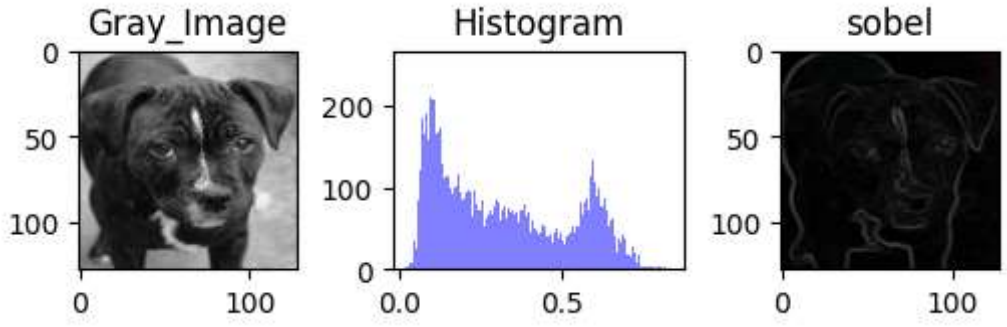
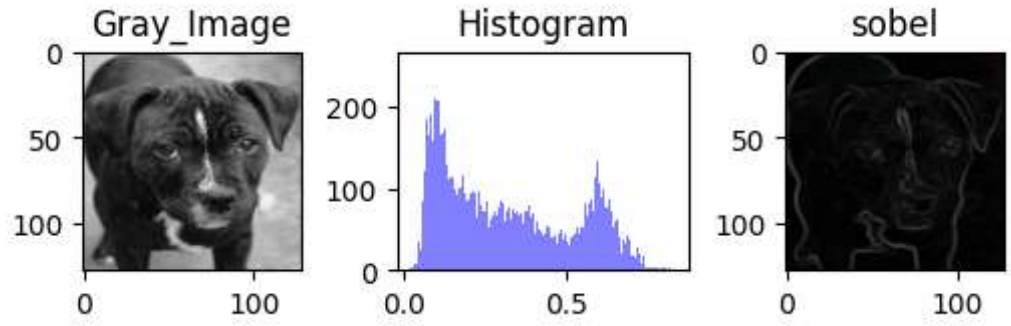
Homework Assignment 1

In [14]:
```
#Image processing


import os
import cv2
import matplotlib.pyplot as plt


#req data
cwd=os.getcwd()
directory = r'Targetdata'
Dog_breeds = [r"\n02093428-American_Staffordshire_terrier\n02093428_10164_target.jp
           r"\n02105251-briard\n02105251_1201_target.jpg",r"\n02105251-briard\n0210
           r"\n02107908-Appenzeller\n02107908_1030_target.jpg",r"\n02107908-Appenze
           r"\n02113978-Mexican_hairless\n02113978_1006_target.jpg",r"\n02113978-Me


from skimage import filters
from skimage.color import rgb2gray
#greyscale n sobel images
for breed in Dog_breeds:
    img = cv2.imread(directory + breed.strip())  # Strip to remove extra whitespace
    gray_img = rgb2gray(img)
    sobel_img = filters.sobel(img)
    print(breed)
    fig = plt.figure()
    fig.add_subplot(331),    plt.title('Gray_Image'),    plt.imshow(gray_img, cmap=
    fig.add_subplot(332),    plt.title('Histogram'),    plt.hist(gray_img.ravel(),
    fig.add_subplot(333),    plt.title('sobel'),    plt.imshow(sobel_img,cmap=plt.g
    plt.show()
```

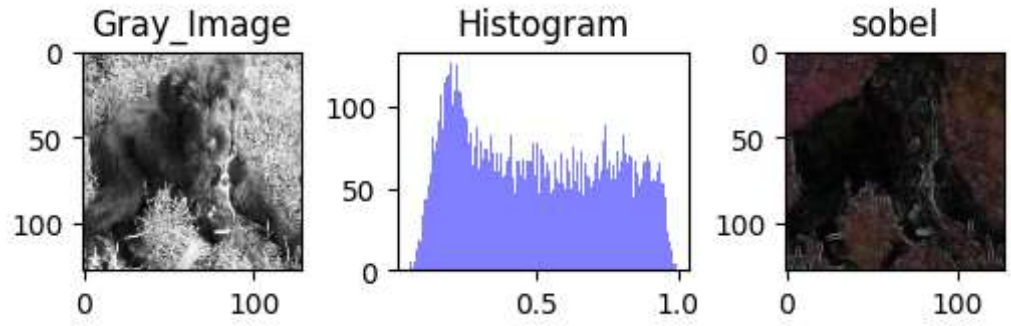
\n02093428-American_Staffordshire_terrier\n02093428_10164_target.jpg



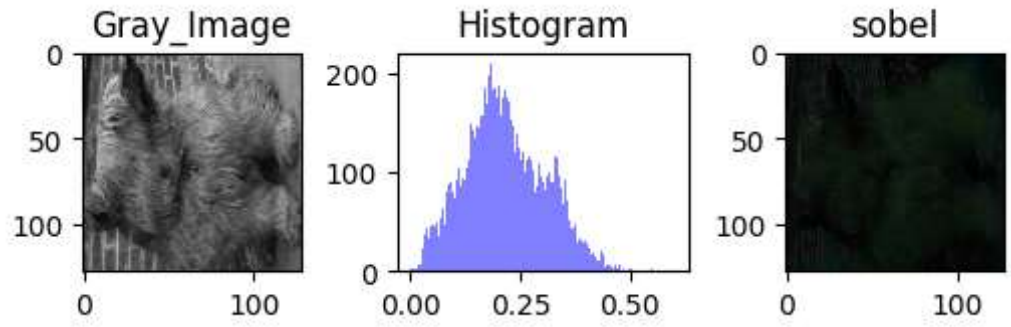
\n02093428-American_Staffordshire_terrier\n02093428_10164_target.jpg



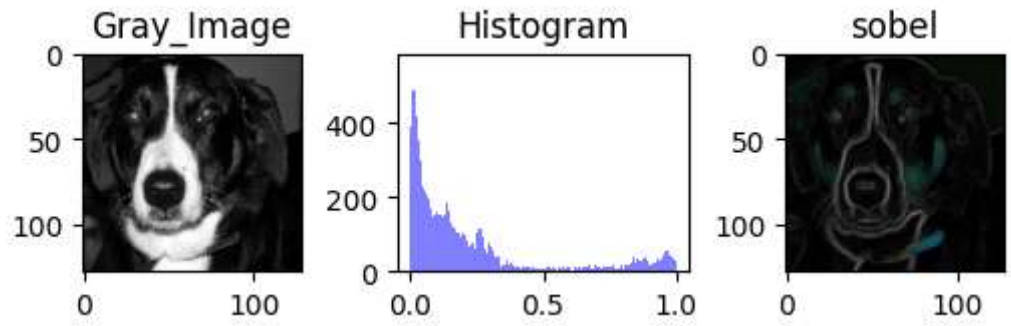
\n02105251-briard\n02105251_1201_target.jpg



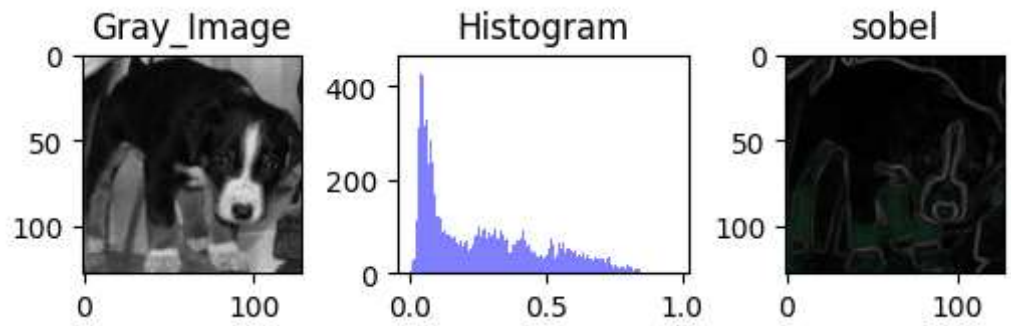
\n02105251-briard\n02105251_1240_target.jpg



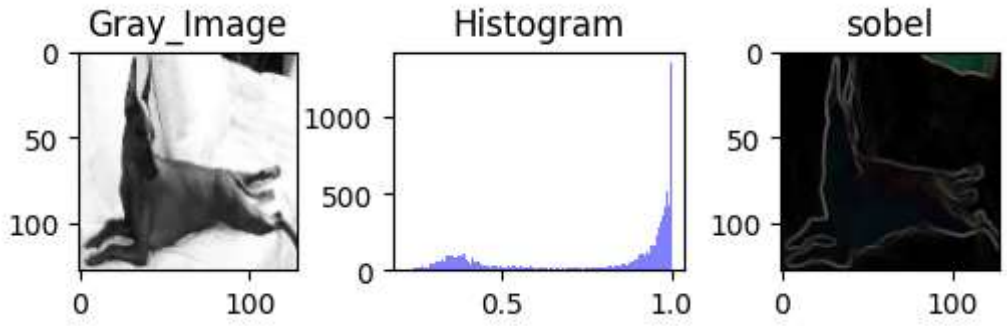
\n02107908-Appenzeller\n02107908_1030_target.jpg



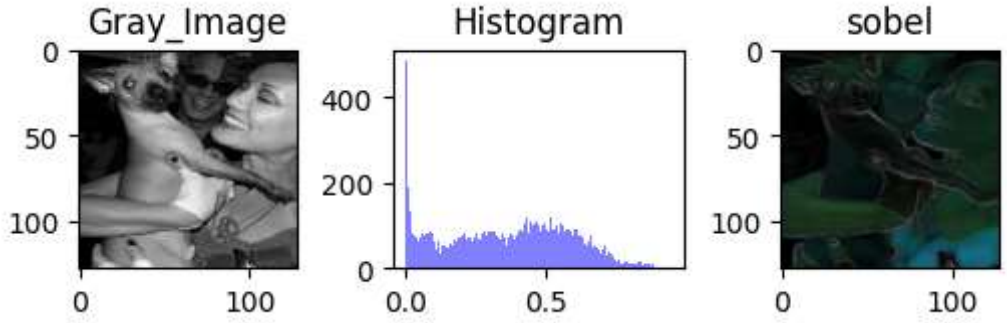
\n02107908-Appenzeller\n02107908_1176_target.jpg



\n02113978-Mexican_hairless\n02113978_1006_target.jpg

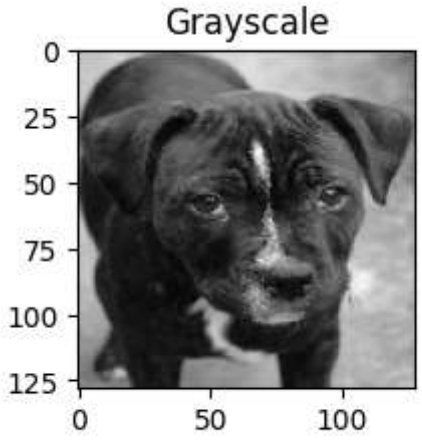


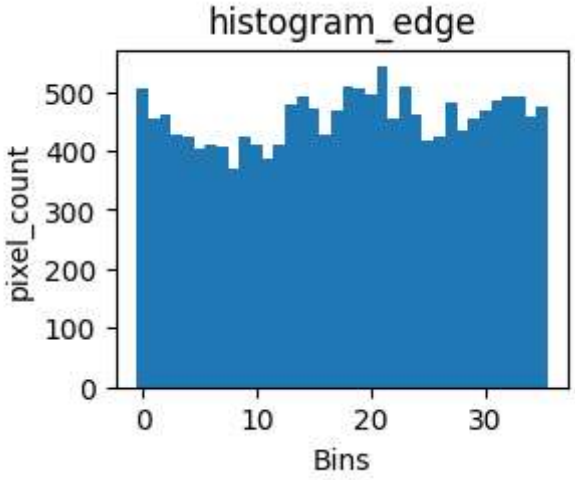
\n02113978-Mexican_hairless\n02113978_1030_target.jpg

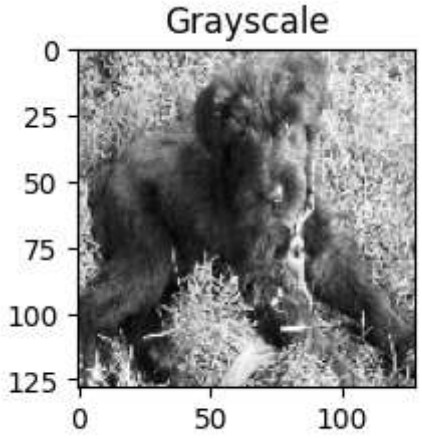


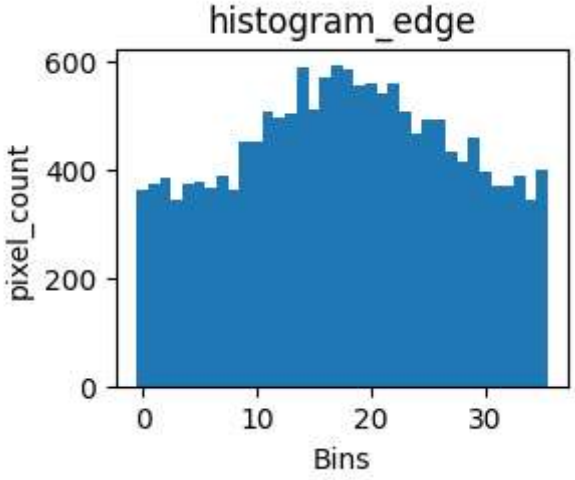
In [17]:

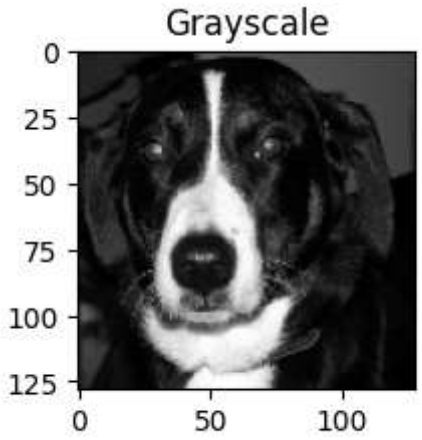
```
###  Edge histogram

from skimage import data, exposure, img_as_float
import numpy as np

def angle(dx, dy):
 """Calculate the angles between horizontal and vertical operators."""
 return np.mod(np.arctan2(dy, dx), np.pi)

directory = r'Targetdata'
Dog_breeds = [r"\n02093428-American_Staffordshire_terrier\n02093428_10164_target.jp
           r"\n02105251-briard\n02105251_1201_target.jpg",
           r"\n02107908-Appenzeller\n02107908_1030_target.jpg",
           r"\n02113978-Mexican_hairless\n02113978_1006_target.jpg"]


for Breedpath in Dog_breeds:
    img = cv2.imread(directory + Breedpath.strip())
    grayscale_img = rgb2gray(img)
    angle_sobel = angle(filters.sobel_h(grayscale_img),filters.sobel_v(grayscale_im
    hist,_=exposure.histogram(angle_sobel, nbins=36)

    fig = plt.figure()
    fig.add_subplot(221) ,    plt.title('Grayscale') ,    plt.imshow(grayscale_img,
    fig.add_subplot(222) ,    plt.title('histogram_edge') ,    plt.bar(np.arange(le
    plt.show()
```

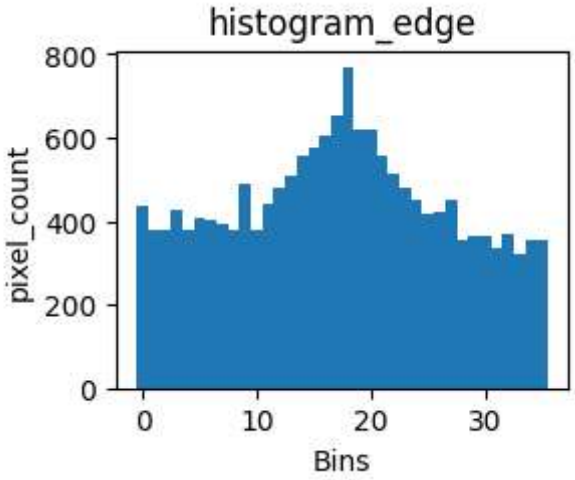

Grayscale
0
25
50
75
100
125
0
50
100

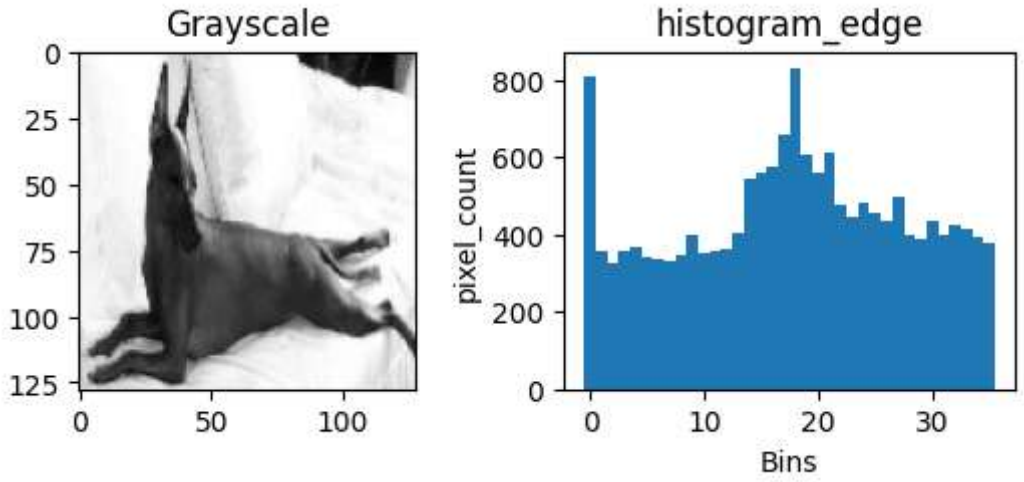

histogram_edge
pixel_count
0
100
200
300
400
500
0
10
20
30
Bins


Grayscale
0
25
50
75
100
125
0
50
100


histogram_edge
pixel_count
0
200
400
600
0
10
20
30
Bins


Grayscale
0
25
50
75
100
125
0
50
100


histogram_edge
pixel_count
0
200
400
600
800
0
10
20
30
Bins



In [26]:
```
## MeasuresofSimilarityandDissimilarity
from sklearn.metrics.pairwise import euclidean_distances, manhattan_distances, cosi
directory = r'Targetdata'
Dog_breeds = [r"\n02093428-American_Staffordshire_terrier\n02093428_10164_target.jp
           r"\n02105251-briard\n02105251_1201_target.jpg"]

dist=[]
for breed in Dog_breeds:
    img = cv2.imread(directory + breed)
    grayscale_img = rgb2gray(img)
    angle_sobel = angle(filters.sobel_h(grayscale_img),filters.sobel_v(grayscale_im
    hist,_=exposure.histogram(angle_sobel, nbins=36)
    dist.append(hist)
```

In [29]:
```
def histogram_comparison(hist1,hist2):
    print("Euclidean distance: {}".format(manhattan_distances(hist1.reshape(1, -1),
    print("Manhattan distance: {}".format(euclidean_distances(hist1.reshape(1, -1),
    print("Cosine distance :{} ".format(cosine_distances(hist1.reshape(1, -1), hist
```

In [34]:
```
#comparing images of different class
histogram_comparison(dist[1],dist[2])
```

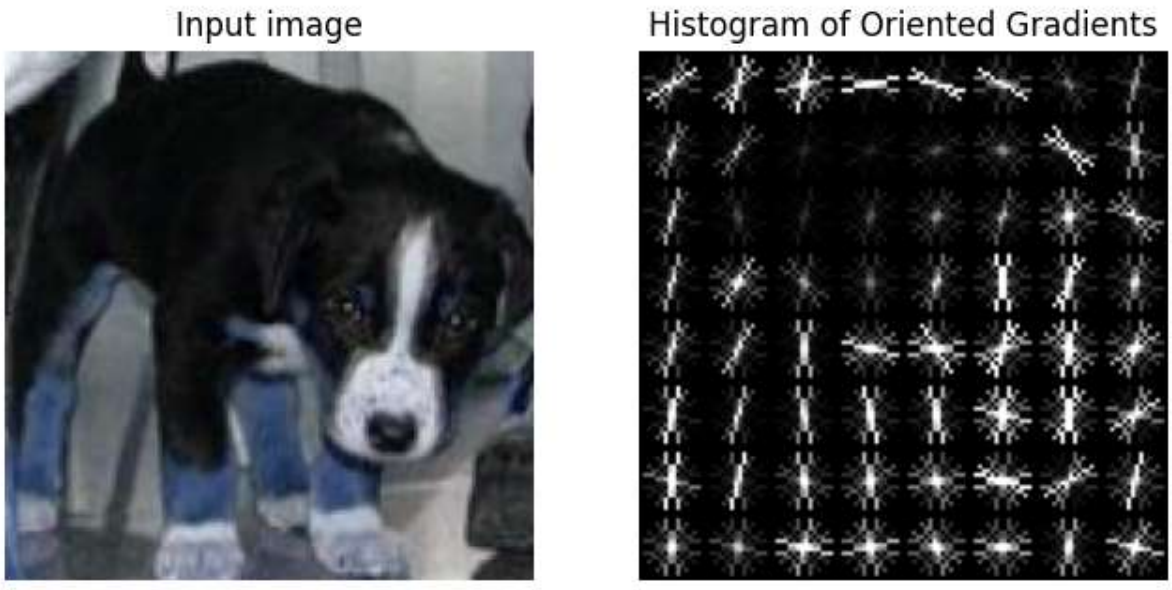
```
Euclidean distance: 5952.0
Manhattan distance: 1107.749069058512
Cosine distance :0.07858653181487085
```

In [35]:
```
#comparing images of same class
histogram_comparison(dist[0],dist[1])
```

```
Euclidean distance: 3768.0
Manhattan distance: 727.266113606292
Cosine distance :0.03397384074751797
```

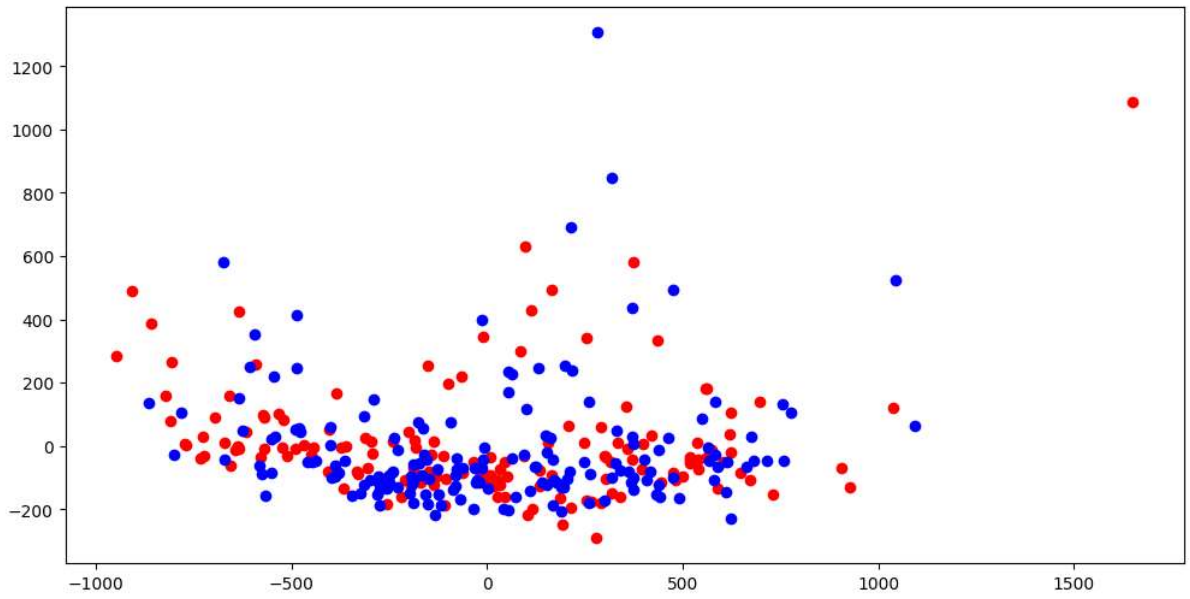
In [38]:
```
# ####  Histogram of Oriented Gradient (HOG) feature descriptor

from skimage.feature import hog

image = cv2.imread(r"Targetdata\\n02107908-Appenzeller\n02107908_1176_target.jpg")
```

```
fd, hog_image = hog(image, orientations=8, pixels_per_cell=(16, 16),
                    cells_per_block=(1, 1), visualize=True, channel_axis=-1)

fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(8, 4), sharex=True, sharey=True)

ax1.axis('off')
ax1.imshow(image, cmap=plt.cm.gray)
ax1.set_title('Input image')

hog_image_rescaled = exposure.rescale_intensity(hog_image, in_range=(0, 10))

ax2.axis('off')
ax2.imshow(hog_image_rescaled, cmap=plt.cm.gray)
ax2.set_title('Histogram of Oriented Gradients')
plt.show()
```



In [41]:
```
#PCA
from sklearn.decomposition import PCA

c1 = r"Targetdata\n02107908-Appenzeller"
c2 = r"Targetdata\n02093428-American_Staffordshire_terrier"
hist=[]

c1_images = [os.path.join(c1, filename) for filename in os.listdir(c1)]
c2_images = [os.path.join(c2, filename) for filename in os.listdir(c2)]
files = [file for file in c1_images + c2_images]

for image in files:
    img = cv2.imread(image)
    gray_img = rgb2gray(img)
    angle_sobel = angle(filters.sobel_h(gray_img),filters.sobel_v(gray_img))
    Hist,_=exposure.histogram(angle_sobel, nbins=36)
    hist.append(Hist)
l1= len(cls_1_images)
l2= len(cls_2_images)
```

```
pca_model= PCA(2)
pca= pca_model.fit_transform(hist)


plt.figure(figsize=(12, 6))
plt.scatter(pca[:l1, 0], pca[:l1, 1], c='r'),plt.scatter(pca[l1:, 0], pca[l1:, 1],
plt.show()
```



We see the points are little overlapped . we could not separate them truley.

citations: https://www.kaggle.com/code/espriella/stanford-dogs-transfer-crop-stack/notebook https://scikit-image.org/docs/stable/auto_examples/color_exposure/plot_rgb_to_gray.html https://scikit-image.org/docs/stable/auto_examples/edges/plot_edge_filter.html#sphx-glr-auto-examples-edges-plot-edge-filter-py https://scikit-image.org/docs/stable/api/skimage.exposure.html#skimage.exposure.histogram https://scikit-learn.org/stable/modules/classes.html#module-sklearn.metrics.pairwise https://scikit-image.org/docs/stable/auto_examples/features_detection/plot_hog.html#sphx-glr-auto-examples-features-detection-plot-hog-py

In [ ]: