

PROJECT REPORT

PROJECT TITLE: FACE MASK DETECTION USING OPENCV IN PYTHON (PYTHON & MACHINE LEARNING PROJECT)

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PROJECT LINK: <https://github.com/Ishika002/FACE-MASK-DETECTION-USING-OPENCV-IN-PYTHON.git>

INTRODUCTION

This project aims to develop a **real-time** face mask detection system using OpenCV and machine learning. It utilizes a deep learning model trained on image datasets to classify whether a person is wearing a mask or not. OpenCV is used for image processing and face detection, while a pre-trained **Convolutional Neural Network (CNN) model**, such as MobileNetV2, is employed for classification. The system can be integrated with a webcam for real-time monitoring, making it useful for enforcing mask policies in public spaces.

DATA & METHODOLOGY

Data:

- Dataset:** Pre-collected face images with and without masks (e.g., Kaggle datasets).
- Data Preprocessing:** Resizing images to a fixed size (e.g., 224x224). Normalizing pixel values. Splitting into training and testing sets.

Methodology:

- Face Detection:** Use OpenCV's Haar Cascade or DNN-based face detection.
- Model Selection:** Train a Convolutional Neural Network (CNN) or use a pre-trained model like MobileNetV2.
- Training:** Train the model on labeled mask/no-mask images using TensorFlow/Keras.
- Real-Time Detection:** Capture video frames, detect faces, classify mask presence, and display results using OpenCV.

Deployment: Implement in real-time applications for monitoring compliance.

KEY INSIGHTS & FINDINGS

- High Accuracy with CNN Models** – Pre-trained models like MobileNetV2 achieve high accuracy in mask classification.
- Real-Time Performance** – OpenCV enables fast face detection and mask classification, making real-time monitoring feasible.
- Challenges in Detection** – Variations in lighting, occlusions, and incorrect mask-wearing can affect model performance.
- Dataset Quality Matters** – A diverse dataset improves the model's ability to generalize across different face types and mask styles.
- Potential for Deployment** – The system can be integrated with surveillance cameras for public safety applications.

CONCLUSION & IMPACT

The Face Mask Detection project using OpenCV and machine learning successfully detects whether individuals are wearing masks in real time. By leveraging deep learning models like MobileNetV2 and OpenCV for face detection, the system achieves high accuracy and efficiency. Challenges such as lighting conditions and improper mask usage can impact performance, but improving dataset diversity and model tuning can enhance reliability. This project has significant applications in public health and safety, particularly in enforcing mask-wearing policies during pandemics. It can be integrated into surveillance systems, workplaces, and public spaces to automate compliance monitoring, reducing the need for manual enforcement and enhancing community safety.