Seeing Crowds Before They Become Chaos

ahhh_people

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Problem Statement

- ➔ High crowd density can lead to safety hazards (e.g., stampedes, overcrowding).
- ➔ Manual counting is inefficient and inaccurate.
- ➔ Need for an AI-based system to estimate crowd density using images.

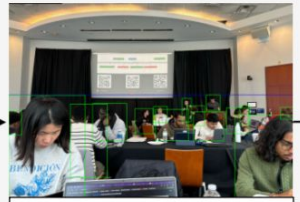
Objective

- ➔ Develop a **computer vision strategy** that estimates crowd density from images.
- ➔ Take into account the number of people and depth
- ➔ Use the model on **real-world crowd images.**

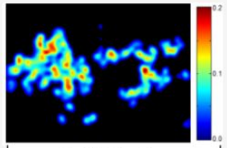
Video Frames

Crowd Density Calculation

Object Detection



Bounding Box Generation



Depth Estimation

Maximum Walkable Area Calculation

$$\text{Crowd Ratio} = \frac{\sum(\text{Person Area} \times (1 - \text{Depth Value}))}{\text{Crowd Box Area} \times \text{Total Weight}}$$

Density Calculation

Signalling System

Risk Detection

Density Classification

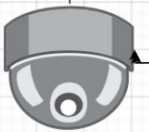
Direction

Hazard to Public Safety?

NO

YES

Alert Appropriate Authorities



Solution

- ➔ Model used: YOLO V8
- ➔ MiDaS for depth detection

Conclusion & Future Scope

- ➔ Achievements: Successfully estimated crowd density using deep learning.
- ➔ Future Enhancements:
  - ◆ Improve model accuracy with more data.
  - ◆ Deploy as a real-time application for smart city management.
  - ◆ Optimize inference speed for mobile/edge devices.