Face Mask Detection using CNN

Dipsikha Rano
Roll No: 240365

Assignment: Mid Evaluation

Introduction

The aim of this project is to classify faces based on mask usage — correctly worn, incorrectly worn, or not worn. This report documents the steps followed from dataset preprocessing to model training and testing.

Understanding and Learning

Through this project, I learned how to implement a complete face mask classification pipeline using deep learning and computer vision. The task was to classify whether a person in an image was wearing a mask correctly, incorrectly, or not at all. I began by parsing XML annotation files to extract bounding boxes and labels. After preprocessing the face regions from the original images, I trained a convolutional neural network using the InceptionV3 model as a feature extractor. Data augmentation techniques were applied to make the model more robust. I also integrated OpenCV's pre-trained face detector to locate faces in unseen images and passed those detected faces to the trained model for prediction. This helped me understand how different components like annotation parsing, image preprocessing, transfer learning, and face detection come together in a real-world classification task. Overall, this assignment gave me hands-on experience in designing and evaluating a practical image classification pipeline end-to-end.

Key Code Snippets

Parsing Annotations

```
def parse_xml(xml_file):
    tree = ET.parse(xml_file)
    ...
    return annotations
```

Face Cropping and Preprocessing

```
for i in range(len(df)):
    ...
    face = image[ymin:ymax, xmin:xmax]
    face = cv2.resize(face, (224, 224))
```

Model Architecture (Transfer Learning)

```
base_model = InceptionV3(weights='imagenet', include_top=False, input_shape=(224,
    ↪ 224, 3))
x = Flatten()(base_model.output)
x = Dense(1024, activation='relu')(x)
...
```

Visualizations

Training vs Validation Accuracy

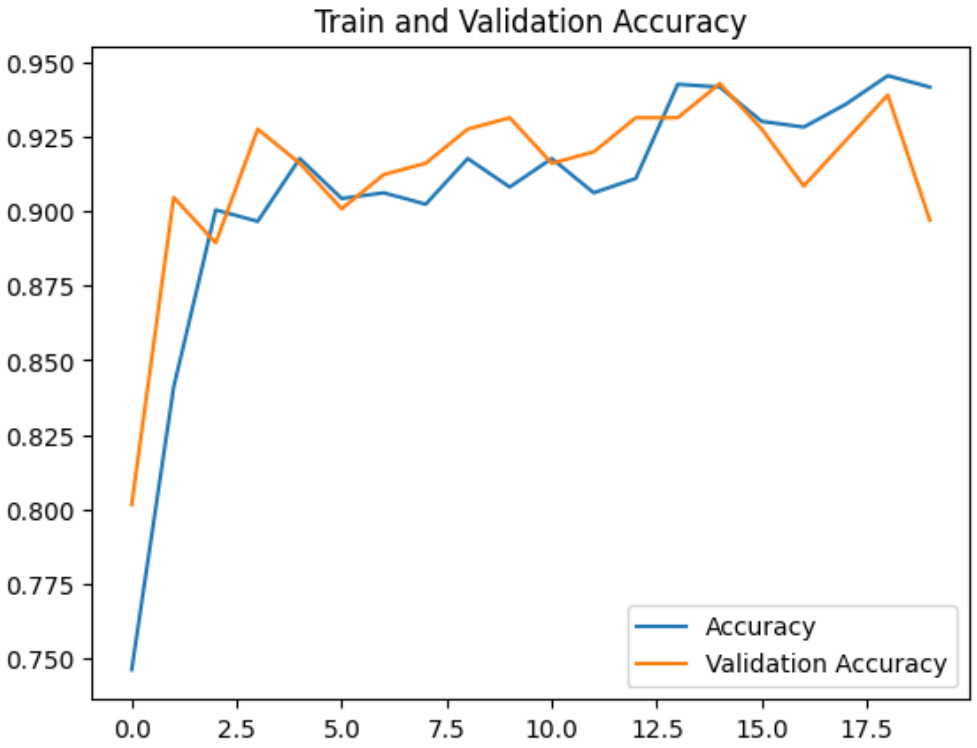

Figure 1: Train vs Validation Accuracy

Training vs Validation Loss

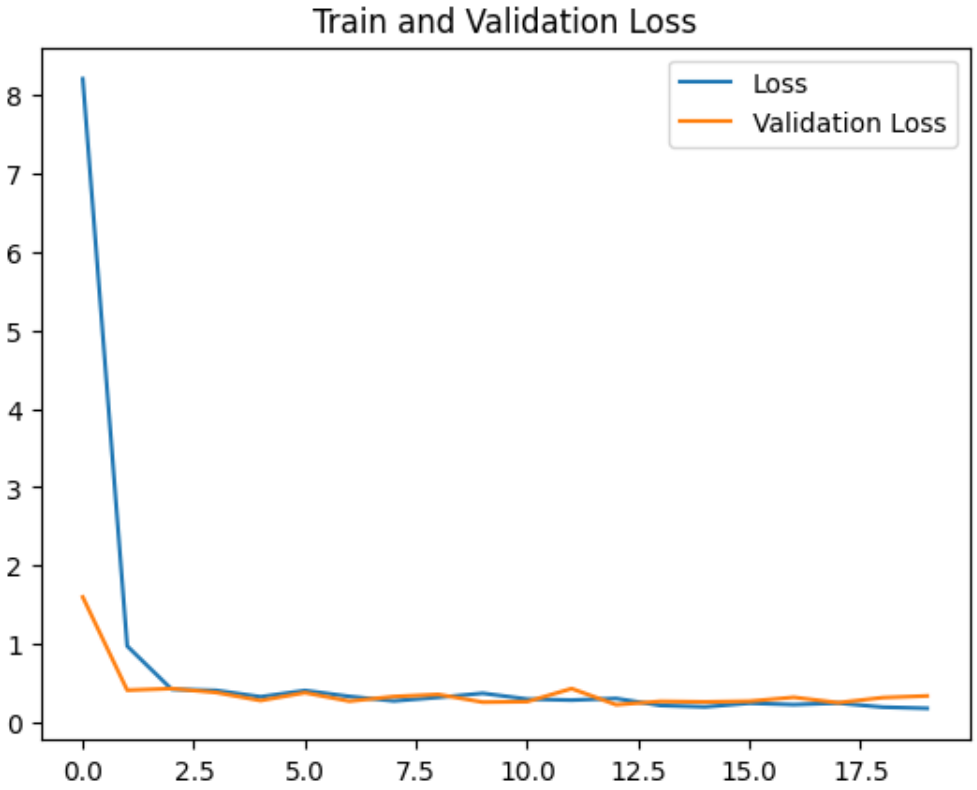

Figure 2: Train vs Validation Loss

Final Prediction Output

Figure 3: Model Prediction with Face Bounding Box and Label

Conclusion

This assignment gave me practical experience in building a real-world computer vision classifier. I learned how to manage annotated datasets, use transfer learning, and integrate face detection with classification to make a working mask detector.