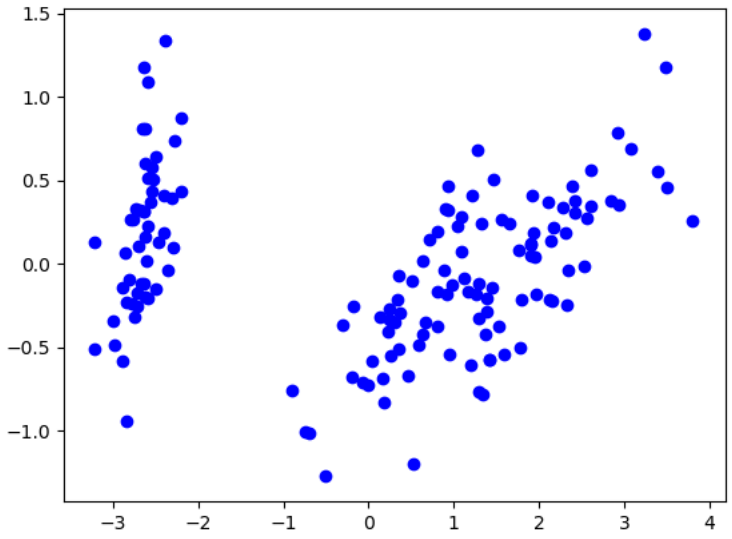
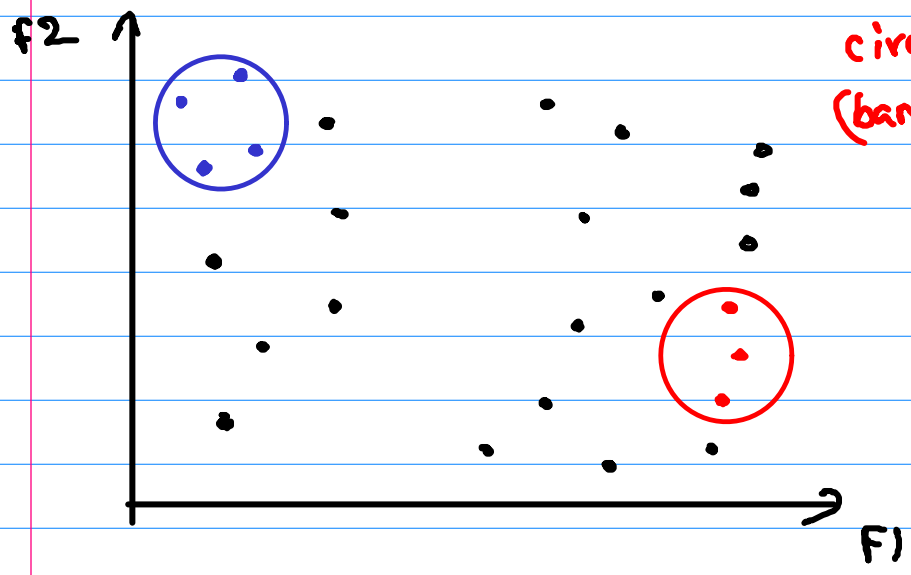
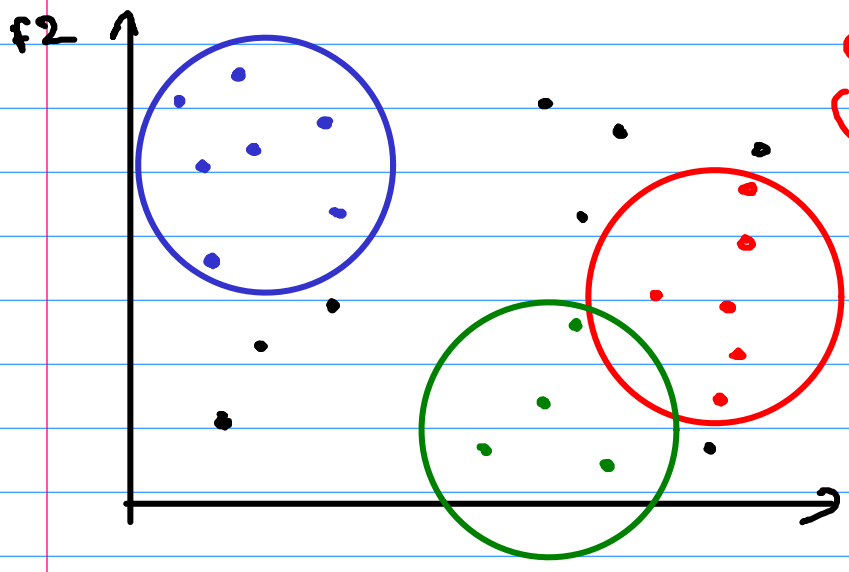
Mean shift clustering

* n-clusters is not defined!



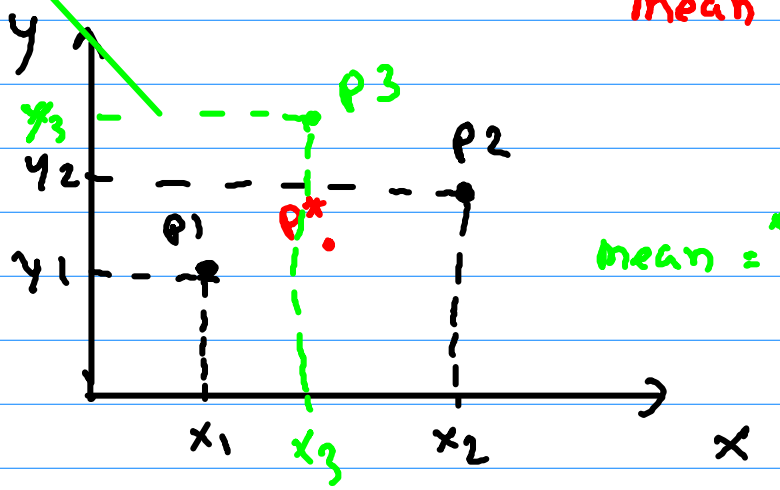


circle radius = 50 units (bandwidth)



circle radius = 100 units (bandwidth)

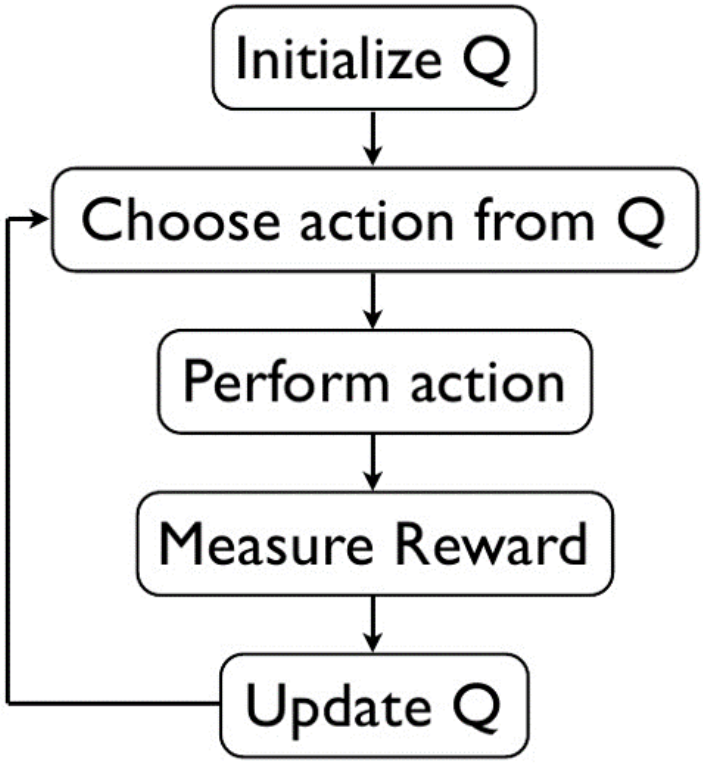
Finding the mean



$$\text{mean} = p^{*}\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

$$\text{mean} = p^{**}\left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$$

Q Learning Algorithm



$$Q(state, action) \leftarrow (1-\alpha)Q(state, action) + \alpha\left(reward + \gamma \max_{a} Q(next\ state, all\ actions)\right)$$

(0)

initially $\alpha = 1$ (assume)

$$Q(S,A) = R(S,A) + \gamma . \max(Q(NS, AA))$$

$R =$

State \ Action	0	1	2	3	4	5
0	-1	-1	-1	-1	0	-1
1	-1	-1	-1	0	-1	100
2	-1	-1	-1	0	-1	-1
3	-1	0	0	-1	0	-1
4	0	-1	-1	0	-1	100
5	-1	0	-1	-1	0	100

The -1's in the table represent null values

$R =$

State \ Action	0	1	2	3	4	5
0	-1	-1	-1	-1	0	-1
1	-1	-1	-1	0	-1	100
2	-1	-1	-1	0	-1	-1
3	-1	0	0	-1	0	-1
4	0	-1	-1	0	-1	100
5	-1	0	-1	-1	0	100

The -1's in the table represent null values

$$Q(S,A) = R(S,A) + \gamma \cdot \max(Q(nS, nA))$$

* S, A randomly selected. $0 \le \gamma \le 1$, $\gamma = 0.8$

S = 1
A = 3

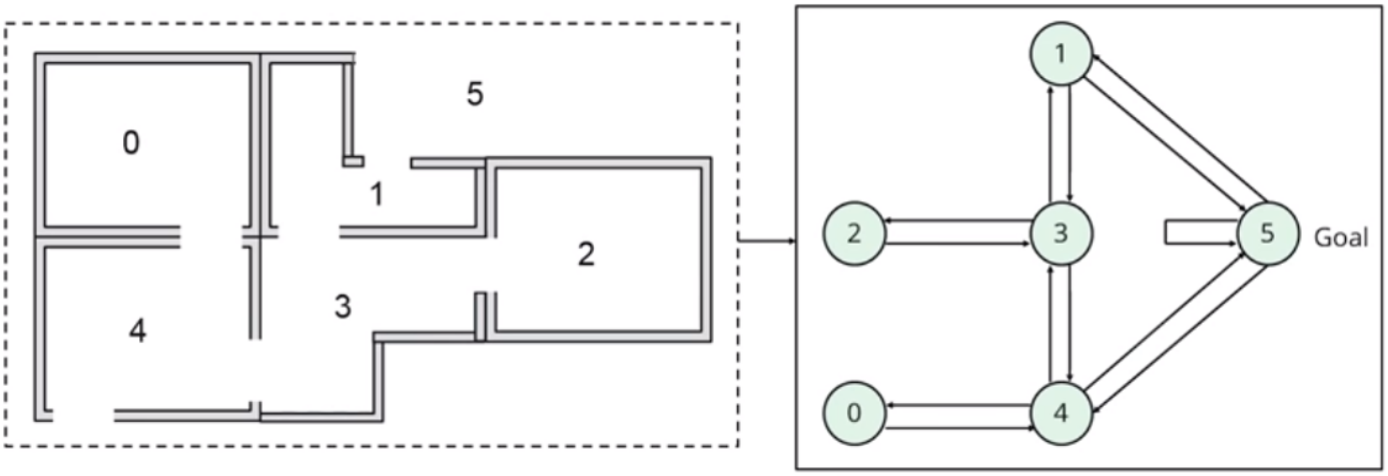
$Q(1,3) = 0 + 0.8(0) = 0$

$Q(4,5) = 100 + 0.8(0) = 100$

$Q(3,4) = 0 + 0.8(100) = 80$

Q

	0	1	2	3	4	5
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	80	0
4	0	0	0	0	0	100
5	0	0	0	0	0	0

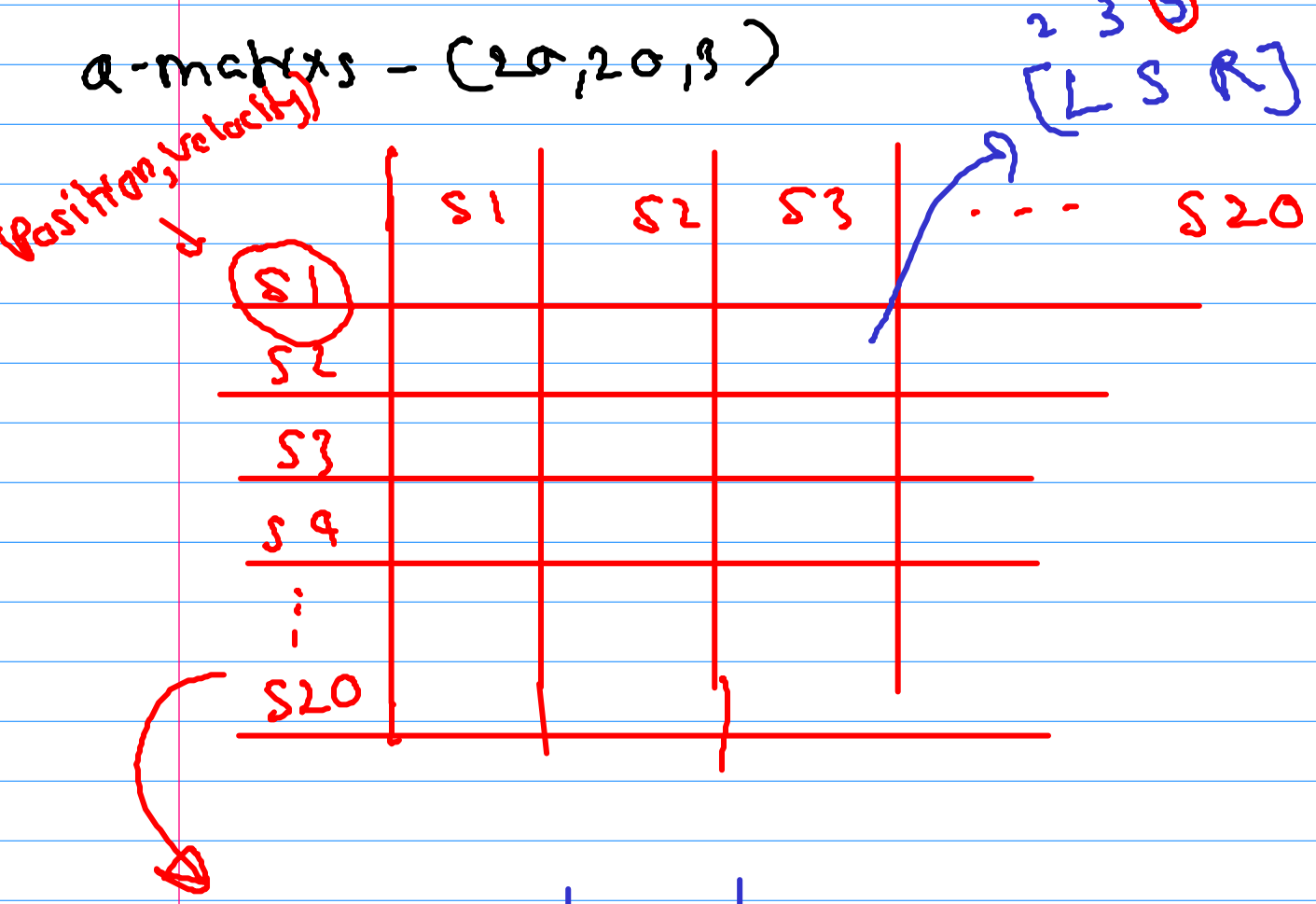



```
Trained Q matrix:
[[  0.    0.    0.    0.   80.    0. ]
 [  0.    0.    0.   64.    0.  100. ]
 [  0.    0.    0.   64.    0.    0. ]
 [  0.   80.   51.2   0.   80.    0. ]
 [  0.   80.   51.2   0.    0.  100. ]
 [  0.   80.    0.    0.   80.  100. ]]
```

Mountain Car

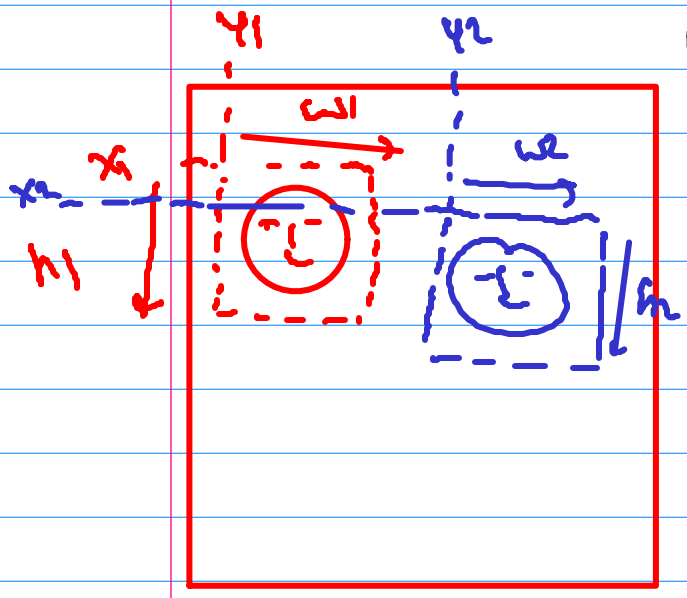
actions: 0 left, 1 still, 2 right

q-matrix = (20, 20, 3)



	Action1	A2	A3
S1	3	2	5 ✓
S2			
S3			
⋮			
S20			

cascade classifiers



faces = [[x1, y1, w1, h1],
[x2, y2, w2, h2]]

opencv rectangle