In [ ]:

```
!pip install opendatasets
```

```
Collecting opendatasets
  Downloading opendatasets-0.1.22-py3-none-any.whl (15 kB)
Requirement already satisfied: tqdm in /usr/local/lib/python3.10/dist-pack
ages (from opendatasets) (4.66.1)
Requirement already satisfied: kaggle in /usr/local/lib/python3.10/dist-pa
ckages (from opendatasets) (1.5.16)
Requirement already satisfied: click in /usr/local/lib/python3.10/dist-pac
kages (from opendatasets) (8.1.7)
Requirement already satisfied: six>=1.10 in /usr/local/lib/python3.10/dist
-packages (from kaggle->opendatasets) (1.16.0)
Requirement already satisfied: certifi in /usr/local/lib/python3.10/dist-p
ackages (from kaggle->opendatasets) (2023.11.17)
Requirement already satisfied: python-dateutil in /usr/local/lib/python3.1
0/dist-packages (from kaggle->opendatasets) (2.8.2)
Requirement already satisfied: requests in /usr/local/lib/python3.10/dist-
packages (from kaggle->opendatasets) (2.31.0)
Requirement already satisfied: python-slugify in /usr/local/lib/python3.1
0/dist-packages (from kaggle->opendatasets) (8.0.1)
Requirement already satisfied: urllib3 in /usr/local/lib/python3.10/dist-p
ackages (from kaggle->opendatasets) (2.0.7)
Requirement already satisfied: bleach in /usr/local/lib/python3.10/dist-pa
ckages (from kaggle->opendatasets) (6.1.0)
Requirement already satisfied: webencodings in /usr/local/lib/python3.10/d
ist-packages (from bleach->kaggle->opendatasets) (0.5.1)
Requirement already satisfied: text-unidecode>=1.3 in /usr/local/lib/pytho
n3.10/dist-packages (from python-slugify->kaggle->opendatasets) (1.3)
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/
python3.10/dist-packages (from requests->kaggle->opendatasets) (3.3.2)
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.10/d
ist-packages (from requests->kaggle->opendatasets) (3.6)
Installing collected packages: opendatasets
Successfully installed opendatasets-0.1.22
```

In [ ]:

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

```
Drive already mounted at /content/drive; to attempt to forcibly remount, c
all drive.mount("/content/drive", force_remount=True).
```

In [ ]:

```python
import numpy as np
import pandas as pd
import os
import datetime

from tensorflow.keras.utils import plot_model

import pydotplus, pydot
import tensorflow as tf
from keras.preprocessing.image import ImageDataGenerator, load_img
from keras.layers import (Conv2D, BatchNormalization, Activation, MaxPoolin
from tensorflow.keras.optimizers import RMSprop, Adam, SGD
from keras import regularizers
from keras.callbacks import CSVLogger, ModelCheckpoint, ReduceLROnPlateau,
import matplotlib.pyplot as plt
from tensorflow.keras.layers import Input, Dense, Flatten, Conv2D, MaxPooli
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.models import Model
import opendatasets as od
```

In [ ]:

```python
ds_url = "https://www.kaggle.com/datasets/xhlulu/140k-real-and-fake-faces"
```

In [ ]:

```python
od.download(ds_url)
```

```
Please provide your Kaggle credentials to download this dataset. Learn mor
e: http://bit.ly/kaggle-creds (http://bit.ly/kaggle-creds)
Your Kaggle username: krdipesh199
Your Kaggle Key: ··········
Downloading 140k-real-and-fake-faces.zip to ./140k-real-and-fake-faces

100%|██████████| 3.75G/3.75G [00:51<00:00, 78.2MB/s]
```

In [ ]:

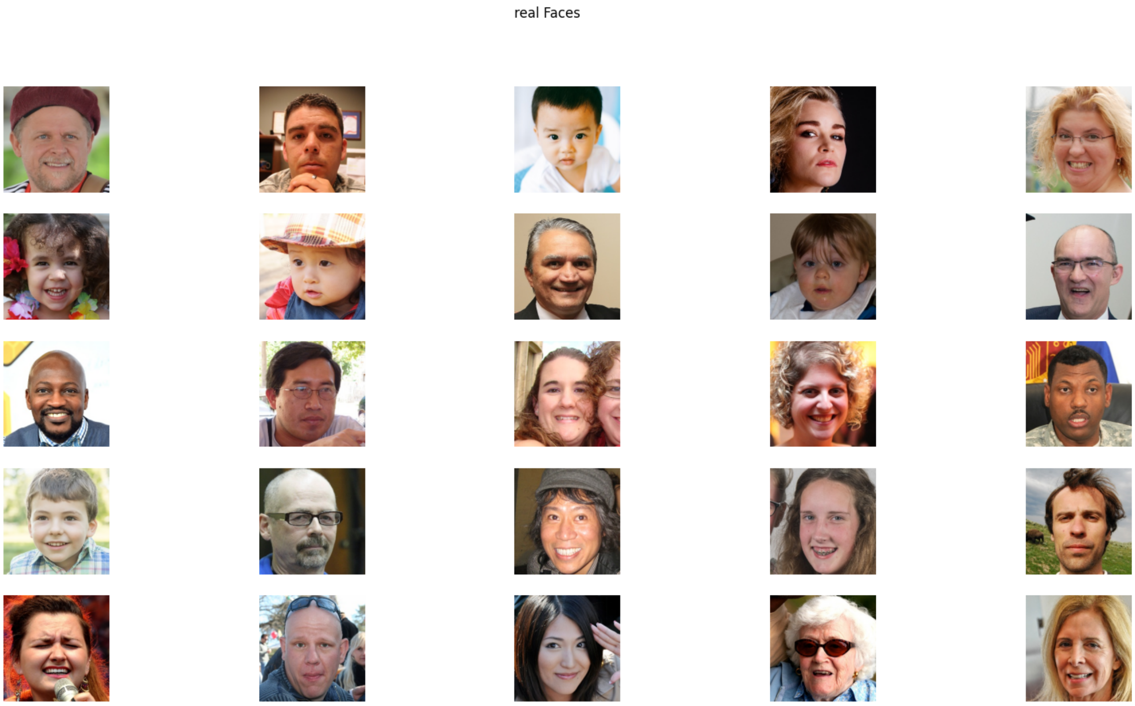
```python
path = '/content/140k-real-and-fake-faces/real_vs_fake/real-vs-fake'
def plot_image(path, set_):
    new_path = os.path.join(path, 'train', set_)
    fig, ax = plt.subplots(5,5, figsize=(20,10))
    fig.suptitle(set_ + 'Faces')
    k = 0
    for j in range(0,5,1):
        for i in range(0,5,1):
            img = load_img(os.path.join(new_path, os.listdir(os.path.join(n
            ax[i,j].imshow(img)
            ax[i,j].set_title("")
            ax[i,j].axis('off')
            k +=1
  #  fig.tight_layout()
    plt.suptitle(set_ + ' Faces')
    return plt
```

In [ ]:

```
plot_image(path,'real')
```

Out[7]:

```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
matplotlib/pyplot.py'>
```

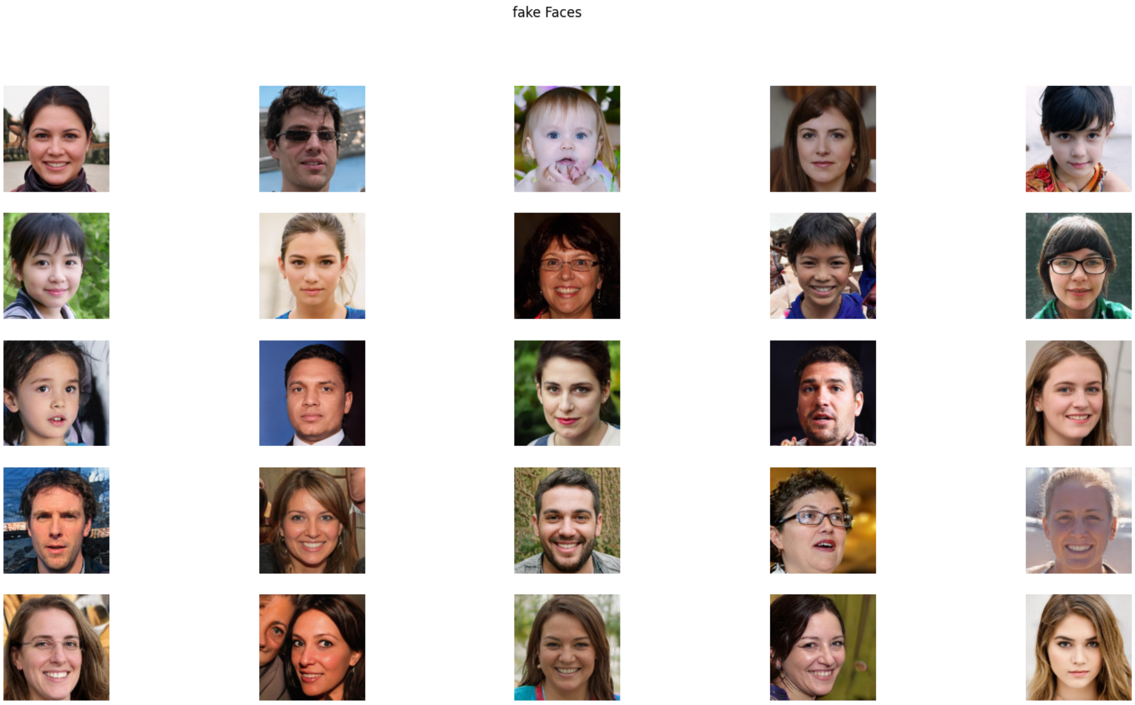


In [ ]:

```
plot_image(path,'fake')
```

Out[8]:

```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
matplotlib/pyplot.py'>
```



In [ ]:

```
bs = 64
row, col = 128, 128
train_datagen = ImageDataGenerator(rescale=1./255,
                                   horizontal_flip=True
                                  )
training_set = train_datagen.flow_from_directory(path + '/train',
                                                 class_mode='binary',
                                                 shuffle=True,
                                                 target_size=(row,col),
                                                 batch_size=bs
                                                )
val_test_datagen = ImageDataGenerator(rescale=1./255)

validation_set = val_test_datagen.flow_from_directory(path + '/valid',
                                                      class_mode='binary',
                                                      shuffle=True,
                                                      target_size=(row,col)
                                                      batch_size=bs
                                                     )
test_set = val_test_datagen.flow_from_directory(path + '/test',
                                                class_mode='binary',
                                                shuffle=True,
                                                target_size=(row,col),
                                                batch_size=bs
                                               )
training_set.class_indices
```

```
Found 100000 images belonging to 2 classes.
Found 20000 images belonging to 2 classes.
Found 20000 images belonging to 2 classes.
```

Out[9]:

```
{'fake': 0, 'real': 1}
```

In [ ]:

```
bs = 64
row, col = 128, 128
train_datagen = ImageDataGenerator(rescale=1./255,
                                   horizontal_flip=True,
                                   featurewise_center=True,
                                   featurewise_std_normalization=True,
                                   rotation_range=30,
                                   width_shift_range=0.2,
                                   height_shift_range=0.2,
                                   shear_range = 0.2,
                                   zoom_range = 0.2,
                                  )
training_set = train_datagen.flow_from_directory(path + '/train',
                                                 class_mode='binary',
                                                 shuffle=True,
                                                 target_size=(row,col),
                                                 batch_size=bs
                                                )
val_test_datagen = ImageDataGenerator(rescale=1./255)

validation_set = val_test_datagen.flow_from_directory(path + '/valid',
                                                      class_mode='binary',
                                                      shuffle=True,
                                                      target_size=(row,col)
                                                      batch_size=bs
                                                     )
test_set = val_test_datagen.flow_from_directory(path + '/test',
                                                class_mode='binary',
                                                shuffle=True,
                                                target_size=(row,col),
                                                batch_size=bs
                                               )
training_set.class_indices
```

```
Found 100000 images belonging to 2 classes.
Found 20000 images belonging to 2 classes.
Found 20000 images belonging to 2 classes.
```

Out[10]:

```
{'fake': 0, 'real': 1}
```

In [ ]:

```
model = tf.keras.models.Sequential(
    [
     tf.keras.layers.Conv2D(32, (3,3), padding='same', activation='relu', i
     tf.keras.layers.MaxPooling2D(2,2),

     tf.keras.layers.Conv2D(64, (3,3), padding='same', activation='relu'),
     tf.keras.layers.MaxPooling2D(2,2),

     tf.keras.layers.Conv2D(128, (3,3), padding='same', activation='relu'),
     tf.keras.layers.MaxPooling2D(2,2),

     tf.keras.layers.Conv2D(256, (3,3), padding='same', activation='relu'),
     tf.keras.layers.MaxPooling2D(2,2),

     tf.keras.layers.Flatten(),

     tf.keras.layers.Dense(512, activation='relu'),
     tf.keras.layers.Dropout(0.5),

    #  tf.keras.layers.Dropout(0.3),
     tf.keras.layers.Dense(2, activation='softmax')
     ]
)
```

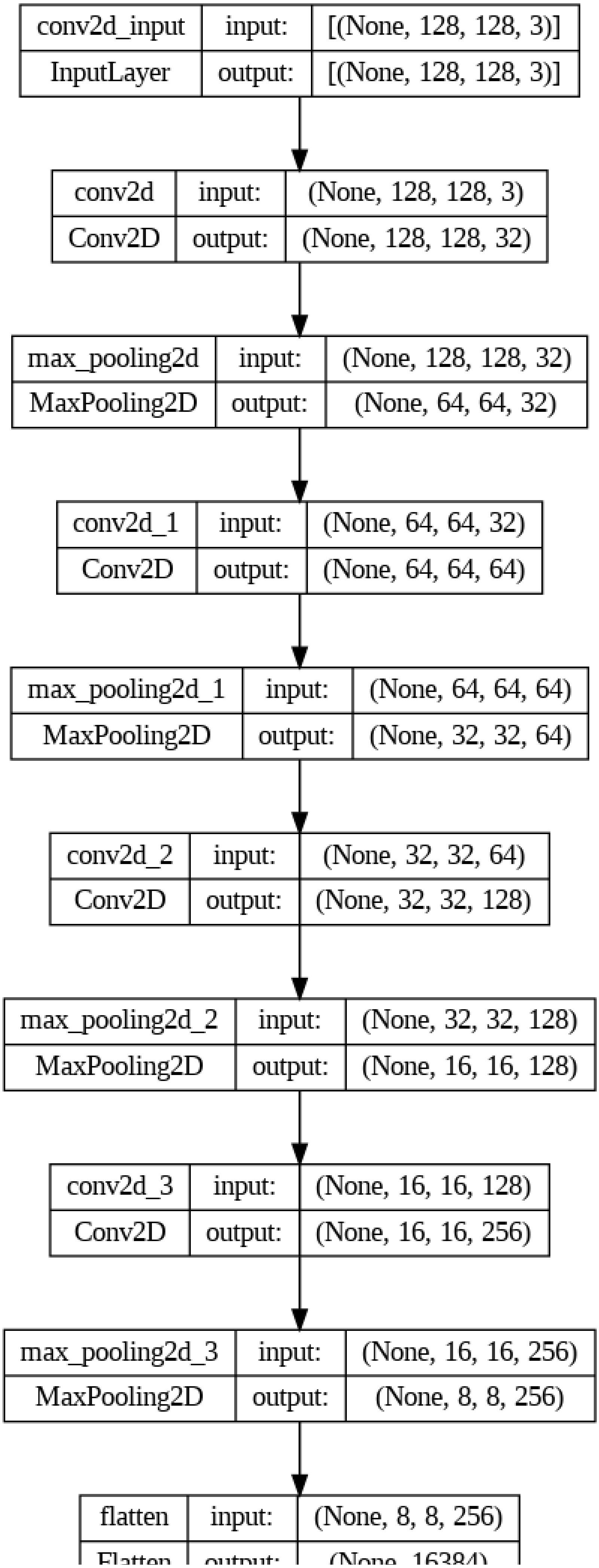
In [ ]:

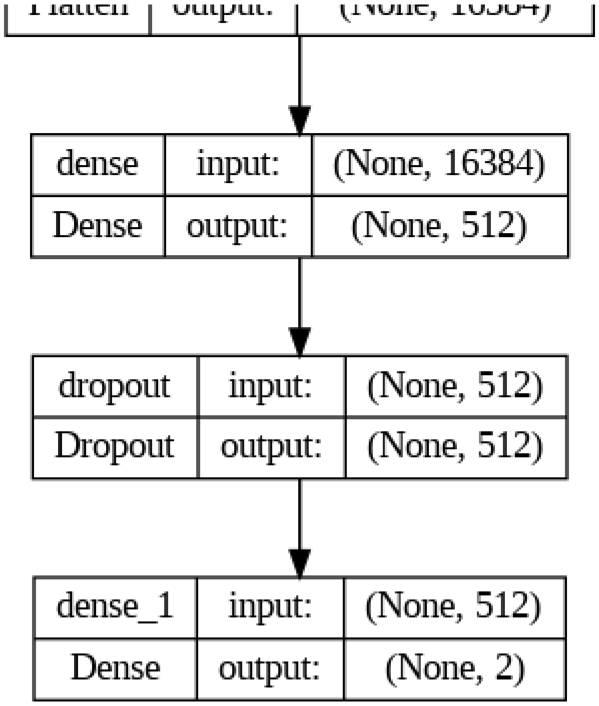
```
tf.keras.utils.pydot = pydot
```

In [ ]:

```
plot_model(model, to_file='model.png', show_shapes=True)
```

```
Out[14]:
```


conv2d_input | input: | [(None, 128, 128, 3)]
InputLayer | output: | [(None, 128, 128, 3)]
conv2d | input: | (None, 128, 128, 3)
Conv2D | output: | (None, 128, 128, 32)
max_pooling2d | input: | (None, 128, 128, 32)
MaxPooling2D | output: | (None, 64, 64, 32)
conv2d_1 | input: | (None, 64, 64, 32)
Conv2D | output: | (None, 64, 64, 64)
max_pooling2d_1 | input: | (None, 64, 64, 64)
MaxPooling2D | output: | (None, 32, 32, 64)
conv2d_2 | input: | (None, 32, 32, 64)
Conv2D | output: | (None, 32, 32, 128)
max_pooling2d_2 | input: | (None, 32, 32, 128)
MaxPooling2D | output: | (None, 16, 16, 128)
conv2d_3 | input: | (None, 16, 16, 128)
Conv2D | output: | (None, 16, 16, 256)
max_pooling2d_3 | input: | (None, 16, 16, 256)
MaxPooling2D | output: | (None, 8, 8, 256)
flatten | input: | (None, 8, 8, 256)
Flatten | output: | (None, 16384)


Flatten
output:
(None, 16384)
dense
input:
(None, 16384)
Dense
output:
(None, 512)
dropout
input:
(None, 512)
Dropout
output:
(None, 512)
dense_1
input:
(None, 512)
Dense
output:
(None, 2)

In [ ]:

```
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #   
=================================================================
 conv2d (Conv2D)             (None, 128, 128, 32)      896       
                                                                 
 max_pooling2d (MaxPooling2  (None, 64, 64, 32)        0         
 D)                                                              
                                                                 
 conv2d_1 (Conv2D)           (None, 64, 64, 64)        18496     
                                                                 
 max_pooling2d_1 (MaxPoolin  (None, 32, 32, 64)        0         
 g2D)                                                            
                                                                 
 conv2d_2 (Conv2D)           (None, 32, 32, 128)       73856     
                                                                 
 max_pooling2d_2 (MaxPoolin  (None, 16, 16, 128)       0         
 g2D)                                                            
                                                                 
 conv2d_3 (Conv2D)           (None, 16, 16, 256)       295168    
                                                                 
 max_pooling2d_3 (MaxPoolin  (None, 8, 8, 256)         0         
 g2D)                                                            
                                                                 
 flatten (Flatten)           (None, 16384)             0         
                                                                 
 dense (Dense)               (None, 512)               8389120   
                                                                 
 dropout (Dropout)           (None, 512)               0         
                                                                 
 dense_1 (Dense)             (None, 2)                 1026      
                                                                 
=================================================================
Total params: 8778562 (33.49 MB)
Trainable params: 8778562 (33.49 MB)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
```

In [ ]:

```
model.compile(optimizer='adam', loss='sparse_categorical_crossentropy', met
```

In [ ]:

```
checkpoint = ModelCheckpoint(filepath='MiniNet_14 Nov.h5',
                             save_best_only=True,
                             verbose=1,
                             mode='min',
                             moniter='val_loss'
                            )
reduce_lr = ReduceLROnPlateau(monitor='val_loss',
                              factor=0.2,
                              patience=10,
                              verbose=1
                             )
csv_logger = CSVLogger('training.log')

early_stopping = EarlyStopping(monitor = 'val_acc',
                              min_delta = 0.001,
                              patience =5,
                              verbose = 0,
                              mode = 'auto')

callbacks = [checkpoint, reduce_lr, early_stopping, csv_logger]
```

In [ ]:
```
history = model.fit(training_set,
                    validation_data = validation_set,
                    callbacks = callbacks,
                    epochs = 10,
                    validation_steps = 32,
                    verbose=1)
```

```
Epoch 1/10
1563/1563 [==============================] - ETA: 0s - loss: 0.6539 - accu
racy: 0.6163
Epoch 1: val_loss improved from inf to 0.60413, saving model to MiniNet_14
Nov.h5

/usr/local/lib/python3.10/dist-packages/keras/src/engine/training.py:3079:
UserWarning: You are saving your model as an HDF5 file via `model.save()`.
This file format is considered legacy. We recommend using instead the nati
ve Keras format, e.g. `model.save('my_model.keras')`.
  saving_api.save_model(
WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,val_loss,val_accuracy,
lr

1563/1563 [==============================] - 619s 395ms/step - loss: 0.653
9 - accuracy: 0.6163 - val_loss: 0.6041 - val_accuracy: 0.6816 - lr: 0.001
0
Epoch 2/10
1563/1563 [==============================] - ETA: 0s - loss: 0.6058 - accu
racy: 0.6706
Epoch 2: val_loss improved from 0.60413 to 0.56620, saving model to MiniNe
t_14 Nov.h5

WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,val_loss,val_accuracy,
lr

1563/1563 [==============================] - 579s 370ms/step - loss: 0.605
8 - accuracy: 0.6706 - val_loss: 0.5662 - val_accuracy: 0.7051 - lr: 0.001
0
Epoch 3/10
1563/1563 [==============================] - ETA: 0s - loss: 0.5592 - accu
racy: 0.7144
Epoch 3: val_loss improved from 0.56620 to 0.53231, saving model to MiniNe
t_14 Nov.h5

WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,val_loss,val_accuracy,
lr

1563/1563 [==============================] - 581s 372ms/step - loss: 0.559
2 - accuracy: 0.7144 - val_loss: 0.5323 - val_accuracy: 0.7295 - lr: 0.001
0
Epoch 4/10
1563/1563 [==============================] - ETA: 0s - loss: 0.5209 - accu
racy: 0.7436
Epoch 4: val_loss improved from 0.53231 to 0.45515, saving model to MiniNe
t_14 Nov.h5

WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,val_loss,val_accuracy,
lr
```

```
1563/1563 [==============================] - 581s 371ms/step - loss: 0.520
9 - accuracy: 0.7436 - val_loss: 0.4551 - val_accuracy: 0.7900 - lr: 0.001
0
Epoch 5/10
1563/1563 [==============================] - ETA: 0s - loss: 0.4910 - accu
racy: 0.7655
Epoch 5: val_loss improved from 0.45515 to 0.42783, saving model to MiniNe
t_14 Nov.h5

WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,val_loss,val_accuracy,
lr

1563/1563 [==============================] - 595s 381ms/step - loss: 0.491
0 - accuracy: 0.7655 - val_loss: 0.4278 - val_accuracy: 0.7988 - lr: 0.001
0
Epoch 6/10
1563/1563 [==============================] - ETA: 0s - loss: 0.4654 - accu
racy: 0.7816
Epoch 6: val_loss did not improve from 0.42783

WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,val_loss,val_accuracy,
lr

1563/1563 [==============================] - 593s 379ms/step - loss: 0.465
4 - accuracy: 0.7816 - val_loss: 0.4354 - val_accuracy: 0.8003 - lr: 0.001
0
Epoch 7/10
1563/1563 [==============================] - ETA: 0s - loss: 0.4476 - accu
racy: 0.7911
Epoch 7: val_loss improved from 0.42783 to 0.40090, saving model to MiniNe
t_14 Nov.h5

WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,val_loss,val_accuracy,
lr

1563/1563 [==============================] - 601s 384ms/step - loss: 0.447
6 - accuracy: 0.7911 - val_loss: 0.4009 - val_accuracy: 0.8203 - lr: 0.001
0
Epoch 8/10
 193/1563 [==>...........................] - ETA: 8:24 - loss: 0.4363 - ac
curacy: 0.7966
```

In [ ]:

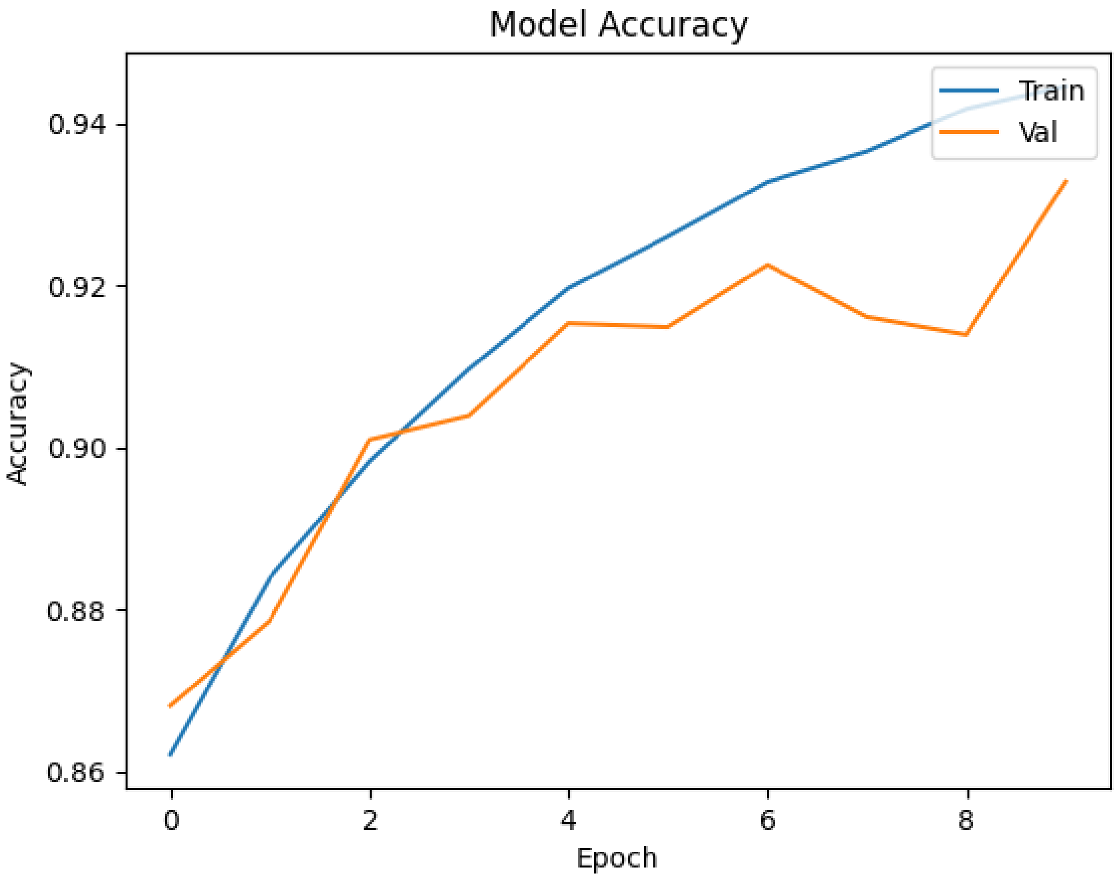
```
history = model.fit(training_set,
                    validation_data = validation_set,
                    callbacks = callbacks,
                    epochs = 10,
                    validation_steps = 100,
                    verbose=1)
```

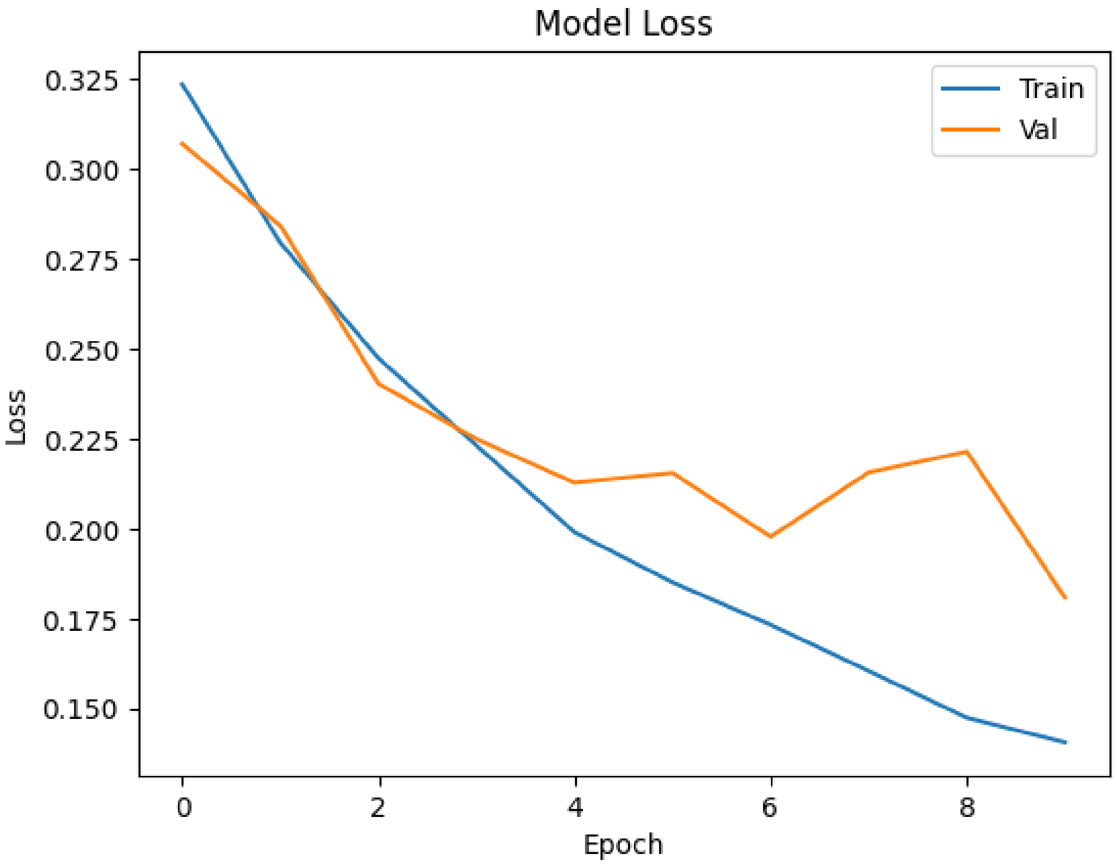
```
Epoch 1/10
1563/1563 [==============================] - ETA: 0s - loss: 0.3236 - accu
racy: 0.8621
Epoch 1: val_loss improved from 0.37980 to 0.30703, saving model to MiniNe
t_14 Nov.h5

WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,val_loss,val_accuracy,
lr

1563/1563 [==============================] - 170s 109ms/step - loss: 0.323
6 - accuracy: 0.8621 - val_loss: 0.3070 - val_accuracy: 0.8681 - lr: 0.001
0
Epoch 2/10
1563/1563 [==============================] - ETA: 0s - loss: 0.2795 - accu
racy: 0.8839
Epoch 2: val_loss improved from 0.30703 to 0.28428, saving model to MiniNe
t_14 Nov.h5

WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,val_loss,val_accuracy,
lr

1563/1563 [==============================] - 167s 107ms/step - loss: 0.279
5 - accuracy: 0.8839 - val_loss: 0.2843 - val_accuracy: 0.8786 - lr: 0.001
0
Epoch 3/10
1563/1563 [==============================] - ETA: 0s - loss: 0.2474 - accu
racy: 0.8982
Epoch 3: val_loss improved from 0.28428 to 0.24032, saving model to MiniNe
t_14 Nov.h5

WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,val_loss,val_accuracy,
lr

1563/1563 [==============================] - 169s 108ms/step - loss: 0.247
4 - accuracy: 0.8982 - val_loss: 0.2403 - val_accuracy: 0.9009 - lr: 0.001
0
Epoch 4/10
1563/1563 [==============================] - ETA: 0s - loss: 0.2231 - accu
racy: 0.9097
Epoch 4: val_loss improved from 0.24032 to 0.22493, saving model to MiniNe
t_14 Nov.h5

WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,val_loss,val_accuracy,
lr
```

```
1563/1563 [==============================] - 167s 107ms/step - loss: 0.223
1 - accuracy: 0.9097 - val_loss: 0.2249 - val_accuracy: 0.9039 - lr: 0.001
0
Epoch 5/10
1563/1563 [==============================] - ETA: 0s - loss: 0.1990 - accu
racy: 0.9196
Epoch 5: val_loss improved from 0.22493 to 0.21280, saving model to MiniNe
t_14 Nov.h5

WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,val_loss,val_accuracy,
lr

1563/1563 [==============================] - 173s 110ms/step - loss: 0.199
0 - accuracy: 0.9196 - val_loss: 0.2128 - val_accuracy: 0.9153 - lr: 0.001
0
Epoch 6/10
1563/1563 [==============================] - ETA: 0s - loss: 0.1851 - accu
racy: 0.9260
Epoch 6: val_loss did not improve from 0.21280

WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,val_loss,val_accuracy,
lr

1563/1563 [==============================] - 167s 107ms/step - loss: 0.185
1 - accuracy: 0.9260 - val_loss: 0.2155 - val_accuracy: 0.9148 - lr: 0.001
0
Epoch 7/10
1563/1563 [==============================] - ETA: 0s - loss: 0.1733 - accu
racy: 0.9328
Epoch 7: val_loss improved from 0.21280 to 0.19777, saving model to MiniNe
t_14 Nov.h5

WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,val_loss,val_accuracy,
lr

1563/1563 [==============================] - 171s 110ms/step - loss: 0.173
3 - accuracy: 0.9328 - val_loss: 0.1978 - val_accuracy: 0.9225 - lr: 0.001
0
Epoch 8/10
1563/1563 [==============================] - ETA: 0s - loss: 0.1605 - accu
racy: 0.9365
Epoch 8: val_loss did not improve from 0.19777

WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,val_loss,val_accuracy,
lr

1563/1563 [==============================] - 170s 109ms/step - loss: 0.160
5 - accuracy: 0.9365 - val_loss: 0.2157 - val_accuracy: 0.9161 - lr: 0.001
0
Epoch 9/10
1563/1563 [==============================] - ETA: 0s - loss: 0.1474 - accu
racy: 0.9418
Epoch 9: val_loss did not improve from 0.19777

WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,val_loss,val_accuracy,
lr
```

```
1563/1563 [==============================] - 169s 108ms/step - loss: 0.147
4 - accuracy: 0.9418 - val_loss: 0.2214 - val_accuracy: 0.9139 - lr: 0.001
0
Epoch 10/10
1563/1563 [==============================] - ETA: 0s - loss: 0.1406 - accu
racy: 0.9446
Epoch 10: val_loss improved from 0.19777 to 0.18089, saving model to MiniN
et_14 Nov.h5

WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,val_loss,val_accuracy,
lr

1563/1563 [==============================] - 162s 104ms/step - loss: 0.140
6 - accuracy: 0.9446 - val_loss: 0.1809 - val_accuracy: 0.9328 - lr: 0.001
0
```

```
In [ ]: plt.plot(history.history['accuracy'])
        plt.plot(history.history['val_accuracy'])
        plt.title('Model Accuracy')
        plt.ylabel('Accuracy')
        plt.xlabel('Epoch')
        plt.legend(['Train', 'Val'], loc='upper right')
        plt.show()

        plt.plot(history.history['loss'])
        plt.plot(history.history['val_loss'])
        plt.title('Model Loss')
        plt.ylabel('Loss')
        plt.xlabel('Epoch')
        plt.legend(['Train', 'Val'], loc='upper right')
        plt.show()
```





```
In [ ]: test_loss, test_acc = model.evaluate(test_set)
```

```
313/313 [==============================] - 39s 126ms/step - loss: 0.1872 -
accuracy: 0.9303
```

```
In [ ]: from tensorflow.keras.models import load_model
```

In [ ]:

```
model_new = load_model('/content/MiniNet.h5')
```

```
---------------------------------------------------------------------------
-
OSError                                   Traceback (most recent call las
t)
<ipython-input-11-087a786a862e> in <cell line: 1>()
----> 1 model_new = load_model('/content/MiniNet.h5')

/usr/local/lib/python3.10/dist-packages/keras/src/saving/saving_api.py in
load_model(filepath, custom_objects, compile, safe_mode, **kwargs)
    260
    261     # Legacy case.
--> 262     return legacy_sm_saving_lib.load_model(
    263         filepath, custom_objects=custom_objects, compile=compile,
**kwargs
    264     )

/usr/local/lib/python3.10/dist-packages/keras/src/utils/traceback_utils.py
in error_handler(*args, **kwargs)
     68             # To get the full stack trace, call:
     69             # `tf.debugging.disable_traceback_filtering()`
---> 70             raise e.with_traceback(filtered_tb) from None
     71         finally:
     72             del filtered_tb

/usr/local/lib/python3.10/dist-packages/keras/src/saving/legacy/save.py in
load_model(filepath, custom_objects, compile, options)
    232                 if isinstance(filepath_str, str):
    233                     if not tf.io.gfile.exists(filepath_str):
--> 234                         raise IOError(
    235                             f"No file or directory found at {f
ilepath_str}"
    236                         )

OSError: No file or directory found at /content/MiniNet.h5
```

In [ ]:

```
_, accu = model_new.evaluate(test_set)
print('Final Test Acccuracy = {:.3f}'.format(accu*100))
```

```
313/313 [==============================] - 27s 85ms/step - loss: 0.1549 -
accuracy: 0.9531
Final Test Acccuracy = 95.305
```

In [ ]:

```
bs = 512
row, col = 128, 128
train_datagen = ImageDataGenerator(rescale=1./255,
                                   horizontal_flip=True
                                  )
training_set = train_datagen.flow_from_directory(path + '/train',
                                                 class_mode='binary',
                                                 shuffle=True,
                                                 target_size=(row,col),
                                                 batch_size=bs
                                                )
val_test_datagen = ImageDataGenerator(rescale=1./255)

validation_set = val_test_datagen.flow_from_directory(path + '/valid',
                                                      class_mode='binary',
                                                      shuffle=True,
                                                      target_size=(row,col)
                                                      batch_size=bs
                                                     )
test_set = val_test_datagen.flow_from_directory(path + '/test',
                                                class_mode='binary',
                                                shuffle=True,
                                                target_size=(row,col),
                                                batch_size=bs
                                               )
training_set.class_indices
```

```
Found 100000 images belonging to 2 classes.
Found 20000 images belonging to 2 classes.
Found 20000 images belonging to 2 classes.
```

Out[22]:

```
{'fake': 0, 'real': 1}
```

In [ ]:

```
model = tf.keras.models.Sequential(
    [
     tf.keras.layers.Conv2D(32, (3,3), padding='same', activation='relu', i
     tf.keras.layers.MaxPooling2D(2,2),

     tf.keras.layers.Conv2D(64, (3,3), padding='same', activation='relu'),
     tf.keras.layers.MaxPooling2D(2,2),

     tf.keras.layers.Conv2D(128, (3,3), padding='same', activation='relu'),
     tf.keras.layers.MaxPooling2D(2,2),

     tf.keras.layers.Conv2D(256, (3,3), padding='same', activation='relu'),
     tf.keras.layers.MaxPooling2D(2,2),

     tf.keras.layers.Flatten(),

     tf.keras.layers.Dense(512, activation='relu'),
     tf.keras.layers.Dropout(0.5),

    #  tf.keras.layers.Dropout(0.3),
     tf.keras.layers.Dense(2, activation='softmax')
     ]
)
```

In [ ]:

```
model.compile(optimizer='adam', loss='sparse_categorical_crossentropy', met
```

In [ ]:

```
checkpoint = ModelCheckpoint(filepath='MiniNet_2.h5',
                             save_best_only=True,
                             verbose=1,
                             mode='min',
                             moniter='val_loss'
                            )
reduce_lr = ReduceLROnPlateau(monitor='val_loss',
                              factor=0.2,
                              patience=10,
                              verbose=1
                             )
csv_logger = CSVLogger('training.log')

early_stopping = EarlyStopping(monitor = 'val_acc',
                              min_delta = 0.001,
                              patience =5,
                              verbose = 0,
                              mode = 'auto')

callbacks = [checkpoint, reduce_lr, early_stopping, csv_logger]
```

In [ ]:

```
history = model.fit(training_set,
                    validation_data = validation_set,
                    callbacks = callbacks,
                    epochs = 10,
                    validation_steps = 100,
                    verbose=1)
```

```
Epoch 1/10
196/196 [==============================] - ETA: 0s - loss: 0.6345 - accura
cy: 0.6240

WARNING:tensorflow:Your input ran out of data; interrupting training. Make
sure that your dataset or generator can generate at least `steps_per_epoch
* epochs` batches (in this case, 100 batches). You may need to use the rep
eat() function when building your dataset.


Epoch 1: val_loss improved from inf to 0.53715, saving model to MiniNet_2.
h5

WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,val_loss,val_accuracy,
lr

196/196 [==============================] - 201s 987ms/step - loss: 0.6345
- accuracy: 0.6240 - val_loss: 0.5371 - val_accuracy: 0.7322 - lr: 0.0010
Epoch 2/10
196/196 [==============================] - ETA: 0s - loss: 0.4703 - accura
cy: 0.7766

WARNING:tensorflow:Can save best model only with val_loss available, skipp
ing.
WARNING:tensorflow:Learning rate reduction is conditioned on metric `val_l
oss` which is not available. Available metrics are: loss,accuracy,lr
WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,lr

196/196 [==============================] - 166s 843ms/step - loss: 0.4703
- accuracy: 0.7766 - lr: 0.0010
Epoch 3/10
196/196 [==============================] - ETA: 0s - loss: 0.3768 - accura
cy: 0.8320

WARNING:tensorflow:Can save best model only with val_loss available, skipp
ing.
WARNING:tensorflow:Learning rate reduction is conditioned on metric `val_l
oss` which is not available. Available metrics are: loss,accuracy,lr
WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,lr

196/196 [==============================] - 167s 852ms/step - loss: 0.3768
- accuracy: 0.8320 - lr: 0.0010
Epoch 4/10
196/196 [==============================] - ETA: 0s - loss: 0.3199 - accura
cy: 0.8633

WARNING:tensorflow:Can save best model only with val_loss available, skipp
ing.
WARNING:tensorflow:Learning rate reduction is conditioned on metric `val_l
oss` which is not available. Available metrics are: loss,accuracy,lr
WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,lr
```

```
196/196 [==============================] - 170s 864ms/step - loss: 0.3199
- accuracy: 0.8633 - lr: 0.0010
Epoch 5/10
196/196 [==============================] - ETA: 0s - loss: 0.2673 - accura
cy: 0.8882

WARNING:tensorflow:Can save best model only with val_loss available, skipp
ing.
WARNING:tensorflow:Learning rate reduction is conditioned on metric `val_l
oss` which is not available. Available metrics are: loss,accuracy,lr
WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,lr

196/196 [==============================] - 170s 872ms/step - loss: 0.2673
- accuracy: 0.8882 - lr: 0.0010
Epoch 6/10
196/196 [==============================] - ETA: 0s - loss: 0.2320 - accura
cy: 0.9051

WARNING:tensorflow:Can save best model only with val_loss available, skipp
ing.
WARNING:tensorflow:Learning rate reduction is conditioned on metric `val_l
oss` which is not available. Available metrics are: loss,accuracy,lr
WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,lr

196/196 [==============================] - 174s 885ms/step - loss: 0.2320
- accuracy: 0.9051 - lr: 0.0010
Epoch 7/10
196/196 [==============================] - ETA: 0s - loss: 0.2018 - accura
cy: 0.9184

WARNING:tensorflow:Can save best model only with val_loss available, skipp
ing.
WARNING:tensorflow:Learning rate reduction is conditioned on metric `val_l
oss` which is not available. Available metrics are: loss,accuracy,lr
WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,lr

196/196 [==============================] - 166s 848ms/step - loss: 0.2018
- accuracy: 0.9184 - lr: 0.0010
Epoch 8/10
196/196 [==============================] - ETA: 0s - loss: 0.1774 - accura
cy: 0.9298

WARNING:tensorflow:Can save best model only with val_loss available, skipp
ing.
WARNING:tensorflow:Learning rate reduction is conditioned on metric `val_l
oss` which is not available. Available metrics are: loss,accuracy,lr
WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,lr

196/196 [==============================] - 166s 845ms/step - loss: 0.1774
- accuracy: 0.9298 - lr: 0.0010
Epoch 9/10
196/196 [==============================] - ETA: 0s - loss: 0.1615 - accura
cy: 0.9360
```

```
WARNING:tensorflow:Can save best model only with val_loss available, skipp
ing.
WARNING:tensorflow:Learning rate reduction is conditioned on metric `val_l
oss` which is not available. Available metrics are: loss,accuracy,lr
WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,lr

196/196 [==============================] - 164s 839ms/step - loss: 0.1615
- accuracy: 0.9360 - lr: 0.0010
Epoch 10/10
196/196 [==============================] - ETA: 0s - loss: 0.1471 - accura
cy: 0.9428

WARNING:tensorflow:Can save best model only with val_loss available, skipp
ing.
WARNING:tensorflow:Learning rate reduction is conditioned on metric `val_l
oss` which is not available. Available metrics are: loss,accuracy,lr
WARNING:tensorflow:Early stopping conditioned on metric `val_acc` which is
not available. Available metrics are: loss,accuracy,lr

196/196 [==============================] - 165s 841ms/step - loss: 0.1471
- accuracy: 0.9428 - lr: 0.0010
```

In [ ]:

```
test_loss, test_acc = model.evaluate(test_set)
```

```
40/40 [==============================] - 30s 760ms/step - loss: 0.1590 - a
ccuracy: 0.9381
```

In [ ]:

```
_, accu = model.evaluate(test_set)
print('Final Test Acccuracy = {:.3f}'.format(accu*100))
```

```
40/40 [==============================] - 42s 1s/step - loss: 0.1521 - accu
racy: 0.9379
Final Test Acccuracy = 93.790
```

In [ ]:

```
import cv2
```

In [ ]:

```
filtered_train_set = '/content/drive/MyDrive/Filtered_images_3x3 avg blur'
os.makedirs(filtered_train_set, exist_ok=True)

def apply_average_filter(image_path):
    # Read the image
    img = cv2.imread(image_path)

    # Apply average filtering with a 3x3 kernel
    filtered_img = cv2.blur(img, (3, 3))

    # Save the filtered image
    filtered_image_path = os.path.join(filtered_train_set, os.path.basename
    cv2.imwrite(filtered_image_path, filtered_img)
```

In [ ]:

```
for filename in os.listdir('training_set'):
    if filename.endswith(".jpg") or filename.endswith(".png"):  # Adjust fi
        image_path = os.path.join('/content/140k-real-and-fake-faces/real_v
        apply_average_filter(image_path)

print("Average filtering applied to all images.")
```

```
Average filtering applied to all images.
```

In [ ]:

```
import cv2
import os
import numpy as np
from tensorflow.keras.preprocessing.image import ImageDataGenerator

# Set parameters for data generators
bs = 64
row, col = 128, 128

# Create a custom data generator with average filtering
class FilteredImageDataGenerator(ImageDataGenerator):
    def __init__(self, *args, **kwargs):
        super(FilteredImageDataGenerator, self).__init__(*args, **kwargs)

    def apply_average_filter(self, image):
        return cv2.blur(image, (3, 3))  # You can adjust the kernel size if

    def flow_from_directory_with_filtering(self, directory, *args, **kwargs
        generator = super(FilteredImageDataGenerator, self).flow_from_direc

        for batch_x, batch_y in generator:
            filtered_batch_x = np.array([self.apply_average_filter(image) f
            yield filtered_batch_x, batch_y

# Create data generators with filtering
train_datagen = FilteredImageDataGenerator(
    rescale=1./255,
    horizontal_flip=True
)

training_set = train_datagen.flow_from_directory_with_filtering(
    os.path.join(path, 'train'),
    class_mode='binary',
    shuffle=True,
    target_size=(row, col),
    batch_size=bs
)

# Validation and test sets without filtering
val_test_datagen = ImageDataGenerator(rescale=1./255)

validation_set = val_test_datagen.flow_from_directory(
    os.path.join(path, 'valid'),
    class_mode='binary',
    shuffle=True,
    target_size=(row, col),
    batch_size=bs
)

test_set = val_test_datagen.flow_from_directory(
    os.path.join(path, 'test'),
    class_mode='binary',
    shuffle=True,
    target_size=(row, col),
    batch_size=bs
)

# Check class indices
```

```
print(training_set.class_indices)
```