Start coding or generate with AI.

```
from google.colab import drive
drive.mount('/content/drive')
```

```
import os
import cv2
import numpy as np
import pandas as pd
from PIL import Image
from pathlib import Path
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split

import tensorflow as tf
from tensorflow import keras

from tensorflow.keras.utils import plot_model #for model visualization
```

```
with_mask_data = os.listdir(r'/content/sample_data/Data/masked')
```

```
print(with_mask_data[0:5])
```

```
['with_mask_5.jpg', 'with_mask_13.jpg', 'with_mask_18.jpg', '.ipynb_checkpoints', 'with_mask_3.jpg']
```

```
print('Number of with mask images:', len(with_mask_data))
```

```
Number of with mask images: 19
```

```
without_mask_data = os.listdir(r'/content/sample_data/Data/unmasked')
```

```
print(without_mask_data[0:5])
```

```
['without_mask_3.jpg', 'without_mask_9.jpg', 'without_mask_6.jpg', 'without_mask_14.jpg', 'without_mask_10.jpg']
```

```
print('Number of without mask images:', len(without_mask_data))
```

```
Number of without mask images: 15
```

```
with_mask_labels = [1]*len(with_mask_data)
print(f"With Mask labels" ,with_mask_labels[0:10])

without_mask_labels = [0]*len(without_mask_data)
print(f"Without Mask Labels", without_mask_labels[0:10])
```

```
With Mask labels [1, 1, 1, 1, 1, 1, 1, 1, 1, 1]
Without Mask Labels [0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
```

```
Labels = with_mask_labels + without_mask_labels
print(f"Labels", Labels[0:10])
print(f"Labels", Labels[-10:])
```

```
Labels [1, 1, 1, 1, 1, 1, 1, 1, 1, 1]
Labels [0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
```

```
def load_images_from_folder(folder):
    images = []  # Initialize the list to store image arrays
    for filename in os.listdir(folder):
        file_path = os.path.join(folder, filename)
```

```
        # Check if it's a file and if it has a valid image extension
        if os.path.isfile(file_path) and filename.lower().endswith(('.png', '.jpg', '.jpeg', '.bmp', '.gif')):
            print(f"Loading image: {filename}")  # Print the filename for debugging
            img = Image.open(file_path)
            img = img.resize((128, 128))  # Resize the image to 128x128
            img = img.convert('RGB')  # Convert the image to RGB
            images.append(np.array(img))  # Convert to numpy array and append to the list
    return images

with_mask_images = load_images_from_folder(r'/content/sample_data/Data/masked')
without_mask_images = load_images_from_folder(r'/content/sample_data/Data/unmasked')
```

```
Loading image: with_mask_5.jpg
Loading image: with_mask_13.jpg
Loading image: with_mask_18.jpg
Loading image: with_mask_3.jpg
Loading image: with_mask_1.jpg
Loading image: with_mask_15.jpg
Loading image: with_mask_8.jpg
Loading image: with_mask_10.jpg
Loading image: with_mask_17.jpg
Loading image: with_mask_11.jpg
Loading image: with_mask_2.jpg
Loading image: with_mask_14.jpg
Loading image: with_mask_12.jpg
Loading image: with_mask_16.jpg
Loading image: with_mask_9.jpg
Loading image: with_mask_6.jpg
Loading image: with_mask_4.jpg
Loading image: with_mask_7.jpg
Loading image: without_mask_3.jpg
Loading image: without_mask_9.jpg
Loading image: without_mask_6.jpg
Loading image: without_mask_14.jpg
Loading image: without_mask_10.jpg
Loading image: without_mask_1.jpg
Loading image: without_mask_4.jpg
Loading image: without_mask_12.jpg
Loading image: without_mask_16.jpg
Loading image: without_mask_11.jpg
Loading image: without_mask_8.jpg
Loading image: without_mask_2.jpg
Loading image: without_mask_5.jpg
Loading image: without_mask_13.jpg
Loading image: without_mask_7.jpg
```

```
images[0]
```

ndarray (128, 128, 3) show data

```
len(images)
```

```
3
```

```
images[0].shape
```

```
(128, 128, 3)
```

```
X = np.array(images)
Y = np.array(Labels)
```

```
X[0]
```

```
ndarray (128, 128, 3) show data
```

```
type(X)
```

```
numpy.ndarray
```

```
Y
```

```
array([1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0])
```

```
X
```

```
              [172, 174, 187],
              ...,
              [137, 150, 155],
              [140, 154, 160],
              [141, 156, 163]]]], dtype=uint8)
```

```
# Assuming you have a list of labels that corresponds to your images
# Example: labels could be [1, 0, 1, ...] for masked/unmasked images
labels = [0] * len(with_mask_images) + [1] * len(without_mask_images)  # Assuming 0 for masked and 1 for unmasked

# Combine your image data and labels
X = np.array(with_mask_images + without_mask_images)  # Combine the images
Y = np.array(labels)  # Corresponding labels

# Check lengths again
print("Length of X:", len(X))
print("Length of Y:", len(Y))

# Now split
from sklearn.model_selection import train_test_split
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.2, random_state=42)
```

```
Length of X: 33
Length of Y: 33
```

```
print(f"Shape of X_train is: {X_train.shape}")
print(f"Shape of Y_train is: {Y_train.shape}\n")
print(f"Shape of X_test is: {X_test.shape}")
print(f"Shape of Y_test is: {Y_test.shape}")
```

```
Shape of X_train is: (26, 128, 128, 3)
Shape of Y_train is: (26,)

Shape of X_test is: (7, 128, 128, 3)
Shape of Y_test is: (7,)
```

```
#scaling the data
X_train = X_train/255
X_test = X_test/255
```

```
# from tensorflow.keras.models import Sequential
# from tensorflow.keras.layers import Flatten ,Dense ,Dropout ,BatchNormalization, GlobalAveragePooling2D
# from tensorflow.keras.optimizers import Adamax

# image_size = (128,128)
# channels = 3
# image_shape = (image_size[0],image_size[1], channels)

# base_model = tf.keras.applications.ResNet152V2(
#     include_top=False,
#     weights="imagenet",
#      input_shape=image_shape)

# base_model.trainable = False

# # Create the model
# model = Sequential([
#     base_model,
#     GlobalAveragePooling2D(),  # Use Global Average Pooling instead of Flatten
#     BatchNormalization(),
#     Dense(256, activation='relu'),
#     Dropout(rate=0.2),
#     Dense(2, activation='softmax')  # Use softmax for multi-class classification
#])


model.compile(Adamax(learning_rate=0.001),
              loss='sparse_categorical_crossentropy',
              metrics=['accuracy'])
```

```
import tensorflow as tf
from tensorflow.keras.layers import Input, Dense, Dropout, GlobalAveragePooling2D

image_size = (128, 128)
channels = 3
image_shape = (image_size[0], image_size[1], channels)

# Load the base model
base_model = tf.keras.applications.ResNet152V2(
    include_top=False,
    weights="imagenet",
    input_shape=image_shape
)

# Set base model to be non-trainable
base_model.trainable = False

# Create the functional model
inputs = Input(shape=image_shape)
x = base_model(inputs, training=False)  # Ensure base model is not trainable
x = GlobalAveragePooling2D()(x)
x = Dense(256, activation='relu')(x)
x = Dropout(rate=0.2)(x)
outputs = Dense(2, activation='softmax')(x)

model = tf.keras.Model(inputs, outputs)

# Print the model summary
model.summary()
```

Model: "functional"

Layer (type)	Output Shape	Param #
input_layer_5 (InputLayer)	(None, 128, 128, 3)	0
resnet152v2 (Functional)	(None, 4, 4, 2048)	58,331,648
global_average_pooling2d_2 (GlobalAveragePooling2D)	(None, 2048)	0
dense_6 (Dense)	(None, 256)	524,544
dropout_3 (Dropout)	(None, 256)	0
dense_7 (Dense)	(None, 2)	514

Total params: 58,856,706 (224.52 MB)
Trainable params: 525,058 (2.00 MB)
Non-trainable params: 58,331,648 (222.52 MB)

```
model.compile(Adamax(learning_rate=0.001),
              loss='sparse_categorical_crossentropy',
              metrics=['accuracy'])
```

```
history = model.fit(X_train, Y_train, epochs=10, validation_split=0.1)
```

```
Epoch 1/10
1/1 ━━━━━━━━━━━━━━━━━━━━ 31s 31s/step - accuracy: 0.5652 - loss: 1.4688 - val_accuracy: 1.0000 - val_loss: 0.0817
Epoch 2/10
1/1 ━━━━━━━━━━━━━━━━━━━━ 5s 5s/step - accuracy: 0.9130 - loss: 0.3183 - val_accuracy: 1.0000 - val_loss: 0.0196
Epoch 3/10
1/1 ━━━━━━━━━━━━━━━━━━━━ 3s 3s/step - accuracy: 0.9565 - loss: 0.1894 - val_accuracy: 1.0000 - val_loss: 0.0032
Epoch 4/10
1/1 ━━━━━━━━━━━━━━━━━━━━ 3s 3s/step - accuracy: 1.0000 - loss: 0.0359 - val_accuracy: 1.0000 - val_loss: 7.5077e-
Epoch 5/10
1/1 ━━━━━━━━━━━━━━━━━━━━ 6s 6s/step - accuracy: 1.0000 - loss: 0.0122 - val_accuracy: 1.0000 - val_loss: 3.4605e-
Epoch 6/10
1/1 ━━━━━━━━━━━━━━━━━━━━ 4s 4s/step - accuracy: 1.0000 - loss: 0.0031 - val_accuracy: 1.0000 - val_loss: 4.0379e-
Epoch 7/10
1/1 ━━━━━━━━━━━━━━━━━━━━ 5s 5s/step - accuracy: 1.0000 - loss: 0.0029 - val_accuracy: 1.0000 - val_loss: 7.4843e-
```

```
Epoch 8/10
1/1 ━━━━━━━━━━━━━━━━━━━━ 6s 6s/step - accuracy: 1.0000 - loss: 0.0012 - val_accuracy: 1.0000 - val_loss: 0.0014
Epoch 9/10
1/1 ━━━━━━━━━━━━━━━━━━━━ 4s 4s/step - accuracy: 1.0000 - loss: 4.7005e-04 - val_accuracy: 1.0000 - val_loss: 0.00
Epoch 10/10
1/1 ━━━━━━━━━━━━━━━━━━━━ 5s 5s/step - accuracy: 1.0000 - loss: 1.5891e-04 - val_accuracy: 1.0000 - val_loss: 0.00
```

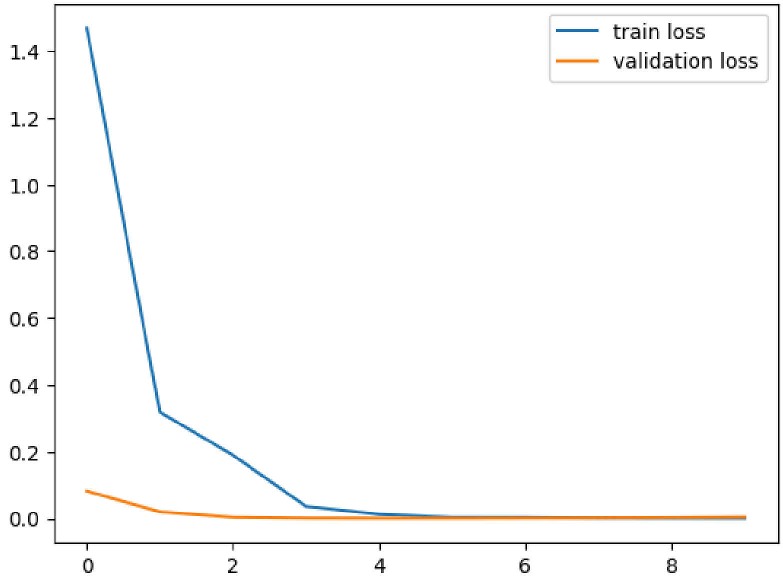
```
loss, accuracy = model.evaluate(X_test, Y_test)
print('Test Accuracy =', accuracy)
```

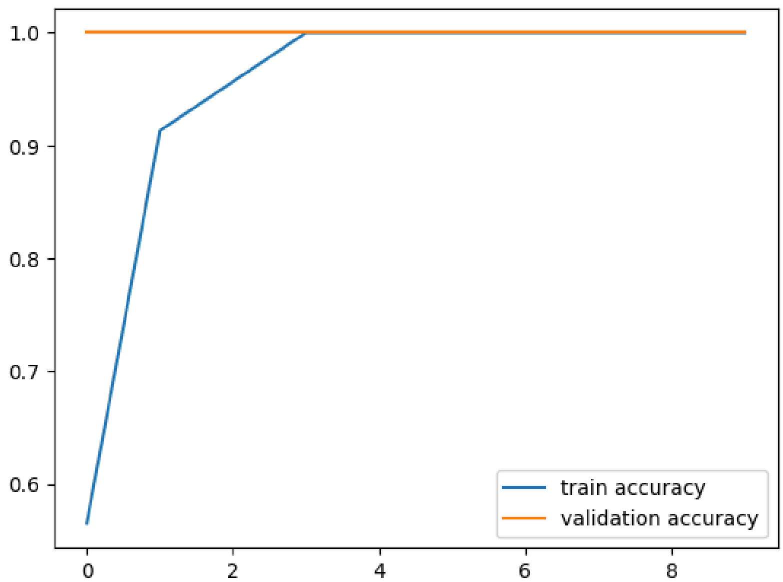
```
1/1 ━━━━━━━━━━━━━━━━━━━━ 1s 1s/step - accuracy: 1.0000 - loss: 4.4956e-05
Test Accuracy = 1.0
```

```
#Classification Report
from sklearn.metrics import classification_report

y_pred = model.predict(X_test)
y_pred = np.argmax(y_pred, axis=1)

print(classification_report(Y_test, y_pred))
```

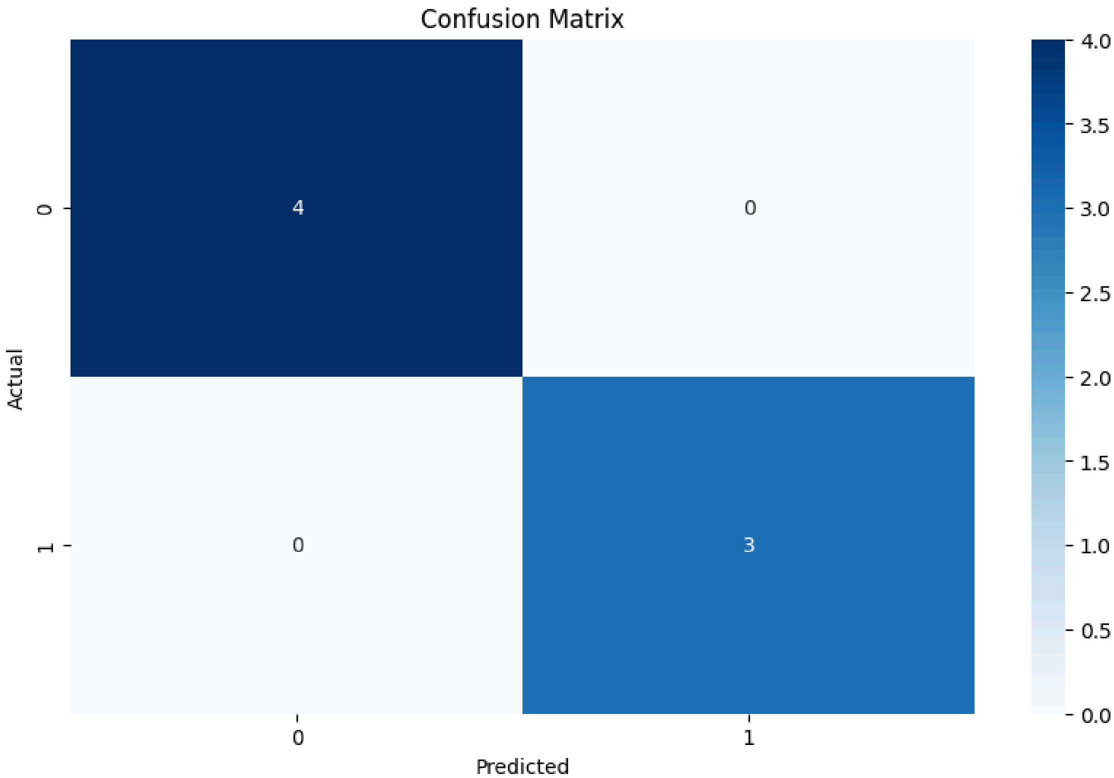
```
1/1 ━━━━━━━━━━━━━━━━━━━━ 8s 8s/step
              precision    recall  f1-score   support

           0       1.00      1.00      1.00         4
           1       1.00      1.00      1.00         3

    accuracy                           1.00         7
   macro avg       1.00      1.00      1.00         7
weighted avg       1.00      1.00      1.00         7
```

```
h = history

# plot the loss value
plt.plot(h.history['loss'], label='train loss')
plt.plot(h.history['val_loss'], label='validation loss')
plt.legend()
plt.show()

# plot the accuracy value
plt.plot(h.history['accuracy'], label='train accuracy')
plt.plot(h.history['val_accuracy'], label='validation accuracy')
plt.legend()
plt.show()
```






```
#Confusion Matrix
from sklearn.metrics import confusion_matrix

cm = confusion_matrix(Y_test, y_pred)
#plot confusion matrix
plt.figure(figsize=(10, 6))
sns.heatmap(cm, annot=True, fmt='d', cmap='Blues')
plt.xlabel('Predicted')
plt.ylabel('Actual')
plt.title('Confusion Matrix')
plt.show()
```




```
input_image_path = '/content/sample_data/Data/masked/with_mask_8.jpg'

input_image = cv2.imread(input_image_path)

plt.imshow(input_image)
plt.show()

input_image_resized = cv2.resize(input_image, (128,128))

input_image_scaled = input_image_resized/255

input_image_reshaped = np.reshape(input_image_scaled, [1,128,128,3])

input_prediction = model.predict(input_image_reshaped)

print(input_prediction)
```

0