Q 1.1.1

first row: Gaussian : smooth image by removing high freq

second row: Laplacian of Gaussian: detect edges

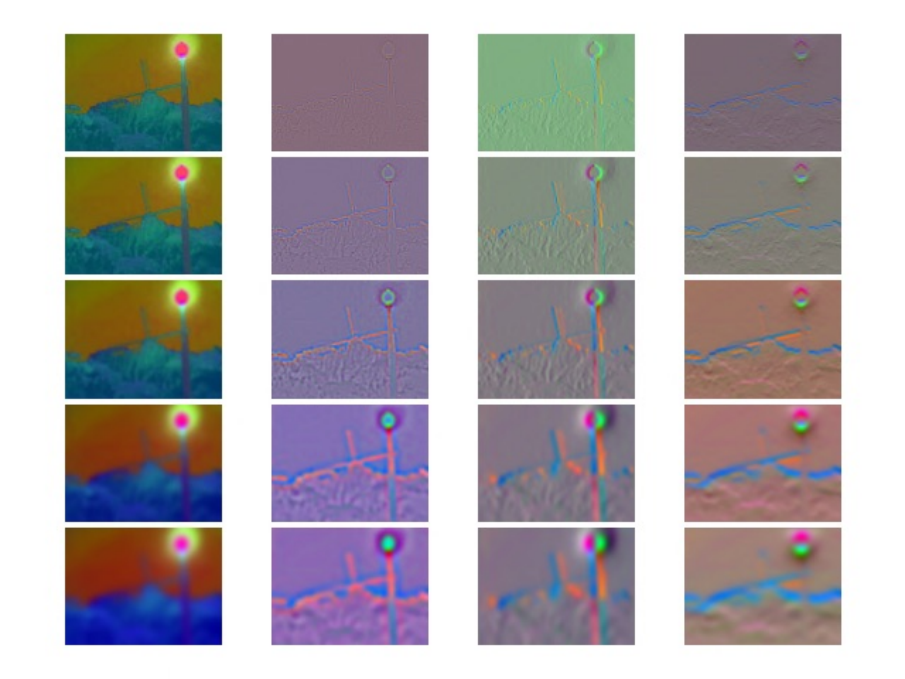
third row: x derivative of Gaussian: detect edges in x-direction

fourth row: y derivative of Gaussian detect edges in y direction

multiple scale: detect different size object. (corners)

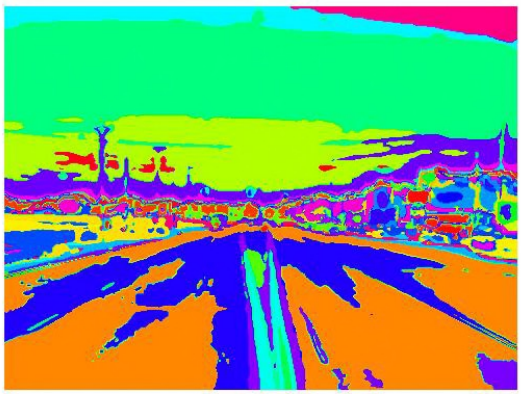
and smooth the image in different rates.

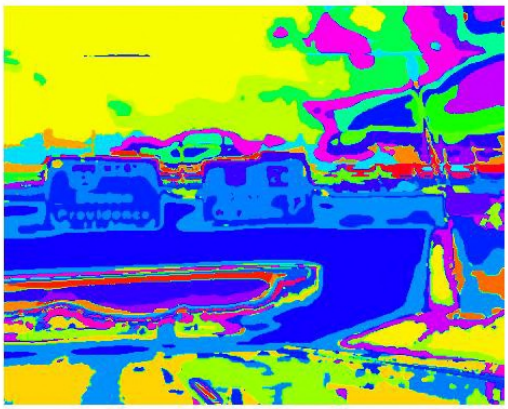
Q 1.1.2



windmill/sun_bcyrzigcapeiwiox.jpg

Q 1.3





When crossing an edge, there is big chance that the color is changed.

We can see that road sign is clustered to one group.

The back of the car is one group.

The line on the ground is one group.

Q.2.5

```
[[13.  1.  1.  0.  0.  1.  3.  1.]
 [ 1.  9.  0.  3.  2.  1.  0.  4.]
 [ 0.  0. 10.  2.  2.  1.  0.  5.]
 [ 0.  1.  1. 11.  0.  0.  1.  6.]
 [ 5.  1.  0.  0. 10.  2.  2.  0.]
 [ 4.  0.  0.  1.  6.  8.  1.  0.]
 [ 1.  0.  0.  0.  1.  5. 13.  0.]
 [ 1.  1.  0.  6.  0.  0.  1. 11.]]
0.53125
```

Q.2.6

These images have many features in different classifications. For example: green plant.

BoG can't distinguish spatial difference, then it can't tell the correct type

Q3.2

```
[[19.  0.  0.  0.  1.  0.  0.  0.]
 [ 1. 16.  1.  0.  0.  0.  1.  1.]
 [ 0.  0. 19.  1.  0.  0.  0.  0.]
 [ 0.  0.  0. 20.  0.  0.  0.  0.]
 [ 0.  0.  0.  0. 19.  1.  0.  0.]
 [ 0.  0.  0.  0.  1. 19.  0.  0.]
 [ 0.  0.  1.  0.  0.  0. 19.  0.]
 [ 0.  0.  0.  1.  0.  0.  0. 19.]]
0.9375
```

VGG peform better than BoW.

① VGG use non-linear activation function it learns more complex pattern.

② convolution is sensible to spatial difference. better classification.