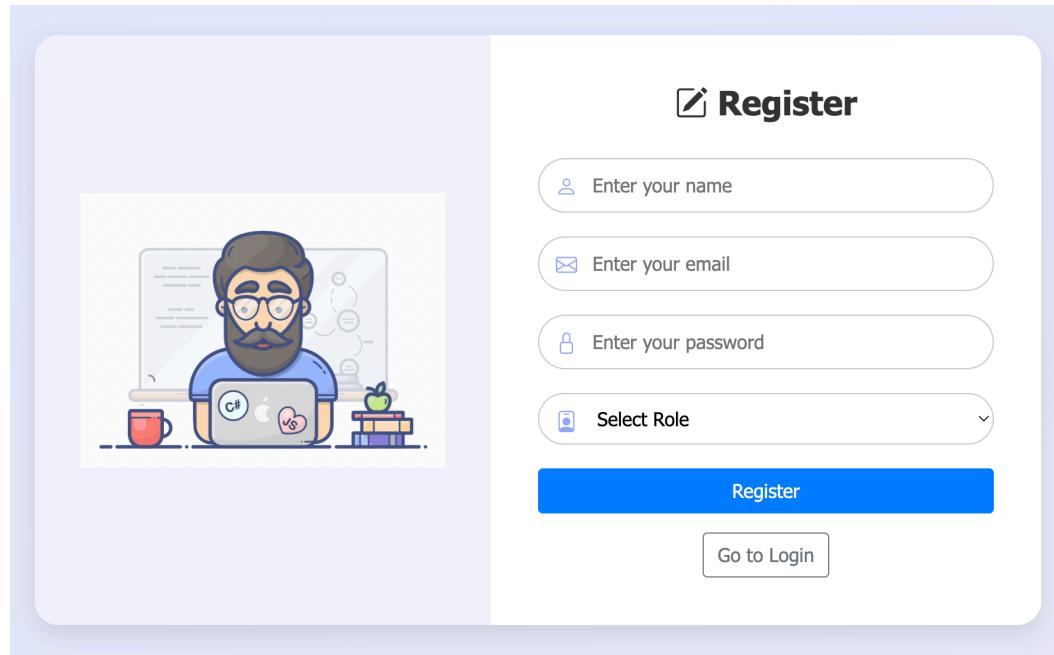
- Alert Status (Above Threshold)

🔔 Alert System Status

Threshold: **50 people**

Current Status: ⚠ ALERT

Milestone 4



- Admin can control all camera settings and download reports.
- Secure role-based access works correctly.
- System logs and analytics accessible and complete.

Conclusion

The real-time people counting system successfully achieves its goal of providing an automated, accurate, and efficient solution for monitoring public spaces. By integrating computer vision and deep learning with a live camera feed, the system delivers reliable people detection, counting, and crowd analysis. The interactive dashboard enhances usability by offering real-time insights, multi-zone monitoring, and alert notifications for high-density conditions. Overall, this project demonstrates how AI-based surveillance can significantly improve security, operational planning, and crowd management in environments like malls, airports, and parks. With its scalable and robust architecture, the system is well-suited for real-world deployment and future enhancements.

Thank you