Machine Learning in Robotics --Assignment 1

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Exercise 1:
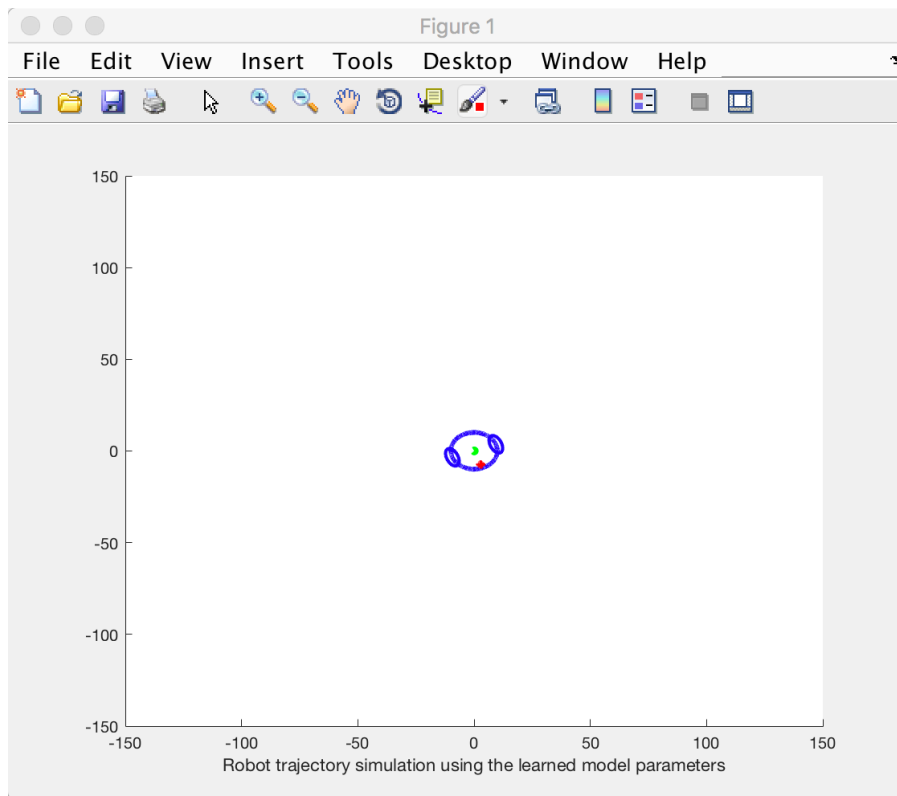
a–b)

For k=2 optimal values: p1=5 , p2=3

For k=5 optimal values: p1=4 , p2=1

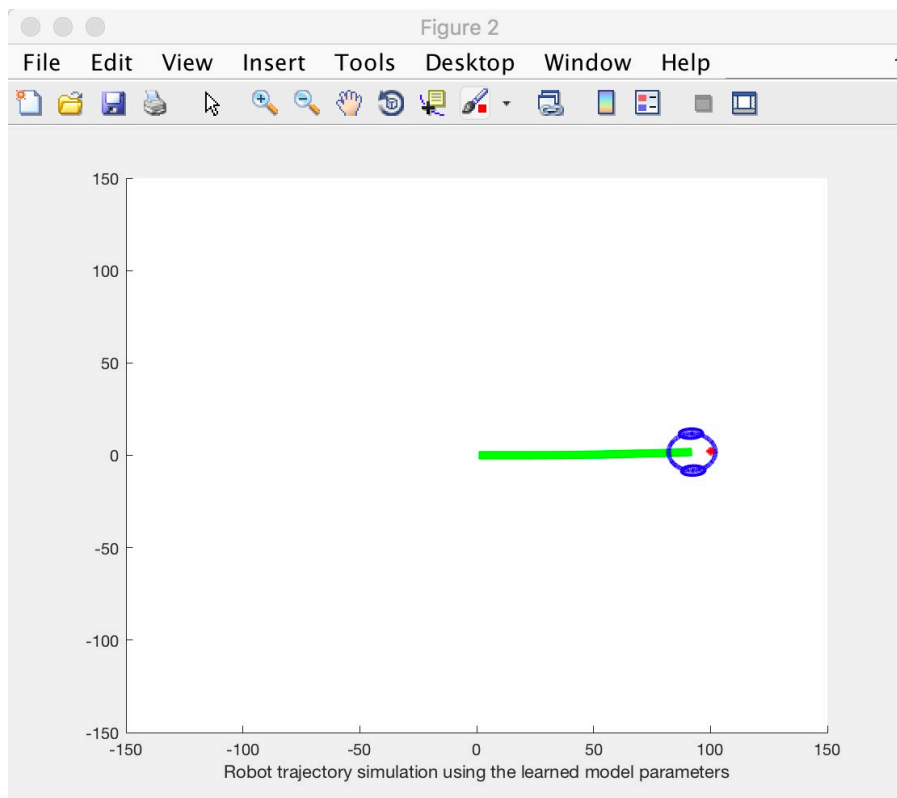learned parameter values , k=5

par{1, 1}	par{1, 2}	par{1, 3}
1	1	
0.0025	−0.0043	
0.9198	−0.0010	
−0.0029	0.0014	
−7.4385e−04	0.4680	
−0.0010	5.6850e−04	
0.0014	−0.0025	
0.0025	−0.0010	
1.3601e−04	1.9246e−05	1
−2.6908e−04	−0.0017	8.0784e−04
6.6926e−05	−6.7254e−04	−3.1902e−04
1.3061e−05	−7.8462e−06	0.9987
−0.0043	0.0035	3.2142e−04
−4.5174e−05	8.7155e−06	

c) Plot for the (v,w) values of $(0, 0.05)$:

Robot trajectory simulation using the learned model parameters

Plot for the (v,w) values of $(1, 0)$:

Robot trajectory simulation using the learned model parameters

Plot for the (v,w) values of (1, 0.05):
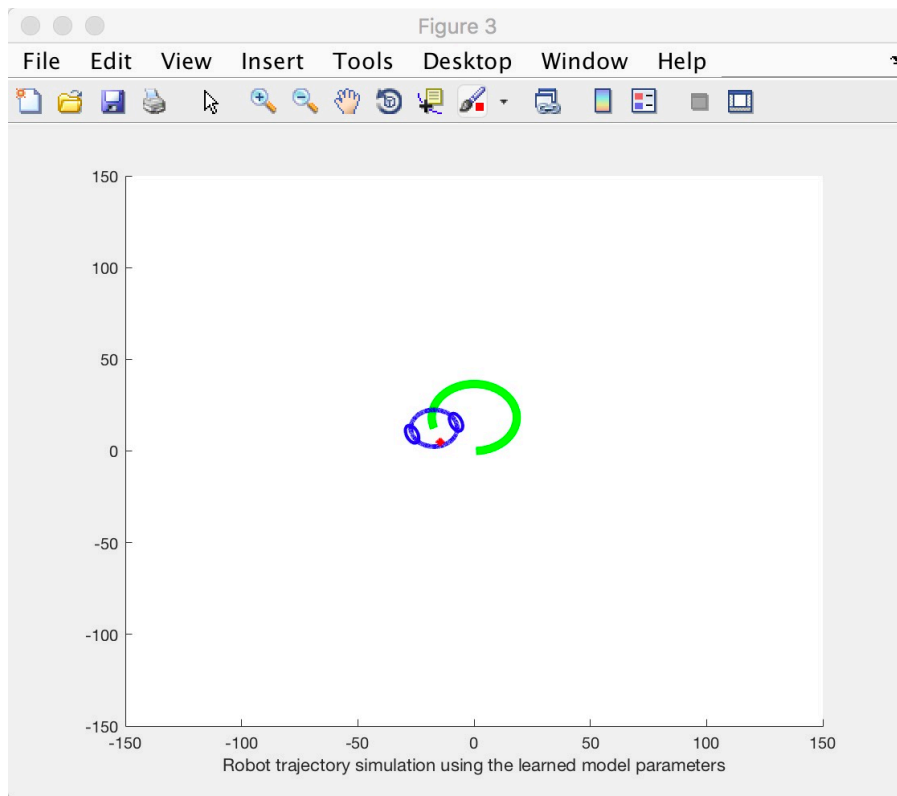
Plot for the (v,w) values of (-1, -0.05):
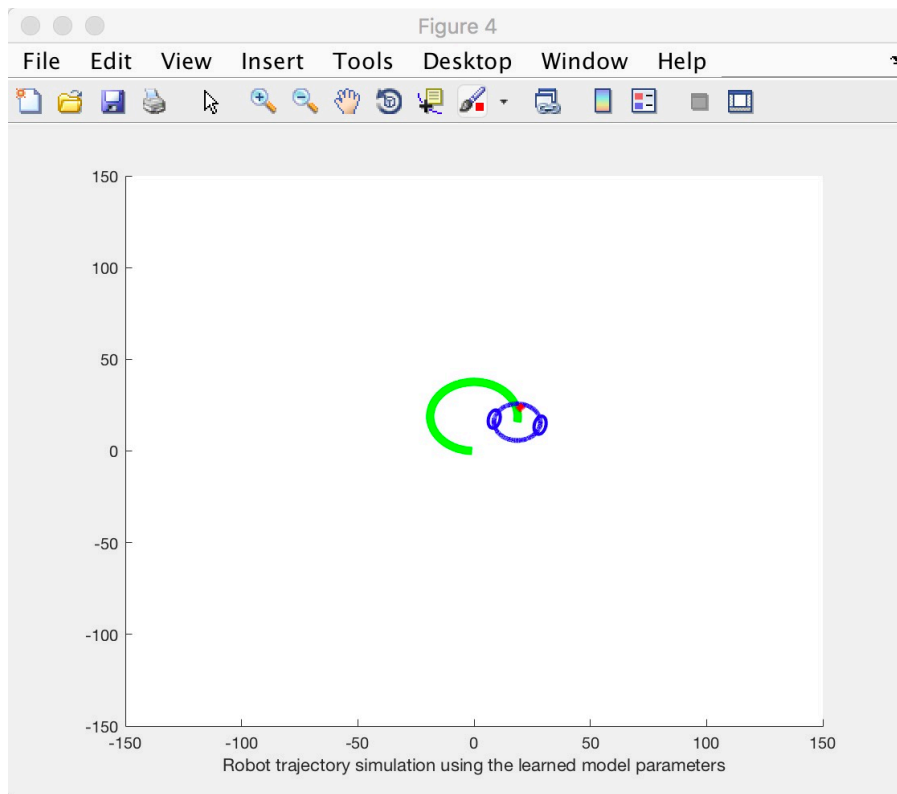
Exercise 2:

Minimal Error: 3.62% at optimal d = 48

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>> Exercise2
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Result:
Minimal error: 3.62 %
with optimal parameter d = 48
with ConfusionMatrix for optimal d:

digit  | 0       1       2       3       4       5       6       7       8       9
----------------------------------------------------------------------------------------
0      | 0.99    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.01    0.00
1      | 0.00    0.97    0.01    0.00    0.00    0.00    0.00    0.00    0.02    0.00
2      | 0.00    0.00    0.97    0.00    0.00    0.00    0.00    0.00    0.02    0.00
3      | 0.00    0.00    0.01    0.96    0.00    0.00    0.00    0.00    0.02    0.00
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    0.02    0.00    0.96    0.00    0.00    0.01    0.00
6      | 0.01    0.00    0.00    0.00    0.00    0.01    0.96    0.00    0.01    0.00
7      | 0.00    0.00    0.03    0.00    0.00    0.00    0.00    0.93    0.01    0.02
8      | 0.00    0.00    0.01    0.01    0.00    0.01    0.00    0.00    0.97    0.01
9      | 0.00    0.00    0.01    0.01    0.01    0.00    0.00    0.01    0.01    0.94
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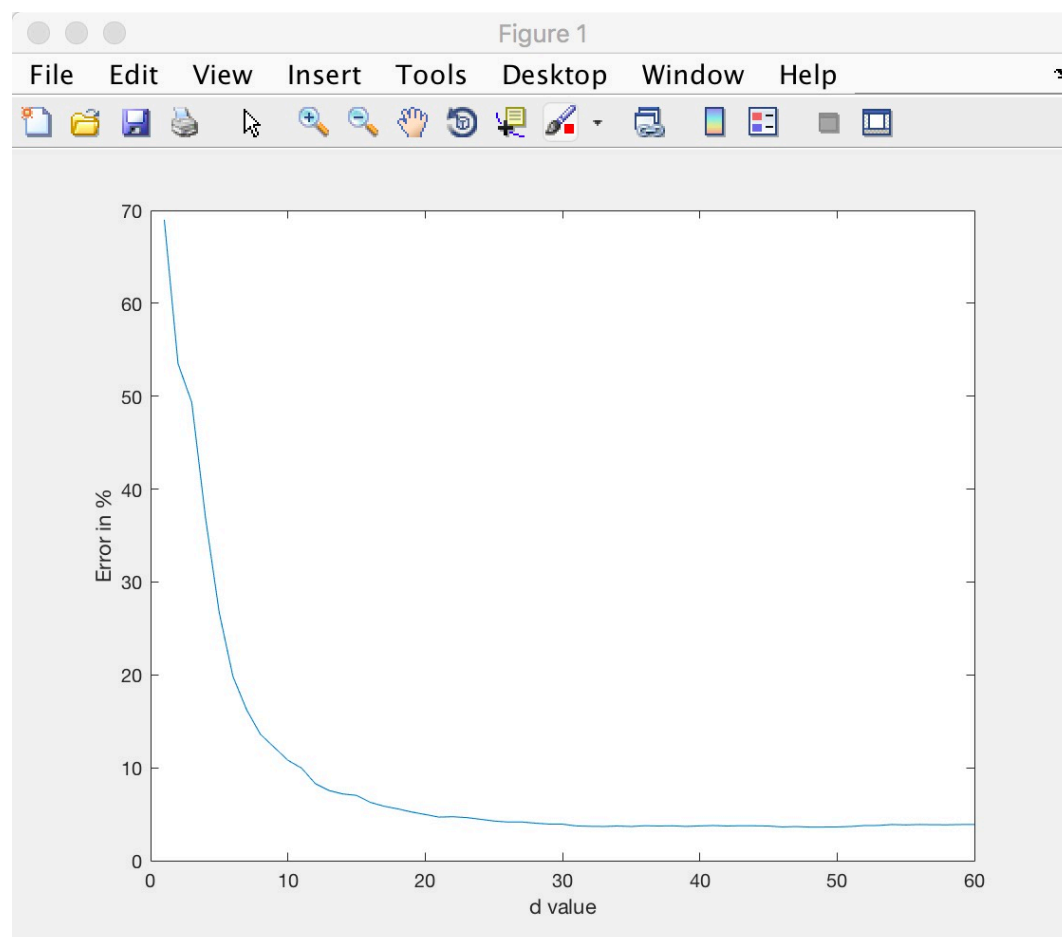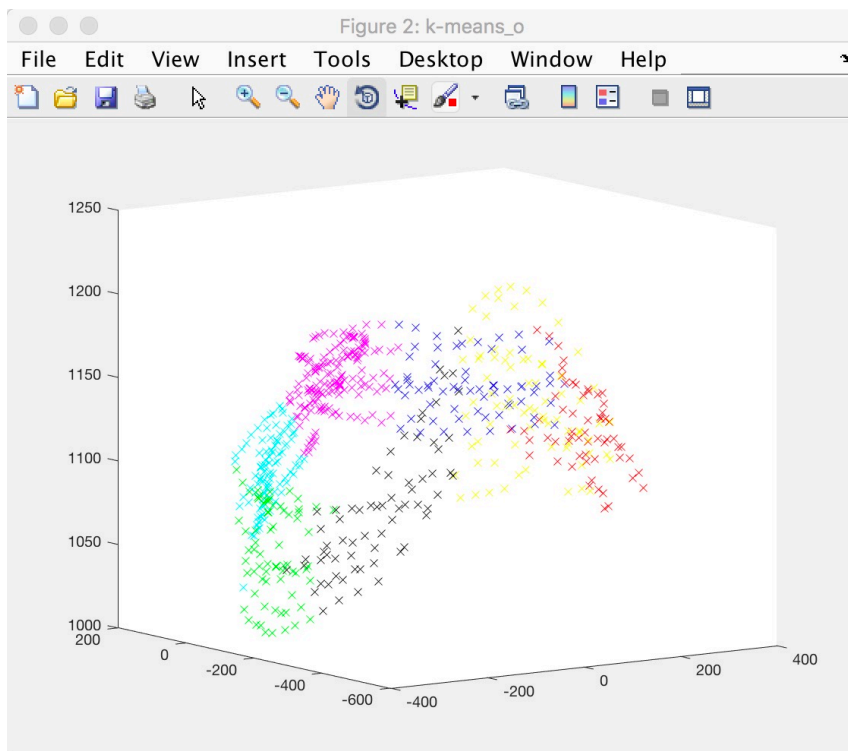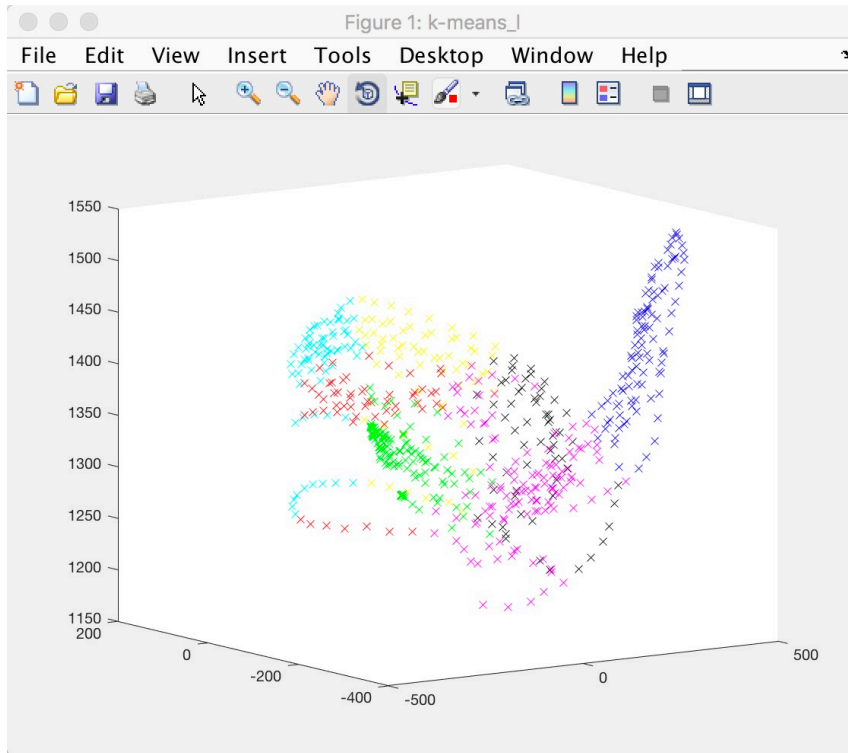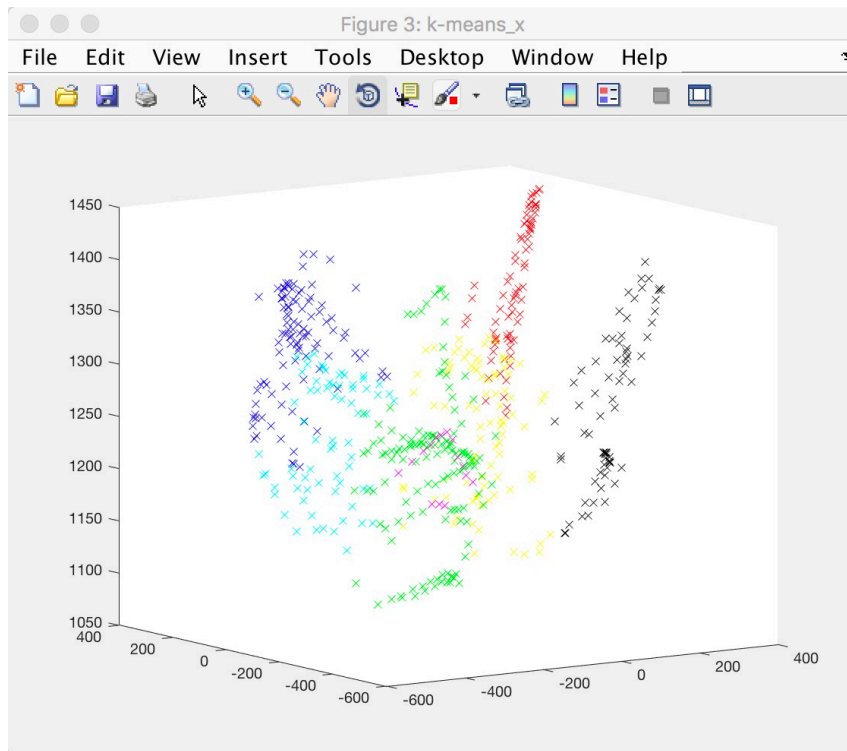
Plot Error:

Exercise 3:

K-Means Plots:

Figure 1: k-means_l

Figure 2: k-means_o

Figure 3: k-means_x

Non-Uniform Binary Split Plots:

Figure 4: non-ubs_l

Figure 5: non-ubs_o

Figure 6: non-ubs_x