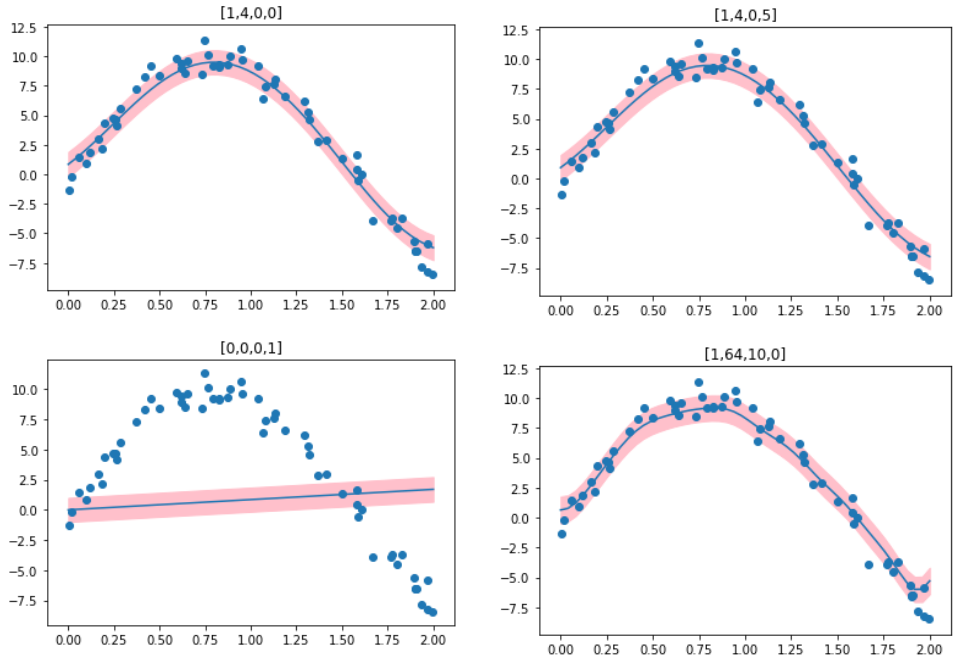
Gaussian Process for Regression homework 3

1.

(i)



(ii)

Training error

kernel1 RMS(train): 1.05224307499

kernel2 RMS(train): 6.65758954447

kernel3 RMS(train): 1.02884040382

kernel4 RMS(train): 1.03287726411

Testing error

kernel2 RMS(test): 6.74853909467

kernel3 RMS(test): 1.2860902333

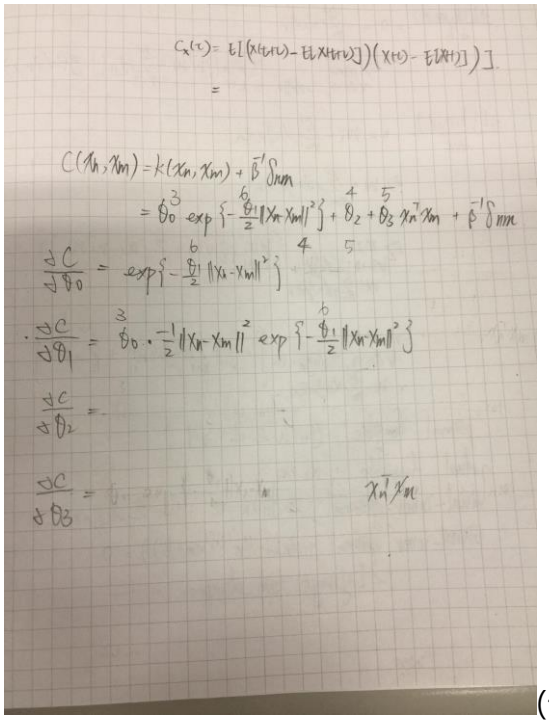
kernel4 RMS(test): 1.37490152336

(iii)

theta 的值對 regression 來說影響很大，選擇適當的 theta 可以讓迴歸的 error 變比較小，如下一小題所做的結果

2.

(i)

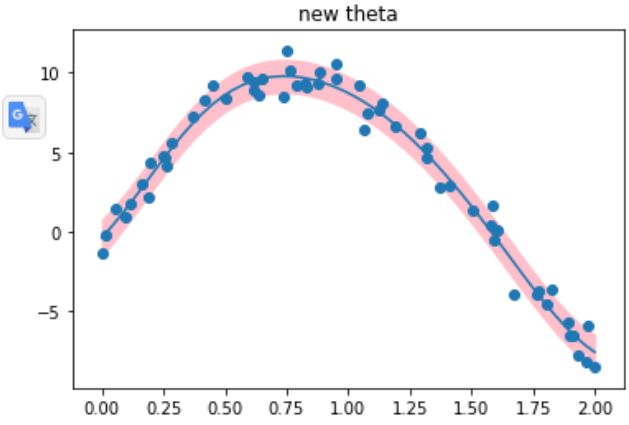


(倒數第二列為 1)

(ii)

theta1 = 10.3564190024
theta2 = 6.0004741783
theta3 = 4.00010058199
theta4 = 5.00001060299

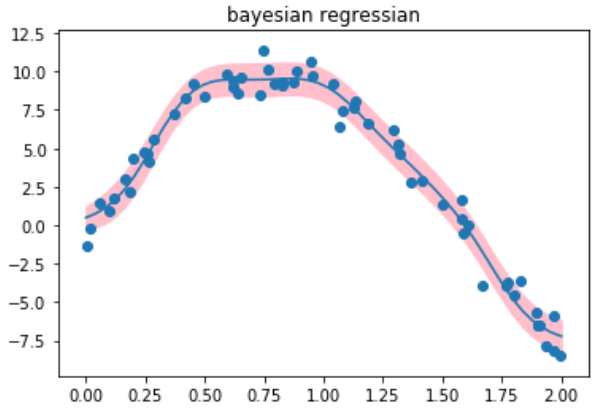
(iii)



(iv)

kernel5 RMS(train): 0.79930429837
kernel5 RMS(test): 1.10038401181

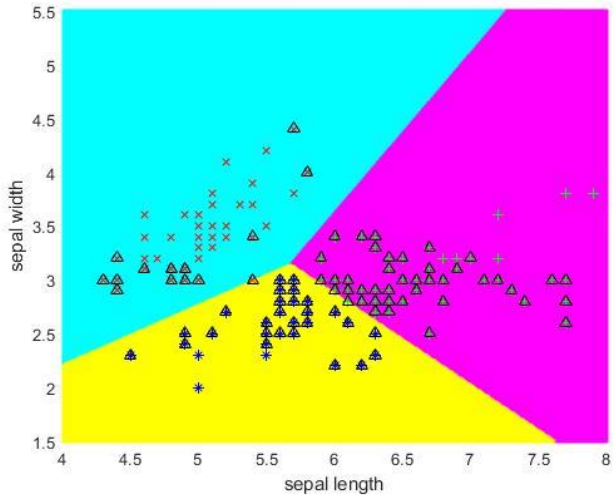
(v)



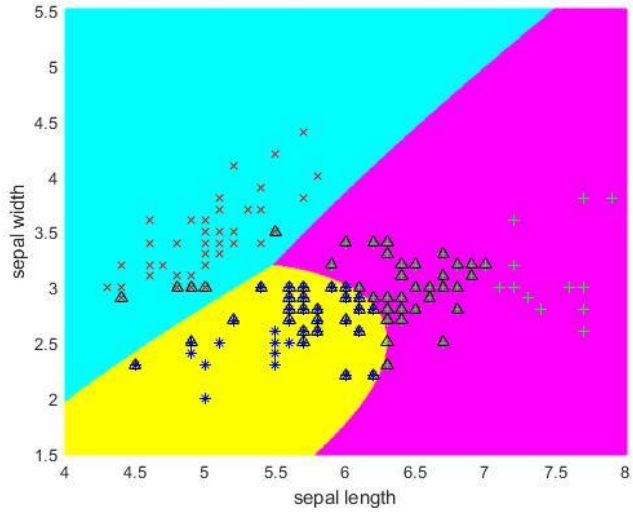
效果差不多，error: 0.8384

2.

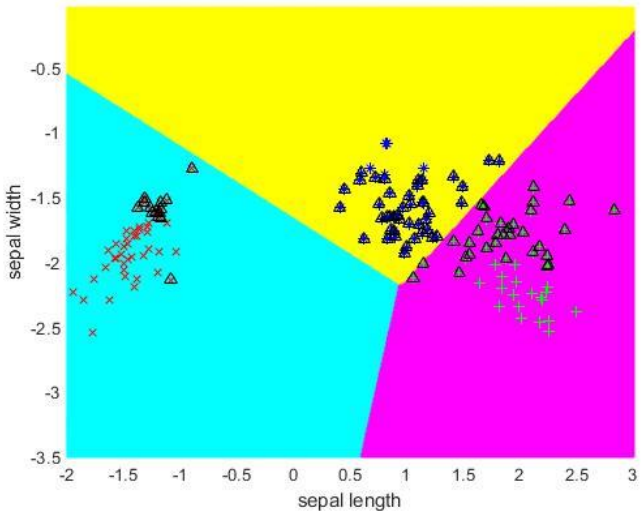
(i)


sepal width
sepal length
5.5
5
4.5
4
3.5
3
2.5
2
1.5
4
4.5
5
5.5
6
6.5
7
7.5
8

(ii)


sepal width
sepal length
5.5
5
4.5
4
3.5
3
2.5
2
1.5
4
4.5
5
5.5
6
6.5
7
7.5
8

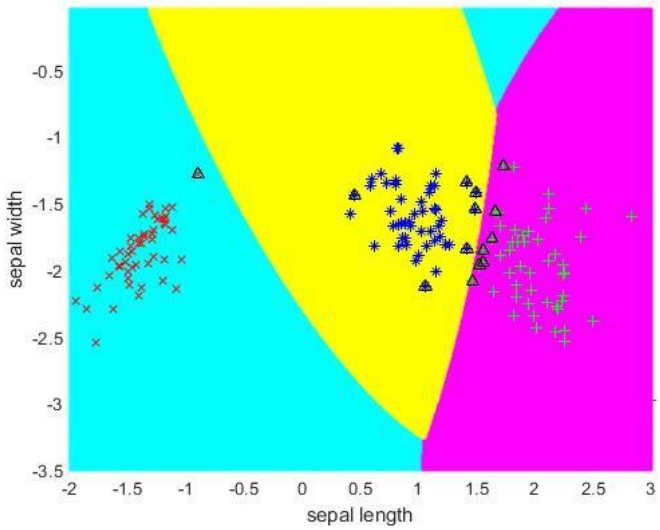
(iii)



(x,y 軸為降維後的 feature)

(不是 sepal length and sepal width)

(iv)



(x,y 軸為降維後的 feature)

(不是 sepal length and sepal width)

(v)使用 LDA 降維後，資料明顯分開許多，與前次作業所任選的 feature 有所差異，效果當然也比任選的好上許多

3.

(i)k=2

	1	2	3
1	0.4664	0.8776	0.1105
2	0.0730	0.1745	0.9819

K=3

	1	2	3
1	0.5583	0.4909	0.6689
2	0.7071	0.6988	0.1081
3	0.8723	0.4842	0.0676

K=5

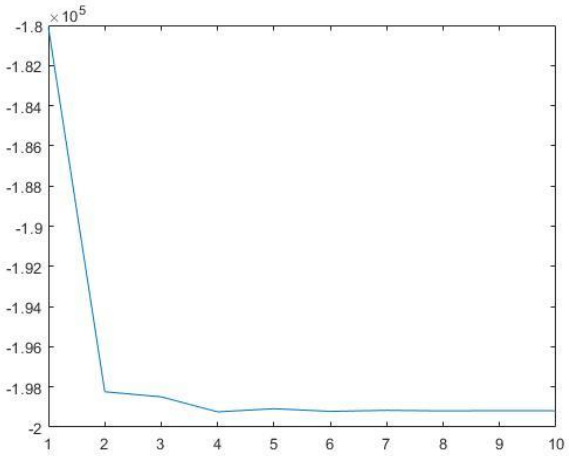
	1	2	3
1	0.2478	0.7094	0.6598
2	0.0038	0.6247	0.7809
3	0.6685	0.1804	0.7215
4	0.1627	0.7470	0.6446
5	0.3632	0.8413	0.4003

K=20

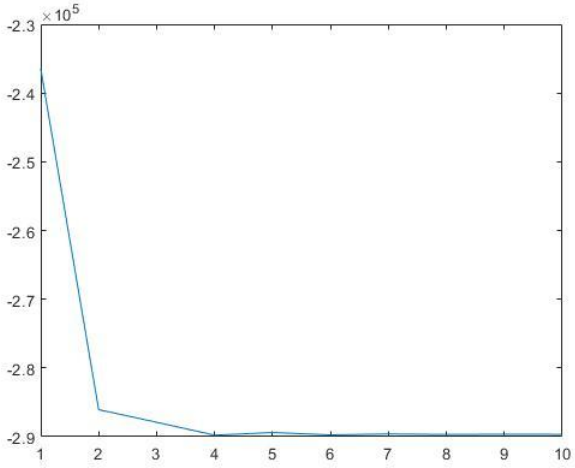
	1	2	3
1	0.7856	0.1399	0.6027
2	0.3207	0.0421	0.9463
3	0.0106	0.8295	0.5583
4	0.3253	0.8488	0.4168
5	0.1848	0.9377	0.2943
6	0.6340	0.4769	0.6088
7	0.5970	0.6306	0.4959
8	0.6839	0.6613	0.3081
9	0.5199	0.8525	0.0535
0	0.4468	0.3875	0.8064
1	0.4823	0.7519	0.4494
2	0.7591	0.4237	0.4943
3	0.1543	0.5434	0.8252
4	0.4999	0.4488	0.7407
5	0.1061	0.9943	0.0044
6	0.5007	0.6650	0.5542
7	0.5762	0.3841	0.7214
8	0.6151	0.4620	0.6389
9	0.1902	0.9585	0.2122
0	0.6138	0.7717	0.1666

(ii)

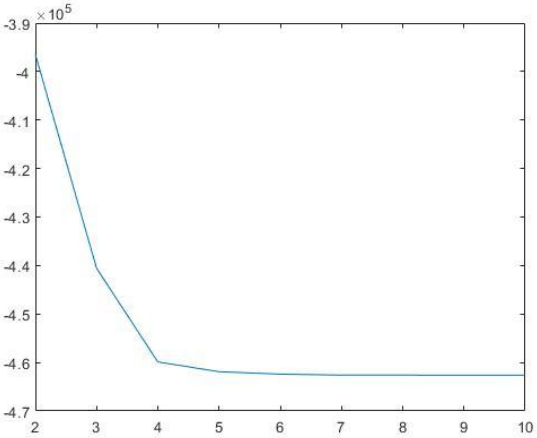
k=2



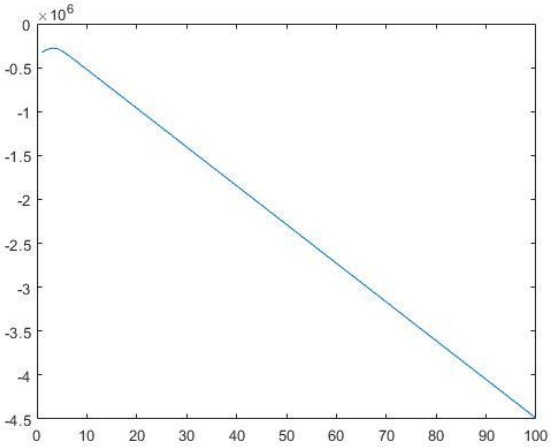
K=3


×10^5
-2.3
-2.4
-2.5
-2.6
-2.7
-2.8
-2.9
1
2
3
4
5
6
7
8
9
10

k=5


×10^5
-3.9
-4
-4.1
-4.2
-4.3
-4.4
-4.5
-4.6
-4.7
2
3
4
5
6
7
8
9
10

K=20


×10^6
0
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
-4
-4.5
0
10
20
30
40
50
60
70
80
90
100

(iii)

k=2

k=3

k=5

k=20