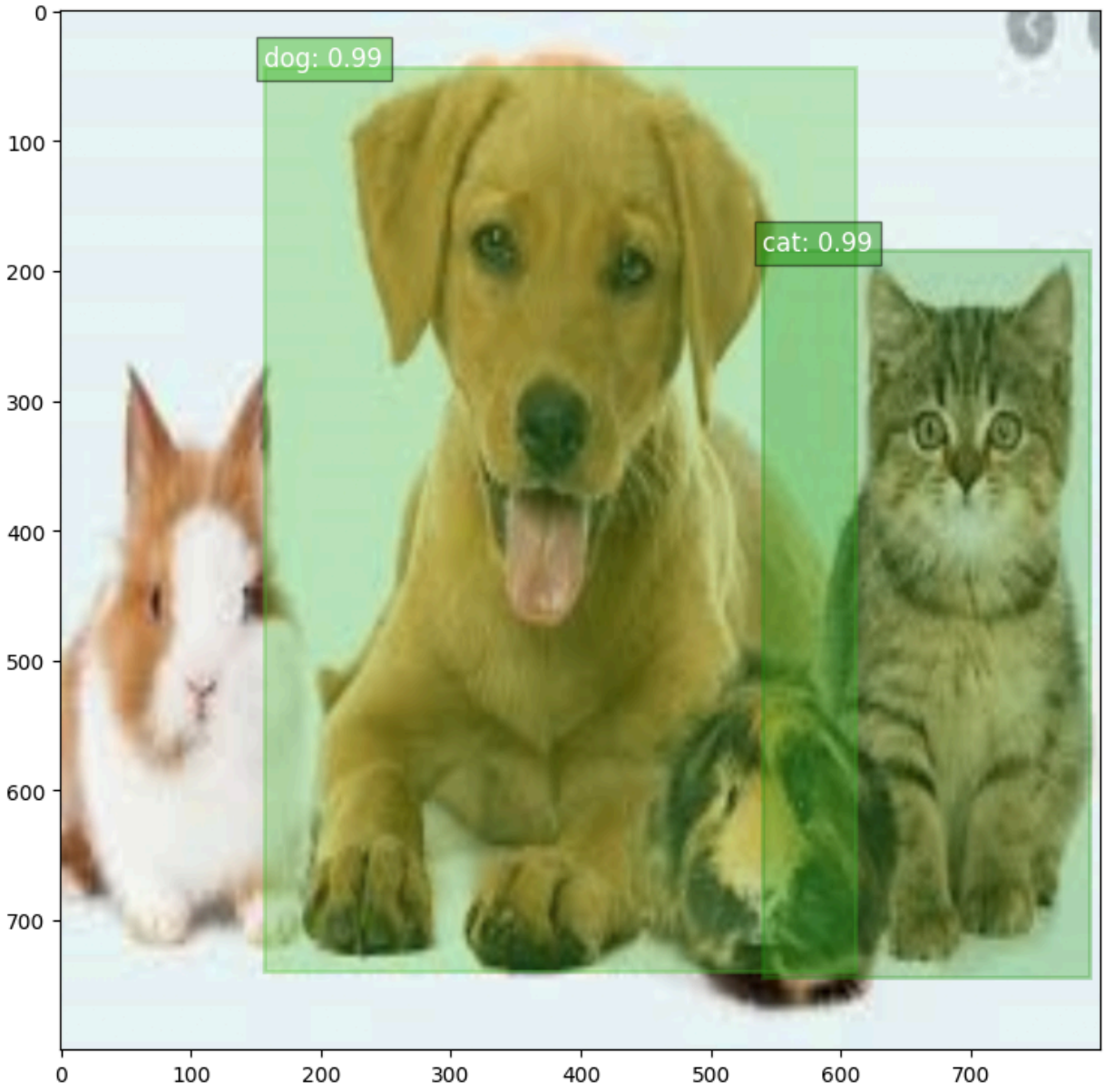
Image Segmentation

In [ ]:

```
import torch
import torchvision
from PIL import Image
import matplotlib.pyplot as plt
import torchvision.transforms as T
import random

model = torchvision.models.detection.fasterrcnn_resnet50_fpn(pretrained=True)
model.eval()

img_path = 'Picture2.jpg'
img = Image.open(img_path).convert("RGB")

transform = T.Compose([
    T.Resize((800, 800)),
    T.ToTensor()
])
img = transform(img)


img = img.unsqueeze(0)

with torch.no_grad():
    prediction = model(img)

confidence_threshold = 0.8

animal_classes = [16, 17, 18]

labels = prediction[0]['labels']
scores = prediction[0]['scores']
boxes = prediction[0]['boxes']
high_conf_indices = [i for i, (label, score) in enumerate(zip(labels, scores)) if scor

filtered_boxes = boxes[high_conf_indices]
filtered_labels = labels[high_conf_indices]
filtered_scores = scores[high_conf_indices]

coco_labels = {
    16: 'bird',
    17: 'cat',
    18: 'dog'
}

def plot_image(image, boxes, labels, scores):
    fig, ax = plt.subplots(1, figsize=(12, 9))
    ax.imshow(image)
    for box, label, score in zip(boxes, labels, scores):
        box = box.cpu().numpy()
        color = [random.random() for _ in range(3)]
        rect = plt.Rectangle(
            (box[0], box[1]),
            box[2] - box[0],
            box[3] - box[1],
            fill=True,
            color=color,
```

```
            alpha=0.3,
            edgecolor=color,
            linewidth=2
        )
        ax.add_patch(rect)
        ax.text(box[0], box[1], f'{coco_labels[label.item()]}: {score:.2f}', fontsize=
    plt.show()

img_np = img.squeeze().permute(1, 2, 0).cpu().numpy()

plot_image(img_np, filtered_boxes, filtered_labels, filtered_scores)
```

```
c:\Users\rowen\AppData\Local\Programs\Python\Python311\Lib\site-packages\torchvision
\models\_utils.py:208: UserWarning: The parameter 'pretrained' is deprecated since 0.
13 and may be removed in the future, please use 'weights' instead.
  warnings.warn(
c:\Users\rowen\AppData\Local\Programs\Python\Python311\Lib\site-packages\torchvision
\models\_utils.py:223: UserWarning: Arguments other than a weight enum or `None` for
'weights' are deprecated since 0.13 and may be removed in the future. The current beh
avior is equivalent to passing `weights=FasterRCNN_ResNet50_FPN_Weights.COCO_V1`. You
can also use `weights=FasterRCNN_ResNet50_FPN_Weights.DEFAULT` to get the most up-to-
date weights.
  warnings.warn(msg)
C:\Users\rowen\AppData\Local\Temp\ipykernel_18556\981470816.py:51: UserWarning: Setti
ng the 'color' property will override the edgecolor or facecolor properties.
  rect = plt.Rectangle(
```

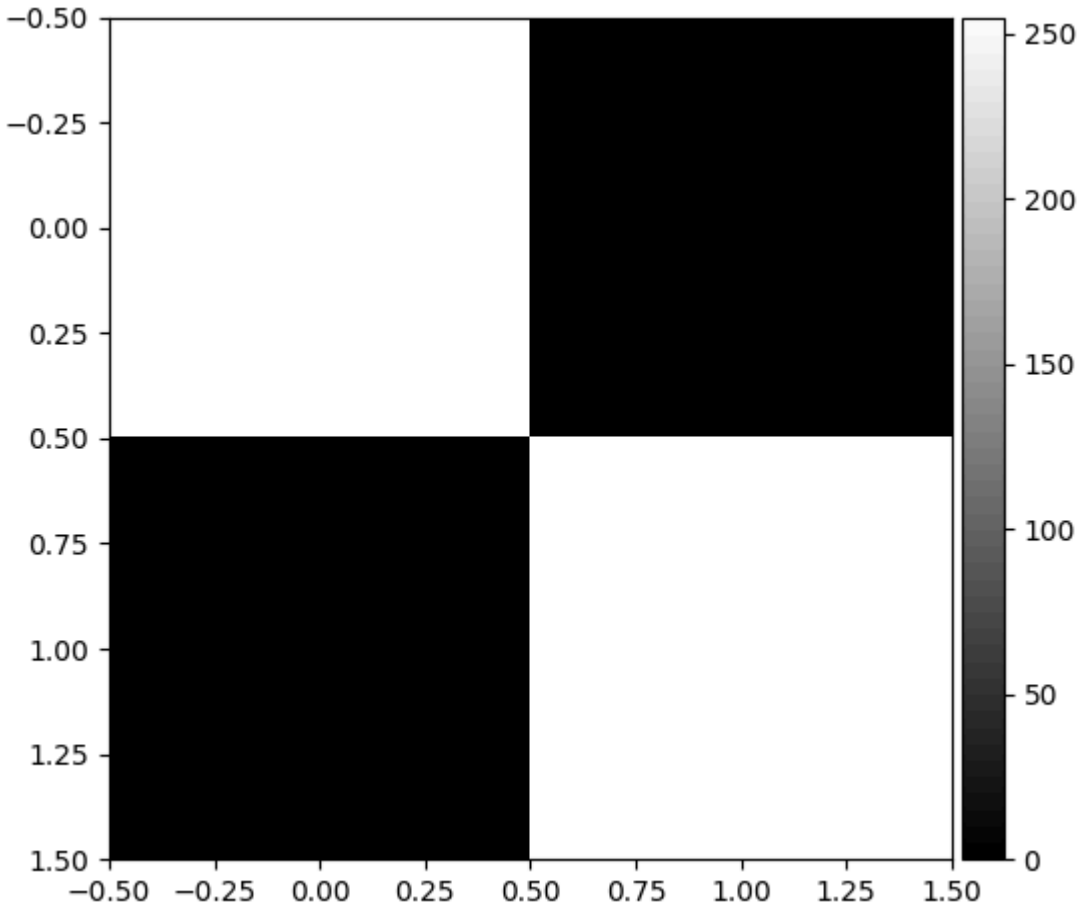



In [ ]:
```
import numpy as np
import matplotlib.pyplot as plt
from skimage.color import rgb2gray
from skimage.io import imshow
from skimage import img_as_ubyte
import cv2
```

In [ ]:
```
array_1= np.array([[255,0], [0,255]])

imshow(array_1, cmap='gray')
```

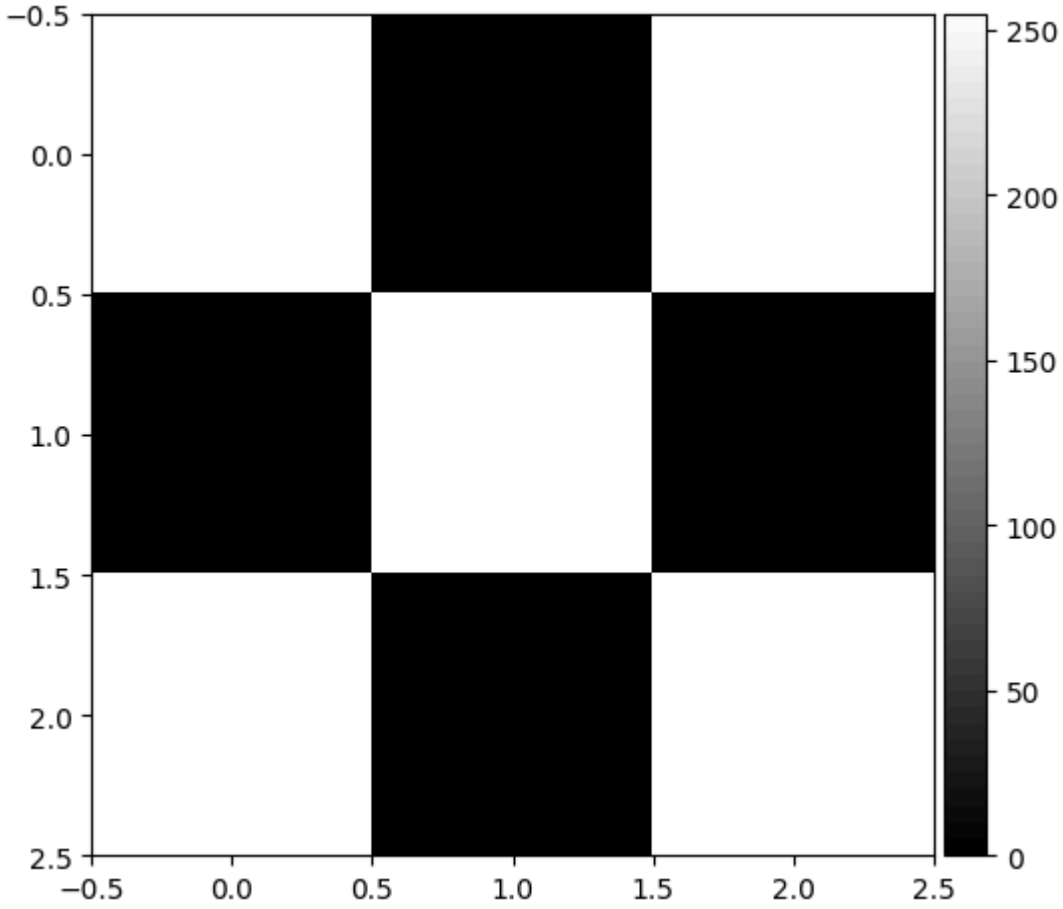
```
c:\Users\rowen\AppData\Local\Programs\Python\Python311\Lib\site-packages\skimage\io\_
plugins\matplotlib_plugin.py:158: UserWarning: Low image data range; displaying image
with stretched contrast.
  lo, hi, cmap = _get_display_range(image)
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x27e4b6a5210>
```

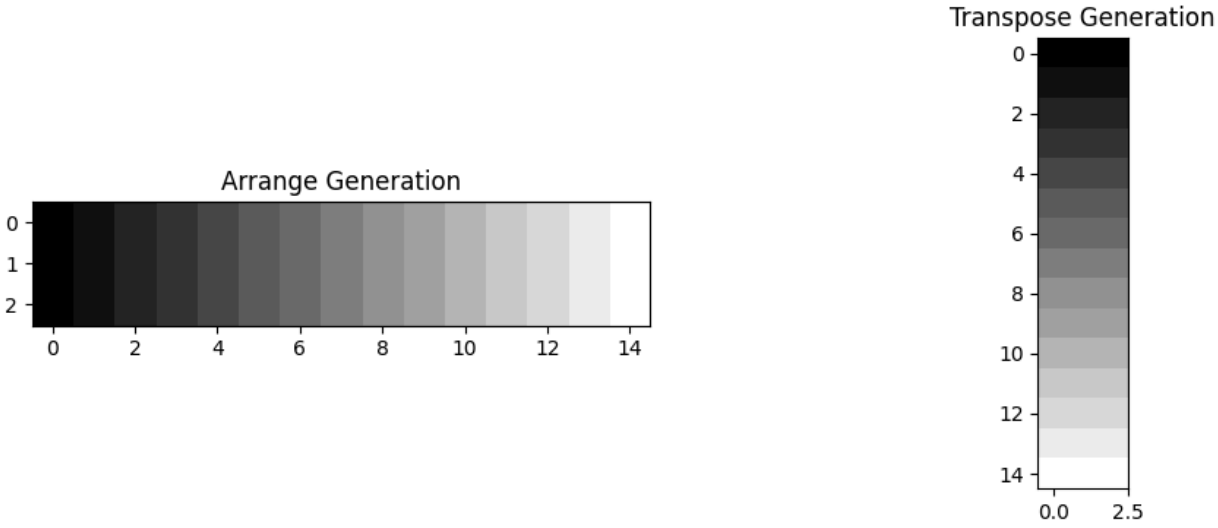



In [ ]:
```
array_1= np.array([[255,0, 255],
                   [0,255, 0],
                   [255,0,255]])

imshow(array_1, cmap='gray')
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x27e6e370090>
```

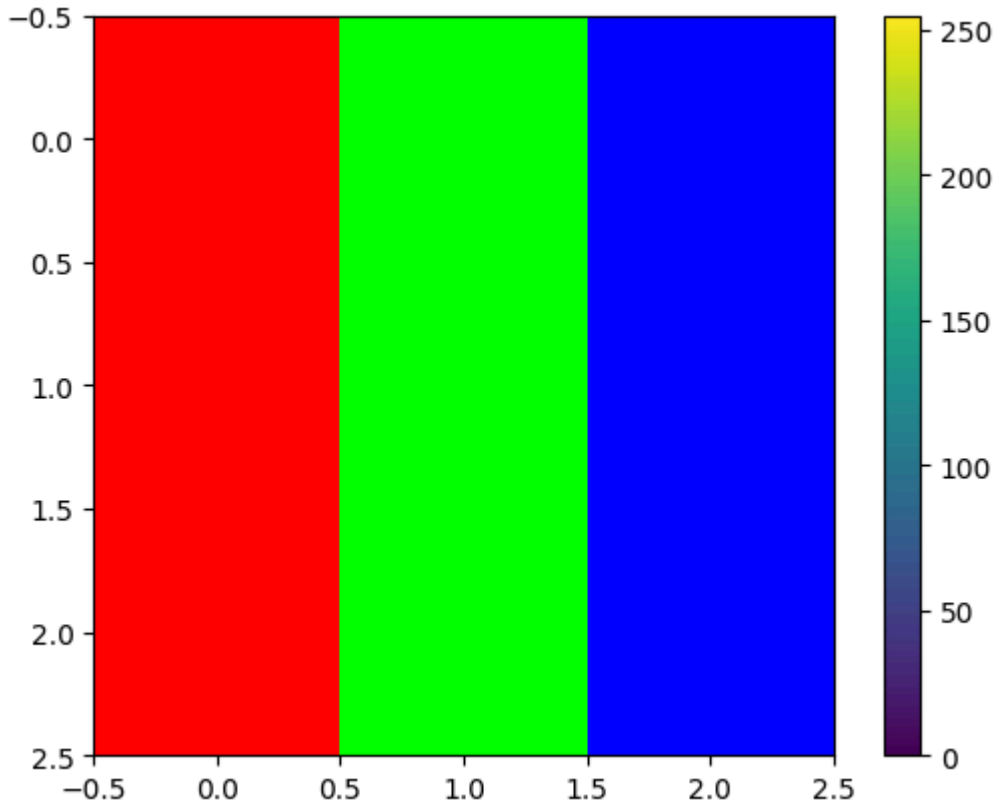



In [ ]:
```
array_spectrum = np.array([np.arange(0, 255, 17), np.arange(0, 255, 17)])
array_spectrum = np.append(array_spectrum, [np.arange(0, 255, 17)], axis=0)

fig, ax = plt.subplots(1, 2, figsize=(12, 4))
ax[0].imshow(array_spectrum, cmap='gray')
ax[0].set_title('Arrange Generation')
ax[1].imshow(array_spectrum.T, cmap='gray')
ax[1].set_title('Transpose Generation')
plt.show()
```



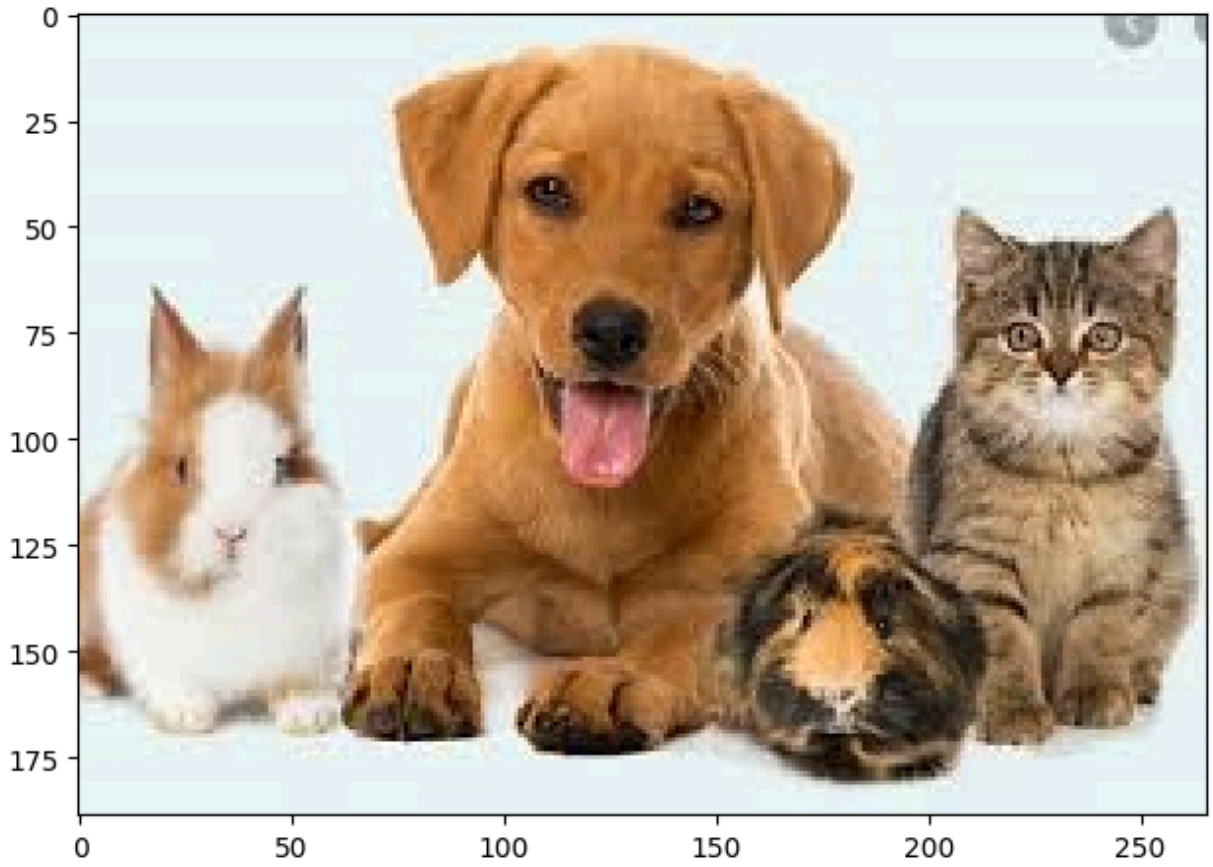

In [ ]:
```
array_colors = np.array([[[255, 0, 0], [0, 255, 0], [0, 0, 255]],
                         [[255, 0, 0], [0, 255, 0], [0, 0, 255]],
```

```
                        [[255, 0, 0], [0, 255, 0], [0, 0, 255]]], dtype=np.uint8)

# Display the image
plt.imshow(array_colors)
plt.colorbar()
plt.show()
```




In [ ]:
```
draft = plt.imread('Picture2.jpg')
imshow(draft)
```

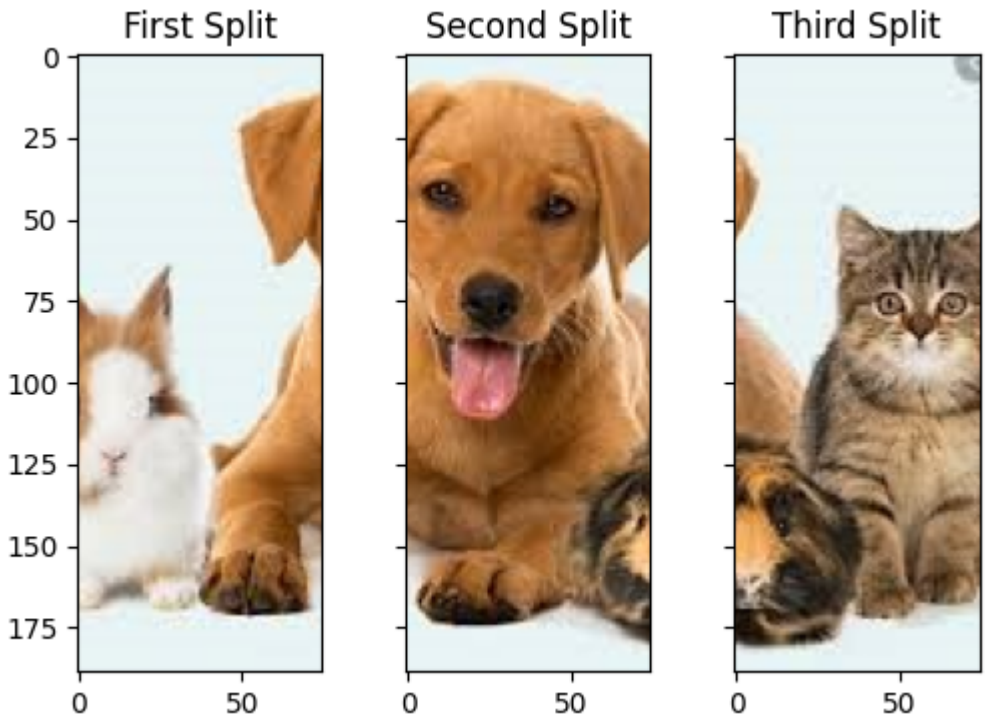
Out[ ]:
```
<matplotlib.image.AxesImage at 0x27e6f5e4890>
```




In [ ]:
```
draft.shape
```

Out[ ]:
```
(189, 266, 3)
```

In [ ]:
```
fig, ax = plt.subplots(1, 3,
                       figsize=(6, 4),
                       sharey=True)

ax[0].imshow(draft[:, 25:100])
ax[0].set_title('First Split')

ax[1].imshow(draft[:, 100:175])
ax[1].set_title('Second Split')

ax[2].imshow(draft[:, 175:250])
ax[2].set_title('Third Split')

plt.show()
```



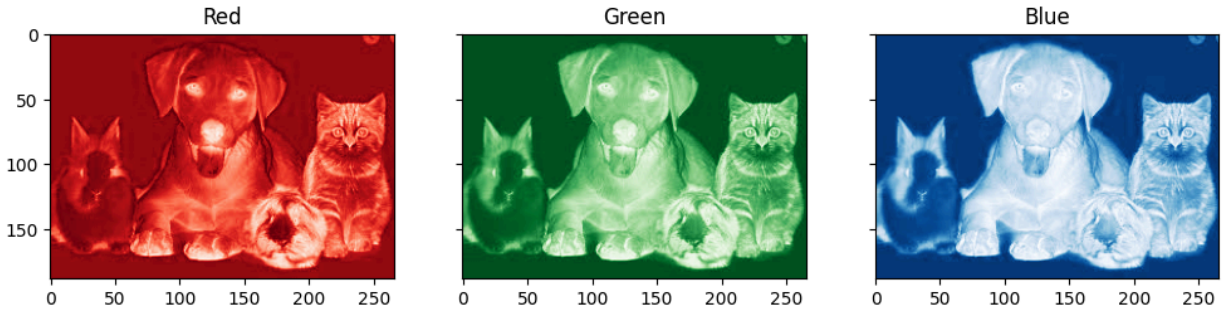

In [ ]:
```
imshow(draft[50:200, 80:200])
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x27e6f5aa510>
```

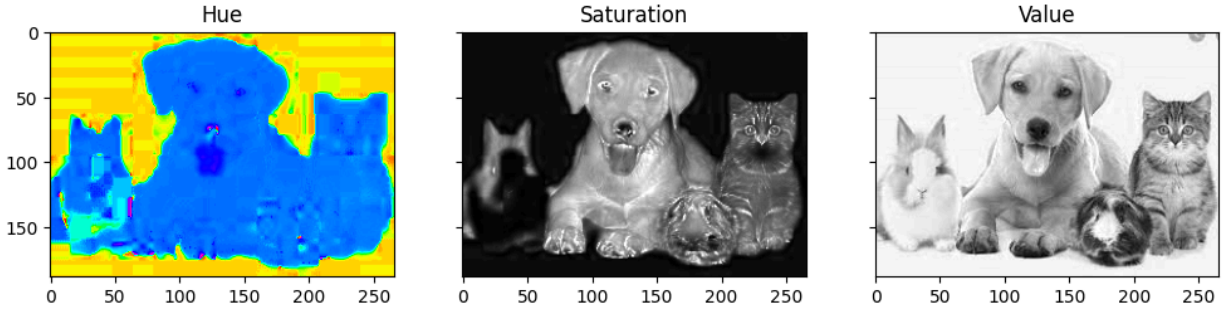

In [ ]:
```
fig, ax = plt.subplots(1, 3, figsize=(12, 4), sharey=True)
```

```
ax[0].imshow(draft[:, :, 0], cmap='Reds')
ax[0].set_title('Red')

ax[1].imshow(draft[:, :, 1], cmap='Greens')
ax[1].set_title('Green')

ax[2].imshow(draft[:, :, 2], cmap='Blues')
ax[2].set_title('Blue')
```

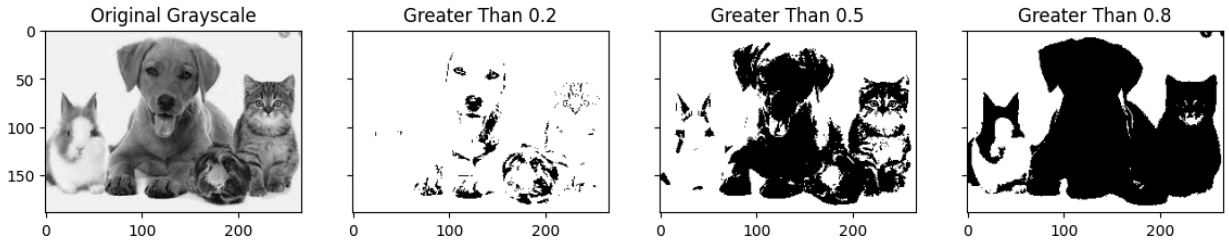
Out[ ]:
```
Text(0.5, 1.0, 'Blue')
```




In [ ]:
```
draft_hsv = cv2.cvtColor(draft, cv2.COLOR_BGR2HSV)
fig, ax = plt.subplots(1, 3, figsize=(12,4), sharey=True)
ax[0].imshow(draft_hsv[:, :, 0], cmap='hsv')
ax[0].set_title('Hue')
ax[1].imshow(draft_hsv[:, :, 1], cmap='gray')
ax[1].set_title('Saturation')
ax[2].imshow(draft_hsv[:, :, 2], cmap='gray')
ax[2].set_title('Value')
plt.show()
```




In [ ]:
```
draft_gray = cv2.cvtColor(draft, cv2.COLOR_BGR2GRAY)
fig, ax = plt.subplots(1, 4, figsize=(14, 4), sharey=True)
ax[0].imshow(draft_gray, cmap='gray')
ax[0].set_title('Original Grayscale')
ax[1].imshow(draft_gray > 50, cmap='gray')
ax[1].set_title('Greater Than 0.2')
ax[2].imshow(draft_gray > 125, cmap='gray')
ax[2].set_title('Greater Than 0.5')
ax[3].imshow(draft_gray > 200, cmap='gray')
ax[3].set_title('Greater Than 0.8')
plt.show()
```




Description

In [ ]:
```
from skimage import io, img_as_ubyte
import matplotlib.pyplot as plt
from skimage.color import label2rgb, rgb2gray
import numpy as np
from skimage.filters import threshold_otsu
from skimage.segmentation import clear_border
from skimage import measure
import pandas as pd
```

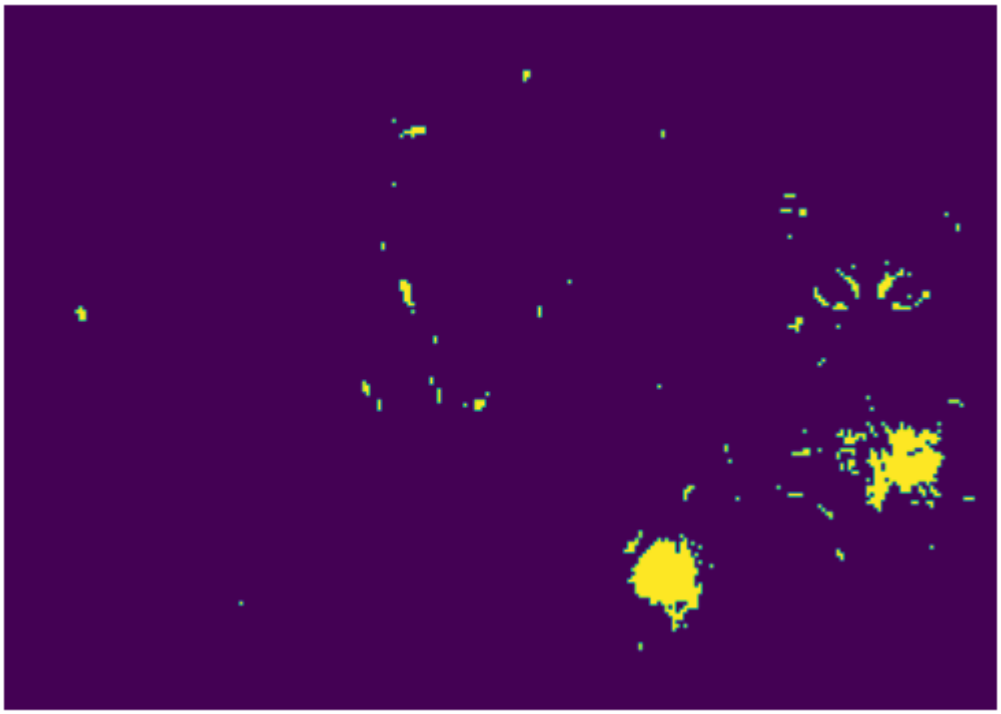
In [ ]:
```
image = img_as_ubyte(io.imread('Picture2.jpg', as_gray=True))

plt.imshow(image, cmap='gray')
plt.axis('off')
plt.show()
```

In [ ]:
```
threshold = threshold_otsu(image)
thresholded_img = image > threshold
plt.imshow(thresholded_img)
plt.axis('off')
```

Out[ ]:
```
(-0.5, 265.5, 188.5, -0.5)
```

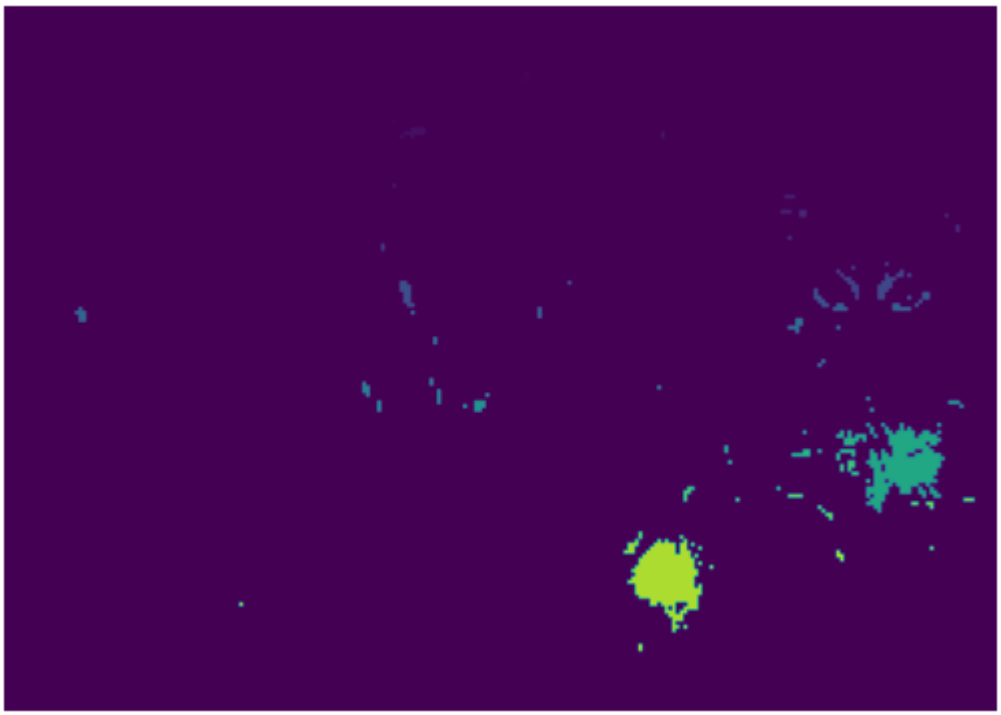
In [ ]:
```
removed = clear_border(thresholded_img)
plt.imshow(removed)
plt.axis('off')
```

Out[ ]:
```
(-0.5, 265.5, 188.5, -0.5)
```

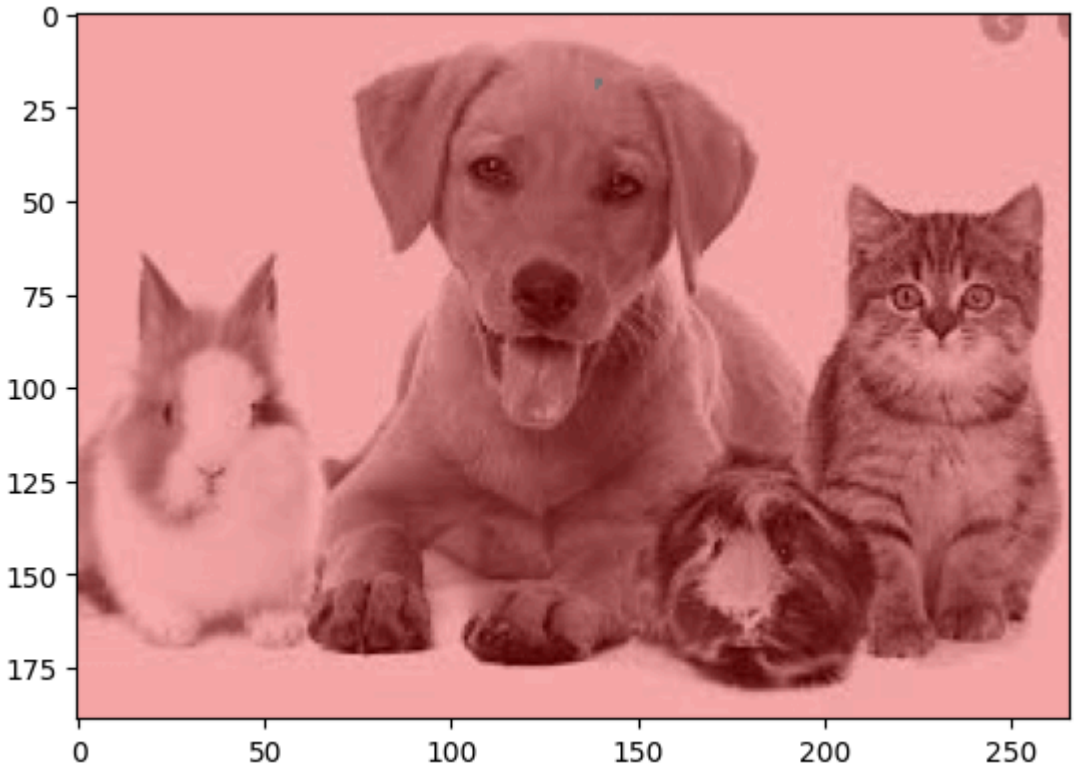


In [ ]:
```
label_image = measure.label(removed, connectivity=image.ndim)
plt.imshow(label_image)
plt.axis('off')
```

Out[ ]:
```
(-0.5, 265.5, 188.5, -0.5)
```



In [ ]:
```
image_label_overlay = label2rgb(label_image, image=image, bg_label=1, colors=['red'])

plt.imshow(image_label_overlay)
plt.show()

plt.imsave('labeled_cast.jpg', image_label_overlay)
```




In [ ]:
```
all_props = measure.regionprops(label_image,image)
```

In [ ]:

```
for prop in all_props:
    print("Label : {}, Area : {}".format(prop.label, prop.area))
```

```
Label : 1, Area : 5.0
Label : 2, Area : 1.0
Label : 3, Area : 12.0
Label : 4, Area : 2.0
Label : 5, Area : 1.0
Label : 6, Area : 3.0
Label : 7, Area : 3.0
Label : 8, Area : 4.0
Label : 9, Area : 1.0
Label : 10, Area : 2.0
Label : 11, Area : 1.0
Label : 12, Area : 2.0
Label : 13, Area : 1.0
Label : 14, Area : 1.0
Label : 15, Area : 12.0
Label : 16, Area : 21.0
Label : 17, Area : 1.0
Label : 18, Area : 16.0
Label : 19, Area : 1.0
Label : 20, Area : 8.0
Label : 21, Area : 6.0
Label : 22, Area : 1.0
Label : 23, Area : 6.0
Label : 24, Area : 7.0
Label : 25, Area : 8.0
Label : 26, Area : 3.0
Label : 27, Area : 1.0
Label : 28, Area : 8.0
Label : 29, Area : 1.0
Label : 30, Area : 2.0
Label : 31, Area : 2.0
Label : 32, Area : 2.0
Label : 33, Area : 6.0
Label : 34, Area : 1.0
Label : 35, Area : 4.0
Label : 36, Area : 1.0
Label : 37, Area : 1.0
Label : 38, Area : 3.0
Label : 39, Area : 8.0
Label : 40, Area : 4.0
Label : 41, Area : 1.0
Label : 42, Area : 1.0
Label : 43, Area : 4.0
Label : 44, Area : 265.0
Label : 45, Area : 1.0
Label : 46, Area : 1.0
Label : 47, Area : 16.0
Label : 48, Area : 2.0
Label : 49, Area : 7.0
Label : 50, Area : 1.0
Label : 51, Area : 7.0
Label : 52, Area : 1.0
Label : 53, Area : 7.0
Label : 54, Area : 2.0
Label : 55, Area : 1.0
Label : 56, Area : 6.0
Label : 57, Area : 1.0
Label : 58, Area : 4.0
Label : 59, Area : 1.0
Label : 60, Area : 3.0
```

```
Label : 61, Area : 2.0
Label : 62, Area : 3.0
Label : 63, Area : 5.0
Label : 64, Area : 11.0
Label : 65, Area : 275.0
Label : 66, Area : 1.0
Label : 67, Area : 1.0
Label : 68, Area : 1.0
Label : 69, Area : 4.0
Label : 70, Area : 1.0
Label : 71, Area : 1.0
Label : 72, Area : 1.0
Label : 73, Area : 1.0
Label : 74, Area : 2.0
```

In [ ]:
```
props = measure.regionprops_table(label_image, image,
                                   properties=['label', 'area', 'equivalent_diameter',
                                               'mean_intensity', 'solidity'])
```

In [ ]:
```
df = pd.DataFrame(props)
df.head()
```

Out[ ]:

| | label | area | equivalent_diameter | mean_intensity | solidity |
|---|---|---|---|---|---|
| **0** | 1 | 5.0 | 2.523133 | 172.0 | 1.00 |
| **1** | 2 | 1.0 | 1.128379 | 173.0 | 1.00 |
| **2** | 3 | 12.0 | 3.908820 | 178.0 | 0.75 |
| **3** | 4 | 2.0 | 1.595769 | 190.0 | 1.00 |
| **4** | 5 | 1.0 | 1.128379 | 172.0 | 1.00 |

In [ ]:
```
df = df[df['area'] > 50]
print(df.head())
```

```
    label   area  equivalent_diameter  mean_intensity  solidity
43     44  265.0            18.368682      183.566038  0.629454
64     65  275.0            18.712052      193.985455  0.804094
```

In [ ]:
```
scale = 2

df['area_no_units'] = df['area'] * (scale)
df['equivalent_diameter_microns'] = df['equivalent_diameter'] * (scale)

print(df.head())

df.to_csv('cleaned_data_2.csv')
```

```
    label   area  equivalent_diameter  mean_intensity  solidity  \
43     44  265.0            18.368682      183.566038  0.629454
64     65  275.0            18.712052      193.985455  0.804094

    area_no_units  equivalent_diameter_microns
43          530.0                    36.737364
64          550.0                    37.424103
```