PROJECT REPORT

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PROJECT NAME: Face Mask Detection with Live Alert System

INTRODUCTION

- In light of recent global health crises, such as the COVID-19 pandemic, face masks have become an essential preventive measure in public spaces. Manual monitoring of mask usage is neither scalable nor practical. Hence, this project presents an AI-powered Face Mask Detection System that can automatically detect whether individuals are wearing face masks using a webcam or images. This system enhances public safety by enabling real-time surveillance and alerting mechanisms.

ABSTRACT

- This project involves building a deep learning-based face mask detection model that can identify individuals with or without masks. A pre-trained model (MobileNetV2) is fine-tuned on a labeled dataset divided into Train, Validation, and Test sets. The model classifies images in real time and can be deployed with a live webcam feed for dynamic monitoring. Additional features like sound alerts and visual warnings are integrated for instant feedback when someone is detected without a mask. The system is designed to be lightweight, scalable, and effective for use in offices, schools, or public areas.

STEPS

1. Data Collection & Organization
2. Model Training
3. Model Evaluation
4. Making web application
5. Prediction logic
6. LAlert System
7. Deployment

TECHNOLOGIES USED:

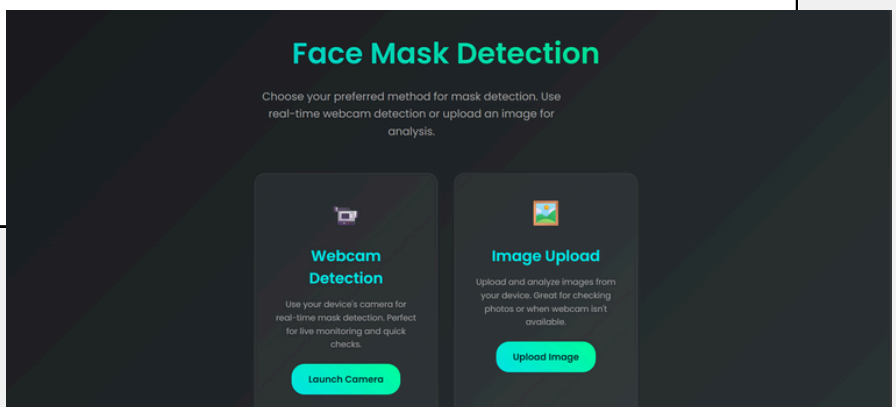
- PYTHON : used as core programming language
- TENSORFLOW & kERAS : used to train and compile CNN model
- PILLOW(PIL) : Image loading and resizing in flask
- OPEN CV : Webcam stream capture and face detection.

- FRONTEND : HTML , CSS , JAVASCRIPT
- BACKEND : FLASK

- GOOGLE COLAB : used as deployment and training environment

LINKS :

- **DATASET :** https://www.kaggle.com/datasets/ashishjangra27/face-mask-12k-images-dataset
- **VIDEO :** Full working video on google drive link.



PROCEDURE :

1. DATA COLLECTION AND ORGANISATION :

Collected face mask **dataset from Kaggle.**
Organized data into **with_mask/ and without_mask/ folders**.
Resized images to model's expected input shape (e.g., 224×224).

2. MODEL TRAINING (CUSTOM CNN) :

We used a lightweight **MobileNetV2 architecture** fine-tuned on our dataset for fast inference on webcam feeds.
Loaded a pretrained **CNN model (.h5)** or built a new one using Keras.Used ImageDataGenerator to preprocess data and perform augmentation.Compiled and trained the model using binary_crossentropy loss.**Achieved ~98% validation accuracy.**

3. MODEL EVALUATION :

Visualized training & validation accuracy using matplotlib.
Ensured **no overfitting using early stopping** and monitoring graphs**.**

4. WEB APPLICATION (FLASK + HTML/JS UI) :

Created a responsive UI using **HTML, CSS, and JavaScript**.
Integrated webcam access via JavaScript.
Captured image from webcam and sent it to F**lask backend** using fetch().

5. PREDICTION LOGIC (FLASK BACKEND) :

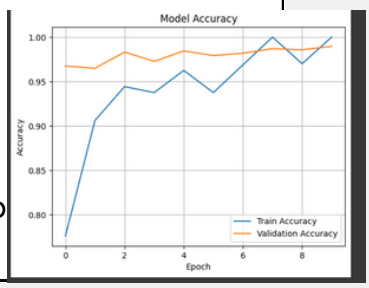
Received image via **POST request** and preprocessed it.
Used the trained model to predict mask status.
Returned JSON response with appropriate label (e.g., "✅ Mask Detected" or "❌ No Mask").

6. ALERT SYSTEM :

Added **buzzer and UI alert message** when mask is not detected**.**

7. DEPLOYMENT :

Hosted the app locally using Flask.
Option to deploy on **Vercel with ngrok** tunnel fo real-time testing.



CONCLUSION:

- THIS PROJECT DEMONSTRATES HOW ARTIFICIAL INTELLIGENCE CAN BE APPLIED TO REAL-WORLD PUBLIC SAFETY CHALLENGES. BY COMBINING DEEP LEARNING WITH COMPUTER VISION, WE SUCCESSFULLY BUILT A REAL-TIME FACE MASK DETECTION SYSTEM THAT CAN:
- THIS SYSTEM CAN BE DEPLOYED IN SCHOOLS, OFFICES, MALLS, AND HOSPITALS TO ASSIST IN HEALTH REGULATION ENFORCEMENT.
- WITH FURTHER IMPROVEMENTS LIKE THERMAL SCREENING INTEGRATION OR PEOPLE-COUNTING, THIS SYSTEM CAN EVOLVE INTO A FULL-FLEDGED SMART SURVEILLANCE SOLUTION.