# Face Mask Detection Using Deep Learning

## Introduction

The Face Mask Detection project aims to identify whether individuals in real-time video streams are wearing a mask or not. Given the global health concerns such as COVID-19, automated mask detection has become a vital tool to ensure public safety and enforce preventive measures in public spaces.

## Abstract

This project leverages deep learning and computer vision to detect faces in video frames and classify them as 'Mask' or 'No Mask'. The MobileNetV2 architecture is used as the backbone for feature extraction, while OpenCV's DNN module handles face detection. The model is trained on a dataset of masked and unmasked faces to predict compliance in real-time video feed.

## Tools Used

• Python 3.10  
• TensorFlow 2.11 & Keras  
• OpenCV (cv2)  
• MobileNetV2 (Pre-trained model)  
• Haarcascade / DNN Face Detector  
• Jupyter Notebook / VS Code

## Steps Involved in Building the Project

1. Data Collection: Used a public dataset containing images of people with and without masks.  
2. Preprocessing: Images resized and normalized, labels encoded.  
3. Model Training: Trained a MobileNetV2-based binary classifier.  
4. Face Detection: Used OpenCV DNN module to locate faces in video frames.  
5. Real-Time Inference: Integrated model with webcam feed to predict and display results.  
6. Performance Tuning: Applied confidence threshold, frame resizing for speed.

## Conclusion

This project successfully demonstrates how deep learning can be applied to real-world problems like face mask detection. With accurate predictions and real-time processing, the solution can be deployed in surveillance systems, public entrances, or workplaces to monitor mask compliance efficiently.