Machine Learning (Homework 2)

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1. Bayesian Linear Regression

(1)

- N = 10

Mn	Sn
2.49	[1.39 -2.11 1.28 -0.6 0.05 -0.01 0.]
3.75	[-2.11 29.04 -47.83 22.43 -1.9 0.42 -0.05]
-0.59	[1.28 -47.83 84.34 -40.56 3.45 -0.77 0.1]
1.45	[-0.6 22.43 -40.56 21.13 -3.07 0.74 -0.09]
-3.39	[0.05 -1.9 3.45 -3.07 2.92 -1.65 0.22]
-2.34	[-0.01 0.42 -0.77 0.74 -1.65 1.9 -0.72]
-4.03	[0. -0.05 0.1 -0.09 0.22 -0.72 1.65]

- N = 15

Mn	Sn
3.0	[0.72 -0.98 0.49 -0.28 0.06 -0.01 0.]
3.67	[-0.98 3.79 -5.35 3.05 -0.66 0.16 -0.02]
-1.54	[0.49 -5.35 10.66 -6.98 1.51 -0.36 0.04]
1.83	[-0.28 3.05 -6.98 5.77 -2.02 0.51 -0.06]
-3.21	[0.06 -0.66 1.51 -2.02 2.45 -1.49 0.18]
-2.36	[-0.01 0.16 -0.36 0.51 -1.49 1.69 -0.63]
-3.6	[0. -0.02 0.04 -0.06 0.18 -0.63 1.24]

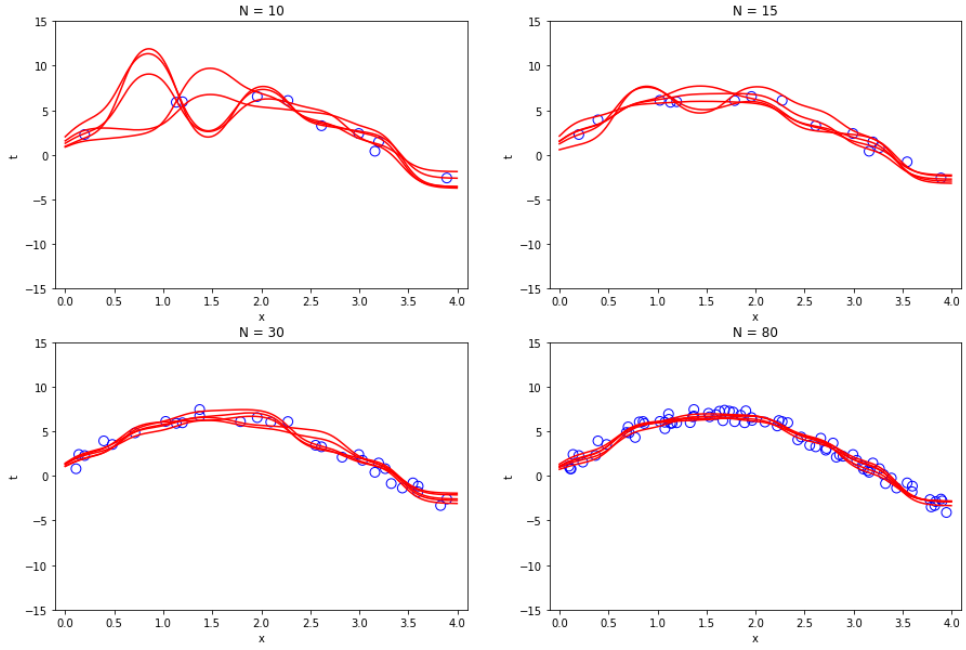
- N = 30

Mn	Sn
2.64	[0.34 -0.46 0.17 -0.05 0.01 -0. 0.]
2.88	[-0.46 1.34 -1.19 0.37 -0.06 0.01 -0.]
1.4	[0.17 -1.19 1.84 -0.95 0.16 -0.03 0.01]
-0.33	[-0.05 0.37 -0.95 1.21 -0.71 0.15 -0.03]
-3.05	[0.01 -0.06 0.16 -0.71 1.22 -0.72 0.13]
-2.37	[-0. 0.01 -0.03 0.15 -0.72 0.93 -0.43]
-3.69	[0. -0. 0.01 -0.03 0.13 -0.43 0.64]

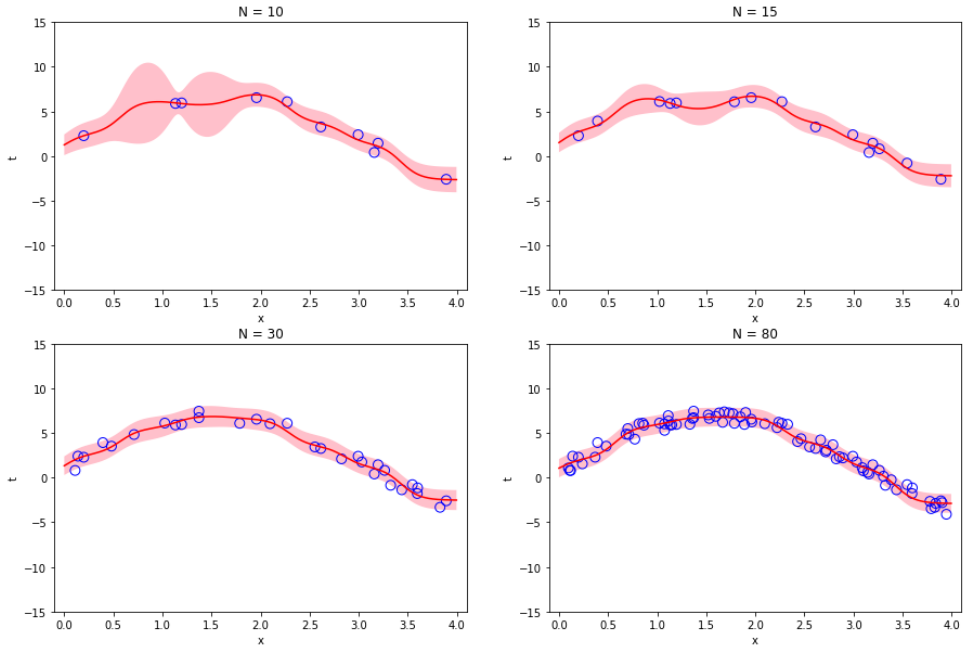
· N = 80

Mn	Sn
2.1	[0.18 -0.21 0.04 -0.01 0. -0. 0.]
3.69	[-0.21 0.39 -0.24 0.08 -0.02 0.01 -0.]
1.0	[0.04 -0.24 0.4 -0.27 0.09 -0.02 0.]
0.02	[-0.01 0.08 -0.27 0.42 -0.27 0.06 -0.01]
-2.92	[0. -0.02 0.09 -0.27 0.41 -0.25 0.06]
-2.81	[-0. 0.01 -0.02 0.06 -0.25 0.38 -0.2]
-3.97	[0. -0. 0. -0.01 0.06 -0.2 0.29]

(2)

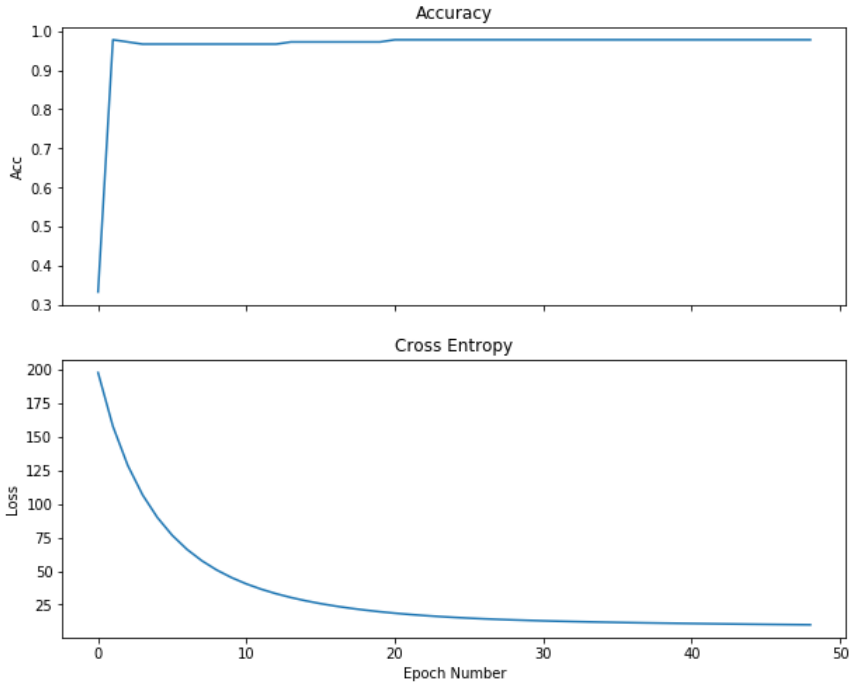


(3)



2. Logistic Regression

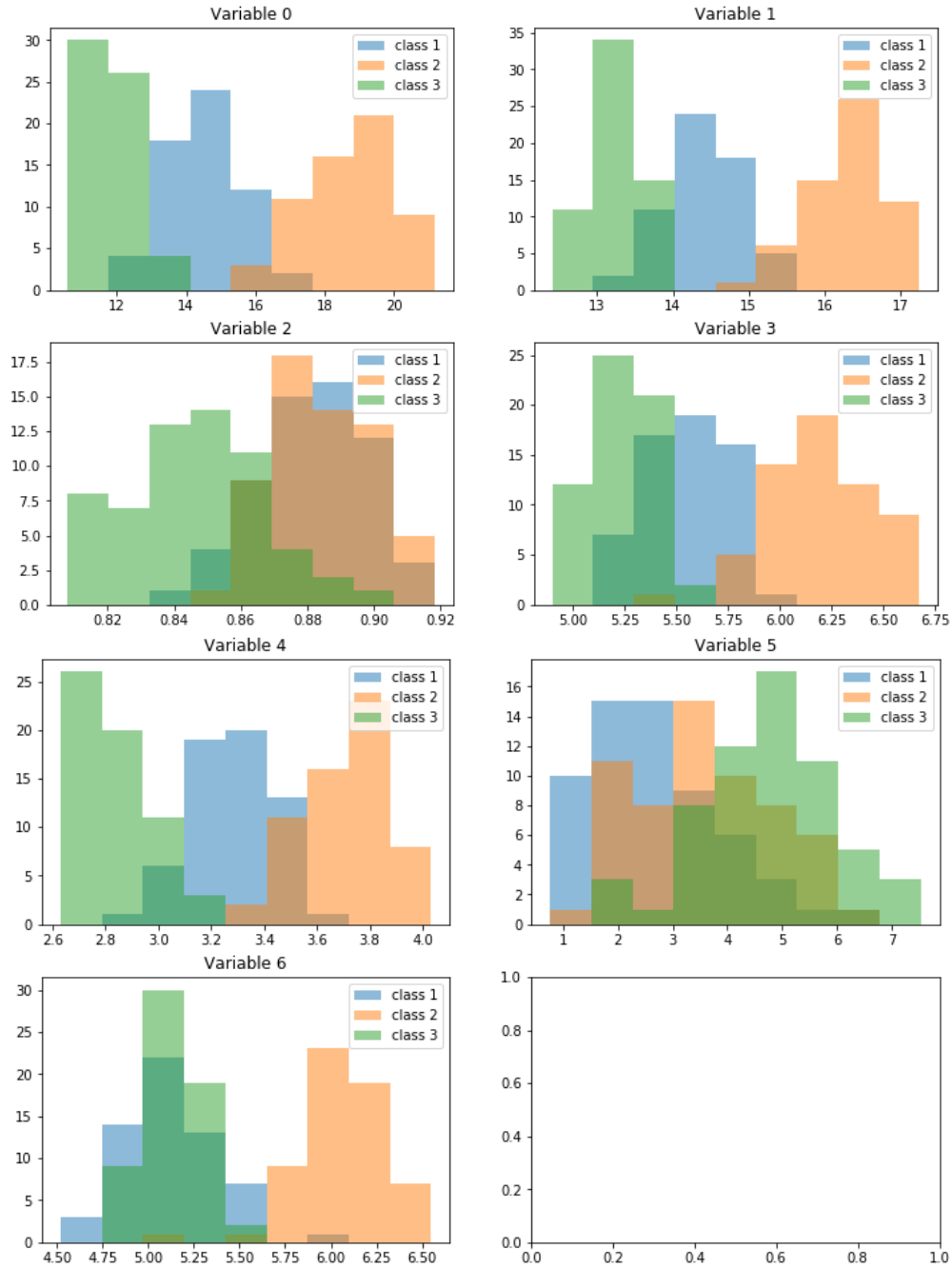
(1)



(2)

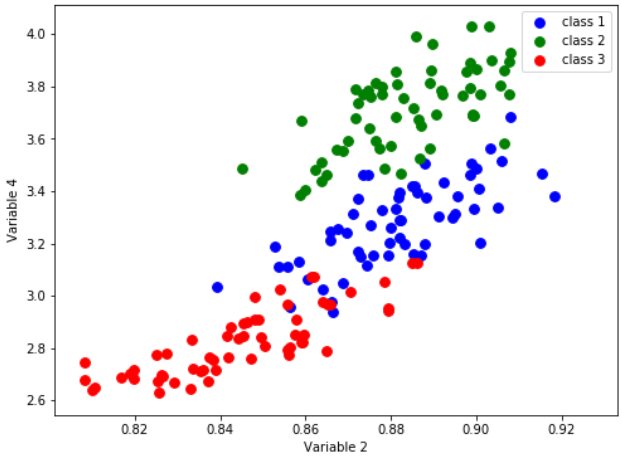
var0	var1	var2	var3	var4	var5	var6	predict
11.42	12.86	0.87	5.01	2.85	2.7	4.61	2
11.23	12.63	0.88	4.9	2.88	2.27	4.7	2
12.36	13.19	0.89	5.08	3.04	3.22	4.61	2
13.22	13.84	0.87	5.4	3.07	4.16	5.09	2
12.78	13.57	0.87	5.26	3.03	1.18	4.78	2
12.88	13.5	0.89	5.14	3.12	2.35	4.61	2
14.34	14.37	0.87	5.63	3.19	1.31	5.15	2
14.01	14.29	0.86	5.61	3.16	2.22	5.13	2
14.37	14.39	0.87	5.57	3.15	1.46	5.3	2
12.73	13.75	0.85	5.41	2.88	3.53	5.07	2
18.3	15.89	0.91	5.98	3.76	2.84	5.96	1
18.94	16.32	0.89	6.14	3.82	2.91	5.95	1
15.38	14.9	0.87	5.88	3.27	4.46	5.8	0
16.16	15.33	0.86	5.84	3.4	4.27	5.8	1
15.56	14.89	0.88	5.78	3.41	4.97	5.85	1
15.38	14.66	0.9	5.48	3.46	3.6	5.44	1
17.36	15.76	0.88	6.14	3.57	3.53	5.97	1
15.57	15.15	0.85	5.92	3.23	2.64	5.88	1
15.6	15.11	0.86	5.83	3.29	2.72	5.75	1
16.23	15.18	0.88	5.87	3.47	3.77	5.92	1
12.38	13.44	0.86	5.22	2.99	5.47	5.04	0
12.67	13.32	0.9	4.98	3.14	2.3	4.74	2
11.18	12.72	0.87	5.01	2.81	4.05	4.83	0
12.7	13.41	0.89	5.18	3.09	8.46	5.0	0
12.37	13.47	0.86	5.2	2.96	3.92	5.0	0
12.19	13.2	0.88	5.14	2.98	3.63	4.87	2
11.23	12.88	0.85	5.14	2.8	4.32	5.0	0
13.2	13.66	0.89	5.24	3.23	8.32	5.06	0
11.84	13.21	0.85	5.18	2.84	3.6	5.04	0
12.3	13.34	0.87	5.24	2.97	5.64	5.06	0

(3)

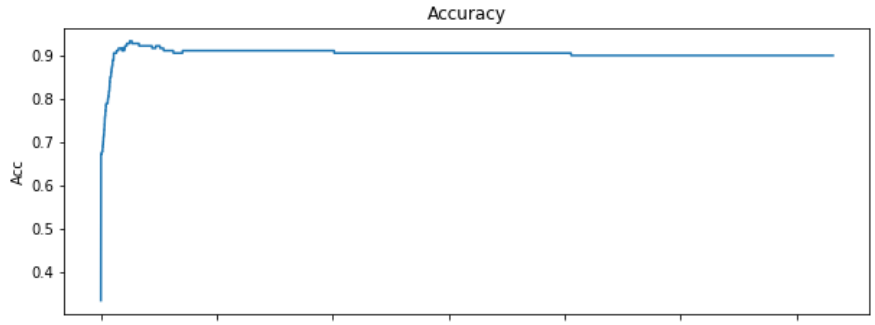


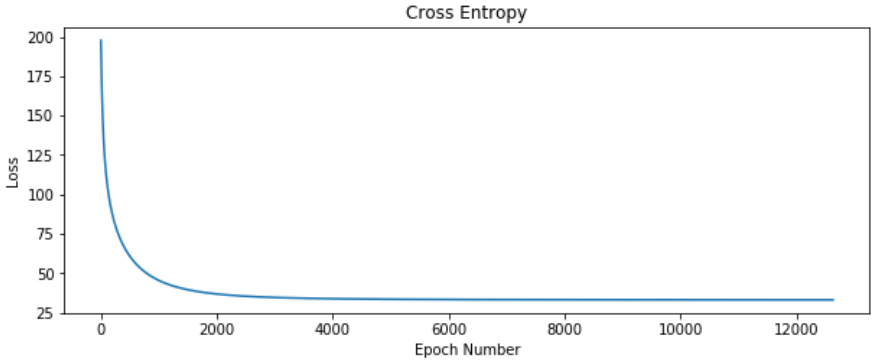
(4) 因為我們是透過 convex function 求出的，所以可以保證為 global minimum。

(5) 經過實驗發現，最具貢獻的變數是第二項與第四項，右圖此兩項變數的分布圖。



(6)





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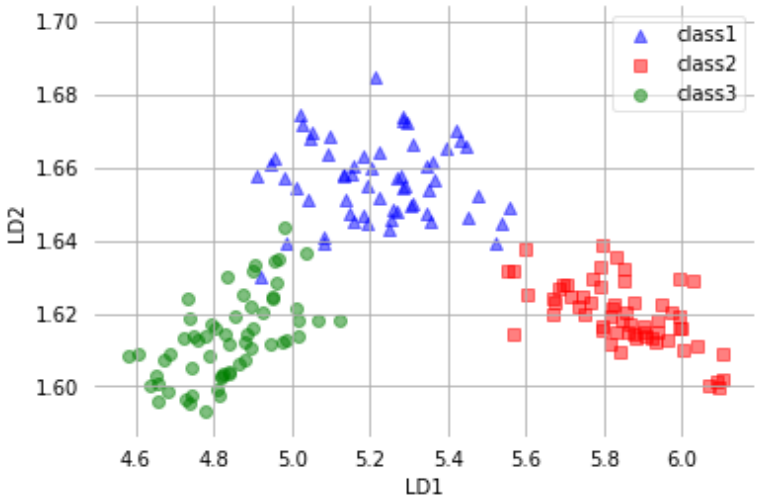
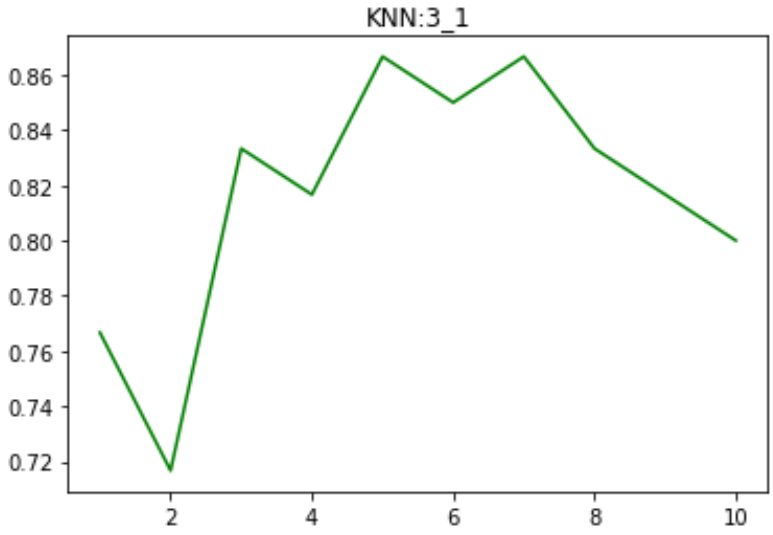
11.23	12.63	0.88	4.9	2.88	2.27	4.7	0
12.36	13.19	0.89	5.08	3.04	3.22	4.61	0
13.22	13.84	0.87	5.4	3.07	4.16	5.09	2
12.78	13.57	0.87	5.26	3.03	1.18	4.78	0
12.88	13.5	0.89	5.14	3.12	2.35	4.61	0
14.34	14.37	0.87	5.63	3.19	1.31	5.15	2
14.01	14.29	0.86	5.61	3.16	2.22	5.13	2
14.37	14.39	0.87	5.57	3.15	1.46	5.3	2
12.73	13.75	0.85	5.41	2.88	3.53	5.07	0
18.3	15.89	0.91	5.98	3.76	2.84	5.96	1
18.94	16.32	0.89	6.14	3.82	2.91	5.95	1
15.38	14.9	0.87	5.88	3.27	4.46	5.8	2
16.16	15.33	0.86	5.84	3.4	4.27	5.8	2
15.56	14.89	0.88	5.78	3.41	4.97	5.85	2
15.38	14.66	0.9	5.48	3.46	3.6	5.44	2
17.36	15.76	0.88	6.14	3.57	3.53	5.97	1
15.57	15.15	0.85	5.92	3.23	2.64	5.88	2
15.6	15.11	0.86	5.83	3.29	2.72	5.75	2
16.23	15.18	0.88	5.87	3.47	3.77	5.92	2
12.38	13.44	0.86	5.22	2.99	5.47	5.04	0
12.67	13.32	0.9	4.98	3.14	2.3	4.74	0
11.18	12.72	0.87	5.01	2.81	4.05	4.83	0
12.7	13.41	0.89	5.18	3.09	8.46	5.0	0
12.37	13.47	0.86	5.2	2.96	3.92	5.0	0
12.19	13.2	0.88	5.14	2.98	3.63	4.87	0
11.23	12.88	0.85	5.14	2.8	4.32	5.0	0
13.2	13.66	0.89	5.24	3.23	8.32	5.06	2
11.84	13.21	0.85	5.18	2.84	3.6	5.04	0
12.3	13.34	0.87	5.24	2.97	5.64	5.06	0

(7)



3. Nonparametric Methods

(1)



(2)