PERSON IDENTIFICATION

PROJECT GOALS

- Person identification in industrial facilities using CCTV footage
- Computer vision-based non-intrusive approach
- Real-time identification capability for safety and security

CHALLENGES

- Low-resolution CCTV cameras (2MP standard)
- Poor and inconsistent lighting conditions
- Similar appearance due to:
  - Standardized safety uniforms
  - Protective equipment (helmets, vests)
  - Distance from cameras
- Multiple viewing angles and occlusions

INITIAL APPROACHES

1. **Facial Recognition**
2. **Feature Embeddings**

Limitations Summary

Method	Key Limitations
Facial Recognition	• Low-resolution cameras • Occlusion from headgear and obstacles. • Ineffective beyond a 4m detection range.
Feature Embeddings	• Inadequate data for reliable feature extraction • Most of the workers wear the same kind of gear (dress code at industry) so get maximum similarity. • Extensive enhancement techniques did not yield consistent improvements.

RESULTS

ARUCO ID BASED IDENTIFICATION

1. Get the MetaData from the video.
2. Crop the Person.
3. Preprocess this crops.
4. Detect the ArUco Marker ID
5. Database check

ARUCO ID PLACEMENT

1. Primary
    a. Upper Back
    b. Front Chest
2. Secondary
    a. Shoulders
    b. Helmets

ANALYSIS

Detection Rate by Area Size
Detection Rate
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
(2.403, 3.146]
(3.146, 3.88]
(3.88, 4.615]
(4.615, 5.35]
(5.35, 6.085]
(6.085, 6.82]
(6.82, 7.555]
(7.555, 8.29]
(8.29, 9.025]
(9.025, 9.76]
Distance Range

ISSUES

- Got constraints on the ArucoID placement.

FURTHER PROPOSALS

1. Facial Recognition + Gait/Body Analysis
2. 10cm Long-Range Visual Markers (Helmet Mounted)
3. Combination: 10cm Markers + Gait/Body Analysis + Facial Rec
4. Gait/Body Analysis + Tag Technology (RFID/BLE/UWB)
5. Gait/Body Analysis + Speech Recognition

IN PROGRESS

Gait/Body Analysis

Step 1: Creating the database and training some models

Step 2: Identifying the person

IN PROGRESS

Till Last week we use multiple features for
for dataset and Identification

IN PROGRESS

Feature Type	Weight	Rationale
OpenGait	35%	Most stable across clothing/lighting changes
Skeleton Gait	25%	Captures unique walking patterns
3D Skeleton	15%	Body structure invariant to clothing
Industrial Pose	8%	Work-specific posture indicators
Height	7%	Physical characteristic
Body Ratios	5%	Proportional measurements
Industrial Color	3%	Safety equipment detection
2D Skeleton	2%	Fallback when 3D unavailable

IN PROGRESS

Approach in this was to take the best one for each track throughout the video

2025-03-12 19:34:57
ID:5 Person_37/Person_36/Person_33
ID:3 Aditya (0.78) :1 Sunil (0.71)
ID:2 Ashutosh (0.73)
Top matches:
Person_37: 0.74
Person_36: 0.73
Person_33: 0.73
Top matches:
Person_37: 0.78
Person_33: 0.75
Top matches:
Aditya: 0.78
Person_37: 0.67
Nayan: 0.66
Top matches:
Sunil: 0.71
Aditya: 0.69
Ashutosh: 0.63
Top matches:
Ashutosh: 0.73
Aditya: 0.70
Sunil: 0.65
C402
Channel41

ID:2 Unknown
ID:16 Person_3 (0.64)
2025-03-12 19:37:22
ID:1 Prachit (0.60)
C402
Channel41

WHAT ALSO EXPRIMENTED

Just Taking the joints of the person and training a lstm for the data and only based on them get the inference

2025-03-12 19:34:48
? 1: Person_5 (0.26)
20/20)
? 3: Person_7 (0.36)
C402
Channel41

CHALLENGES FACED

- Missing features
- Identity conflicts
- Temporal consistency
- Varying Camera angles (View Invariance)

WHAT NEXT

Traditional Approach: Best single frame per track
New Approach: Temporal sequence learning

Benefits:
✓ Handles missing features through temporal context
✓ Improves temporal consistency
✓ Learns walking patterns over time
✓ More robust to occlusions and camera angle changes

THANK YOU

2025-03-12 19:34:50
ID:25 Pending...
ID:24 Unknown
ID:3 Person_3 (0.69)
ID:1 Prachit (0.65)
C402
Channel41