```
# unzipping dataset
from google.colab import drive
drive.mount('/content/gdrive')
!unzip gdrive/MyDrive/FaceRecognition/archive2.zip
```

```
    inflating: archive2/UTKFace/23_1_4_20170117194319028.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._23_1_4_20170117194319028.jpg.chip.jpg
    inflating: archive2/UTKFace/72_1_3_20170104220952910.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._72_1_3_20170104220952910.jpg.chip.jpg
    inflating: archive2/UTKFace/22_1_2_20170116172614669.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._22_1_2_20170116172614669.jpg.chip.jpg
    inflating: archive2/UTKFace/2_1_2_20170103213340236.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._2_1_2_20170103213340236.jpg.chip.jpg
    inflating: archive2/UTKFace/31_0_1_20170117134930189.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._31_0_1_20170117134930189.jpg.chip.jpg
    inflating: archive2/UTKFace/1_1_4_20161221201512713.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._1_1_4_20161221201512713.jpg.chip.jpg
    inflating: archive2/UTKFace/28_0_1_20170113150932640.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._28_0_1_20170113150932640.jpg.chip.jpg
    inflating: archive2/UTKFace/68_0_1_20170117194555228.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._68_0_1_20170117194555228.jpg.chip.jpg
    inflating: archive2/UTKFace/32_0_0_20170113141839586.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._32_0_0_20170113141839586.jpg.chip.jpg
    inflating: archive2/UTKFace/35_1_0_20170117203415648.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._35_1_0_20170117203415648.jpg.chip.jpg
    inflating: archive2/UTKFace/29_1_2_20170104021748445.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._29_1_2_20170104021748445.jpg.chip.jpg
    inflating: archive2/UTKFace/48_0_1_20170117165012988.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._48_0_1_20170117165012988.jpg.chip.jpg
    inflating: archive2/UTKFace/34_0_3_20170119200757565.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._34_0_3_20170119200757565.jpg.chip.jpg
    inflating: archive2/UTKFace/2_1_4_20161221201556929.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._2_1_4_20161221201556929.jpg.chip.jpg
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    inflating: __MACOSX/archive2/UTKFace/._30_0_2_20170116173004384.jpg.chip.jpg
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    inflating: __MACOSX/archive2/UTKFace/._88_1_0_20170110183756051.jpg.chip.jpg
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    inflating: __MACOSX/archive2/UTKFace/._1_0_2_20161219160949398.jpg.chip.jpg
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    inflating: __MACOSX/archive2/UTKFace/._1_0_2_20161219204845029.jpg.chip.jpg
    inflating: archive2/UTKFace/1_1_3_20161220145206031.jpg.chip.jpg
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    inflating: __MACOSX/archive2/UTKFace/._14_0_1_20170113151234215.jpg.chip.jpg
    inflating: archive2/UTKFace/32_0_0_20170117010455142.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._32_0_0_20170117010455142.jpg.chip.jpg
    inflating: archive2/UTKFace/24_1_3_20170104232545657.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._24_1_3_20170104232545657.jpg.chip.jpg
    inflating: archive2/UTKFace/26_1_2_20170116162008791.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._26_1_2_20170116162008791.jpg.chip.jpg
    inflating: archive2/UTKFace/25_0_0_20170117142949572.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._25_0_0_20170117142949572.jpg.chip.jpg
    inflating: archive2/UTKFace/58_1_0_20170109220512395.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._58_1_0_20170109220512395.jpg.chip.jpg
    inflating: archive2/UTKFace/13_0_0_20170110225717809.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._13_0_0_20170110225717809.jpg.chip.jpg
    inflating: archive2/UTKFace/39_0_0_20170113183735128.jpg.chip.jpg
    inflating: __MACOSX/archive2/UTKFace/._39_0_0_20170113183735128.jpg.chip.jpg
    inflating: archive2/UTKFace/72_0_0_20170120225150033.jpg.chip.jpg
```

```
# import modules
import random
import keras
from tensorflow.keras import layers
from keras.models import Sequential
import tensorflow as tf
import tensorflow_datasets as tfds
from keras.layers.core import Dense, Activation, Dropout, Flatten
from keras.layers.convolutional import Convolution2D, MaxPooling2D
from keras.optimizers import SGD, RMSprop, adam
from keras.utils import np_utils
from sklearn.tree import DecisionTreeClassifier # Import Decision Tree Classifier
import matplotlib.pyplot as plt
import numpy as np
import os
import cv2
```

```
from PIL import Image
import matplotlib.pyplot as plt
from keras.utils import np_utils
from sklearn.model_selection import train_test_split
from keras.applications.vgg16 import VGG16
from keras.applications.vgg16 import VGG16
from keras.models import Model
from tensorflow.keras import layers
from tensorflow.keras.applications.vgg16 import preprocess_input
import tensorflow_datasets as tfds


path = "/content/archive2/UTKFace/"

training = []
count = 0
for img in os.listdir(path):
    if count % 3 == 0 and img !=".DS_Store":
      classification = img.split("_")
      category = int(classification[1])

      img_array = cv2.imread(os.path.join(path, img))
      #img_array = tf.keras.utils.load_img(os.path.join(path,img))
      #imga = img_array.resize((100,100))
      img_array = cv2.cvtColor(img_array,cv2.COLOR_RGB2BGR)
      imga = cv2.resize(img_array,dsize = (100,100), interpolation = cv2.INTER_CUBIC)
      training.append([imga, category])
    count +=1
# randomizes data
random.shuffle(training)


plt.imshow(training[3][0])
```
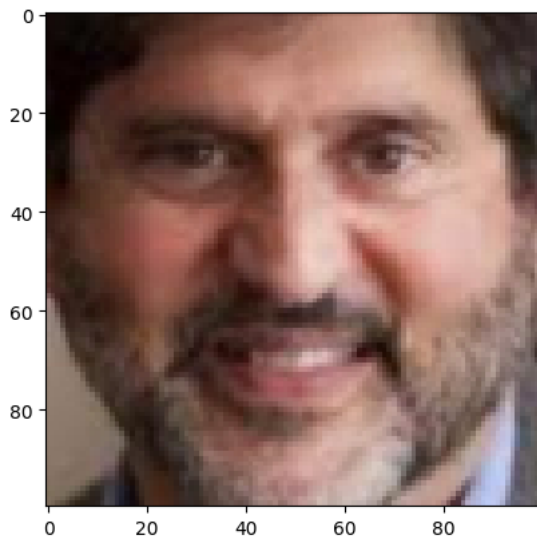
    <matplotlib.image.AxesImage at 0x7fad05a86f50>


```
X = []
y = []

for features, label in training:
    X.append(features)
    y.append(label)

Xarray = np.array(X).reshape(-1, 100, 100, 3)
Xarray.shape
Xarraydiv = Xarray/ 255

Xarraytype = Xarraydiv.astype('float32')
nexty = np_utils.to_categorical(y,2)
print(nexty.shape)
```

    (7903, 2)

```
X_train, X_test, y_train, y_test = train_test_split(Xarraytype,nexty,test_size = .2, random_state = 2)


input_shape = (100,100,3)
model6 = keras.Sequential(
    [
        keras.Input(shape=input_shape),
        layers.RandomFlip("horizontal"),
        layers.Conv2D(32, kernel_size=(3, 3), activation="relu"),
        layers.MaxPooling2D(pool_size=(2, 2)),
        layers.Dropout(0.2),
        layers.Conv2D(64, kernel_size=(3, 3), activation="relu"),
        layers.MaxPooling2D(pool_size=(2, 2)),
        layers.RandomRotation(0.1),
        layers.Conv2D(128,kernel_size=(3, 3), activation="relu"),
        layers.MaxPooling2D(pool_size=(2,2)),
        layers.Dropout(0.2),
        layers.Conv2D(256,kernel_size=(3,3), activation = "relu"),
        layers.MaxPooling2D(pool_size=(2,2)),
        layers.Conv2D(512,kernel_size = (3,3), activation = "relu"),
        layers.MaxPooling2D(pool_size = (2,2)),
        layers.Flatten(),
        layers.Dropout(0.5),
        layers.Dense(100),
        layers.Dense(2, activation="sigmoid"),
    ]
)
model6.summary()
```

Model: "sequential"

Layer (type)	Output Shape	Param #
random_flip (RandomFlip)	(None, 100, 100, 3)	0
conv2d (Conv2D)	(None, 98, 98, 32)	896
max_pooling2d (MaxPooling2D)	(None, 49, 49, 32)	0
dropout (Dropout)	(None, 49, 49, 32)	0
conv2d_1 (Conv2D)	(None, 47, 47, 64)	18496
max_pooling2d_1 (MaxPooling2D)	(None, 23, 23, 64)	0
random_rotation (RandomRotation)	(None, 23, 23, 64)	0
conv2d_2 (Conv2D)	(None, 21, 21, 128)	73856
max_pooling2d_2 (MaxPooling2D)	(None, 10, 10, 128)	0
dropout_1 (Dropout)	(None, 10, 10, 128)	0
conv2d_3 (Conv2D)	(None, 8, 8, 256)	295168
max_pooling2d_3 (MaxPooling2D)	(None, 4, 4, 256)	0
conv2d_4 (Conv2D)	(None, 2, 2, 512)	1180160
max_pooling2d_4 (MaxPooling2D)	(None, 1, 1, 512)	0
flatten (Flatten)	(None, 512)	0
dropout_2 (Dropout)	(None, 512)	0
dense (Dense)	(None, 100)	51300
dense_1 (Dense)	(None, 2)	202

```
Total params: 1,620,078
Trainable params: 1,620,078
Non-trainable params: 0
```

```
batch_size = 32
epochs = 20
model6.compile(loss="binary_crossentropy", optimizer="adam", metrics=["accuracy"])

model6.fit(X_train, y_train, batch_size=batch_size, epochs=epochs, validation_data =(X_test,y_test))

    Epoch 1/20
    198/198 [==============================] - 19s 26ms/step - loss: 0.6935 - accuracy: 0.5177 - val_loss: 0.6900 - val_accuracy:
    Epoch 2/20
    198/198 [==============================] - 4s 22ms/step - loss: 0.6764 - accuracy: 0.5685 - val_loss: 0.6216 - val_accuracy:
    Epoch 3/20
    198/198 [==============================] - 4s 21ms/step - loss: 0.6138 - accuracy: 0.6724 - val_loss: 0.5441 - val_accuracy:
    Epoch 4/20
    198/198 [==============================] - 4s 20ms/step - loss: 0.5584 - accuracy: 0.7210 - val_loss: 0.5224 - val_accuracy:
    Epoch 5/20
    198/198 [==============================] - 4s 20ms/step - loss: 0.5306 - accuracy: 0.7412 - val_loss: 0.4972 - val_accuracy:
    Epoch 6/20
    198/198 [==============================] - 4s 21ms/step - loss: 0.5227 - accuracy: 0.7510 - val_loss: 0.4951 - val_accuracy:
    Epoch 7/20
    198/198 [==============================] - 4s 23ms/step - loss: 0.4972 - accuracy: 0.7649 - val_loss: 0.4562 - val_accuracy:
    Epoch 8/20
    198/198 [==============================] - 4s 20ms/step - loss: 0.4812 - accuracy: 0.7787 - val_loss: 0.4524 - val_accuracy:
    Epoch 9/20
    198/198 [==============================] - 4s 21ms/step - loss: 0.4671 - accuracy: 0.7765 - val_loss: 0.4136 - val_accuracy:
    Epoch 10/20
    198/198 [==============================] - 4s 21ms/step - loss: 0.4479 - accuracy: 0.7861 - val_loss: 0.4040 - val_accuracy:
    Epoch 11/20
    198/198 [==============================] - 4s 20ms/step - loss: 0.4324 - accuracy: 0.8035 - val_loss: 0.3882 - val_accuracy:
    Epoch 12/20
    198/198 [==============================] - 4s 20ms/step - loss: 0.4134 - accuracy: 0.8097 - val_loss: 0.3556 - val_accuracy:
    Epoch 13/20
    198/198 [==============================] - 4s 22ms/step - loss: 0.3946 - accuracy: 0.8178 - val_loss: 0.3522 - val_accuracy:
    Epoch 14/20
    198/198 [==============================] - 4s 20ms/step - loss: 0.3800 - accuracy: 0.8290 - val_loss: 0.3433 - val_accuracy:
    Epoch 15/20
    198/198 [==============================] - 4s 20ms/step - loss: 0.3688 - accuracy: 0.8293 - val_loss: 0.3562 - val_accuracy:
    Epoch 16/20
    198/198 [==============================] - 4s 22ms/step - loss: 0.3628 - accuracy: 0.8350 - val_loss: 0.3237 - val_accuracy:
    Epoch 17/20
    198/198 [==============================] - 4s 21ms/step - loss: 0.3571 - accuracy: 0.8417 - val_loss: 0.3424 - val_accuracy:
    Epoch 18/20
    198/198 [==============================] - 4s 20ms/step - loss: 0.3455 - accuracy: 0.8512 - val_loss: 0.3369 - val_accuracy:
    Epoch 19/20
    198/198 [==============================] - 4s 22ms/step - loss: 0.3440 - accuracy: 0.8504 - val_loss: 0.3464 - val_accuracy:
    Epoch 20/20
    198/198 [==============================] - 5s 27ms/step - loss: 0.3285 - accuracy: 0.8570 - val_loss: 0.3160 - val_accuracy:
    <keras.callbacks.History at 0x7fc2d816bf40>

path = "/content/gdrive/MyDrive/GenderRecognition"
model6.save(path)

    WARNING:absl:Found untraced functions such as _jit_compiled_convolution_op, _jit_compiled_convolution_op, _jit_compiled_convo
```