**Introduction**

The objective of this project is to implement a real-time system for detecting human faces and estimating their gender and age using pre-trained deep learning models in OpenCV. This project leverages computer vision techniques to process video streams, detect faces, and classify their attributes such as age and gender.

The system finds practical applications in areas such as personalized marketing, security, crowd analytics, and user experience enhancement. By utilizing OpenCV’s pre-trained models, the project achieves efficient and reasonably accurate predictions while operating in real-time, making it suitable for integration into various applications.

**Methodology**

1. **Framework and Tools:**
   * The project utilizes **OpenCV**, a popular computer vision library, to handle image processing tasks and load pre-trained deep learning models.
   * The models used are based on deep learning frameworks such as Caffe, and pre-trained. caffemodel files are employed to predict gender and age.
2. **Face Detection:**
   * The **OpenCV DNN module** is used to detect faces in video streams. A pre-trained face detection model (opencv\_face\_detector\_uint8.pb) is employed to identify bounding boxes around faces.
   * Detected faces are cropped from the frame and resized to a fixed input size required by the classification models.
3. **Age and Gender Classification:**
   * **Pre-trained Models:**
     + The gender prediction model (gender\_net.caffemodel) classifies faces into Male or Female.
     + The age prediction model (age\_net.caffemodel) predicts the age range of the detected face from predefined categories: (0-2), (4-6), (8-12), (15-20), (25-32), (38-43), (48-53), (60+).
   * Input images are preprocessed by resizing them to 227x227 pixels and normalizing using mean values.
   * Forward passes through the respective models yield predictions for gender and age.
4. **Real-Time Processing:**
   * The system uses a webcam or a video feed for real-time face detection and classification.
   * Bounding boxes and predicted labels (age and gender) are overlaid on the video frame and displayed on the screen.
5. **Performance Considerations:**
   * A confidence threshold ensures only reliable face detections are processed.
   * Padding is applied to the bounding boxes to improve the accuracy of predictions.

**Output**



