```
pip install scikit-learn opencv-python numpy matplotlib

Requirement already satisfied: scikit-learn in c:\users\de\anaconda3\
lib\site-packages (1.6.1)
Requirement already satisfied: opencv-python in c:\users\de\anaconda3\
lib\site-packages (4.12.0.88)
Requirement already satisfied: numpy in c:\users\de\anaconda3\lib\
site-packages (2.1.3)
Requirement already satisfied: matplotlib in c:\users\de\anaconda3\
lib\site-packages (3.10.0)
Requirement already satisfied: scipy>=1.6.0 in c:\users\de\anaconda3\
lib\site-packages (from scikit-learn) (1.15.3)
Requirement already satisfied: joblib>=1.2.0 in c:\users\de\anaconda3\
lib\site-packages (from scikit-learn) (1.4.2)
Requirement already satisfied: threadpoolctl>=3.1.0 in c:\users\de\
anaconda3\lib\site-packages (from scikit-learn) (3.5.0)
Requirement already satisfied: contourpy>=1.0.1 in c:\users\de\
anaconda3\lib\site-packages (from matplotlib) (1.3.1)
Requirement already satisfied: cycler>=0.10 in c:\users\de\anaconda3\
lib\site-packages (from matplotlib) (0.11.0)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\de\
anaconda3\lib\site-packages (from matplotlib) (4.55.3)
Requirement already satisfied: kiwisolver>=1.3.1 in c:\users\de\
anaconda3\lib\site-packages (from matplotlib) (1.4.8)
Requirement already satisfied: packaging>=20.0 in c:\users\de\
anaconda3\lib\site-packages (from matplotlib) (24.2)
Requirement already satisfied: pillow>=8 in c:\users\de\anaconda3\lib\
site-packages (from matplotlib) (11.1.0)
Requirement already satisfied: pyparsing>=2.3.1 in c:\users\de\
anaconda3\lib\site-packages (from matplotlib) (3.2.0)
Requirement already satisfied: python-dateutil>=2.7 in c:\users\de\
anaconda3\lib\site-packages (from matplotlib) (2.9.0.post0)
Requirement already satisfied: six>=1.5 in c:\users\de\anaconda3\lib\
site-packages (from python-dateutil>=2.7->matplotlib) (1.17.0)
Note: you may need to restart the kernel to use updated packages.

import os
import numpy as np
import cv2
from sklearn.model_selection import train_test_split
from sklearn.svm import SVC
from sklearn.metrics import accuracy_score, confusion_matrix
from skimage.feature import hog
import matplotlib.pyplot as plt
import seaborn as sns

def load_images_with_hog(data_path, img_size=(128, 128)):
    X = []
    y = []
```

```python
    for file in os.listdir(data_path):
        if file.endswith(".jpg") or file.endswith(".png"):
            label = 0 if "cat" in file.lower() else 1
            path = os.path.join(data_path, file)
            img = cv2.imread(path, cv2.IMREAD_GRAYSCALE)
            img = cv2.resize(img, img_size)

            # HOG feature extraction
            features, _ = hog(img, orientations=9, pixels_per_cell=(8,
8),
                              cells_per_block=(2, 2), block_norm='L2-
Hys',
                              visualize=True)

            X.append(features)
            y.append(label)

    return np.array(X), np.array(y)


X, y = load_data("C:/Users/de/Downloads/archive (1)/train")
print("Total images:", len(X), "| Cats & Dogs:", np.bincount(y))

X_train, X_test, y_train, y_test = train_test_split(X, y,
test_size=0.2, random_state=42, stratify=y)
```

Total images: 557 | Cats & Dogs: [279 278]

```python
svm_rbf = SVC(kernel='rbf', C=10, gamma=0.001)
svm_rbf.fit(X_train, y_train)
```

SVC(C=10, gamma=0.001)

```python
y_pred = svm_rbf.predict(X_test)
acc = accuracy_score(y_test, y_pred)
print("Accuracy:", acc)
```

Accuracy: 0.6607142857142857

```python
cm = confusion_matrix(y_test, y_pred)
sns.heatmap(cm, annot=True, fmt='d', cmap='Blues', xticklabels=['Cat',
'Dog'], yticklabels=['Cat', 'Dog'])
plt.xlabel("Predicted")
plt.ylabel("Actual")
plt.title("Confusion Matrix")
plt.show()
```

Confusion Matrix