PetClassification_CNN

June 23, 2023

0.1 Pet classification using CNN

[ ]:
```
# To mount the drive
from google.colab import drive
drive.mount('/content/gdrive')
```

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

[ ]:
```
import tensorflow as tf
from keras.models import Sequential
from keras.layers import Conv2D
from keras.layers import MaxPooling2D
from keras.layers import Flatten
from keras.layers import Dense,Dropout,BatchNormalization
from keras.preprocessing.image import ImageDataGenerator
```

[ ]:
```
# To generate more images

from keras.preprocessing.image import ImageDataGenerator

train_datagen = ImageDataGenerator(rotation_range=13,
            width_shift_range=0.3,
            height_shift_range=0.3,
            shear_range=0.2,
            zoom_range=0.1,
            rescale=1./255,
            horizontal_flip=True,
            vertical_flip=True,
            validation_split=0.20,
            fill_mode='nearest')
```

[ ]:
```
test_datagen = ImageDataGenerator(rescale = 1./255)
```

[ ]:
```
training_set = train_datagen.flow_from_directory('/content/gdrive/MyDrive/Pets/
↪train',
                                                 target_size = (128,128),
```

```
                                                batch_size = 8,
                                                class_mode = 'categorical')
```

```
Found 40 images belonging to 2 classes.
```

[ ]:
```
test_set = test_datagen.flow_from_directory('/content/gdrive/MyDrive/Pets/test',
                                            target_size = (128,128),
                                            batch_size = 8,
                                            class_mode = 'categorical')
```

```
Found 20 images belonging to 2 classes.
```

[ ]:
```
model=Sequential()
model.add(Conv2D( 32, (5, 5 ), activation = 'relu', padding = 'same',␣
 ↪input_shape = (128, 128 , 3 ),kernel_regularizer =tf.keras.regularizers.l2(␣
 ↪l=0.03)))
# model.add(BatchNormalization())
model.add(MaxPooling2D(2,2))
model.add(Conv2D(64, (5, 5 ), activation = 'relu',kernel_regularizer =tf.keras.
 ↪regularizers.l2( l=0.03)))
# model.add(BatchNormalization())
model.add(MaxPooling2D((2,2)))
model.add(Dropout(0.4))
model.add(Flatten())
model.add(Dense(32, activation = 'relu',kernel_regularizer =tf.keras.
 ↪regularizers.l2( l=0.001)))
model.add(Dense(2, activation = 'softmax'))
```

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

Running for 100 epochs

[ ]:
```
! pip install livelossplot
```

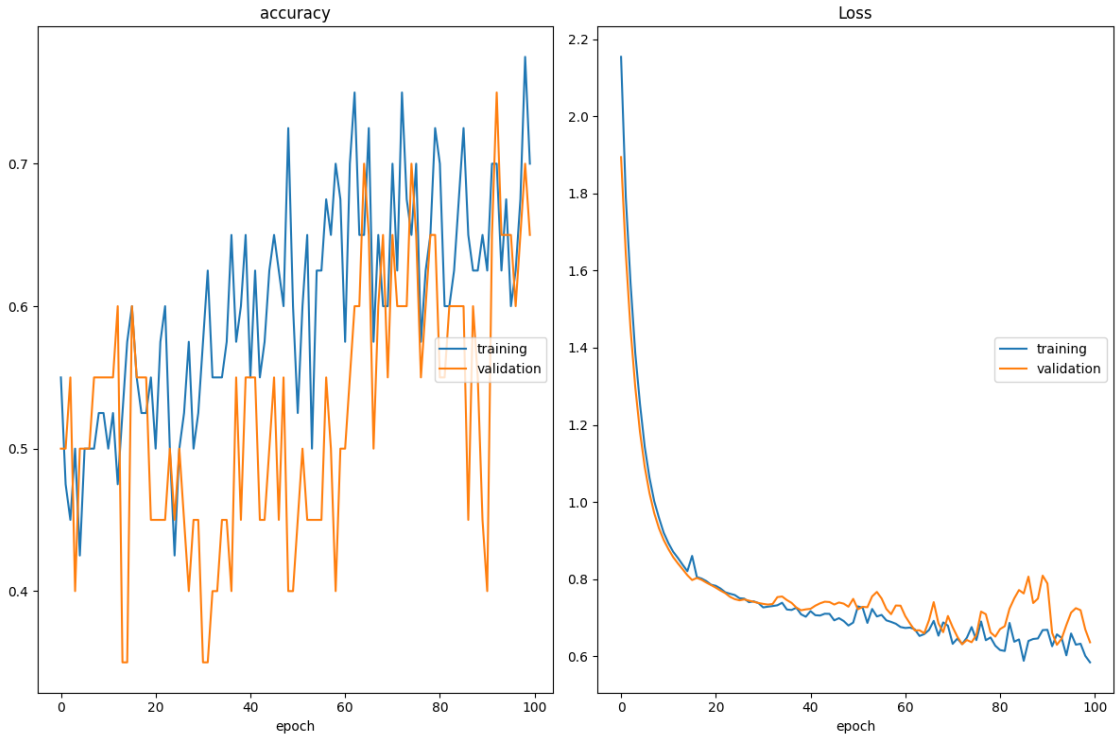
```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-
wheels/public/simple/
Requirement already satisfied: livelossplot in /usr/local/lib/python3.10/dist-
packages (0.5.5)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.10/dist-
packages (from livelossplot) (3.7.1)
Requirement already satisfied: bokeh in /usr/local/lib/python3.10/dist-packages
(from livelossplot) (2.4.3)
Requirement already satisfied: Jinja2>=2.9 in /usr/local/lib/python3.10/dist-
packages (from bokeh->livelossplot) (3.1.2)
Requirement already satisfied: numpy>=1.11.3 in /usr/local/lib/python3.10/dist-
packages (from bokeh->livelossplot) (1.22.4)
Requirement already satisfied: packaging>=16.8 in
```

```
/usr/local/lib/python3.10/dist-packages (from bokeh->livelossplot) (23.1)
Requirement already satisfied: pillow>=7.1.0 in /usr/local/lib/python3.10/dist-
packages (from bokeh->livelossplot) (8.4.0)
Requirement already satisfied: PyYAML>=3.10 in /usr/local/lib/python3.10/dist-
packages (from bokeh->livelossplot) (6.0)
Requirement already satisfied: tornado>=5.1 in /usr/local/lib/python3.10/dist-
packages (from bokeh->livelossplot) (6.3.1)
Requirement already satisfied: typing-extensions>=3.10.0 in
/usr/local/lib/python3.10/dist-packages (from bokeh->livelossplot) (4.5.0)
Requirement already satisfied: contourpy>=1.0.1 in
/usr/local/lib/python3.10/dist-packages (from matplotlib->livelossplot) (1.0.7)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.10/dist-
packages (from matplotlib->livelossplot) (0.11.0)
Requirement already satisfied: fonttools>=4.22.0 in
/usr/local/lib/python3.10/dist-packages (from matplotlib->livelossplot) (4.39.3)
Requirement already satisfied: kiwisolver>=1.0.1 in
/usr/local/lib/python3.10/dist-packages (from matplotlib->livelossplot) (1.4.4)
Requirement already satisfied: pyparsing>=2.3.1 in
/usr/local/lib/python3.10/dist-packages (from matplotlib->livelossplot) (3.0.9)
Requirement already satisfied: python-dateutil>=2.7 in
/usr/local/lib/python3.10/dist-packages (from matplotlib->livelossplot) (2.8.2)
Requirement already satisfied: MarkupSafe>=2.0 in
/usr/local/lib/python3.10/dist-packages (from Jinja2>=2.9->bokeh->livelossplot)
(2.1.2)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.10/dist-
packages (from python-dateutil>=2.7->matplotlib->livelossplot) (1.16.0)
```

[ ]:
```
from livelossplot import PlotLossesKerasTF
```

[ ]:
```
tf.config.run_functions_eagerly(True)
```

[ ]:
```
pets=model.fit(training_set,epochs=100,validation_data =␣
↪test_set,callbacks=[PlotLossesKerasTF()])
```




```
accuracy
        training                 (min:    0.425, max:    0.775, cur:    0.700)
        validation               (min:    0.350, max:    0.750, cur:    0.650)
Loss
        training                 (min:    0.584, max:    2.154, cur:    0.584)
        validation               (min:    0.630, max:    1.894, cur:    0.636)
5/5 [==============================] - 1s 235ms/step - loss: 0.5843 - accuracy:
0.7000 - val_loss: 0.6363 - val_accuracy: 0.6500
```

Doing hyperparameter tuning and adding l2 regularization

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

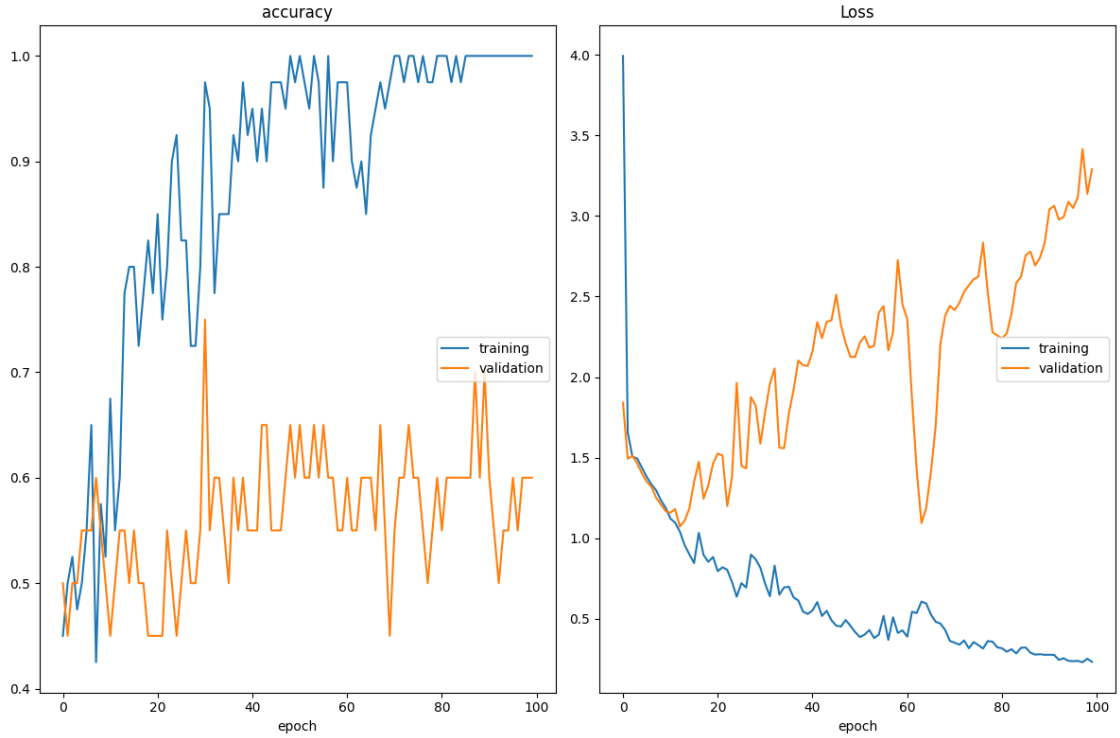
```
2/2 [==============================] - 0s 24ms/step - loss: 2.8962 - accuracy:
0.5500
```

[ ]:
```
model1=Sequential()
model1.add(Conv2D( 32, (5, 5 ), activation = 'relu', padding = 'same',␣
 ↪input_shape = (128, 128 , 3 ),kernel_regularizer =tf.keras.regularizers.l1(␣
 ↪l=0.01)))
# model.add(BatchNormalization())
model1.add(MaxPooling2D(2,2))
model1.add(Conv2D(64, (5, 5 ), activation = 'relu',kernel_regularizer =tf.keras.
 ↪regularizers.l1( l=0.01)))
```

```
# model.add(BatchNormalization())
model1.add(MaxPooling2D((2,2)))
model1.add(Dropout(0.4))
model1.add(Flatten())
model1.add(Dense(32, activation = 'relu',kernel_regularizer =tf.keras.
 ↪regularizers.l1( l=0.01)))
model1.add(Dense(2, activation = 'softmax'))
```

[ ]:
```
model1.compile(optimizer = 'adam', loss = 'binary_crossentropy', metrics =␣
 ↪['accuracy'])
```

[ ]:
```
pets=model1.fit(training_set,epochs=100,validation_data =␣
 ↪test_set,callbacks=[PlotLossesKerasTF()])
```




```
accuracy
        training                 (min:    0.425, max:    1.000, cur:    1.000)
        validation               (min:    0.450, max:    0.750, cur:    0.600)
Loss
        training                 (min:    0.231, max:    3.992, cur:    0.233)
        validation               (min:    1.073, max:    3.415, cur:    3.290)
3/3 [==============================] - 2s 885ms/step - loss: 0.2334 - accuracy:
1.0000 - val_loss: 3.2896 - val_accuracy: 0.6000
```

[ ]:
```
test_loss, test_accuracy = model1.evaluate(test_set)
```

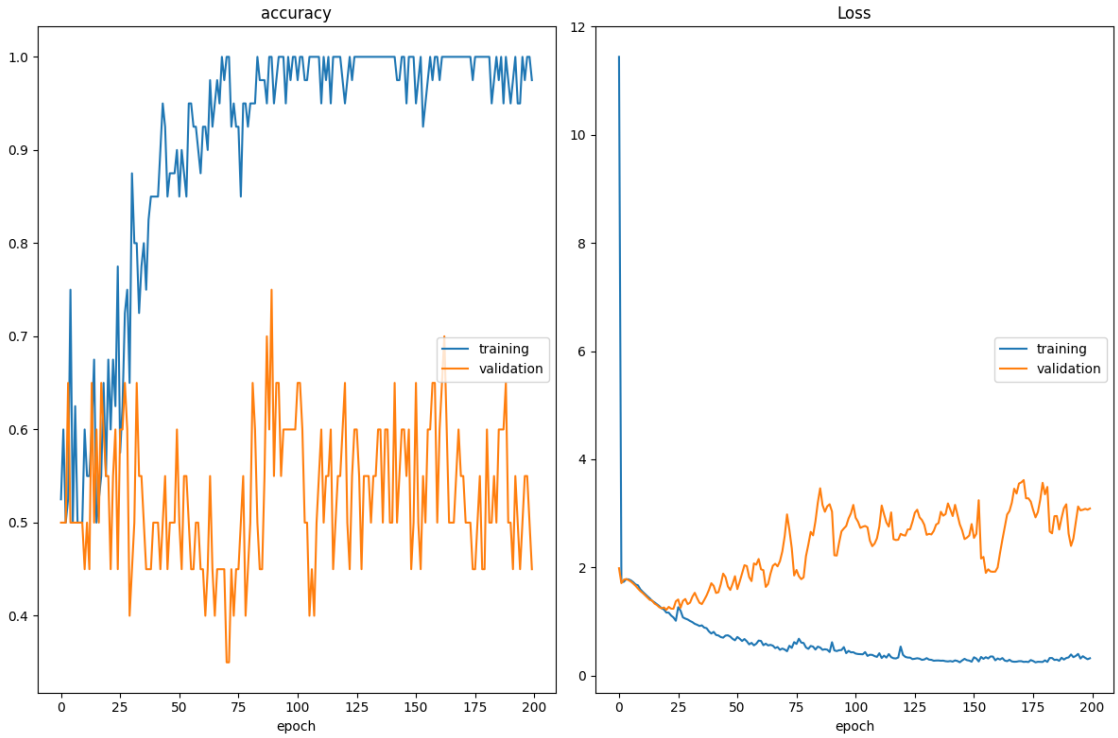
```
2/2 [==============================] - 0s 31ms/step - loss: 3.2896 - accuracy:
0.6000
```

1 Running for 200 epochs

[ ]:
```
model2=Sequential()
model2.add(Conv2D( 32, (5, 5 ), activation = 'relu', padding = 'same',␣
↪input_shape = (256,  256 , 3 )))
model2.add(MaxPooling2D(2,2))
model2.add(Conv2D(64, (5, 5 ), activation = 'relu',kernel_regularizer =tf.keras.
↪regularizers.l2( l=0.01)))
# model2.add(BatchNormalization())
model2.add(MaxPooling2D((2,2)))
model2.add(Dropout(0.4))
model2.add(Flatten())
model2.add(Dense(32, activation = 'relu',kernel_regularizer =tf.keras.
↪regularizers.l2( l=0.01)))
# model2.add(BatchNormalization())
model2.add(Dense(2, activation = 'softmax'))
```

[ ]:
```
model2.compile(optimizer = 'adam', loss = 'binary_crossentropy', metrics =␣
↪['accuracy'])
```

[ ]:
```
pets=model2.fit(training_set,epochs=200,validation_data =␣
↪test_set,callbacks=[PlotLossesKerasTF()])
```




```
accuracy
        training                 (min:    0.500, max:    1.000, cur:    0.975)
        validation               (min:    0.350, max:    0.750, cur:    0.450)
Loss
        training                 (min:    0.242, max:   11.443, cur:    0.318)
        validation               (min:    1.213, max:    3.614, cur:    3.088)
3/3 [==============================] - 2s 789ms/step - loss: 0.3180 - accuracy:
0.9750 - val_loss: 3.0880 - val_accuracy: 0.4500
```

[ ]:
```
test_loss, test_accuracy = model2.evaluate(test_set)
```

```
2/2 [==============================] - 0s 25ms/step - loss: 3.0880 - accuracy:
0.4500
```

2 Running for 300 epochs

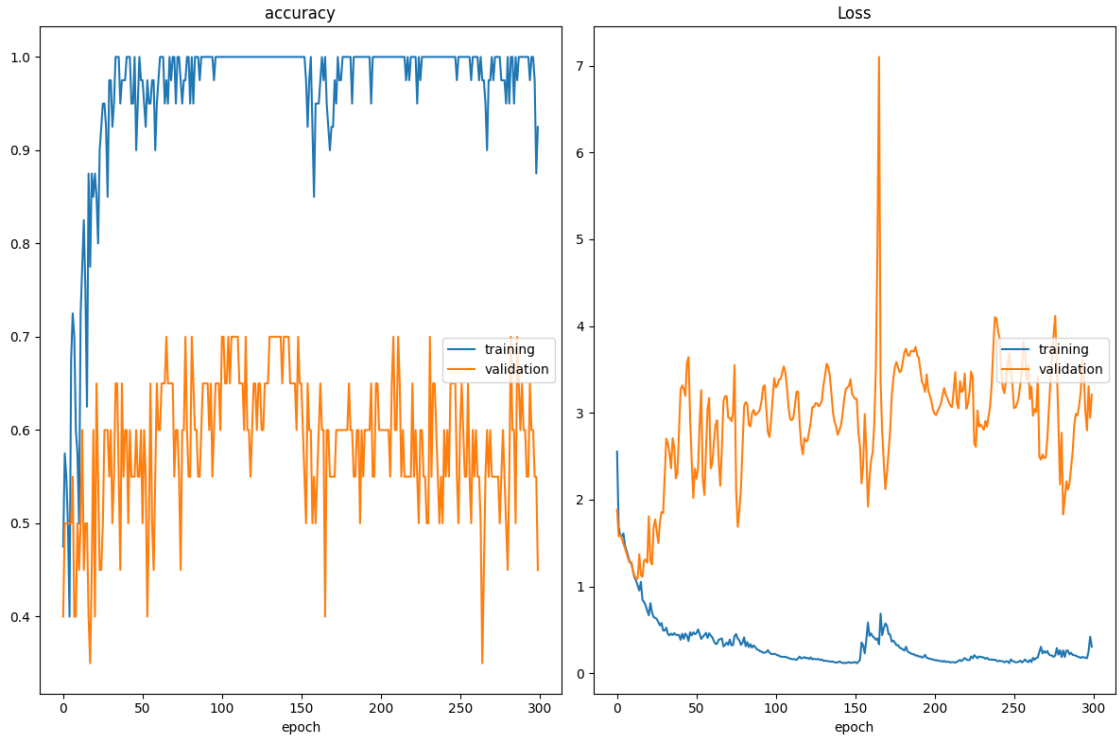
trying without regularization and using sgd optimizer

[ ]:
```
model3=Sequential()
model3.add(Conv2D( 32, (5, 5 ), activation = 'relu', padding = 'same',␣
 ↪input_shape = (256,  256 , 3 )))
model3.add(MaxPooling2D(2,2))
```

```
model3.add(Conv2D(64, (5, 5 ), activation = 'relu',kernel_regularizer =tf.keras.
 ↪regularizers.l2( l=0.01)))
# model2.add(BatchNormalization())
model3.add(MaxPooling2D((2,2)))
model3.add(Dropout(0.4))
model3.add(Flatten())
model3.add(Dense(32, activation = 'relu',kernel_regularizer =tf.keras.
 ↪regularizers.l2( l=0.01)))
# model2.add(BatchNormalization())
model3.add(Dense(2, activation = 'softmax'))
```

[ ]:
```
model3.compile(optimizer = 'adam', loss = 'binary_crossentropy', metrics =␣
 ↪['accuracy'])
```

[ ]:
```
pets=model3.fit(training_set,epochs=300,validation_data =␣
 ↪test_set,callbacks=[PlotLossesKerasTF()])
```




```
accuracy
        training                  (min:    0.400, max:    1.000, cur:    0.925)
        validation                (min:    0.350, max:    0.700, cur:    0.450)
Loss
        training                  (min:    0.115, max:    2.554, cur:    0.306)
        validation                (min:    1.090, max:    7.101, cur:    3.210)
```

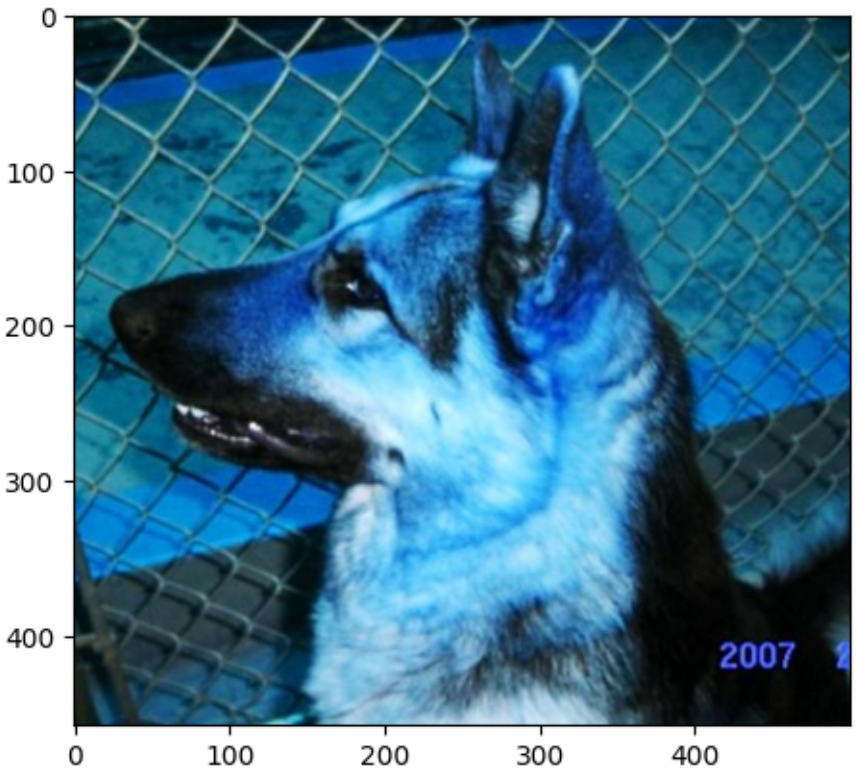
```
3/3 [==============================] - 1s 531ms/step - loss: 0.3060 - accuracy:
0.9250 - val_loss: 3.2102 - val_accuracy: 0.4500
```

[ ]:
```
import cv2
import matplotlib.pyplot as plt
import numpy as np
%matplotlib inline
```

[ ]:
```
image = '/content/gdrive/MyDrive/Pets/test/cats/110.jpg'
img = cv2.imread(image)
plt.imshow(img)
plt.show()
img = cv2.resize(img,(256,256))
img = np.reshape(img, (1, 256,256, 3))
# classes = model3.predict_classes(img)
predict_x=model3.predict(img)
classes_x=np.argmax(predict_x,axis=1)
classes=["cat" if classes_x==0 else "dog"]
print(classes)
```


```
1/1 [==============================] - 0s 137ms/step
['cat']
```

[ ]:
```
image = '/content/gdrive/MyDrive/Pets/test/dogs/107.jpg'
img = cv2.imread(image)
plt.imshow(img)
plt.show()
img = cv2.resize(img,(256,256))
img = np.reshape(img, (1, 256,256, 3))
# classes = model3.predict_classes(img)
predict_x=model3.predict(img)
classes_x=np.argmax(predict_x,axis=1)
classes=["dog" if classes_x==1 else "cat"]
print(classes)
```




```
1/1 [==============================] - 0s 95ms/step
['dog']
```

[ ]:
```

```