```
import matplotlib.pyplot as plt
import tensorflow as tf
import pandas as pd
import numpy as np

import warnings
warnings.filterwarnings('ignore')

from tensorflow import keras
from keras import layers
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Activation, Dropout, Flatten, Dense
from tensorflow.keras.layers import Conv2D, MaxPooling2D
from tensorflow.keras.utils import image_dataset_from_directory
from tensorflow.keras.preprocessing.image import ImageDataGenerator, load_img
from tensorflow.keras.preprocessing import image_dataset_from_directory

import os
import matplotlib.image as mpimg
```

```
!unzip /content/AugmentedDataset.zip
```

```
       inflating: Augmented Dataset/kids_running/a_0_9883.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9884.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9887.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9891.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9893.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9897.jpeg
       inflating: Augmented Dataset/kids_running/a_0_990.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9900.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9902.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9903.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9905.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9907.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9908.jpeg
       inflating: Augmented Dataset/kids_running/a_0_991.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9913.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9917.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9918.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9919.jpeg
       inflating: Augmented Dataset/kids_running/a_0_992.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9922.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9923.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9931.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9932.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9933.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9934.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9935.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9937.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9938.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9940.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9941.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9943.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9946.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9949.jpeg
       inflating: Augmented Dataset/kids_running/a_0_995.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9955.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9956.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9957.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9959.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9964.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9965.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9967.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9968.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9970.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9971.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9972.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9974.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9976.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9977.jpeg
       inflating: Augmented Dataset/kids_running/a_0_998.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9980.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9983.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9987.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9988.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9989.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9990.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9991.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9994.jpeg
       inflating: Augmented Dataset/kids_running/a_0_9998.jpeg
```

```
path = '/content/Augmented Dataset'
classes = os.listdir(path)
classes
```

```
['dogs running', 'kids running']
```

```
base_dir = '/content/Augmented Dataset'

# Create datasets
train_datagen = image_dataset_from_directory(base_dir,
                                             image_size=(200,200),
                                             subset='training',
                                             seed = 1,
                                            validation_split=0.1,
                                             batch_size= 32)
test_datagen = image_dataset_from_directory(base_dir,
                                             image_size=(200,200),
                                             subset='validation',
                                             seed = 1,
                                            validation_split=0.1,
                                             batch_size= 32)
```

```
Found 10079 files belonging to 2 classes.
Using 9072 files for training.
Found 10079 files belonging to 2 classes.
Using 1007 files for validation.
```

```
model = tf.keras.models.Sequential([
    layers.Conv2D(32, (3, 3), activation='relu', input_shape=(200, 200, 3)),
    layers.MaxPooling2D(2, 2),
    layers.Conv2D(64, (3, 3), activation='relu'),
    layers.MaxPooling2D(2, 2),
    layers.Conv2D(64, (3, 3), activation='relu'),
    layers.MaxPooling2D(2, 2),
    layers.Conv2D(64, (3, 3), activation='relu'),
    layers.MaxPooling2D(2, 2),

    layers.Flatten(),
    layers.Dense(512, activation='relu'),
    layers.BatchNormalization(),
    layers.Dense(512, activation='relu'),
    layers.Dropout(0.1),
    layers.BatchNormalization(),
    layers.Dense(512, activation='relu'),
    layers.Dropout(0.2),
    layers.BatchNormalization(),
    layers.Dense(1, activation='sigmoid')
])
```

```
model.summary()
```

```
Model: "sequential_2"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d_8 (Conv2D)           (None, 198, 198, 32)      896

 max_pooling2d_8 (MaxPooling  (None, 99, 99, 32)       0
 2D)

 conv2d_9 (Conv2D)           (None, 97, 97, 64)        18496

 max_pooling2d_9 (MaxPooling  (None, 48, 48, 64)       0
 2D)

 conv2d_10 (Conv2D)          (None, 46, 46, 64)        36928

 max_pooling2d_10 (MaxPoolin  (None, 23, 23, 64)       0
 g2D)

 conv2d_11 (Conv2D)          (None, 21, 21, 64)        36928

 max_pooling2d_11 (MaxPoolin  (None, 10, 10, 64)       0
 g2D)

 flatten_2 (Flatten)         (None, 6400)              0

 dense_8 (Dense)             (None, 512)               3277312

 batch_normalization_6 (Batc  (None, 512)              2048
 hNormalization)

 dense_9 (Dense)             (None, 512)               262656

 dropout_4 (Dropout)         (None, 512)               0

 batch_normalization_7 (Batc  (None, 512)              2048
 hNormalization)
```

```
 dense_10 (Dense)            (None, 512)               262656

 dropout_5 (Dropout)         (None, 512)               0

 batch_normalization_8 (Batc  (None, 512)              2048
 hNormalization)

 dense_11 (Dense)            (None, 1)                 513

=================================================================
Total params: 3,902,529
Trainable params: 3,899,457
Non-trainable params: 3,072
_________________________________________________________________
```

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

```
history = model.fit(train_datagen,
          epochs=10,
          validation_data=test_datagen)
```

```
Epoch 1/10
284/284 [==============================] - 688s 2s/step - loss: 0.7430 - accuracy: 0.5646 - val_loss: 0.9131 - val_accuracy: 0.5055
Epoch 2/10
284/284 [==============================] - 694s 2s/step - loss: 0.6782 - accuracy: 0.6101 - val_loss: 2.6579 - val_accuracy: 0.4876
Epoch 3/10
284/284 [==============================] - 669s 2s/step - loss: 0.6789 - accuracy: 0.5942 - val_loss: 1.4525 - val_accuracy: 0.5204
Epoch 4/10
284/284 [==============================] - 665s 2s/step - loss: 0.6407 - accuracy: 0.6452 - val_loss: 0.7802 - val_accuracy: 0.5720
Epoch 5/10
284/284 [==============================] - 660s 2s/step - loss: 0.6303 - accuracy: 0.6542 - val_loss: 0.9781 - val_accuracy: 0.5591
Epoch 6/10
284/284 [==============================] - 662s 2s/step - loss: 0.6110 - accuracy: 0.6685 - val_loss: 1.9413 - val_accuracy: 0.5243
Epoch 7/10
284/284 [==============================] - 659s 2s/step - loss: 0.6055 - accuracy: 0.6756 - val_loss: 0.6964 - val_accuracy: 0.6028
Epoch 8/10
284/284 [==============================] - 658s 2s/step - loss: 0.5797 - accuracy: 0.6969 - val_loss: 0.6932 - val_accuracy: 0.6087
Epoch 9/10
284/284 [==============================] - 659s 2s/step - loss: 0.5688 - accuracy: 0.7140 - val_loss: 1.1368 - val_accuracy: 0.5293
Epoch 10/10
284/284 [==============================] - 662s 2s/step - loss: 0.5490 - accuracy: 0.7248 - val_loss: 0.6144 - val_accuracy: 0.6713
```