Intel Unnati Project Report

Project Title

AI-Based Personalized Discount Trigger System Using Real-Time Video Analytics

Objective

To develop an AI-driven system that leverages real-time video analytics to monitor customer presence in store sections and trigger discounts when a section remains unoccupied for a specific time duration. The solution aims to enhance customer engagement and optimize space utilization without human intervention.

Core Idea

- Divide the retail store area (video feed) based upon sections.
- Detect and track people in each section using object detection and tracking algorithms.
- If no person is detected in a section for more than 10 seconds, trigger a 20% discount notification on that section.
- Remove the discount if more than 10 people visit the section.

Technologies & Libraries Used

- YOLOv8 (Ultralytics) for object detection
- DeepSORT for person tracking
- OpenVINO for optimized inference on Intel hardware

- OpenCV for video processing and visualization
- Python as the programming language
- Intel OpenVINO Toolkit for model optimization and deployment

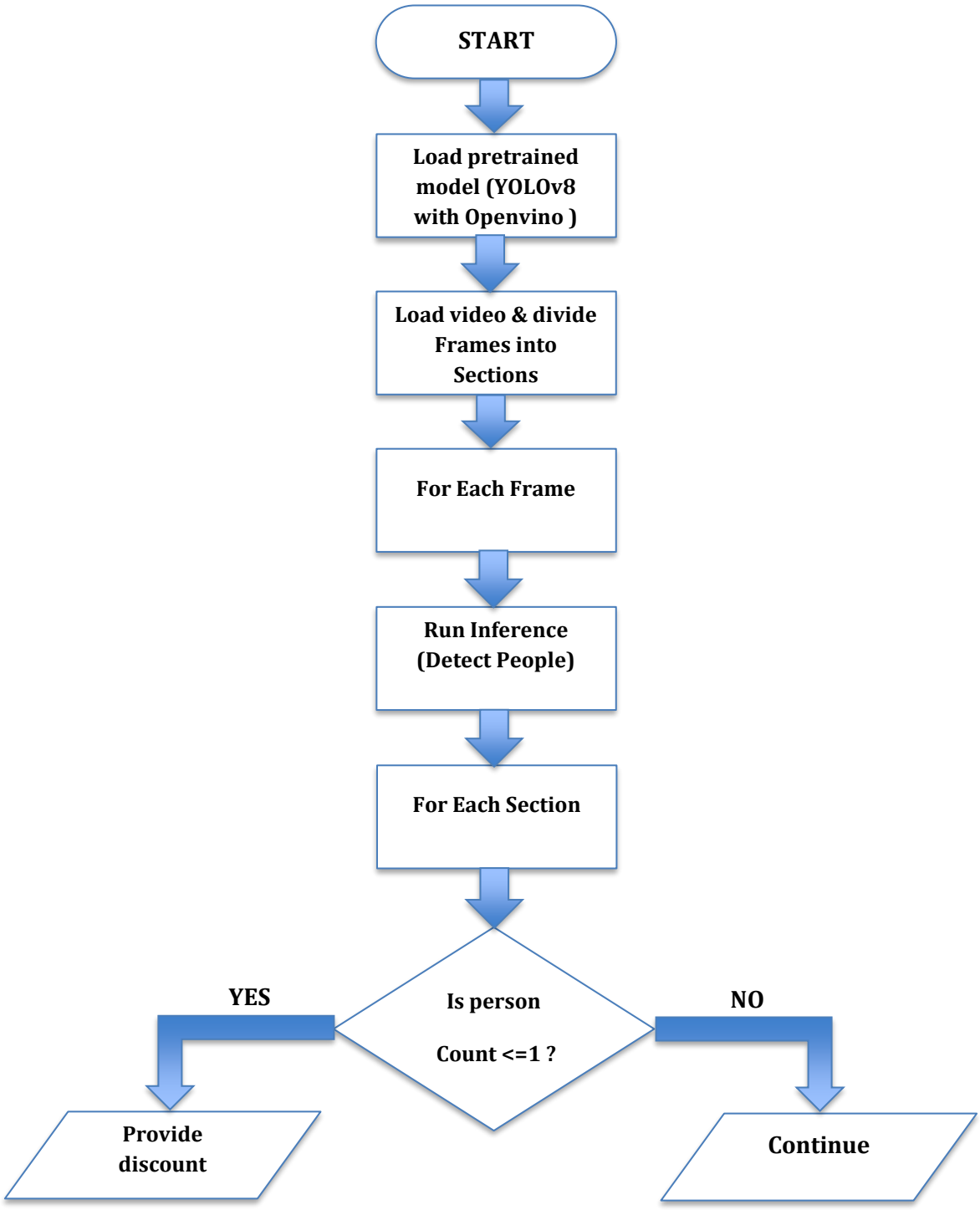
Dataset / Input

- Static test video showing people walking in a store-like environment
- Video resolution: 640x480
- Number of sections: User-defined (e.g., 2)

System Workflow

1. Load video and initialize the YOLOv8 + DeepSORT model with OpenVINO.
2. Split the frame into N sections.
3. For each frame:
   - Run YOLOv8 (OpenVINO-optimized) to detect people.
   - Use DeepSORT to track individuals.
   - Count how many people are in each section.
4. If a section has ≤1 person for more than 10 seconds:
   - Trigger a '20% Discount for 20 Minutes' message.
5. If people return or section gets crowded:
   - Remove discount.

Flowchart


START
Load pretrained model (YOLOv8 with Openvino)
Load video & divide Frames into Sections
For Each Frame
Run Inference (Detect People)
For Each Section
Is person
Count <=1 ?
YES
NO
Provide discount
Continue

Output Visualization

- Live video with:
  - Section boundaries drawn
  - Real-time person detection boxes
  - Discount message overlay when conditions are met

System Configuration

- Processor: Intel i5
- RAM: 8GB
- OS: Windows 11
- Python Version: 3.8–3.10
- Dependencies Installed:
  - opencv-python
  - ultralytics
  - deep_sort_realtime
  - openvino

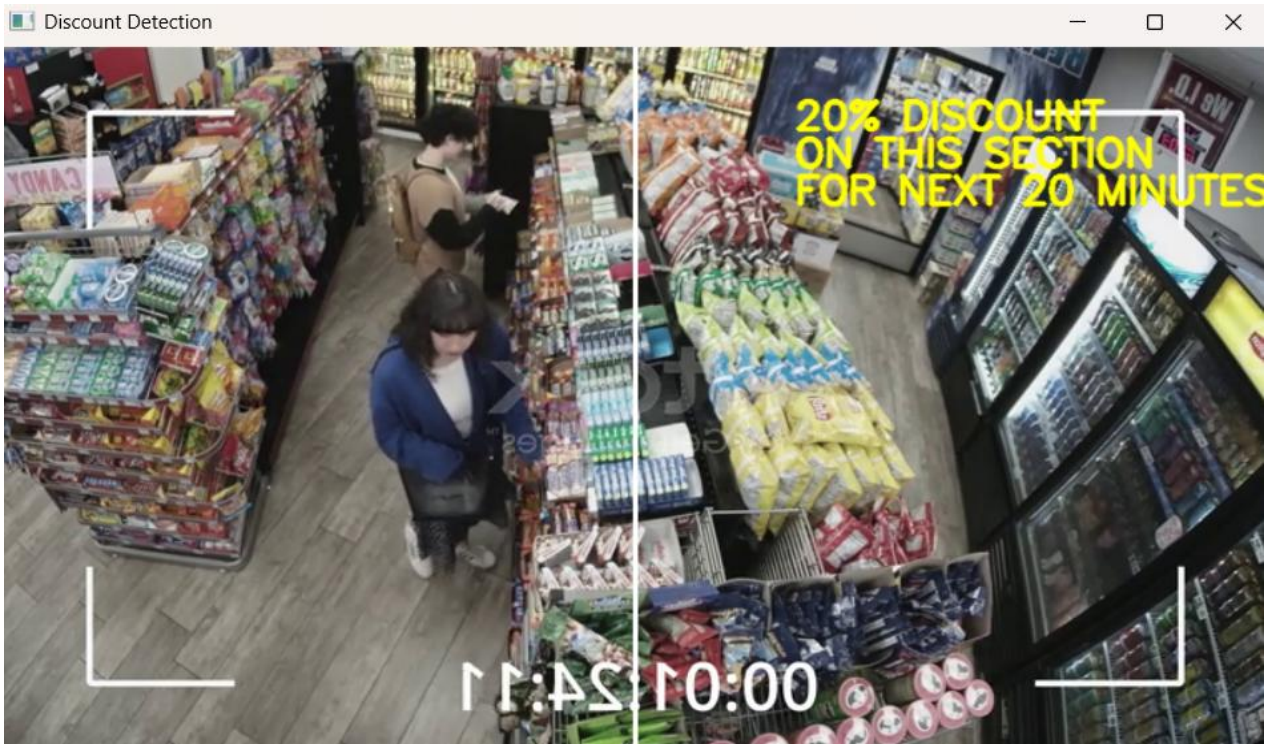
Testing & Evaluation

Section Count	Test Duration	Trigger Time	Discount Triggered	Comments
2	60s	10s	✅ Yes	Works as expected
3	90s	10s	✅ Yes	Stable detection
2	45s	<10s	❌ No	Correct behavior

Achievements

- Successfully integrated YOLOv8 + DeepSORT with OpenVINO.
- Real-time tracking and section-based logic implemented.
- Trigger system works dynamically and resets correctly.
- Achieved near real-time performance (~20–30 FPS on CPU with OpenVINO).

Output:



As there are no customers in the right side section for more than 10 seconds , a new discount has been announced for the products of that particular section for next 20 minutes.

Challenges Faced

- Integrating OpenVINO inference with YOLOv8 outputs.
- Handling numpy tensor vs array mismatches.
- Tuning DeepSORT tracker for smoother tracking.
- Ensuring accurate section indexing even with bounding box overlaps.

Future Improvements

- Add support for different discount types (e.g., based on average dwell time).
- Use heatmaps to visualize crowd density over time.
- Add a backend to connect the system to store inventory or POS systems.

- Develop a web dashboard to display section analytics and discount logs.

Contributors

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