Face Mask Detection with Live Alert System

Project Report: Face Mask Detection with Live Alert System

Title:

Face Mask Detection with Live Alert System

Introduction:

The COVID-19 pandemic highlighted the importance of wearing face masks in public spaces to reduce virus transmission. Ensuring compliance manually is challenging and inefficient. This project aims to automate face mask detection in real-time using computer vision, alerting users if no mask is detected.

Abstract:

This project utilizes deep learning and computer vision to detect whether a person is wearing a face mask. A Convolutional Neural Network (CNN) is trained on images of masked and unmasked faces. The system uses a webcam feed to perform real-time detection with OpenCV and TensorFlow/Keras. If a face without a mask is detected, the system triggers an alert sound. This model can be deployed in public areas like offices, malls, or schools for real-time monitoring.

Tools Used:

- Python
- OpenCV
- TensorFlow / Keras
- Haar Cascades (for face detection)
- NumPy
- Streamlit (optional for UI)

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- Pre-trained MobileNetV2 (used as base CNN)

Steps Involved in Building the Project:

1. Dataset Collection:

   - Used Kaggle dataset with two categories: 'with_mask' and 'without_mask'.

2. Data Preprocessing:

   - Resized images to 224x224 pixels

   - Normalized pixel values

   - Labeled and split data into training and validation sets

3. Model Building:

   - Used MobileNetV2 as a feature extractor

   - Added dense layers for classification

   - Trained using binary cross-entropy loss

4. Face Detection:

   - Haar Cascades used to detect faces in webcam feed

   - Detected face is passed to CNN model for classification

5. Live Alert System:

   - Real-time webcam input analyzed

   - If 'no mask' is detected, an alarm sound is triggered

   - Bounding boxes with labels displayed on screen

6. Deployment (Optional):

- Flask or Streamlit can be used for simple web interface
- Code is modular and can be easily deployed

Conclusion:

This face mask detection system demonstrates how AI can contribute to public safety during health crises. The model performs well on real-time webcam inputs with high accuracy and fast inference time. It can be integrated into existing CCTV or entrance systems for mask compliance monitoring. Further improvements could include multi-face detection, low-light performance, and edge-device deployment using TensorFlow Lite or OpenVINO.