AI-Powered Video Analytics with OpenVINO

Project Overview

This project leverages AI-driven video processing to analyze real-time video streams. Using OpenVINO for accelerated inference, the system performs:

- Object detection (YOLOv8)
- Emotion recognition
- Person tracking with ID assignment
- Analytics for visitor statistics and sentiment analysis

Features

- **Real-Time Object Detection:** Identifies people in video frames using YOLOv8.
- **Emotion Recognition:** Detects facial expressions and aggregates dominant emotions.
- **Person Tracking:** Assigns unique IDs and tracks movement across frames.
- **Web Interface:** Streams processed video via Flask.
- **Analytics Dashboard:** Provides visitor counts and sentiment statistics.

Project Structure

```
├── models/              # Pre-trained models (YOLOv8, FER)
├── static/              # Frontend assets
├── templates/           # HTML templates
├── video_processor.py   # Core AI processing module
├── app.py               # Flask web application
├── requirements.txt     # Dependencies
└── README.md            # Documentation
```

Installation

Prerequisites

- Python 3.8+
- OpenVINO Toolkit

- Flask
- OpenCV

Steps

1. Clone the repository:
2. git clone <repo_url>
3. cd <repo_folder>
4. Install dependencies:
5. pip install -r requirements.txt
6. Download and place OpenVINO models in the models/ directory.

Usage

Running the Application

Start the Flask server:

python app.py

Access the web interface at http://localhost:5000.

API Endpoints

Endpoint	**Method**	**Description**
/	GET	Web interface
/video_feed	GET	Streams processed video
/analytics	GET	JSON analytics data

Modules

video_processor.py

Handles:

- Model loading & inference
- Object detection & tracking
- Emotion recognition

- Drawing analytics on frames

app.py

- Initializes Flask app
- Handles video streaming & WebSocket connections
- Serves analytics data

Performance Optimization

- **OpenVINO Optimized Models** for efficient inference.
- **Multi-threaded Processing** for real-time performance.
- **Memory-efficient tracking** with minimal computation overhead.

Future Enhancements

- Add multi-camera support
- Deploy on edge devices (Raspberry Pi, Jetson)
- Improve emotion classification with deep learning models

Acknowledgments

- OpenVINO Toolkit
- YOLOv8 by Ultralytics
- Flask for web framework

Analytics Data Structure

```
{
  "total_visitors": 42,
  "active_visitors": 5,
  "emotion_stats": {"happy": 15, "neutral": 20, "sad": 5},
  "timestamp": 1711234567.89
}
```

Future Enhancements

- Add multi-camera support

- Improve tracking robustness with deep learning
- Integrate a cloud-based analytics dashboard

Contributors

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