In [10]:
```
from keras.preprocessing.image import load_img
from keras.preprocessing.image import img_to_array
from keras.applications.vgg16 import preprocess_input
from keras.applications.vgg16 import decode_predictions
from keras.applications.vgg16 import VGG16
import matplotlib.pyplot as plt
import numpy as np
%matplotlib inline
# load the model
model = VGG16()
# load an image from file
image1 = load_img('1.jpg', target_size=(224, 224))
# convert the image pixels to a numpy array
image2 = img_to_array(image1)
# reshape data for the model
image3 = image2.reshape((1, image2.shape[0], image2.shape[1], image2.shape[2]
# prepare the image for the VGG model
image4 = preprocess_input(image3)
# predict the probability across all output classes
yhat = model.predict(image4)
# convert the probabilities to class labels
label = decode_predictions(yhat)
# retrieve the most likely result, e.g. highest probability
label = label[0][0]
# print the classification
print('%s (%.2f%%)' % (label[1], label[2]*100))
```

```
English_foxhound (70.54%)
```

Weights Plotting

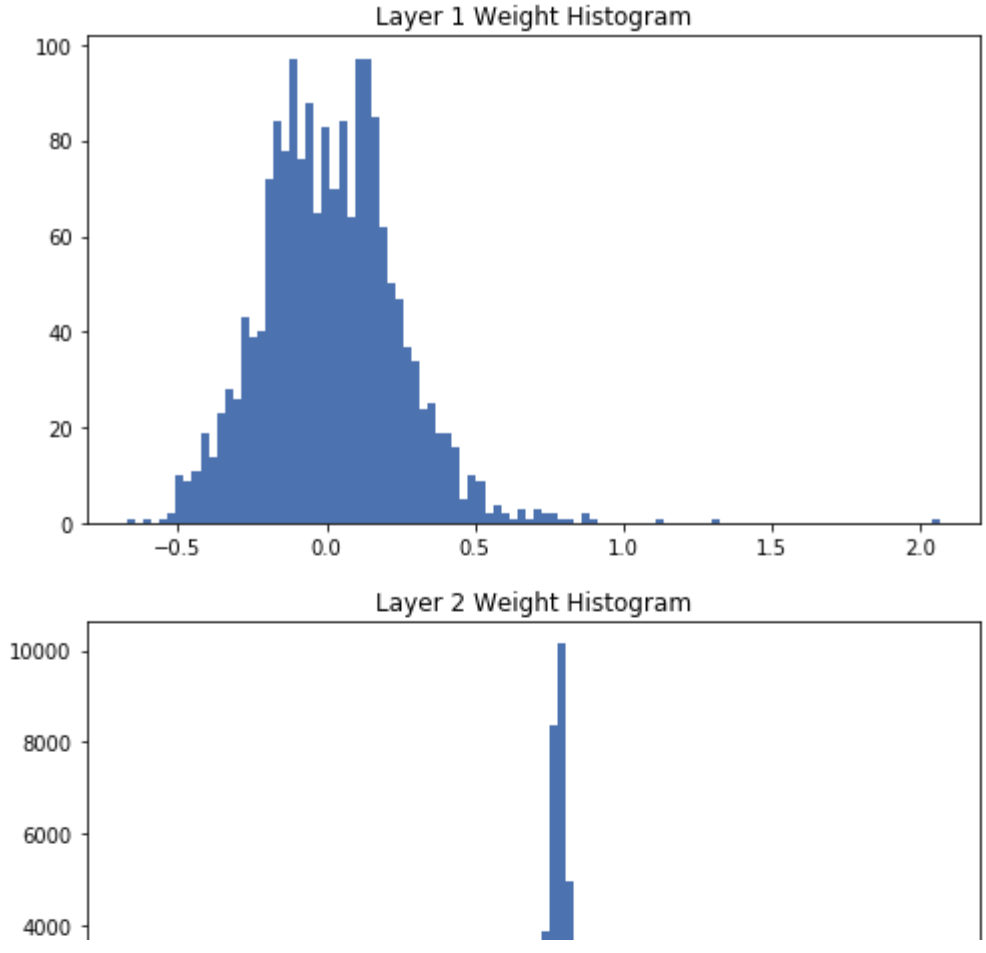
In [11]:
```
weight=[0]*23
for index,layer in enumerate(model.layers):
    weight[index]=layer.get_weights()
```

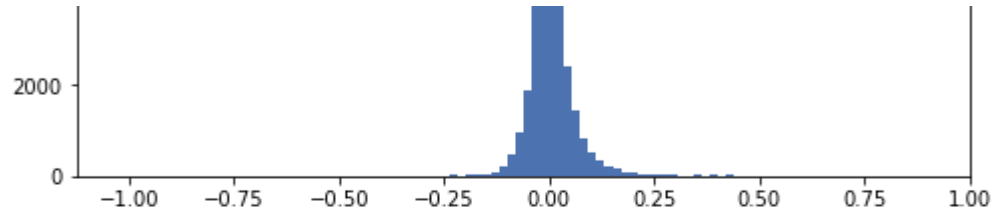
Note: I have considered 5 layers as the first 5 convolution layers of vgg16.

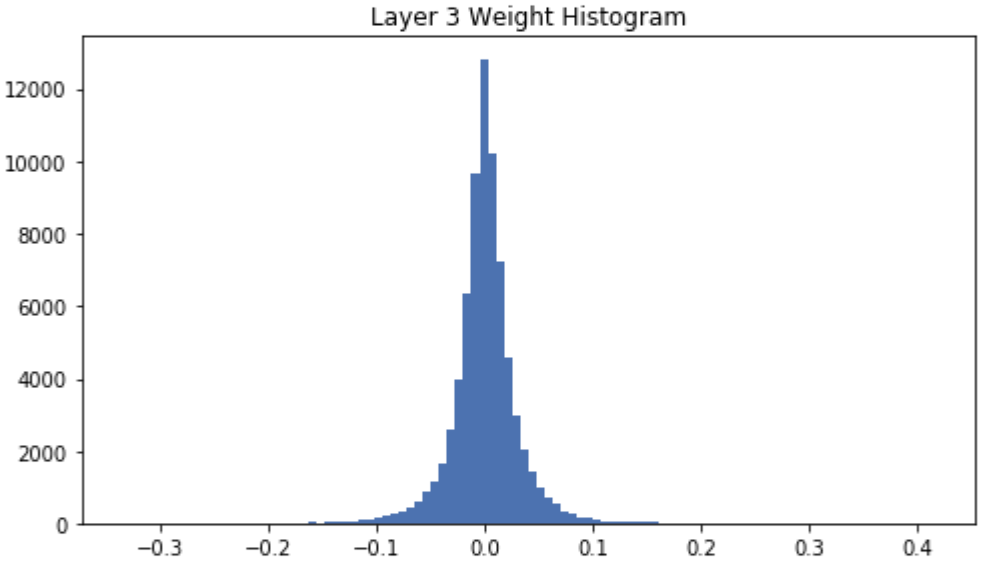
In [24]:
```
weight_1=list(weight[1][0].flatten())+list(weight[1][1].flatten()) # layer1
weight_2=list(weight[2][0].flatten())+list(weight[2][1].flatten()) # layer2
weight_3=list(weight[4][0].flatten())+list(weight[4][1].flatten()) # layer3
weight_4=list(weight[5][0].flatten())+list(weight[5][1].flatten()) # layer4
weight_5=list(weight[7][0].flatten())+list(weight[7][1].flatten()) # layer5
```

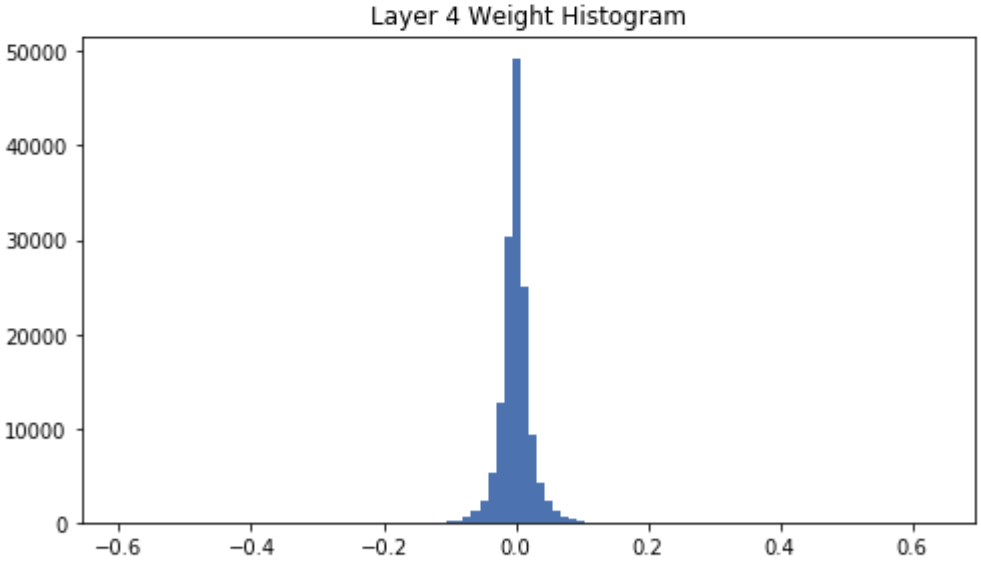
In [63]:

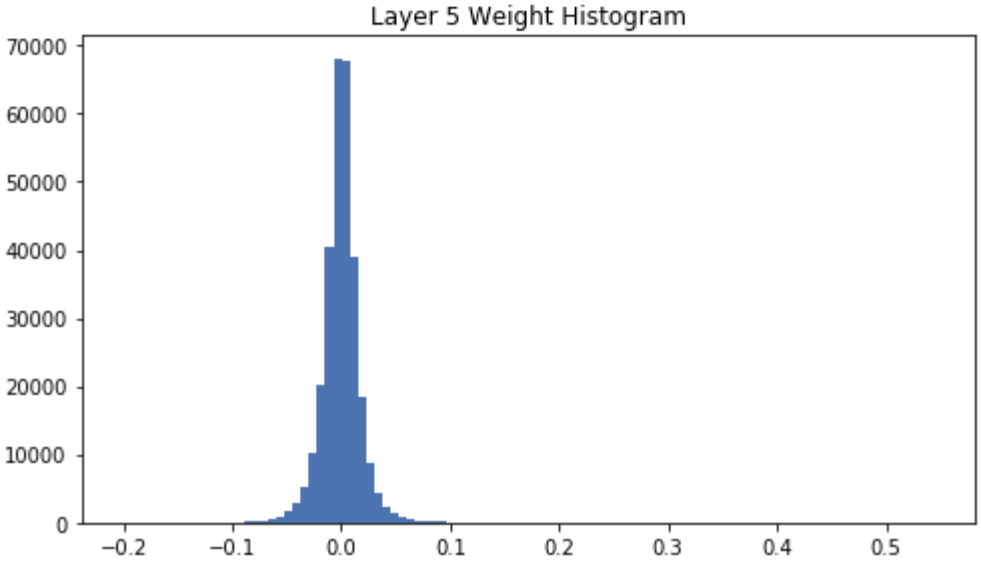
```
# bins = np.linspace(-2,2, 100)
from matplotlib.pyplot import figure
figure(num=None, figsize=(8, 26))
plt.style.use('seaborn-deep')
# plt.hist(weight_1)
# plt.figsize(20,20)
import matplotlib.pyplot as plt
plt.subplot(5, 1, 1)
plt.hist(weight_1,bins=100)
plt.title('Layer 1 Weight Histogram')

plt.subplot(5, 1, 2)
plt.hist(weight_2,bins=100)
plt.title('Layer 2 Weight Histogram')

plt.subplot(5, 1, 3)
plt.hist(weight_3,bins=100)
plt.title('Layer 3 Weight Histogram')

plt.subplot(5, 1, 4)
plt.hist(weight_4,bins=100)
plt.title('Layer 4 Weight Histogram')

plt.subplot(5, 1, 5)
plt.hist(weight_5,bins=100)
plt.title('Layer 5 Weight Histogram')

plt.show()
```




2000
0
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00


Layer 3 Weight Histogram
12000
10000
8000
6000
4000
2000
0
−0.3
−0.2
−0.1
0.0
0.1
0.2
0.3
0.4


Layer 4 Weight Histogram
50000
40000
30000
20000
10000
0
−0.6
−0.4
−0.2
0.0
0.2
0.4
0.6


Layer 5 Weight Histogram
70000
60000
50000
40000
30000
20000
10000
0
−0.2
−0.1
0.0
0.1
0.2
0.3
0.4
0.5

Output Plotting of first 5 layers

In [43]:
```
vgg_layers = [ layer.name for layer in model.layers]
print(vgg_layers)
len(vgg_layers)
```

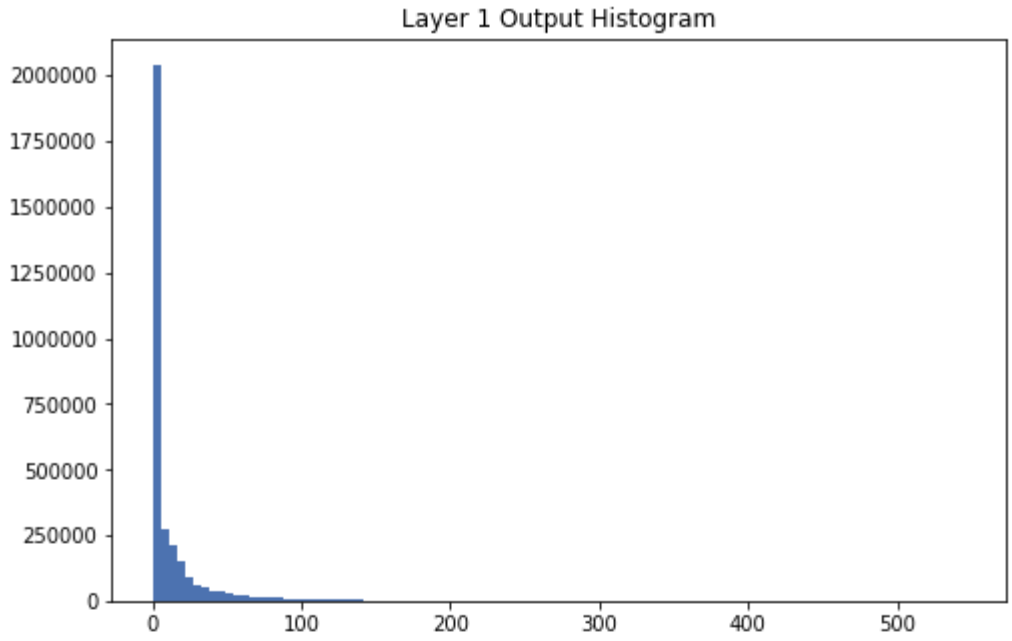
```
['input_3', 'block1_conv1', 'block1_conv2', 'block1_pool', 'block2_conv1',
'block2_conv2', 'block2_pool', 'block3_conv1', 'block3_conv2', 'block3_conv
3', 'block3_pool', 'block4_conv1', 'block4_conv2', 'block4_conv3', 'block4_
pool', 'block5_conv1', 'block5_conv2', 'block5_conv3', 'block5_pool', 'flat
ten', 'fc1', 'fc2', 'predictions']
```

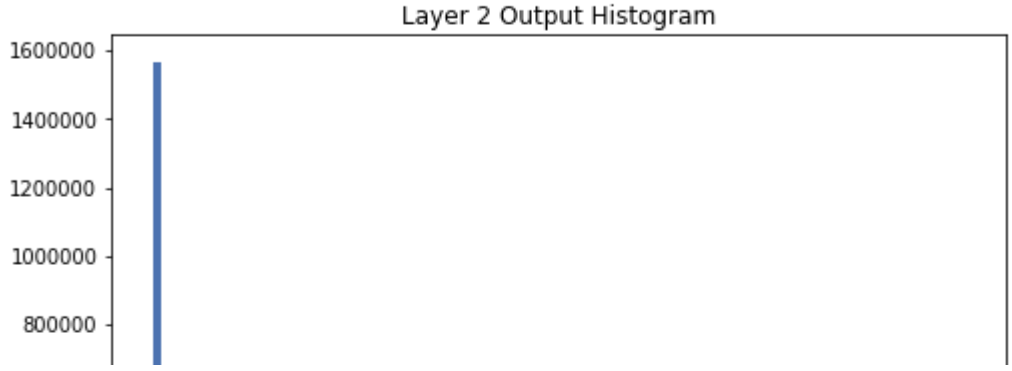
Out[43]:
```
23
```

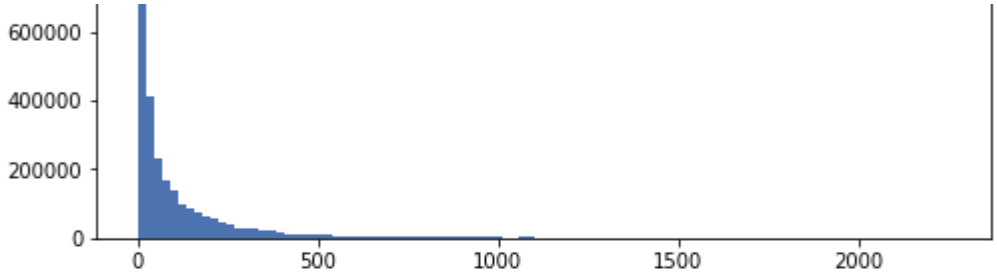
In [59]:
```
from keras.models import Model
layer1_extractor = Model(inputs=model.input, outputs=model.get_layer('block1_
layer1_featres = layer1_extractor.predict(image4)

layer2_extractor = Model(inputs=model.input, outputs=model.get_layer('block1_
layer2_featres = layer2_extractor.predict(image4)

layer3_extractor = Model(inputs=model.input, outputs=model.get_layer('block2_
layer3_featres = layer3_extractor.predict(image4)

layer4_extractor = Model(inputs=model.input, outputs=model.get_layer('block2_
layer4_featres = layer4_extractor.predict(image4)

layer5_extractor = Model(inputs=model.input, outputs=model.get_layer('block3_
layer5_featres = layer5_extractor.predict(image4)
```

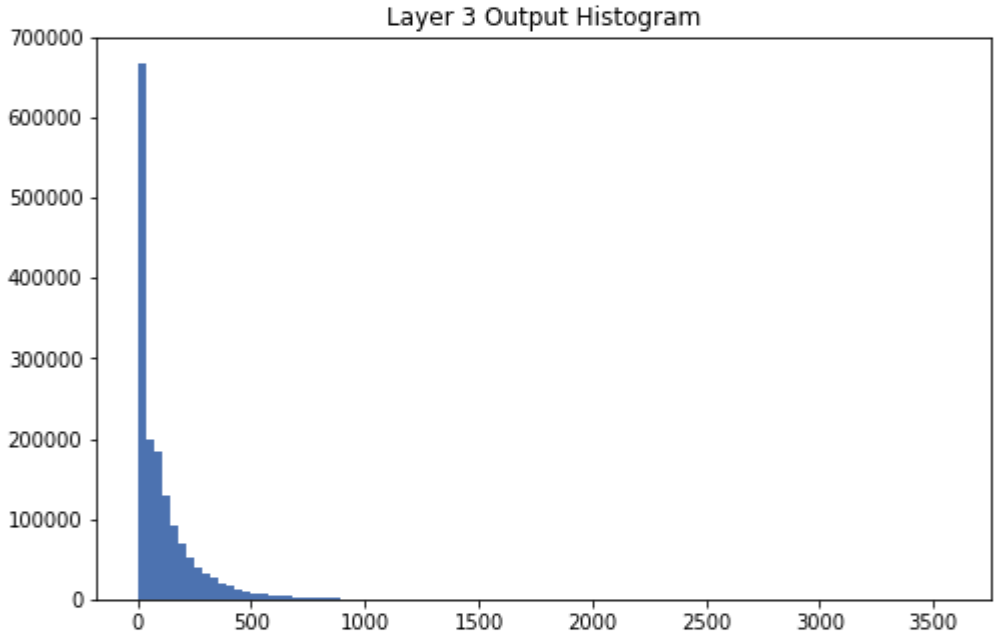
```
545.17413
2255.2034
3572.5889
5584.258
7665.3066
```

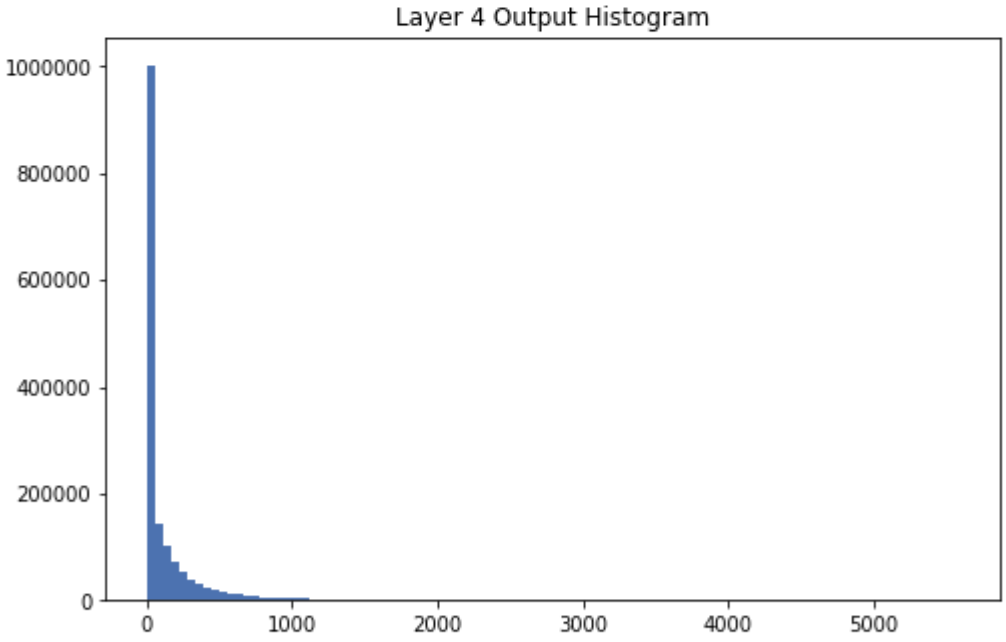
In [60]:
```
from matplotlib.pyplot import figure
import matplotlib.pyplot as plt
figure(num=None, figsize=(8, 30))
plt.style.use('seaborn-deep')
plt.subplot(5, 1, 1)
plt.hist(layer1_featres.flatten(),bins=100)
plt.title('Layer 1 Output Histogram')

plt.subplot(5, 1, 2)
plt.hist(layer2_featres.flatten(),bins=100)
plt.title('Layer 2 Output Histogram')

plt.subplot(5, 1, 3)
plt.hist(layer3_featres.flatten(),bins=100)
plt.title('Layer 3 Output Histogram')

plt.subplot(5, 1, 4)
plt.hist(layer4_featres.flatten(),bins=100)
plt.title('Layer 4 Output Histogram')

plt.subplot(5, 1, 5)
plt.hist(layer5_featres.flatten(),bins=100)
plt.title('Layer 5 Output Histogram')

plt.show()
```

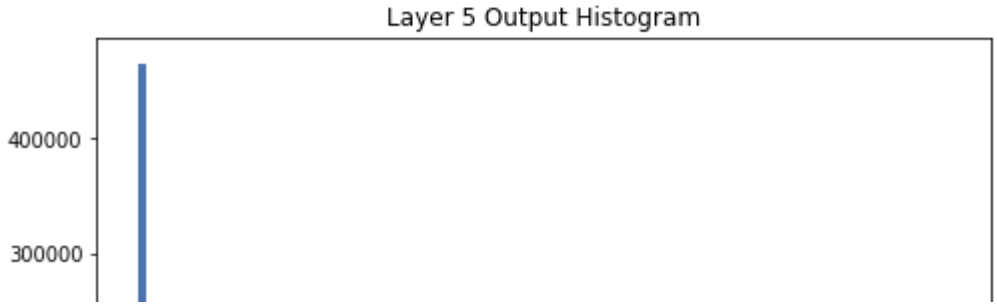


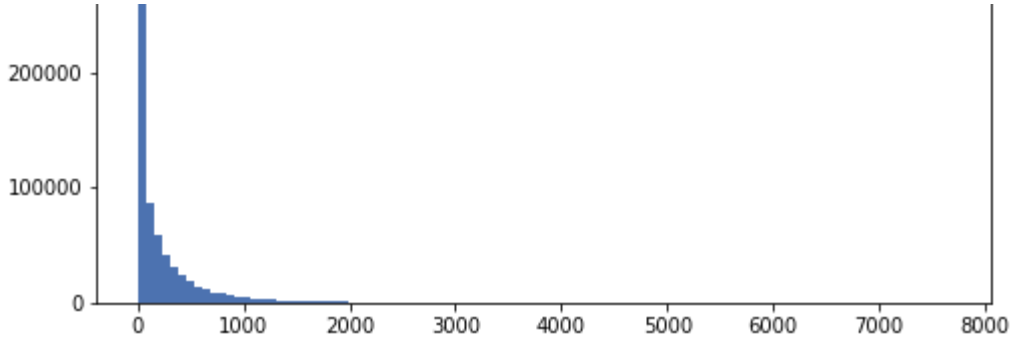



600000
400000
200000
0
0
500
1000
1500
2000


Layer 3 Output Histogram
700000
600000
500000
400000
300000
200000
100000
0
0
500
1000
1500
2000
2500
3000
3500


Layer 4 Output Histogram
1000000
800000
600000
400000
200000
0
0
1000
2000
3000
4000
5000


Layer 5 Output Histogram
400000
300000



In [ ]: