

```

import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)
import seaborn as sns
import matplotlib.pyplot as plt
from pathlib import Path
from sklearn.model_selection import train_test_split
from sklearn.metrics import confusion_matrix, classification_report,
r2_score
import os
import glob
from PIL import Image
import seaborn as sns
import matplotlib.pyplot as plt
import tensorflow as tf
%matplotlib inline
import warnings, cv2
warnings.filterwarnings('ignore')
from tqdm.notebook import tqdm
from keras.models import Sequential, load_model
from keras.regularizers import l2
from keras.layers import Conv2D, MaxPooling2D, Dense, Flatten,
Dropout, BatchNormalization
from sklearn.preprocessing import LabelEncoder
from tensorflow.keras.utils import to_categorical
from keras.callbacks import EarlyStopping, ReduceLROnPlateau,
ModelCheckpoint

for dirname, _, filenames in os.walk('/kaggle/input'):
    for filename in filenames:
        print(os.path.join(dirname, filename))

```

```

/kaggle/input/surface-crack/valid/Negative/IMG_2626_8_8.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0293_4_10.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2979_8_7.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2511_4_13.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_9627_8_9.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0254_7_8.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2977_3_3.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0254_9_6.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2016_1_11.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2010_2_8.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_1424_5_16.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2979_8_8.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0472_10_10.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0471_3_5.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2015_11_3.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2626_8_7.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2181_4_4.jpg

```

/kaggle/input/surface-crack/valid/Negative/IMG_0492_12_15.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0254_7_9.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_3069_9_1.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_9609_2_15.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2010_9_17.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2626_6_16.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0258_7_2.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_1987_8_5.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_1492_11_12.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2896_2_14.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0581_2_14.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0292_2_14.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2626_11_3.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0491_2_10.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0257_9_2.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_1421_2_8.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0492_6_7.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_9238_1_4.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_1426_2_3.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_1923_4_12.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_9124_2_5.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_9609_1_10.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_3079_12_11.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0257_9_3.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2454_4_8.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0576_2_7.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2017_6_11.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0283_12_5.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_9609_12_10.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_3022_9_1.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_9706_12_3.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0491_11_10.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0121_11_15.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0292_11_16.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_9609_5_3.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_1924_7_16.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2390_6_8.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0390_13_8.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_1426_9_3.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_9706_1_5.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0257_7_10.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0254_4_8.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2477_6_6.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_9627_12_3.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2896_1_10.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0493_7_10.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_9629_1_9.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_3089_4_14.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_9124_2_4.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0379_9_8.jpg

/kaggle/input/surface-crack/valid/Negative/IMG_9707_2_7.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_1493_11_12.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0254_4_7.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2176_11_18.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_1493_11_13.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0121_4_5.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0307_2_15.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2896_2_15.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2016_1_10.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_3078_6_9.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_9707_5_3.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0257_10_11.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2626_11_2.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_9706_12_4.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2011_6_6.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_3026_6_7.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_9627_12_4.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_1494_7_8.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_9630_1_16.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0121_12_13.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_9186_1_7.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_1492_11_11.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_1425_8_1.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0250_6_9.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_1903_5_1.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_3077_5_5.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0473_11_13.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2467_5_2.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0581_10_9.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_0250_6_10.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2016_3_17.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_2176_12_1.jpg
/kaggle/input/surface-crack/valid/Negative/IMG_1987_5_17.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9097_7_16.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9300_8_8.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9645_8_8.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9318_8_5.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9118_12_4.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9168_8_10.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_1427_7_12.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9723_7_9.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_0581_7_8.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9095_6_16.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_0589_3_13.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9241_13_12.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9169_6_18.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9163_7_10.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9192_8_3.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9687_6_12.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9303_7_4.jpg

/kaggle/input/surface-crack/valid/Positive/IMG_9222_9_11.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9273_10_10.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9316_6_9.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9642_2_18.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9699_10_3.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9724_7_5.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9317_8_5.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9096_7_8.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9660_10_6.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9142_8_9.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9619_5_6.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9115_9_10.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9337_3_7.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9221_6_11.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9182_8_1.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9299_7_12.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9115_10_10.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9661_4_10.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9642_10_12.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9147_9_15.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9272_8_18.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9682_6_4.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9272_5_2.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_1474_4_3.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9699_8_12.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9636_9_4.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9280_13_13.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_0680_9_15.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9180_11_7.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9747_7_16.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_1422_6_8.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9096_7_9.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9314_10_8.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9721_7_14.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9641_7_7.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9143_12_15.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9195_7_9.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9244_13_14.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9330_6_10.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9246_8_10.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9240_9_9.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9618_6_7.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9241_12_12.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_0581_8_7.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9118_5_8.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_1474_9_14.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_0585_10_9.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9720_11_4.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9684_10_1.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9333_10_10.jpg

/kaggle/input/surface-crack/valid/Positive/IMG_9620_8_11.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9178_9_18.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9660_10_5.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9702_9_13.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9703_6_14.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9333_11_10.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9620_8_12.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9719_6_18.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9146_9_9.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_1427_6_12.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9118_6_8.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9753_8_1.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9194_8_8.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9656_8_18.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9180_4_13.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9180_10_7.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9398_7_9.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9698_9_17.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9331_8_11.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_0580_11_11.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9194_8_7.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9217_1_9.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9684_3_13.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9195_7_10.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9280_13_14.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9398_6_10.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9391_7_13.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9618_6_6.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_0679_12_14.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_1464_12_18.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_1464_6_13.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9318_8_6.jpg
/kaggle/input/surface-crack/valid/Positive/IMG_9143_4_8.jpg
/kaggle/input/surface-crack/predict/IMG_1133.JPG
/kaggle/input/surface-crack/predict/IMG_1129.JPG
/kaggle/input/surface-crack/predict/IMG_1132.JPG
/kaggle/input/surface-crack/predict/IMG_1130.JPG
/kaggle/input/surface-crack/predict/IMG_1134.JPG
/kaggle/input/surface-crack/predict/IMG_1131.JPG
/kaggle/input/surface-crack/test/Negative/DJI_0820_10_22.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0708_10_14.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0814_15_5.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0701_5_1.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0814_9_8.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0742_1_24.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0682_9_21.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0822_11_15.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0814_15_3.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0815_16_7.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0814_15_8.jpg

/kaggle/input/surface-crack/test/Negative/DJI_0820_15_5.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0841_9_19.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0815_8_9.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0669_15_5.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0815_13_3.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0738_1_21.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0822_7_1.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0721_8_15.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0814_8_20.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0815_16_10.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0742_3_23.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0721_8_20.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0678_15_15.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0669_15_10.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0701_4_4.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0814_16_9.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0822_5_23.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0814_9_1.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0670_4_10.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0731_1_16.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0721_9_5.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0820_15_24.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0820_15_14.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0815_13_1.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0833_5_19.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0814_15_4.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0830_12_23.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0670_6_4.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0830_12_15.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0701_6_3.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0814_9_7.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0814_8_24.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0830_12_7.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0670_6_7.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0844_12_1.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0742_3_22.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0695_3_15.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0841_10_16.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0820_10_19.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0670_6_2.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0682_9_22.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0701_5_2.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0815_6_8.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0820_15_11.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0841_12_17.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0842_5_5.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0678_14_18.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0830_12_22.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0682_6_16.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0815_13_2.jpg

/kaggle/input/surface-crack/test/Negative/DJI_0844_13_6.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0682_6_15.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0815_6_14.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0669_15_1.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0815_16_13.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0820_15_8.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0696_2_13.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0678_10_2.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0841_11_10.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0708_9_14.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0833_5_22.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0815_16_14.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0815_16_1.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0845_7_5.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0815_12_15.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0820_10_18.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0731_8_22.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0815_12_14.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0833_9_20.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0670_6_3.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0669_14_9.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0701_5_3.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0822_8_14.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0732_4_24.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0732_5_2.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0669_15_2.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0833_5_24.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0700_4_5.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0848_11_18.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0822_8_12.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0708_9_16.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0678_10_3.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0695_7_11.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0845_8_1.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0721_9_14.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0848_11_10.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0700_7_7.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0844_6_22.jpg
/kaggle/input/surface-crack/test/Negative/DJI_0721_11_8.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0700_11_21.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0780_10_22.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0742_16_10.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0750_11_10.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0689_8_4.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0766_4_6.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0800_6_16.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0689_10_21.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0720_12_13.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0766_4_7.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0798_6_8.jpg

/kaggle/input/surface-crack/test/Positive/DJI_0752_10_7.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0803_12_14.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0702_13_17.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0770_9_8.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0677_5_14.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0712_7_9.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0746_13_14.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0712_7_10.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0788_9_8.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0735_1_15.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0788_8_19.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0736_16_12.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0710_15_16.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0792_15_5.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0766_3_10.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0721_3_9.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0803_9_14.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0687_5_15.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0694_7_3.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0677_10_16.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0746_9_13.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0723_7_4.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0702_4_18.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0786_5_10.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0689_10_20.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0731_2_17.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0786_6_10.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0767_9_17.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0741_14_13.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0728_14_22.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0687_5_14.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0770_10_8.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0800_6_12.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0765_12_20.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0753_5_16.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0788_8_16.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0767_8_18.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0786_4_10.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0702_14_16.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0763_16_15.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0678_4_13.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0677_14_17.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0792_14_9.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0781_14_19.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0767_9_15.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0689_7_5.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0796_6_14.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0694_5_12.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0733_6_21.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0770_3_11.jpg

/kaggle/input/surface-crack/test/Positive/DJI_0767_9_16.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0762_11_15.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0678_3_12.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0710_14_16.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0685_4_9.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0788_9_9.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0796_6_15.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0796_7_6.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0702_12_17.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0785_12_10.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0728_12_21.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0710_11_16.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0767_9_13.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0732_9_12.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0752_12_7.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0794_16_8.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0800_4_14.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0762_5_14.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0796_5_16.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0746_5_13.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0728_13_21.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0738_2_10.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0785_13_10.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0780_9_22.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0694_6_2.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0742_16_9.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0781_15_19.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0687_5_17.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0752_12_8.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0798_6_13.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0694_3_14.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0687_6_8.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0781_16_20.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0746_10_13.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0791_9_16.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0766_5_7.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0792_10_2.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0720_9_13.jpg
/kaggle/input/surface-crack/test/Positive/DJI_0746_14_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2920_6_6.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2226_8_13.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3027_8_6.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2930_6_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2403_12_1.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2517_6_11.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2179_11_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2452_3_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2518_5_3.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2890_1_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2750_3_9.jpg

/kaggle/input/surface-crack/train/Negative/IMG_2188_8_18.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2733_12_10.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2626_10_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2182_11_13.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2188_8_17.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9607_10_11.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2196_10_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2193_3_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2219_5_9.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3060_10_11.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9627_10_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2528_3_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3118_8_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2894_2_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2896_3_11.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2518_4_9.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9607_10_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9606_6_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2226_8_11.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2914_8_10.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2498_1_15.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2405_7_15.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9607_1_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9630_10_6.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2919_10_18.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9704_10_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3034_13_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2514_6_1.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9609_7_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2723_3_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9609_13_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3064_11_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3030_1_9.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2896_3_10.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2967_5_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2966_10_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9607_6_3.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9622_8_9.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2964_9_13.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3114_2_12.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2723_4_11.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2510_4_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9608_6_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9705_1_13.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2403_6_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9622_8_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2508_9_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2374_11_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9606_7_16.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3129_5_1.jpg

/kaggle/input/surface-crack/train/Negative/IMG_2514_7_1.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2897_8_12.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3167_1_12.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2383_10_16.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2183_9_1.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9610_4_3.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9705_9_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2901_9_4.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3114_2_10.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2514_7_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2185_7_6.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2895_12_3.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9680_10_11.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2226_8_12.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2528_5_16.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9603_8_18.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9122_9_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9607_6_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2966_10_15.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2185_6_10.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9608_6_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2583_13_18.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2386_13_15.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2626_10_3.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9629_13_15.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3118_8_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2567_3_6.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2454_9_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2626_6_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2498_1_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9379_7_15.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9624_4_11.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2177_12_11.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9607_2_6.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2893_10_15.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9629_2_4.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3115_9_16.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9706_4_10.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2190_7_15.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3129_8_18.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2386_13_13.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2967_5_9.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9607_13_3.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3146_10_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2893_10_16.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9629_13_16.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2528_6_16.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2185_8_6.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9630_10_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2896_2_16.jpg

/kaggle/input/surface-crack/train/Negative/IMG_2670_11_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9611_2_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2454_5_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3114_2_11.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2582_4_13.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2792_2_4.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9622_8_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2518_5_13.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3030_5_4.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3022_7_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3115_8_9.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2508_9_13.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2960_9_6.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2580_6_5.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2979_8_9.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2192_11_11.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2626_4_9.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2960_12_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3067_6_16.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2374_11_1.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2628_7_16.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2967_5_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9706_4_9.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9611_2_13.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2895_10_18.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9603_10_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9236_5_3.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2224_9_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2196_10_16.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9626_7_10.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2567_3_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9610_8_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2564_9_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3138_8_13.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2733_12_12.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2192_11_10.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9629_13_17.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2219_5_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2734_4_12.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2190_7_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9680_10_9.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9609_2_6.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2898_6_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3036_8_1.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9609_1_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2194_9_9.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3027_9_3.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2564_5_12.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2630_3_3.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3138_8_10.jpg

/kaggle/input/surface-crack/train/Negative/IMG_2582_5_13.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9630_5_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2517_6_10.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2930_3_16.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9608_5_15.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2179_12_5.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2626_6_3.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2497_4_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9610_3_18.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2792_1_4.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9704_10_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2626_10_4.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2960_12_4.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9624_6_5.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2670_9_6.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9610_10_15.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3022_6_5.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2914_7_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2995_6_6.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9704_10_6.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9707_2_5.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2196_10_15.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9606_7_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2194_12_5.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9705_9_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2670_9_10.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3022_5_4.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2919_11_17.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9610_10_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2582_4_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2901_12_1.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2179_7_12.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9609_12_11.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9706_9_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3064_11_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9707_13_3.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9707_7_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9705_8_13.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9235_4_12.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9607_2_4.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3036_6_18.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9122_9_13.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2391_3_4.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9680_10_10.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2178_7_18.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2443_6_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9706_3_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2564_4_11.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2443_5_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9607_6_1.jpg

/kaggle/input/surface-crack/train/Negative/IMG_2899_5_1.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2382_2_9.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9705_2_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2384_2_17.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9707_1_16.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2930_6_9.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2567_4_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2890_8_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2219_6_9.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2454_8_9.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2224_3_16.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2224_9_10.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2383_9_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9707_7_3.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9705_3_3.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2178_5_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2890_8_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3106_11_12.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9627_1_16.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3116_2_3.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2723_6_12.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2914_8_11.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3167_1_13.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9707_6_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2748_3_6.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9627_10_4.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2190_7_13.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2965_1_12.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3138_10_15.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2580_1_13.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2966_8_17.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3106_9_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2995_6_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9627_11_6.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2979_9_5.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3034_13_15.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3027_12_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9610_4_4.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9603_8_17.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3118_9_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2580_6_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2585_8_12.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3106_10_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9611_2_6.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2979_12_16.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2964_9_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3030_3_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2391_11_16.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9629_2_5.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2899_6_2.jpg

/kaggle/input/surface-crack/train/Negative/IMG_3064_10_11.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2735_13_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9609_13_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2517_6_9.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9379_10_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2740_7_7.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2403_11_4.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2750_3_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9627_1_12.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3035_3_10.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2901_11_18.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3128_4_2.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9330_13_6.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9630_6_4.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9630_5_3.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2897_8_13.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2585_7_6.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2628_7_1.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3036_6_17.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9624_4_12.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9122_9_12.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2187_7_18.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3060_5_17.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2391_3_3.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2791_10_11.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2194_12_6.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2897_8_11.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9379_11_1.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2740_6_9.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3060_10_9.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2405_6_15.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2895_11_1.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2994_9_10.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3068_5_3.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2386_13_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_9609_1_8.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2405_7_14.jpg
/kaggle/input/surface-crack/train/Negative/IMG_3067_6_17.jpg
/kaggle/input/surface-crack/train/Negative/IMG_2182_10_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2512_6_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3137_8_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9731_8_6.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3183_9_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9066_8_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2670_3_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1879_3_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1878_13_16.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3229_11_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2897_7_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1443_2_12.jpg

/kaggle/input/surface-crack/train/Positive/IMG_2384_13_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3112_2_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9859_2_2.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3191_5_3.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9274_8_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9065_8_6.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9143_4_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0577_5_14.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9681_4_6.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9081_8_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3051_12_2.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9175_8_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1907_5_16.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3132_9_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1479_1_14.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2957_11_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3206_6_6.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3183_11_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1495_4_3.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9063_6_3.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1481_2_5.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0679_7_17.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2957_9_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3118_13_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0679_7_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1969_7_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9706_5_14.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1485_6_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0482_1_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9110_8_14.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9143_4_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2830_8_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9089_7_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0675_6_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0489_3_17.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9230_11_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3191_5_1.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1475_5_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9630_10_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2030_9_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1477_3_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3088_3_4.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9654_5_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9261_10_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2048_12_2.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9619_6_5.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9110_8_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9308_8_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9619_3_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9261_8_12.jpg

/kaggle/input/surface-crack/train/Positive/IMG_2520_12_16.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2773_11_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9308_9_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0675_6_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0575_8_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2226_7_5.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9087_7_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9175_10_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2041_8_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9687_7_4.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2030_10_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9859_6_14.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3090_7_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1881_7_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1475_5_14.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2806_11_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9387_4_16.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9111_8_16.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2598_11_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2225_5_1.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9087_7_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9182_8_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1969_7_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3118_13_14.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1965_6_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3112_1_6.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2013_8_5.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3082_4_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9655_8_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9141_7_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9228_10_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9854_4_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0675_5_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9676_9_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9681_4_4.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3166_13_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0674_10_4.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1495_4_4.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1803_8_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9175_8_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3117_9_18.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0675_5_14.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1883_9_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1878_13_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3064_8_18.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0583_8_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9724_8_5.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9141_10_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9312_8_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3213_7_11.jpg

/kaggle/input/surface-crack/train/Positive/IMG_2670_4_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3228_4_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9087_7_14.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3137_10_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1486_8_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9287_6_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9724_9_1.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2604_1_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9630_10_16.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1475_5_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9702_9_6.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1883_8_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9184_7_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1881_10_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9696_6_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1803_7_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9176_9_4.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1881_8_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2957_3_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0563_6_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2179_4_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9859_2_14.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3137_11_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9619_4_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1803_6_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3082_3_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9303_5_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9353_9_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9724_9_2.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9150_7_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9308_10_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1439_8_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3051_12_1.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9110_8_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9682_7_18.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1449_10_17.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1442_12_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9387_4_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3228_1_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9065_8_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1447_3_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9089_8_3.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9706_6_14.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3183_8_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1485_5_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3206_6_5.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2180_13_14.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3137_11_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9850_11_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3213_8_11.jpg

/kaggle/input/surface-crack/train/Positive/IMG_3159_12_17.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2830_7_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9699_10_1.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9619_6_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9631_6_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2512_12_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3183_11_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9852_1_14.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2384_11_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2225_6_2.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9699_9_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2512_7_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2528_3_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0487_9_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2528_4_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9859_3_14.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0494_3_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1476_10_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2030_10_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0574_8_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9228_8_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3088_6_4.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1477_7_16.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1449_9_17.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9274_9_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3051_11_1.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9677_8_5.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3183_10_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1880_12_3.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1481_4_4.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3160_6_3.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3211_7_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9654_5_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0489_5_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3062_10_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9184_8_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9148_11_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1485_5_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9722_6_1.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2930_4_17.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0482_9_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2960_7_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9274_8_4.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9631_6_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3110_6_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9649_6_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1489_1_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3117_9_17.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3051_8_1.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9114_12_10.jpg

/kaggle/input/surface-crack/train/Positive/IMG_2655_4_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2528_2_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9274_9_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2226_5_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3191_5_2.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9649_6_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3082_2_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9148_11_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9655_8_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9655_8_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1439_8_14.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1485_5_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3158_8_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1479_4_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9850_10_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9681_4_5.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3159_12_18.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2825_10_6.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9349_5_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9207_8_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9647_10_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1969_8_5.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3082_7_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9353_9_14.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9103_1_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9081_9_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3146_12_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3051_9_1.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3206_7_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1489_2_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9720_9_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2960_6_17.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9702_9_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2226_5_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9141_9_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9349_4_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3165_7_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0487_7_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3159_11_16.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3207_6_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9699_10_2.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9312_8_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2020_12_5.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9207_8_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0679_9_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9731_7_15.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0584_2_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0574_8_5.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9731_8_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9065_8_9.jpg

```
/kaggle/input/surface-crack/train/Positive/IMG_1488_4_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2384_10_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9095_7_17.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1969_7_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9184_8_5.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3155_10_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2825_10_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2957_9_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9387_4_14.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2598_7_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1449_10_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1481_3_5.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9319_8_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1475_5_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3062_9_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3213_2_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1479_4_1.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0577_4_14.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9116_12_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1476_11_10.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9271_8_7.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2772_7_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3117_10_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2510_1_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3132_8_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9321_10_9.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9224_4_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9110_8_8.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2655_4_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1476_9_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2957_11_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3137_9_2.jpg
/kaggle/input/surface-crack/train/Positive/IMG_2655_5_11.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1479_4_12.jpg
/kaggle/input/surface-crack/train/Positive/IMG_3088_5_5.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9683_4_13.jpg
/kaggle/input/surface-crack/train/Positive/IMG_0489_3_16.jpg
/kaggle/input/surface-crack/train/Positive/IMG_9355_7_6.jpg
/kaggle/input/surface-crack/train/Positive/IMG_1907_6_5.jpg
```

Data Visualization

```
positive_dir = Path(r'/kaggle/input/surface-crack/test/Positive')
negative_dir = Path(r'/kaggle/input/surface-crack/test/Negative')
```

```
def generate_df(img_dir, label):
```

```
    file_Path = pd.Series(list(img_dir.glob(r'*.jpg')),
name='File_Path').astype(str)
```

```

labels = pd.Series(label, name='Label', index=file_Path.index)
df = pd.concat([file_Path, labels], axis=1)

return df

positive_df = generate_df(positive_dir, 'POSITIVE')
negative_df = generate_df(negative_dir, 'NEGATIVE')

# concatenate both positive and negative df
all_df = pd.concat([positive_df, negative_df], axis=0).sample(frac=1,
random_state=1).reset_index(drop=True)

all_df.head()

```

	File_Path	Label
0	/kaggle/input/surface-crack/test/Positive/DJI_...	POSITIVE
1	/kaggle/input/surface-crack/test/Positive/DJI_...	POSITIVE
2	/kaggle/input/surface-crack/test/Positive/DJI_...	POSITIVE
3	/kaggle/input/surface-crack/test/Negative/DJI_...	NEGATIVE
4	/kaggle/input/surface-crack/test/Negative/DJI_...	NEGATIVE

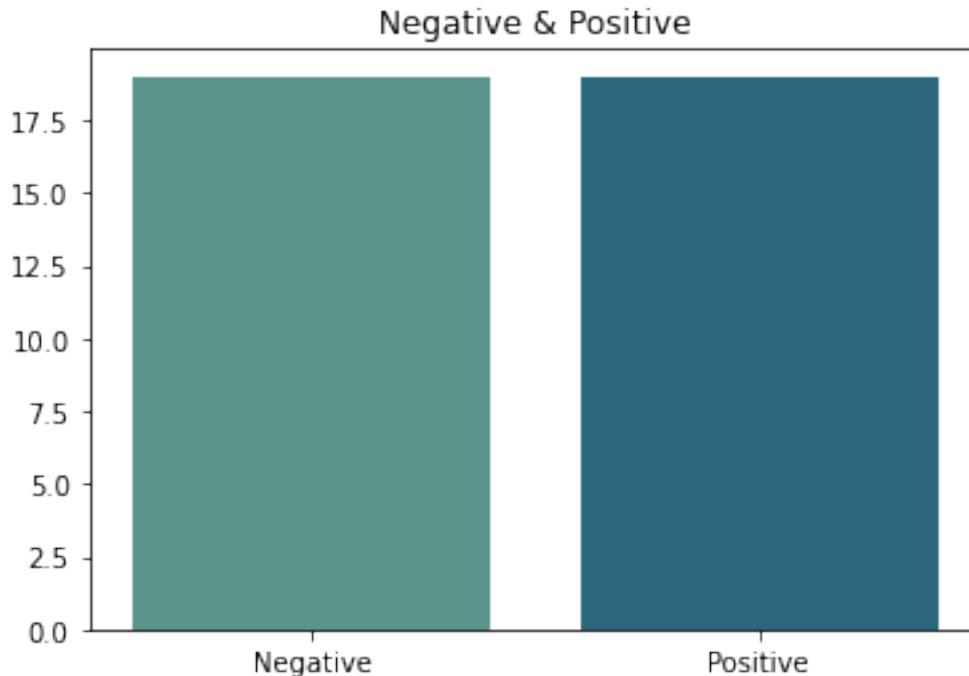
```

path = 'data/'
path_all = list(glob.glob(path+'**/*.jpg'))
positive_df = path + 'Negative/*.jpg'
negative_df = path + 'Positive/*.jpg'

sns.barplot(x=['Negative', 'Positive'], y=[len(negative_df),
len(positive_df)], palette='crest' )
plt.title('Negative & Positive')

Text(0.5, 1.0, 'Negative & Positive')

```



```
positive_dir = Path(r'/kaggle/input/surface-crack/train/Positive')
negative_dir = Path(r'/kaggle/input/surface-crack/train/Negative')
```

```
def generate_df(img_dir, label):
```

```
    file_Path = pd.Series(list(img_dir.glob(r'*.jpg')),
name='File_Path').astype(str)
    labels = pd.Series(label, name='Label', index=file_Path.index)
    df = pd.concat([file_Path, labels], axis=1)
```

```
    return df
```

```
positive_df = generate_df(positive_dir, 'POSITIVE')
```

```
negative_df = generate_df(negative_dir, 'NEGATIVE')
```

```
# concatenate both positive and negative df
```

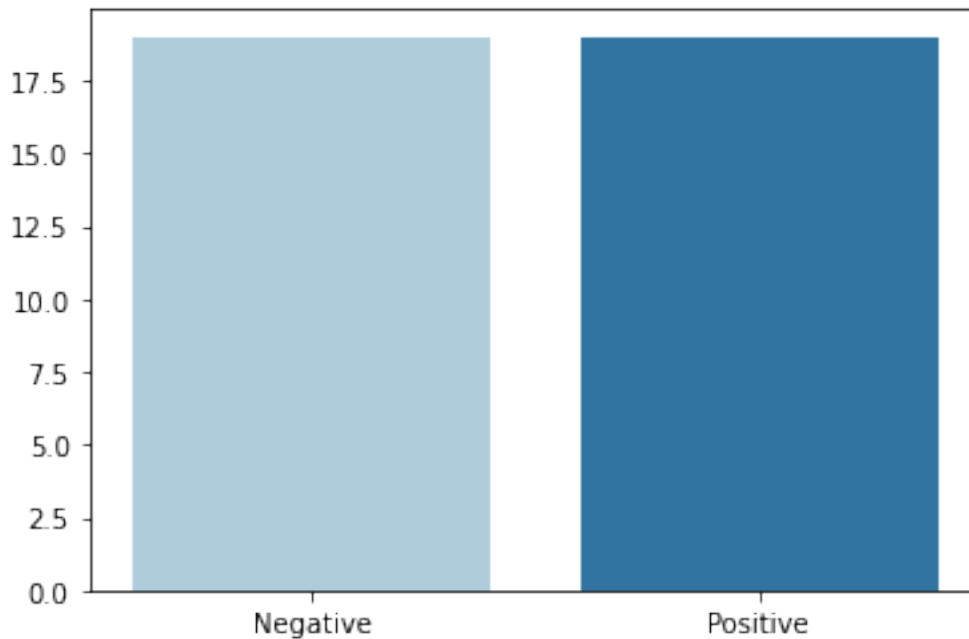
```
all_df = pd.concat([positive_df, negative_df], axis=0).sample(frac=1,
random_state=1).reset_index(drop=True)
all_df.head()
```

	File_Path	Label
0	/kaggle/input/surface-crack/train/Negative/IMG...	NEGATIVE
1	/kaggle/input/surface-crack/train/Negative/IMG...	NEGATIVE
2	/kaggle/input/surface-crack/train/Negative/IMG...	NEGATIVE
3	/kaggle/input/surface-crack/train/Negative/IMG...	NEGATIVE
4	/kaggle/input/surface-crack/train/Positive/IMG...	POSITIVE

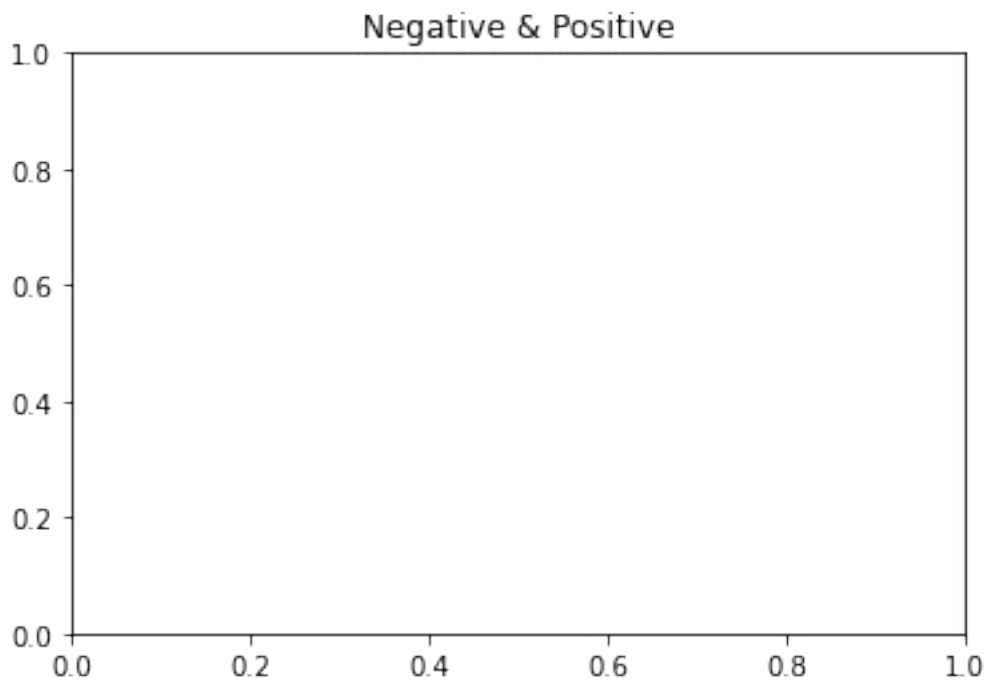
```
path = 'data/'
path_all = list(glob.glob(path+'**/*.jpg'))
positive_df = path + 'Negative/*.jpg'
negative_df = path + 'Positive/*.jpg'

sns.barplot(x=['Negative', 'Positive'], y=[len(negative_df),
len(positive_df)], palette='Paired' )

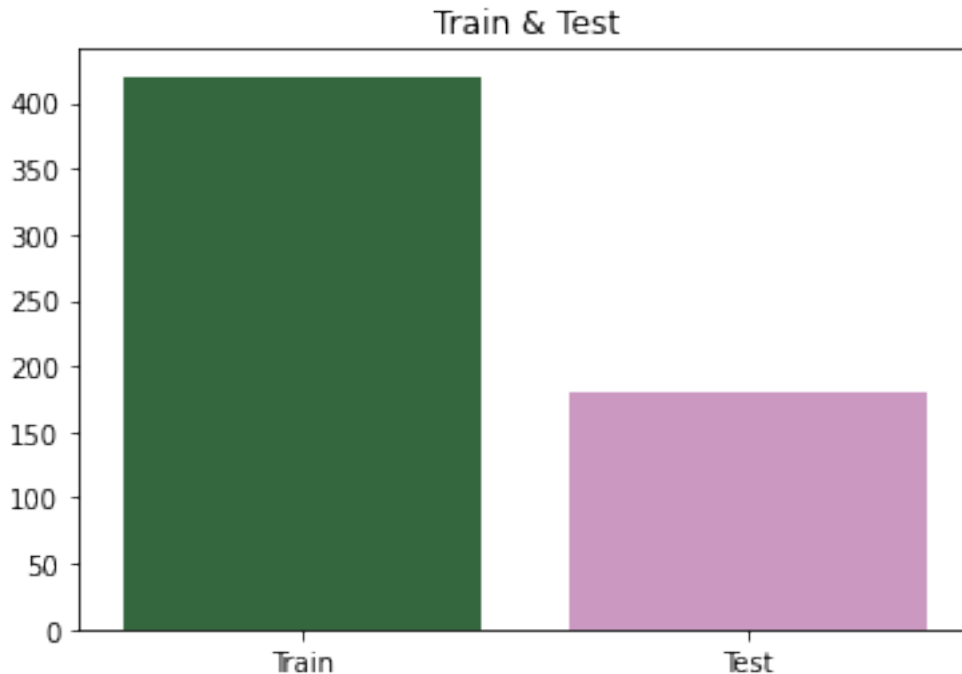
<AxesSubplot:>
```



```
plt.title('Negative & Positive')
Text(0.5, 1.0, 'Negative & Positive')
```

```
train_dir, test_dir =  
train_test_split(all_df, train_size=0.7, shuffle=True, random_state=42)  
train_dir.shape  
(420, 2)  
test_dir.shape  
(180, 2)  
sns.barplot(x=['Train', 'Test'], y=[len(train_dir), len(test_dir)],  
palette='cubehelix' )  
plt.title('Train & Test')  
Text(0.5, 1.0, 'Train & Test')
```



Data Preprocessing

```
train_dir = "../input/surface-crack/train/"
```

```
test_dir = "../input/surface-crack/test/"
```

```
def load_images(directory):  
    images = []  
    labels = []  
  
    for category in os.listdir(directory):  
        for filename in tqdm(os.listdir(directory+category)):  
            image_path = os.path.join(directory,category,filename)  
            image = cv2.imread(image_path)  
            image = cv2.cvtColor(image,cv2.COLOR_BGR2RGB)  
            image = cv2.resize(image,(224,224))  
            images.append(image)  
            labels.append(category)
```

```
    images = np.array(images,dtype='float32')
```

```
    return images, labels
```

```
X_train, y_train = load_images(train_dir)
```

```
X_test, y_test = load_images(test_dir)
```

```
{"model_id":"120ad8434846406fb301e7288286f946","version_major":2,"version_minor":0}
```

```
{"model_id":"9885344fc6ca43e0b3f89b1d9f2c9980","version_major":2,"version_minor":0}
```

```
{"model_id": "5999179ae89c4d52893d49601b90c2fc", "version_major": 2, "version_minor": 0}
```

```
{"model_id": "2994b6ccbefc411f805da51e6955adb6", "version_major": 2, "version_minor": 0}
```

```
X_train = X_train / 255.0  
X_test = X_test / 255.0
```

```
encoder = LabelEncoder()  
y_train = encoder.fit_transform(y_train)  
y_test = encoder.transform(y_test)  
ytr=y_train  
yte=y_test  
y_train = to_categorical(y_train)  
y_test = to_categorical(y_test)
```

CNN Model

```
model = Sequential()  
model.add(Conv2D(64, 3, padding="same",  
activation="relu", input_shape=(224, 224, 3)))  
model.add(MaxPooling2D())  
  
model.add(Conv2D(64, 3, padding="same", activation="relu"))  
model.add(MaxPooling2D())  
  
model.add(Conv2D(128, 3, padding="same", activation="relu"))  
model.add(MaxPooling2D())  
  
model.add(Flatten())  
model.add(Dense(256, activation="relu", kernel_regularizer=l2(0.001)))  
model.add(Dropout(0.1))  
model.add(BatchNormalization())  
model.add(Dense(2, activation="sigmoid"))
```

```
model.summary()
```

```
Model: "sequential_11"
```

Layer (type)	Output Shape	Param #
=====		
conv2d_33 (Conv2D)	(None, 224, 224, 64)	1792
max_pooling2d_33 (MaxPooling)	(None, 112, 112, 64)	0
conv2d_34 (Conv2D)	(None, 112, 112, 64)	36928
max_pooling2d_34 (MaxPooling)	(None, 56, 56, 64)	0

conv2d_35 (Conv2D)	(None, 56, 56, 128)	73856
max_pooling2d_35 (MaxPooling)	(None, 28, 28, 128)	0
flatten_11 (Flatten)	(None, 100352)	0
dense_22 (Dense)	(None, 256)	25690368
dropout_11 (Dropout)	(None, 256)	0
batch_normalization_11 (Batch Normalization)	(None, 256)	1024
dense_23 (Dense)	(None, 2)	514
=====		
Total params: 25,804,482		
Trainable params: 25,803,970		
Non-trainable params: 512		

```
model.compile(loss='binary_crossentropy', optimizer='adam', metrics=['accuracy'])
```

```
early_stopping =
EarlyStopping(monitor='val_accuracy', patience=20, mode='max', verbose=1,
restore_best_weights=True)
reduce_lr =
ReduceLROnPlateau(monitor='val_accuracy', patience=5, mode='max', verbose
=1, factor=0.1, min_lr=0.001)
checkpoint_filename = 'checkpoint/'
model_checkpoint =
ModelCheckpoint(filepath=checkpoint_filename, monitor='val_accuracy', verbose=1, save_best_only=True, save_weights_only=True, mode='max')
```

```
r = model.fit(x=X_train,
              y=y_train,
              epochs=50,
              batch_size=32,
              validation_data=(X_test, y_test),
              callbacks=[early_stopping, reduce_lr, model_checkpoint])
```

```
Epoch 1/50
19/19 [=====] - 2s 67ms/step - loss: 1.1600 -
accuracy: 0.5350 - val_loss: 3.4192 - val_accuracy: 0.5000
```

```
Epoch 00001: val_accuracy improved from -inf to 0.50000, saving model
to checkpoint/
```

```
Epoch 2/50
19/19 [=====] - 1s 47ms/step - loss: 1.1193 -
accuracy: 0.6683 - val_loss: 5.6907 - val_accuracy: 0.5000
```

Epoch 00002: val_accuracy did not improve from 0.50000
Epoch 3/50
19/19 [=====] - 1s 48ms/step - loss: 0.9678 -
accuracy: 0.7400 - val_loss: 3.1569 - val_accuracy: 0.5000

Epoch 00003: val_accuracy did not improve from 0.50000
Epoch 4/50
19/19 [=====] - 1s 48ms/step - loss: 0.8360 -
accuracy: 0.8267 - val_loss: 1.5439 - val_accuracy: 0.5000

Epoch 00004: val_accuracy did not improve from 0.50000
Epoch 5/50
19/19 [=====] - 1s 52ms/step - loss: 0.6722 -
accuracy: 0.8733 - val_loss: 1.6383 - val_accuracy: 0.5000

Epoch 00005: val_accuracy did not improve from 0.50000
Epoch 6/50
19/19 [=====] - 1s 53ms/step - loss: 0.5407 -
accuracy: 0.9183 - val_loss: 1.6105 - val_accuracy: 0.5000

Epoch 00006: val_accuracy did not improve from 0.50000
Epoch 7/50
19/19 [=====] - 1s 47ms/step - loss: 0.4578 -
accuracy: 0.9583 - val_loss: 1.5971 - val_accuracy: 0.5000

Epoch 00007: val_accuracy did not improve from 0.50000
Epoch 8/50
19/19 [=====] - 1s 47ms/step - loss: 0.4024 -
accuracy: 0.9667 - val_loss: 1.5070 - val_accuracy: 0.5000

Epoch 00008: val_accuracy did not improve from 0.50000
Epoch 9/50
19/19 [=====] - 1s 47ms/step - loss: 0.3493 -
accuracy: 0.9717 - val_loss: 1.4160 - val_accuracy: 0.5000

Epoch 00009: val_accuracy did not improve from 0.50000
Epoch 10/50
19/19 [=====] - 1s 47ms/step - loss: 0.2962 -
accuracy: 0.9867 - val_loss: 1.2430 - val_accuracy: 0.5000

Epoch 00010: val_accuracy did not improve from 0.50000
Epoch 11/50
19/19 [=====] - 1s 47ms/step - loss: 0.2515 -
accuracy: 0.9883 - val_loss: 1.1777 - val_accuracy: 0.5000

Epoch 00011: val_accuracy did not improve from 0.50000
Epoch 12/50
19/19 [=====] - 1s 47ms/step - loss: 0.2470 -
accuracy: 0.9917 - val_loss: 1.1818 - val_accuracy: 0.5000

Epoch 00012: val_accuracy did not improve from 0.50000
Epoch 13/50
19/19 [=====] - 1s 47ms/step - loss: 0.2075 -
accuracy: 0.9983 - val_loss: 1.1174 - val_accuracy: 0.5000

Epoch 00013: val_accuracy did not improve from 0.50000
Epoch 14/50
19/19 [=====] - 1s 47ms/step - loss: 0.2098 -
accuracy: 0.9867 - val_loss: 0.9518 - val_accuracy: 0.5000

Epoch 00014: val_accuracy did not improve from 0.50000
Epoch 15/50
19/19 [=====] - 1s 47ms/step - loss: 0.2137 -
accuracy: 0.9883 - val_loss: 0.9755 - val_accuracy: 0.5000

Epoch 00015: val_accuracy did not improve from 0.50000
Epoch 16/50
19/19 [=====] - 1s 47ms/step - loss: 0.2146 -
accuracy: 0.9867 - val_loss: 0.9304 - val_accuracy: 0.5000

Epoch 00016: val_accuracy did not improve from 0.50000
Epoch 17/50
19/19 [=====] - 1s 47ms/step - loss: 0.2186 -
accuracy: 0.9867 - val_loss: 0.8583 - val_accuracy: 0.5000

Epoch 00017: val_accuracy did not improve from 0.50000
Epoch 18/50
19/19 [=====] - 1s 47ms/step - loss: 0.2181 -
accuracy: 0.9917 - val_loss: 0.8006 - val_accuracy: 0.5000

Epoch 00018: val_accuracy did not improve from 0.50000
Epoch 19/50
19/19 [=====] - 1s 47ms/step - loss: 0.2326 -
accuracy: 0.9850 - val_loss: 0.8353 - val_accuracy: 0.4850

Epoch 00019: val_accuracy did not improve from 0.50000
Epoch 20/50
19/19 [=====] - 1s 49ms/step - loss: 0.1949 -
accuracy: 0.9950 - val_loss: 0.7738 - val_accuracy: 0.4450

Epoch 00020: val_accuracy did not improve from 0.50000
Epoch 21/50
19/19 [=====] - 1s 47ms/step - loss: 0.1620 -
accuracy: 0.9967 - val_loss: 0.7566 - val_accuracy: 0.7150

Epoch 00021: val_accuracy improved from 0.50000 to 0.71500, saving
model to checkpoint/
Epoch 22/50

19/19 [=====] - 1s 47ms/step - loss: 0.1405 -
accuracy: 0.9983 - val_loss: 0.9089 - val_accuracy: 0.5000

Epoch 00022: val_accuracy did not improve from 0.71500

Epoch 23/50

19/19 [=====] - 1s 47ms/step - loss: 0.1154 -
accuracy: 0.9983 - val_loss: 0.6729 - val_accuracy: 0.4850

Epoch 00023: val_accuracy did not improve from 0.71500

Epoch 24/50

19/19 [=====] - 1s 47ms/step - loss: 0.0974 -
accuracy: 0.9983 - val_loss: 0.6871 - val_accuracy: 0.4300

Epoch 00024: val_accuracy did not improve from 0.71500

Epoch 25/50

19/19 [=====] - 1s 47ms/step - loss: 0.0855 -
accuracy: 0.9983 - val_loss: 0.6977 - val_accuracy: 0.4750

Epoch 00025: val_accuracy did not improve from 0.71500

Epoch 26/50

19/19 [=====] - 1s 48ms/step - loss: 0.0851 -
accuracy: 0.9983 - val_loss: 0.6976 - val_accuracy: 0.5000

Epoch 00026: val_accuracy did not improve from 0.71500

Epoch 27/50

19/19 [=====] - 1s 47ms/step - loss: 0.0860 -
accuracy: 0.9983 - val_loss: 0.6937 - val_accuracy: 0.4950

Epoch 00027: val_accuracy did not improve from 0.71500

Epoch 28/50

19/19 [=====] - 1s 49ms/step - loss: 0.0851 -
accuracy: 0.9983 - val_loss: 0.6586 - val_accuracy: 0.8050

Epoch 00028: val_accuracy improved from 0.71500 to 0.80500, saving
model to checkpoint/

Epoch 29/50

19/19 [=====] - 1s 48ms/step - loss: 0.0896 -
accuracy: 0.9950 - val_loss: 0.7570 - val_accuracy: 0.4850

Epoch 00029: val_accuracy did not improve from 0.80500

Epoch 30/50

19/19 [=====] - 1s 47ms/step - loss: 0.1416 -
accuracy: 0.9867 - val_loss: 1.3178 - val_accuracy: 0.5550

Epoch 00030: val_accuracy did not improve from 0.80500

Epoch 31/50

19/19 [=====] - 1s 47ms/step - loss: 0.1967 -
accuracy: 0.9850 - val_loss: 0.8245 - val_accuracy: 0.6400

Epoch 00031: val_accuracy did not improve from 0.80500
Epoch 32/50
19/19 [=====] - 1s 47ms/step - loss: 0.1867 -
accuracy: 0.9883 - val_loss: 0.8067 - val_accuracy: 0.6550

Epoch 00032: val_accuracy did not improve from 0.80500
Epoch 33/50
19/19 [=====] - 1s 47ms/step - loss: 0.1609 -
accuracy: 0.9967 - val_loss: 0.6986 - val_accuracy: 0.6950

Epoch 00033: val_accuracy did not improve from 0.80500
Epoch 34/50
19/19 [=====] - 1s 47ms/step - loss: 0.1263 -
accuracy: 1.0000 - val_loss: 1.1415 - val_accuracy: 0.6050

Epoch 00034: val_accuracy did not improve from 0.80500
Epoch 35/50
19/19 [=====] - 1s 47ms/step - loss: 0.1101 -
accuracy: 0.9967 - val_loss: 0.8050 - val_accuracy: 0.6150

Epoch 00035: val_accuracy did not improve from 0.80500
Epoch 36/50
19/19 [=====] - 1s 47ms/step - loss: 0.1032 -
accuracy: 0.9983 - val_loss: 0.7285 - val_accuracy: 0.6550

Epoch 00036: val_accuracy did not improve from 0.80500
Epoch 37/50
19/19 [=====] - 1s 49ms/step - loss: 0.0919 -
accuracy: 1.0000 - val_loss: 0.7207 - val_accuracy: 0.6550

Epoch 00037: val_accuracy did not improve from 0.80500
Epoch 38/50
19/19 [=====] - 1s 57ms/step - loss: 0.0867 -
accuracy: 0.9967 - val_loss: 0.7747 - val_accuracy: 0.6250

Epoch 00038: val_accuracy did not improve from 0.80500
Epoch 39/50
19/19 [=====] - 1s 47ms/step - loss: 0.0919 -
accuracy: 0.9983 - val_loss: 0.9207 - val_accuracy: 0.6450

Epoch 00039: val_accuracy did not improve from 0.80500
Epoch 40/50
19/19 [=====] - 1s 47ms/step - loss: 0.1020 -
accuracy: 0.9950 - val_loss: 0.6847 - val_accuracy: 0.7450

Epoch 00040: val_accuracy did not improve from 0.80500
Epoch 41/50
19/19 [=====] - 1s 49ms/step - loss: 0.1053 -
accuracy: 0.9983 - val_loss: 0.6845 - val_accuracy: 0.7400

Epoch 00041: val_accuracy did not improve from 0.80500
Epoch 42/50
19/19 [=====] - 1s 47ms/step - loss: 0.1029 -
accuracy: 0.9967 - val_loss: 0.7555 - val_accuracy: 0.6850

Epoch 00042: val_accuracy did not improve from 0.80500
Epoch 43/50
19/19 [=====] - 1s 47ms/step - loss: 0.0995 -
accuracy: 0.9967 - val_loss: 1.4931 - val_accuracy: 0.5900

Epoch 00043: val_accuracy did not improve from 0.80500
Epoch 44/50
19/19 [=====] - 1s 47ms/step - loss: 0.1055 -
accuracy: 0.9967 - val_loss: 1.4479 - val_accuracy: 0.5850

Epoch 00044: val_accuracy did not improve from 0.80500
Epoch 45/50
19/19 [=====] - 1s 47ms/step - loss: 0.1306 -
accuracy: 0.9917 - val_loss: 0.7367 - val_accuracy: 0.7100

Epoch 00045: val_accuracy did not improve from 0.80500
Epoch 46/50
19/19 [=====] - 1s 47ms/step - loss: 0.1426 -
accuracy: 0.9917 - val_loss: 1.2638 - val_accuracy: 0.6250

Epoch 00046: val_accuracy did not improve from 0.80500
Epoch 47/50
19/19 [=====] - 1s 47ms/step - loss: 0.1299 -
accuracy: 0.9983 - val_loss: 1.3936 - val_accuracy: 0.6150

Epoch 00047: val_accuracy did not improve from 0.80500
Epoch 48/50
19/19 [=====] - 1s 47ms/step - loss: 0.1015 -
accuracy: 1.0000 - val_loss: 1.3930 - val_accuracy: 0.6300
Restoring model weights from the end of the best epoch.

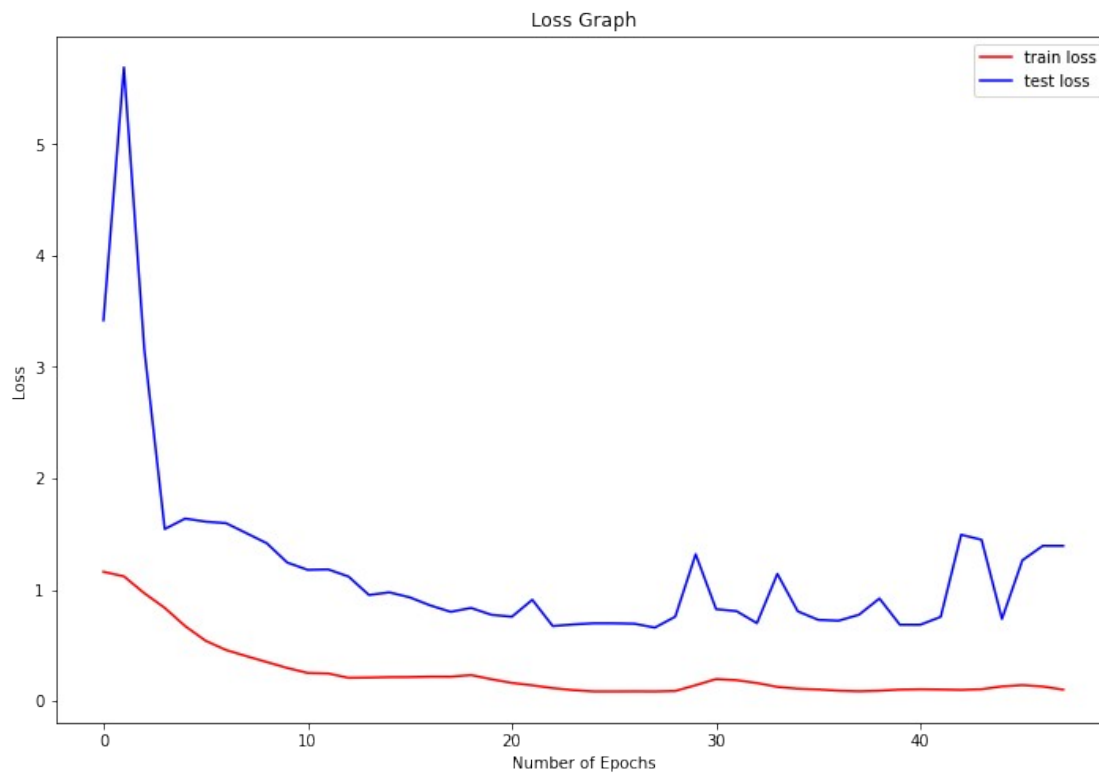
Epoch 00048: val_accuracy did not improve from 0.80500
Epoch 00048: early stopping

model.load_weights(checkpoint_filename)

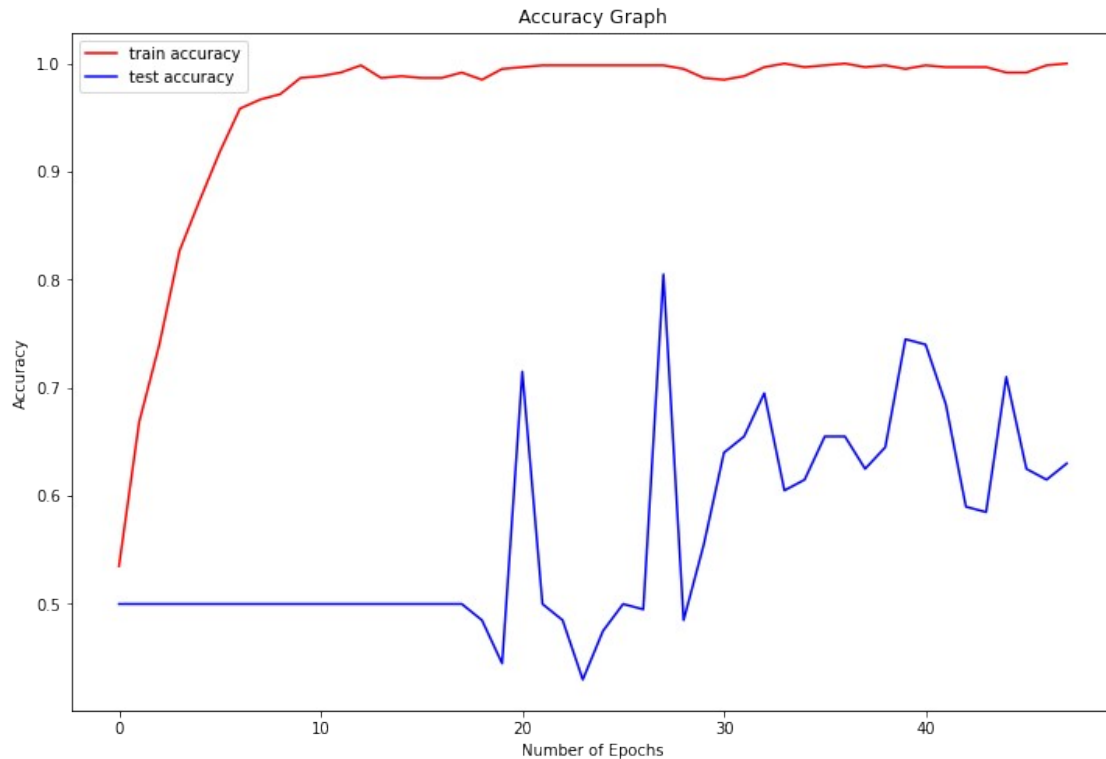
<tensorflow.python.training.tracking.util.CheckpointLoadStatus at
0x7f482709ec90>

```
plt.figure(figsize=(12,8))  
plt.plot(r.history['loss'],'r',label='train loss')  
plt.plot(r.history['val_loss'],'b',label='test loss')  
plt.xlabel('Number of Epochs')  
plt.ylabel('Loss')
```

```
plt.title('Loss Graph')
plt.legend();
```



```
plt.figure(figsize=(12,8))
plt.plot(r.history['accuracy'],'r',label='train accuracy')
plt.plot(r.history['val_accuracy'],'b',label='test accuracy')
plt.xlabel('Number of Epochs')
plt.ylabel('Accuracy')
plt.title('Accuracy Graph')
plt.legend();
```



```

y_pred_train=model.predict(x=X_train)
y_pred_test=model.predict(x=X_test)

y_pred_test=np.argmax(y_pred_test, axis=1)
y_pred_train=np.argmax(y_pred_train, axis=1)

import sklearn.metrics
conftest=sklearn.metrics.confusion_matrix(yte, y_pred_test)
conftrain=sklearn.metrics.confusion_matrix(ytr, y_pred_train)
print(conftest)

[[100  0]
 [ 39 61]]

print(conftrain)

[[278  22]
 [  0 300]]

print(sklearn.metrics.accuracy_score(yte,y_pred_test))
print(sklearn.metrics.precision_score(yte,y_pred_test))
print(sklearn.metrics.recall_score(yte,y_pred_test))
print(sklearn.metrics.f1_score(yte,y_pred_test))

0.805
1.0
0.61
0.7577639751552795

```