Problem Definition (What)

Imagine a simple scene:
Inside a large shopping mall crowded with shops and visitors, there is a security officer sitting in the control room, facing dozens of screens connected to surveillance cameras. These cameras are running 7/24, recording everything, but in reality, the officer cannot focus on all of them at the same time, The result?

- A small theft can happen within seconds, and no one notices
- A child can get lost in the crowd, and the parents keep searching for hours
- An incident of harassment or a sudden fight might occur, and it goes unnoticed until it is too late
- And if a serious case happens, such as a kidnapping or even a murder, security and police forces have to manually review hours of footage just to locate the exact moment of the incident

The core issue here: cameras record, but they do not think. There is no system that helps with real-time action, which puts people's lives and properties at greater risk and wastes critical time for intervention

Motivation (Why)

Why is this idea important?

- **Protecting lives above all:** Children who go missing in public spaces like malls or metro stations, or elderly people who might get lost in hospitals or transport hubs. Every minute matters between saving them or losing them
- **Preventing crimes and reducing losses:** Small thefts in supermarkets or harassment in crowded places can be avoided if there is a smart system that detects such incidents in real-time
- **Faster response for security staff:** Instead of spending hours reviewing endless footage, the system instantly identifies the problem - this camera, this location, this time
- **Supporting police investigations:** In bigger cases, the system allows police to upload long videos and quickly identify the suspect's appearance, saving days of manual review
- **Building trust and safety for people:** Locations equipped with this system become safer and more reliable, encouraging families, commuters, and patients to feel secure
- **Keeping pace with technological transformation:** With the world moving toward Smart Cities, solutions like this are a crucial step in building intelligent safety infrastructure

Methodology (How)

Our system is designed to transform traditional CCTV cameras into an AI-powered intelligent monitoring tool. The approach can be summarized as follows:

AI Model for Video Analysis:

- In our project, the AI model is like the brain that makes cameras understand. A normal camera just records, but our model is trained on videos that include different scenarios such as kidnapping, theft, or harassment. This way, it learns to recognize the difference between normal behavior (people walking normally) and abnormal or dangerous actions (someone trying to steal or grab a child)

- When the system is running, the model analyzes video streams frame by frame in real time. If anything unusual happens — like a person chasing a child or a sudden fight in the middle of the area — the model immediately detects it, classifies the type of incident, and sends it to the app with details about what happened and which camera/location it was captured in

- This transforms cameras from being just (eyes that record into eyes that understand)— able to see, think, and react instantly. In the future, the model can be improved even more to not only detect actions, but also identify missing persons or analyze sounds if audio data is added.

Mobile Application (Flutter):

- Security staff and managers will use a mobile app to register their locations and cameras
- The app provides instant notifications whenever the AI detects a suspicious incident
- Alerts include the type of incident, the location (floor, area), and the exact camera ID

Backend Integration:

- A backend system connects the AI model with the application, ensuring smooth communication between live video analysis and mobile alerts
- It also manages user authentication, camera registration, and log history of incidents

Police Investigation Support (Advanced Feature):

- Beyond real-time detection, the system will also allow uploading of long recorded videos
- Users can input details about a person of interest (e.g., appearance, clothing, age)
- The AI will analyze the footage and highlight the exact timestamps and locations where this person appeared

Target Audience (Who)

- Supermarkets & Shopping Malls
- Metro Stations & Transport Hubs
- Airports
- Hospitals
- Schools & Universities
- Stadiums & Arenas
- Public Streets & Smart Cities

Teams (Who)

- AI/ML Developers → Mohamed Reda, Mohamed El-Henafy
- UI/UX Designer → Salma Tarek
- Flutter Developers → Shahd Omran, Mostafa Galal
- Backend Developers → Ahmed, Hanaa Nabil

Challenges

- **Achieving high accuracy and minimizing false alarms:**
  The model must be highly accurate and avoid generating too many false alerts (e.g., detecting a fight when it is only a group of people talking loudly)

- **Handling privacy concerns and compliance with legal regulations:**
  Privacy and data protection laws must be considered to ensure the system is not misused against people's privacy

- **Managing and processing large amounts of video data:**
  Surveillance cameras generate massive amounts of video 24/7, and analyzing this data in real time requires strong computational capabilities

- **Ensuring real-time performance across multiple cameras:**
  The system must work instantly and efficiently, even when dozens or hundreds of cameras are active at the same time

- **Future scalability and cost of servers or cloud infrastructure:**
  As the system expands, the cost of servers or cloud infrastructure can become high. Planning for scalability from the start is essential

Future Work

Desktop/Web Dashboard: To provide centralized monitoring in control rooms with full access to camera feeds, incident history, and detailed reports

Audio Analysis: Detect abnormal sounds such as screaming, gunshots, or calls for help to complement video-based detection

Crowd Density Detection: Identify overcrowded areas and send alerts to prevent accidents or manage large gatherings.

Suspicious Object Detection: Recognize unattended bags or visible weapons to prevent potential threats.

Missing Person Matching: Allow security or police to input the photo/details of a missing person and let the system automatically detect their presence in live or recorded videos

Predictive Alerts: Use patterns in movement or behavior to predict and warn about possible incidents before they occur