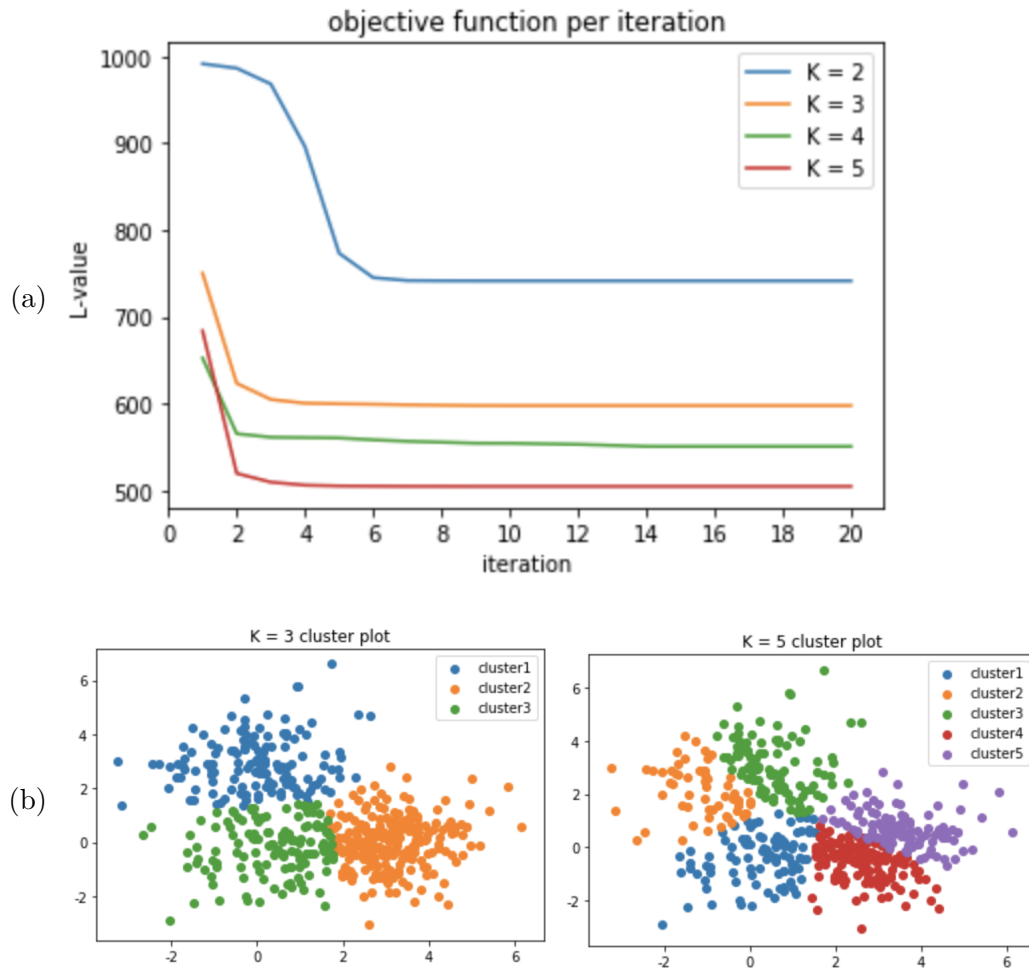
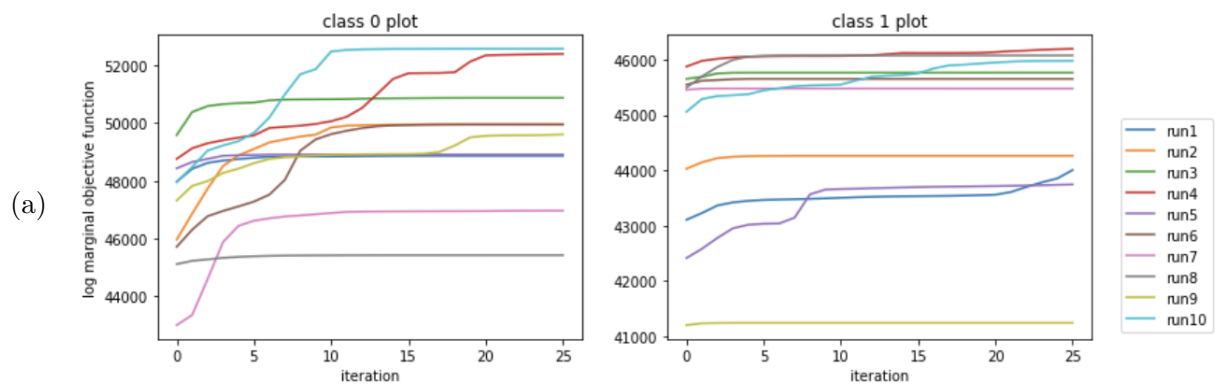


## 1. Solution to Problem 1



## 2. Solution to Problem 2



(b) Result of 1-GMM:

Accuracy: 0.64

	<b>y_1</b>	<b>y_0</b>
<b>pred_1</b>	173	156
<b>pred_0</b>	9	122

Result of 2-GMM:

Accuracy: 0.73

	<b>y_1</b>	<b>y_0</b>
<b>pred_1</b>	172	114
<b>pred_0</b>	10	164

Result of 3-GMM:

Accuracy: 0.76

	<b>y_1</b>	<b>y_0</b>
<b>pred_1</b>	170	96
<b>pred_0</b>	12	182

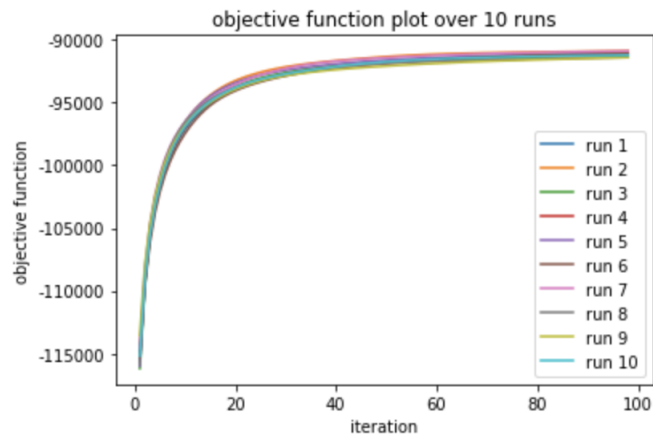
Result of 4-GMM:

Accuracy: 0.78

	<b>y_1</b>	<b>y_0</b>
<b>pred_1</b>	161	77
<b>pred_0</b>	21	201

### 3. Solution to Problem 3

(a)



	rmse	objective
1	1.1156	-90886.2
6	1.11972	-90888.6
4	1.10314	-91019.3
5	1.1473	-91051.3
3	1.12152	-91087.4
0	1.10324	-91192.2
9	1.08699	-91214.8
2	1.11788	-91286.8
7	1.13138	-91393.2
8	1.12629	-91404.3

(b) The list contains 11 movies (including the movie being picked)

10 closest movies for Goodfellas:

	movie_id	movie_name	distance
0	182	GoodFellas	0.000000
1	180	Apocalypse Now	0.718481
2	187	Godfather: Part II, The	0.787832
3	177	Good, The Bad and The Ugly, The	0.810482
4	523	Cool Hand Luke	0.836712
5	518	Miller's Crossing	0.837655
6	469	Short Cuts	0.840653
7	188	Full Metal Jacket	0.853117
8	504	Bonnie and Clyde	0.909487
9	494	His Girl Friday	0.927509
10	135	2001: A Space Odyssey	0.972085

10 closest movies for My Fair Lady:

	movie_id	movie_name	distance
0	485	My Fair Lady	0.000000
1	419	Mary Poppins	0.432294
2	486	Sabrina	0.587397
3	699	Little Women	0.686037
4	8	Babe	0.743942
5	418	Cinderella	0.761354
6	465	Jungle Book, The	0.766173
7	602	American in Paris, An	0.771249
8	705	Singin' in the Rain	0.781714
9	99	Snow White and the Seven Dwarfs	0.795669
10	1197	Family Thing, A	0.814295

10 closest movies for Star Wars:

	movie_id	movie_name	distance
0	50	Star Wars	0.000000
1	172	Empire Strikes Back, The	0.322864
2	174	Raiders of the Lost Ark	0.501493
3	181	Return of the Jedi	0.660750
4	210	Indiana Jones and the Last Crusade	0.862648
5	12	Usual Suspects, The	0.953355
6	204	Back to the Future	1.005424
7	613	My Man Godfrey	1.028646
8	87	Searching for Bobby Fischer	1.059556
9	166	Manon of the Spring	1.070490
10	487	Roman Holiday	1.073037