Exercise 1.*a* − *b*)

$k = 5$ (p1 = 4, p2 = 1)	$k = 2$ (p1 = 5, p2 = 3)
a1,1 = 0.0025 a1,2 = 0.9198 a1,3 = -0.0029 a1,4 = -0.0007 a1,5 = -0.0010 a1,6 = 0.0014 a1,7 = 0.0025 a1,8 = 0.0001 a1,9 = -0.0003 a1,10 = 6.6926 e-05 a1,11 = 1.3061 e-05 a1,12 = -0.0043 a1,13=4.5174 e-05	a1,1 = 0.0022 a1,2 = 0.9217 a1,3 = 0.0066 a1,4 = -0.0016 a1,5 = -9.9158 e-04 a1,6 = 0.0025 a1,7 = 0.0023 a1,8 = -1.1665 e-05 a1,9 = -0.0130 a1,10 = 1.2268 e-04 a1,11 = 1.2836 e-05 a1,12 = -0.0045 a1,13 = -4.3099 e-05 a1,14 = 1.6696 e-06 a1,15 = 0.0026 a1,16 = -4.0239 e-07
a2,1 = -0.0043 a2,2 = -0.0010 a2,3 = 0.0014 a2,4 = 0.4680 a2,5 = 5.6850 e-04 a2,6 = -0.0025 a2,7 = -0.0010 a2,8 = 1.9246 e-05 a2,9 = -0.0017 a2,10 = 6.7254 e-04 a2,11 = -7.8462 e-06 a2,12 = 0.0035 a2,13=8.7155 e-06	a2,1 = -0.0027 a2,2 = -0.0014 a2,3 = -0.0115 a2,4 = 0.4730 a2,5 = 2.4454 e-04 a2,6 = -0.0083 a2,7 = 7.4693 e-05 a2,8 = 4.3810 e-05 a2,9 = 0.0164 a2,10 = -9.7700 e-04 a2,11 = -5.2889 e-06 a2,12 = 0.0043 a2,13 = -4.4187 e-06 a2,14 = -2.6911 e-07 a2,15 = -0.0038 a2,16 = 2.1016 e-06
a3,1 = 8.0784 e-04 a3,2 = -3.1902 e-04 a3,3 = 0.9987 a3,4 = 3.2142 e-04	a3,1 = -5.9515 e-04 a3,1 = -1.7107 e-04 a3,1 = 0.9997 a3,1 = 8.3936 e-04 a3,1 = 1.2687 e-04 a3,1 = 0.0018 a3,1 = -1.4105 e-04 a3,1 = -4.5223 e-06 a3,1 = -6.2224 e-04 a3,1 = -1.3221 e-05

Exercise 1.*c*)

$k = 5$	$k = 2$

(v, w) = (0, 0.05)

Robot trajectory simulation using the learned model parameters

(v, w) = (1, 0)

Robot trajectory simulation using the learned model parameters

(v, w) = (1, 0.05)

Robot trajectory simulation using the learned model parameters

(v, w) = (-1, -0.05)

Robot trajectory simulation using the learned model parameters
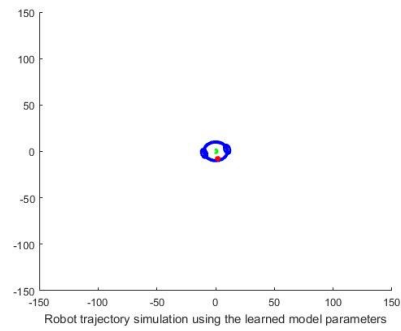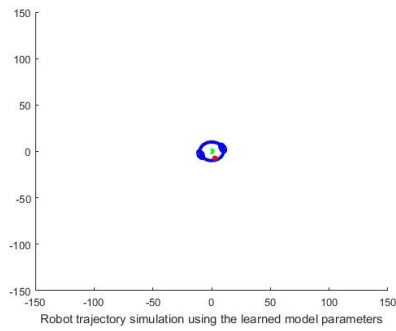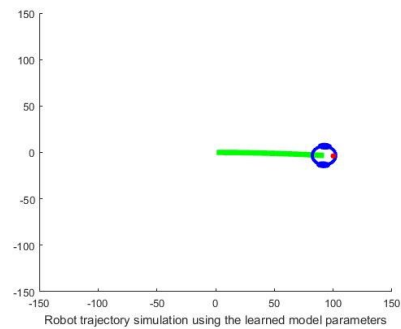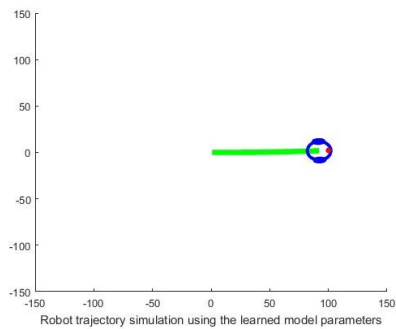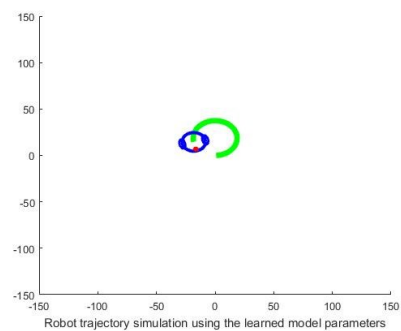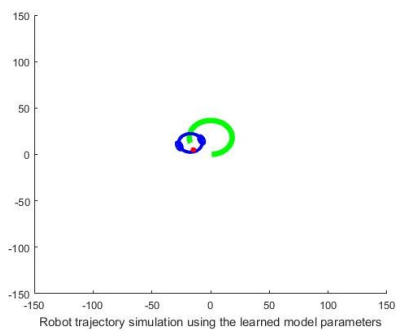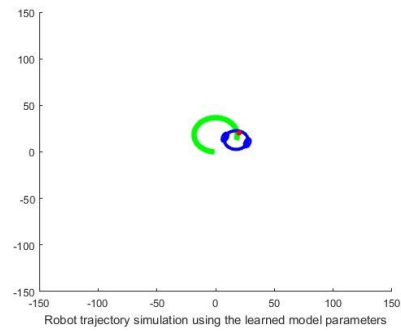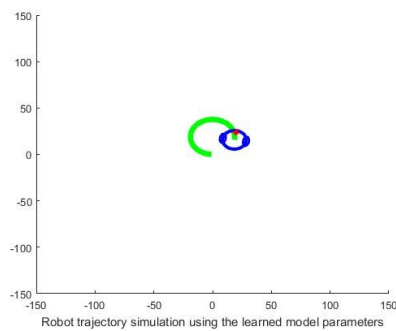
Exercise 2

- The optimal value of d is 48 and its classification error is 3.62%.
- The plot of classification error when varying d from 1 to 60

- The confusion matrix of the optimal *d* is:
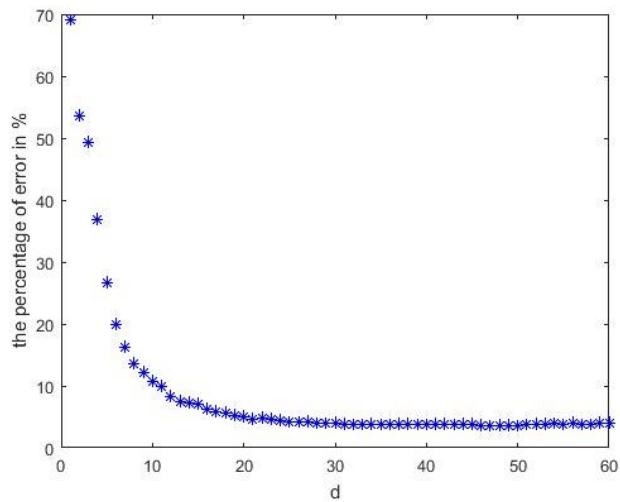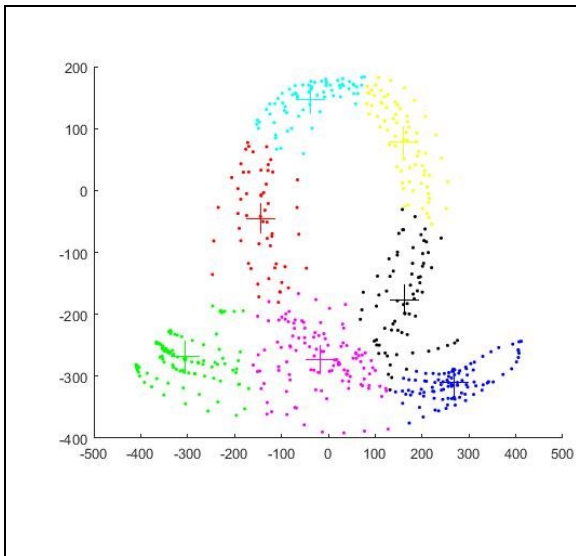
$$
\begin{bmatrix}
970 & 0 & 3 & 2 & 1 & 2 & 8 & 1 & 3 & 5 \\
0 & 1098 & 0 & 0 & 0 & 0 & 1 & 2 & 0 & 1 \\
1 & 11 & 1001 & 8 & 3 & 1 & 1 & 31 & 7 & 10 \\
0 & 1 & 3 & 972 & 0 & 18 & 0 & 1 & 10 & 7 \\
0 & 2 & 3 & 0 & 964 & 0 & 3 & 2 & 1 & 10 \\
2 & 1 & 0 & 5 & 0 & 859 & 13 & 3 & 5 & 2 \\
1 & 1 & 2 & 0 & 3 & 2 & 924 & 0 & 1 & 0 \\
1 & 0 & 1 & 2 & 2 & 0 & 0 & 956 & 1 & 6 \\
5 & 21 & 18 & 17 & 3 & 10 & 8 & 13 & 941 & 15 \\
0 & 0 & 1 & 4 & 6 & 0 & 0 & 19 & 5 & 953
\end{bmatrix}
$$

- The percentage form of this confusion matrix is:

digit	0	1	2	3	4	5	6	7	8	9
0	0.97	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
1	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.01	0.93	0.01	0.00	0.00	0.00	0.03	0.01	0.01
3	0.00	0.00	0.00	0.96	0.00	0.02	0.00	0.00	0.01	0.01
4	0.00	0.00	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.01
5	0.00	0.00	0.00	0.01	0.00	0.97	0.01	0.00	0.01	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.01
8	0.00	0.02	0.02	0.02	0.00	0.01	0.01	0.01	0.90	0.01
9	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.01	0.96

Exercise 3

k-means   NUBS