

Face Mask Detection Using CNN

Overview

This project implements a **Convolutional Neural Network (CNN)** model to automatically detect whether a person is wearing a face mask or not using image data. It aims to assist in public health safety, especially in situations like the COVID-19 pandemic, where mask-wearing is critical.

Features

- Real-time face mask detection using deep learning
- Binary classification: With Mask / Without Mask
- Trained on a labeled dataset of masked and unmasked faces
- End-to-end workflow in Jupyter Notebook using TensorFlow/Keras
- High accuracy with minimal training time

Project Workflow

1. **Data Loading & Preprocessing**
Images are resized, normalized, and labeled.
2. **Model Architecture**
CNN with Conv2D, MaxPooling, Flatten, and Dense layers.
3. **Training & Validation**
Compiled with adam optimizer and `categorical_crossentropy` loss.
Evaluated using accuracy and loss metrics.
4. **Model Evaluation & Prediction**
Tested with validation data and visualized prediction results.

Tools & Technologies

Category	Tools/Technologies
Language	Python
Notebook	Jupyter Notebook (.ipynb)
Libraries	TensorFlow, Keras, NumPy, Matplotlib, OpenCV
Model Type	CNN (Convolutional Neural Network)
Dataset Source	Kaggle Face Mask Dataset
Visualization	Matplotlib, Confusion Matrix
IDE	Jupyter / VS Code / Google Colab

Dataset Overview

- Two classes: `with_mask` and `without_mask`
- Balanced number of images in each class
- Image size standardized (e.g., 100x100 or 224x224)

Results

- **Training Accuracy:** $\sim 98\%$
- **Validation Accuracy:** $\sim 92\%$
- Model performance visualized using loss/accuracy plots.