Major Project Report

Face Mask Detection using Deep Learning

Abstract

This project is a real-time face mask detection system using computer vision and deep learning. It utilizes a Convolutional Neural Network (CNN) trained on images of faces with and without masks. The system employs OpenCV for face detection and uses a Flask-based web interface to stream the webcam feed with live mask detection overlays.

Introduction

With the COVID-19 pandemic increasing the need for health safety protocols, this project addresses the challenge of mask compliance. It provides a solution that is easy to deploy, requiring only a webcam and minimal system resources to monitor and ensure mask usage.

Tools Used

- Python
- OpenCV
- TensorFlow & Keras
- Flask (for web interface)
- Haar Cascade Classifier (for face detection)
- HTML/CSS (for UI rendering)

Steps Involved

1. Data Preparation & Training: Collected dataset of masked and unmasked faces. Trained a CNN using TensorFlow/Keras in a Jupyter notebook.
2. Model Saving: Exported trained model to `mask_detection_model.h5`.
3. Face Detection: Used Haar Cascade to detect face regions from the webcam feed.
4. Prediction: The model classifies the detected face as "Mask Worn" or "No Mask".

5. Deployment: Two scripts were created - one (`live_detection.py`) for standalone use, and another (`app.py`) for running as a web app via Flask with live video streaming to a webpage.
6. User Interface: A simple HTML/CSS page (`index.html`) displays the stream in the browser.

Conclusion

This project demonstrates a practical use-case of AI in health safety by providing a real-time face mask detection system. It is lightweight, efficient, and deployable on personal computers for environments like offices, schools, or public entrances.