Face, Hand and Object Detection System

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Introduction

This project is **Face, Hand & Object Detection System** designed to provide real-time insights on facial attributes and hand landmarks. It uses deep learning models and computer vision techniques to analyze images and video streams.

Key Features

- **Face Detection :** Identifies faces in an image or video.
- **Age & Gender Prediction :** Uses Deep Neural Networks (DNN) with OpenCV to predict age and gender.
- **Hand Detection :** Recognizes hands and tracks movements.
- **Object Detection :** Detects and classifies objects in images or videos using the Facebook DERT model.

Technologies Used

- **Python :** Core programming language
- **OpenCV :** For face detection & age/gender prediction
- **Mediapipe :** For hand detection & landmark tracking
- **Streamlit :** Web-based interface for the project
- **NumPy :** For numerical calculations and frame processing
- **Pillow :** For image processing and drawing bounding boxes
- **Requests :** For fetching images from URLs
- **Transformer :** For integrating Generative AI models

Implementation Details

- **Face & Gender Detection Process**
  - Detects faces using OpenCV’s Deep Neural Network (DNN) model.
  - Predicts age and gender using pre-trained models for accurate classification.

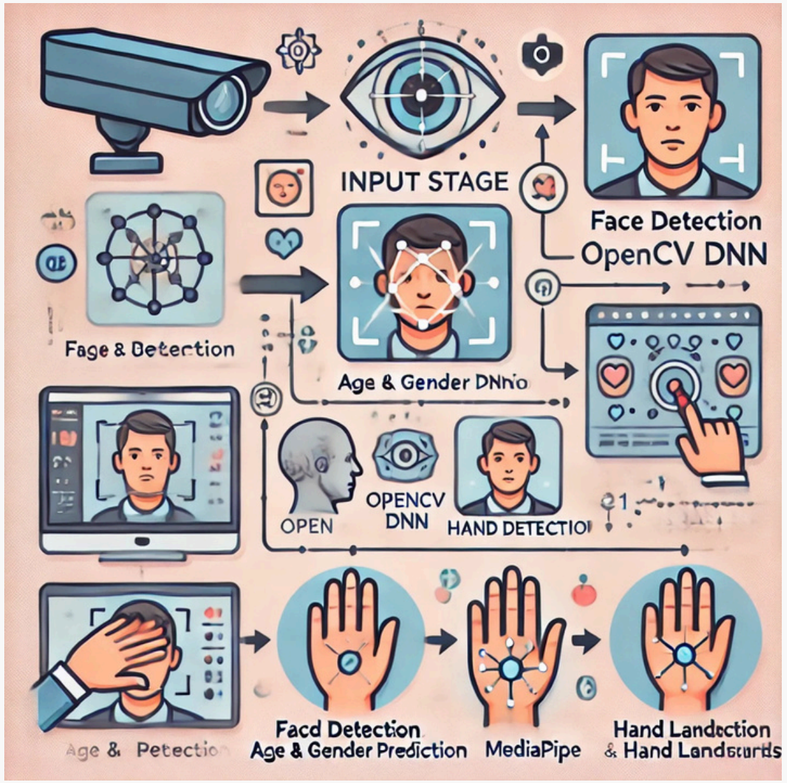
- **Hand Detection Process**
  - Uses Mediapipe to detect hands in real-time.
  - Identifies 21 landmark points, enabling hand gesture recognition and tracking.

- **Object Detection Process**
  - Implements object detection using the Facebook DERT (Dynamic Efficient Representation Transformer) model.
  - Detects and classifies multiple objects in real-time with high accuracy.

Workflow of the System

Workflow Steps:

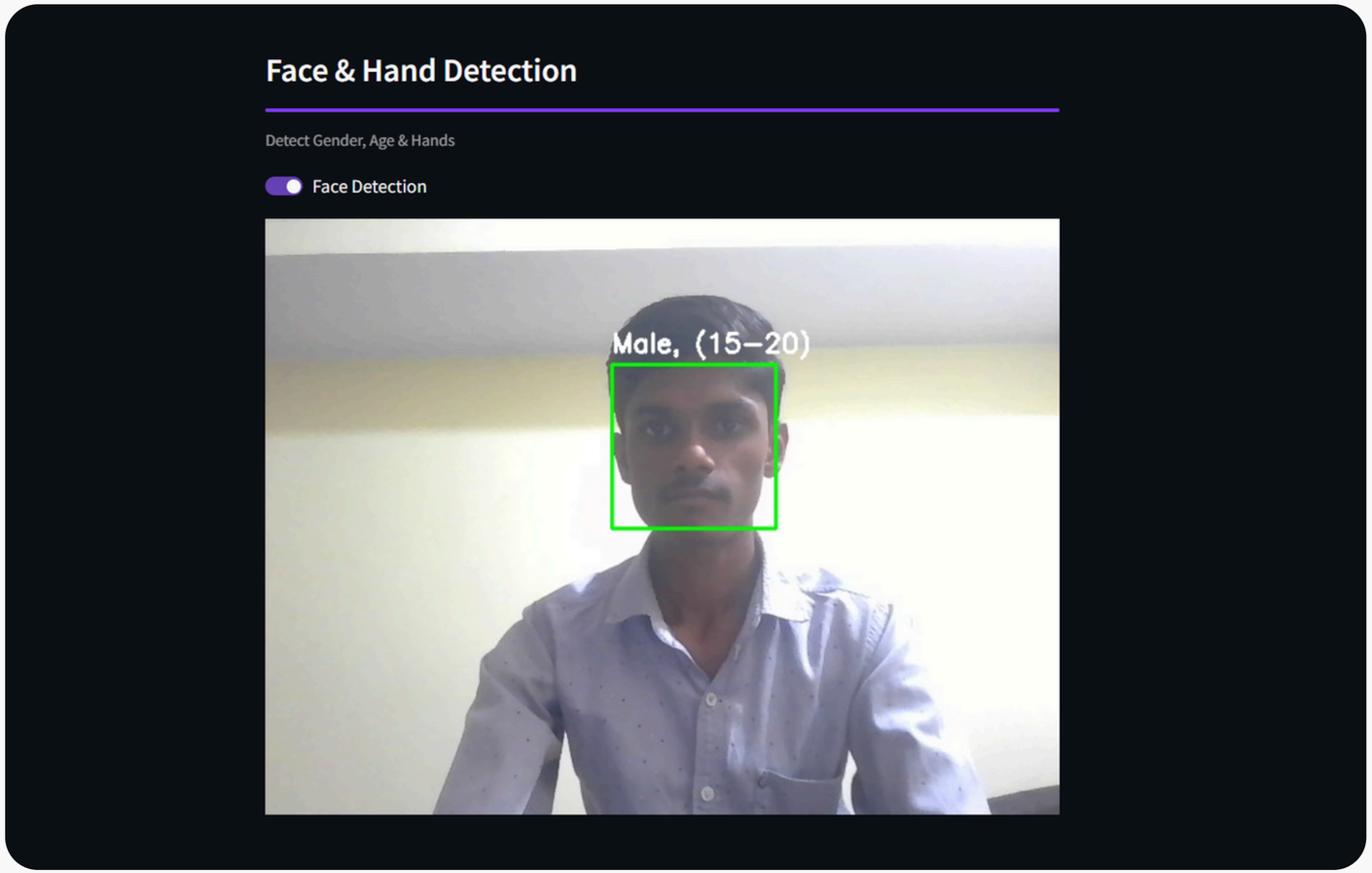
1. **Input →**
   Webcam/Image Upload
2. **Face Detection (OpenCV DNN) →**
   Predict Age & Gender
3. **Hand Detection (Mediapipe) →**
   Recognize Landmarks
4. **Display Output on the Streamlit Web Interface**



Workflow Diagram

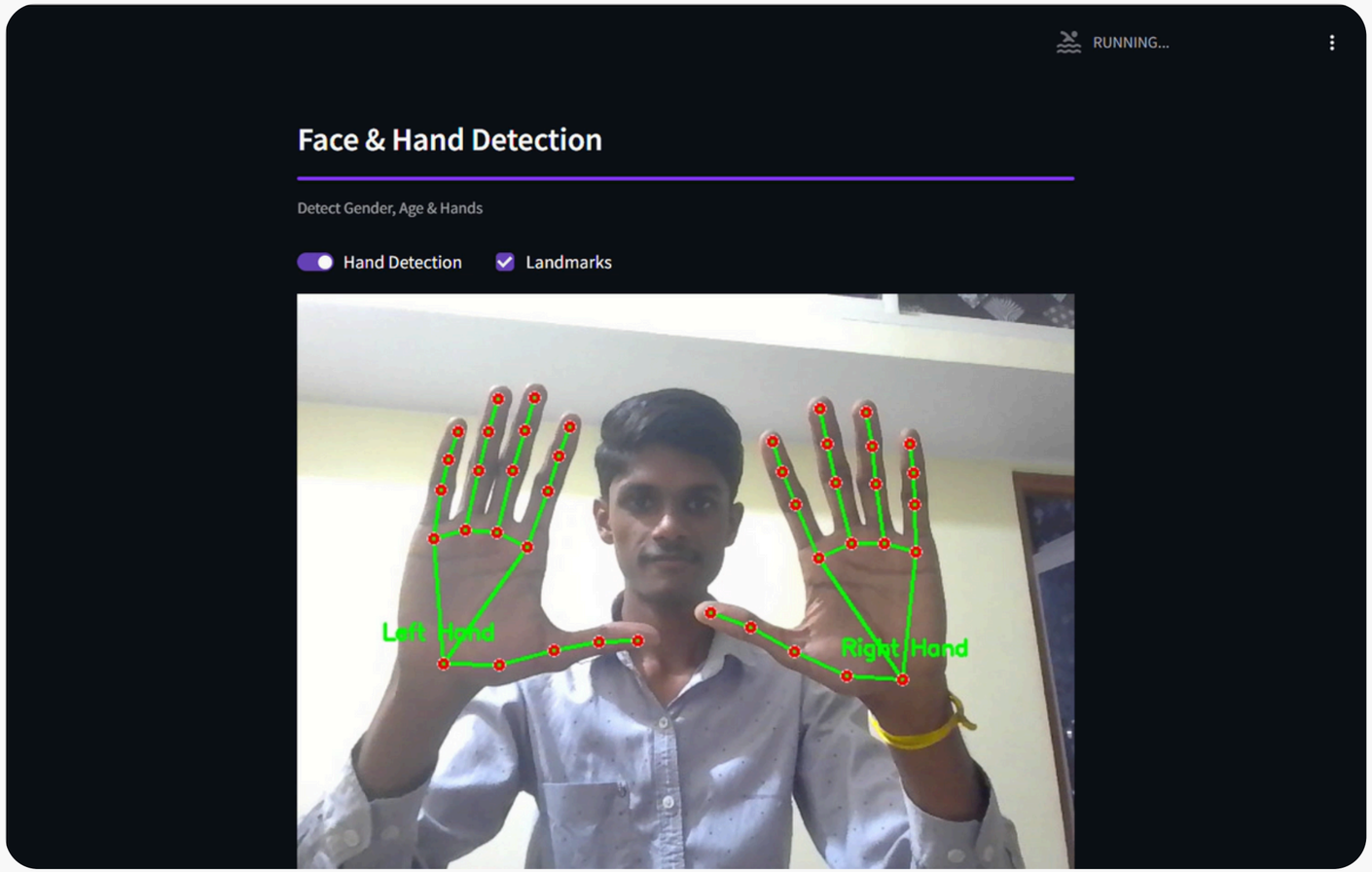
Demo

- **Face & Gender Detection**



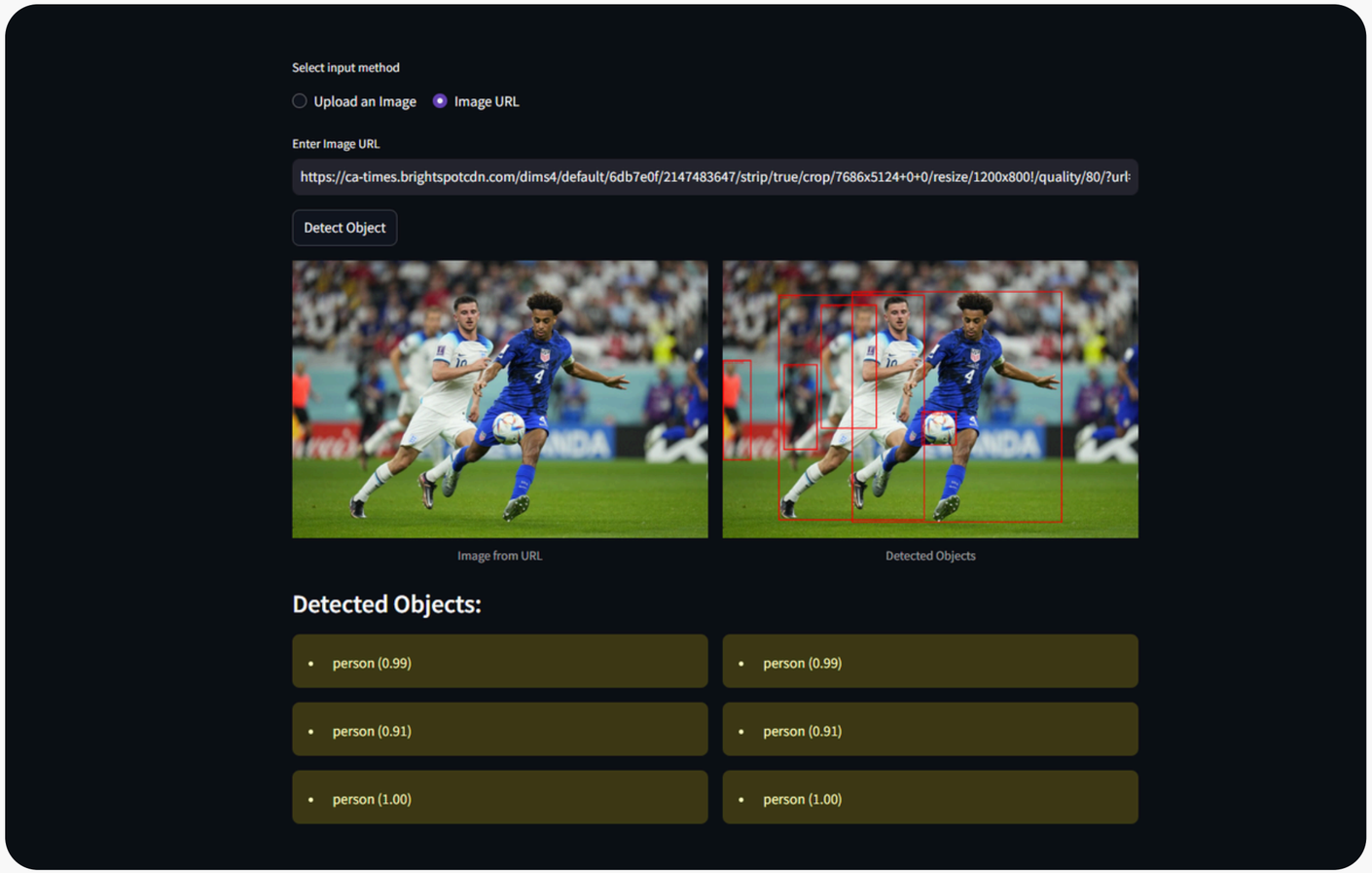
Demo

- **Hand Detection**



Demo

- **Object Detection**



Applications & Future Scope

- **Current Applications**
  - AI-based security & surveillance
  - Interactive applications (gesture-based controls)

- **Future Enhancements**
  - Adding emotion detection
  - Optimizing for edge devices (Raspberry Pi, mobile phones, etc.)

Conclusion

This project combines real-time face, hand, and object detection using advanced AI models. It leverages OpenCV’s DNN for face detection, Mediapipe for hand gesture recognition, and the Facebook DERT model for dynamic object detection. The entire system is integrated into a user-friendly Streamlit web app.

- **Key Takeaways**
  - Real-time performance, enabling face, hand, and object detection on live video or images.
  - Web-based interface with easy access for users to upload images or use their webcam.
  - Intuitive and user-friendly design for a seamless experience.

Thank You!

For more details and source code
you can scan the QR code.