HOMEWORK 8

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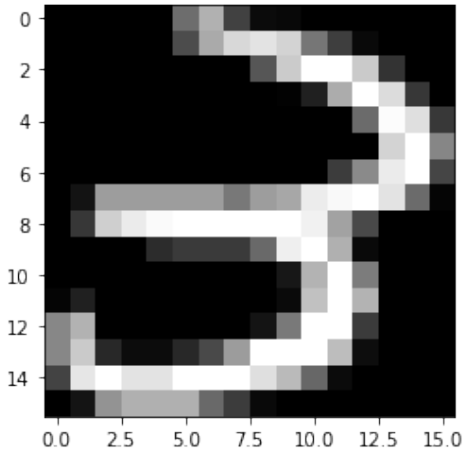
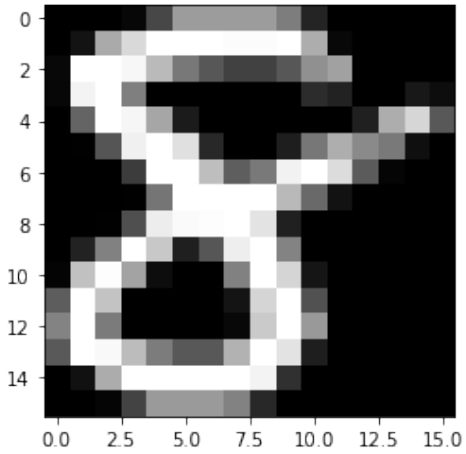
Solution 1

Solution 1.1

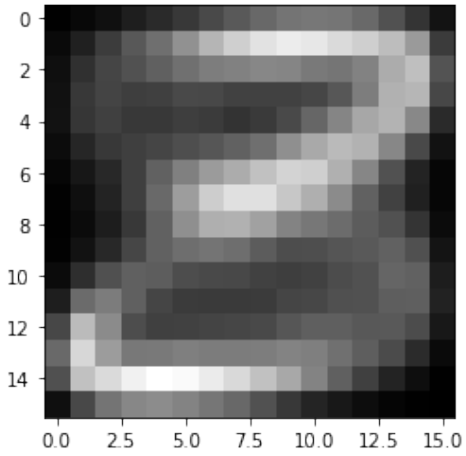


1.1 Three



1.1 Eight

Solution 1.2



1.2 Mean

Solution 1.3

Submatrix

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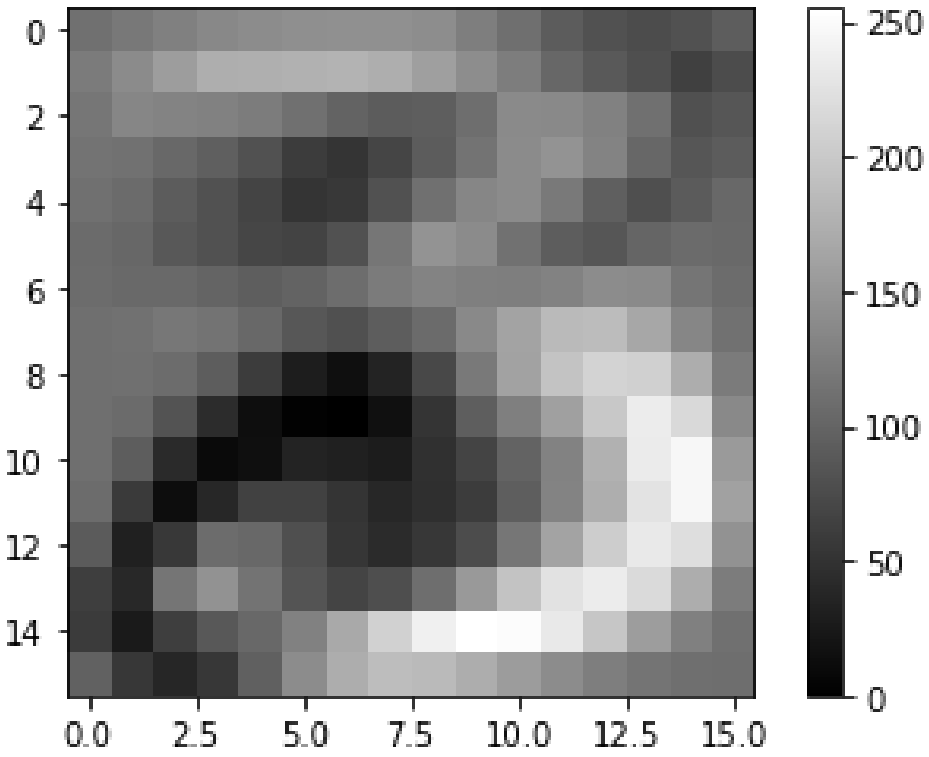
S[0:5, 0:5]
```

```
array([[  59.16729323,  142.14943609,   28.68201754,   -7.17857143,
         -14.3358396 ],
       [ 142.14943609,  878.93879073,  374.13731203,   24.12778195,
         -87.12781955],
       [  28.68201754,  374.13731203, 1082.9058584 ,  555.2268797 ,
          33.72431078],
       [  -7.17857143,   24.12778195,  555.2268797 , 1181.24408521,
         777.77192982],
       [ -14.3358396 ,  -87.12781955,   33.72431078,  777.77192982,
        1429.95989975]])
```

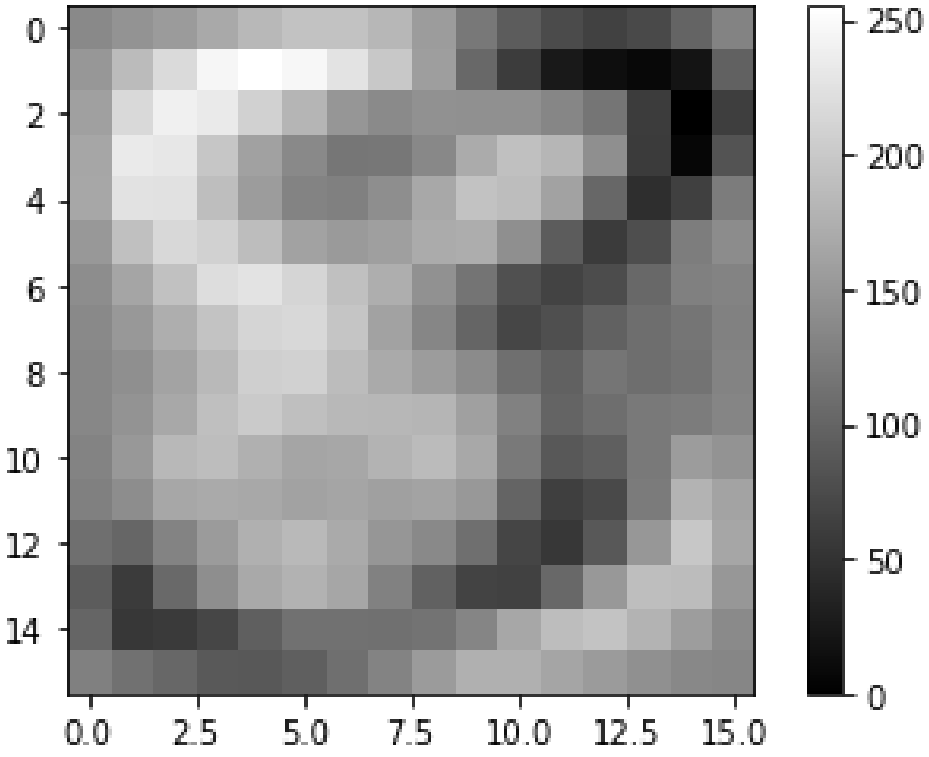
1.3 S submatrix

Solution 1.4

$\lambda_1 = 237155.24629049$ $\lambda_2 = 145188.35268683$


0
2
4
6
8
10
12
14
0.0
2.5
5.0
7.5
10.0
12.5
15.0
250
200
150
100
50
0

v1

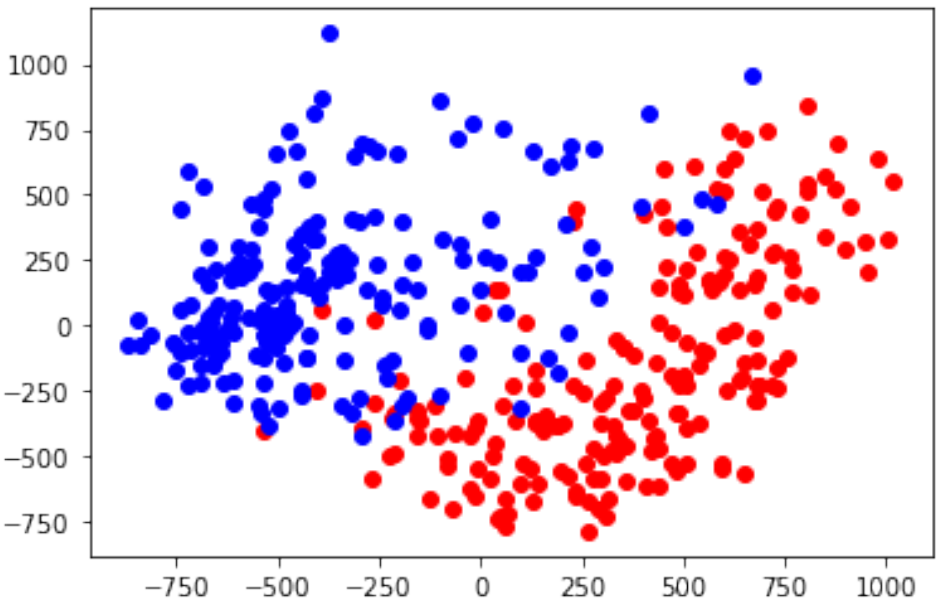

0
2
4
6
8
10
12
14
0.0
2.5
5.0
7.5
10.0
12.5
15.0
250
200
150
100
50
0

v2

Solution 1.5

projection for 1st line of three: [136.20872784, -242.62848028] projection for 1st line of eight: [-312.68702792, 649.57346086]

Solution 1.6



1.6 blue = eight, red = three

Solution 2

Solution 2.1

Q table depends on initialization, initializing with A stay results in:

State	Move	Stay
A	0	5
B	0.2	0

Solution 2.2

State	Move	Stay
A	3.99236031	4.99232348
B	3.99236031	4.99232348

Solution 2.3

For stay states:

$$U(s_0, s_1, \ldots) = r(s_0) + \gamma r(s_1) + \gamma^2 r(s_2) + \ldots$$

$$= \sum_{t \geq 0}^{\infty} \gamma^t r(s_t)$$

$r(s_0) = r(s_1) = \ldots = 1$

$\Rightarrow$ geometric series with parameters $r = 1$, $\gamma = 0.8$

$$= \frac{r}{1-\gamma} = \frac{1}{1-0.8} \Rightarrow 5$$

For move states

$$U(s_0, s_1, \ldots) = r(s_0) + \gamma r(s_1) + \gamma^2 r(s_2) + \ldots$$

$$= 0 + \frac{1}{1-0.8} - 1 = 4$$

$r(s_0) = 0$ $r(s_1) = r(s_2) = \ldots = 1$

Q table:

	move	stay
A	4	5
B	4	5

2.3