

Face Mask Detection with Live Alert System

◆ Introduction

The COVID-19 pandemic has made face masks a crucial preventive measure. Ensuring compliance with mask mandates in public places can be challenging. This project aims to automate mask detection using a real-time webcam feed, enabling proactive safety monitoring through deep learning and computer vision.

◆ Abstract

This project implements a real-time face mask detection system using Python, OpenCV, and TensorFlow/Keras. A Convolutional Neural Network (CNN) was trained on a dataset containing images of people with and without masks. Haar Cascade classifiers were used for face detection, and the model was integrated with a live video stream. The system alerts when a person without a mask is detected, and a web interface deployment is optionally provided using Flask. This lightweight and efficient solution can assist in enforcing public health policies in real-time environments.

◆ Tools Used

- Programming Language: Python
 - Libraries: TensorFlow/Keras, OpenCV, NumPy, scikit-learn
 - Face Detection: Haar Cascade Classifier
 - IDE: Jupyter Notebook
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◆ Steps Involved in Building the Project

1. **Data Collection & Preprocessing:**
Used a Kaggle dataset with two categories: with_mask and without_mask. Images were resized, converted to grayscale, and normalized for consistency.
 2. **Model Building & Training:**
A CNN was constructed with convolutional, pooling, and dense layers. The model was trained for binary classification and achieved good validation accuracy.
 3. **Real-Time Detection:**
Haar Cascades were used to detect faces in a webcam feed. Detected faces were passed to the trained model to predict mask status. Alerts were printed for non-compliance.
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◆ Conclusion

This Face Mask Detection system effectively combines deep learning with traditional computer vision techniques to provide a fast and reliable solution for public safety monitoring. The project demonstrates practical deployment of AI in solving real-world health-related problems. Future enhancements could include support for multiple people, crowd analysis, and cloud deployment.