TASK 2 - Classification

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Task 2.1

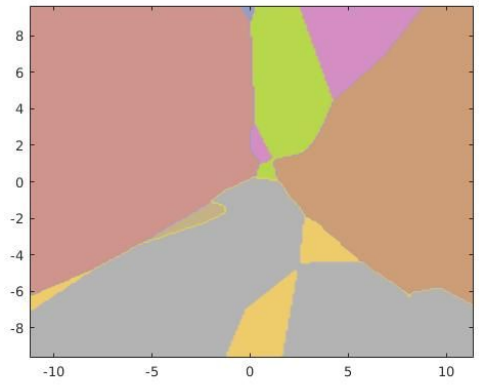
Number of test samples N is 4013.
Report information shown on the display

```
k = 1
Elapsed time is 17.711891 seconds
Nerrs = 126
acc = 0.9686

k = 3
Elapsed time is 13.492741 seconds
Nerrs = 114
acc = 0.9716

k = 5
Elapsed time is 12.604080 seconds
Nerrs = 117
acc = 0.9708

k = 10
Elapsed time is 12.561000 seconds
Nerrs = 137
acc = 0.9659

k = 20
Elapsed time is 12.655084 seconds
Nerrs = 149
acc = 0.9629
```

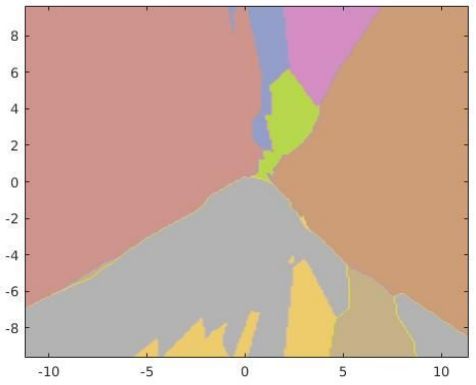
Task 2.2

Cross section decision regions of k-NN with a 2D PCA plane.
When running on the whole dataset of Xtrn and Ytrn, my program exhausted the memory, so I used a subset of data.
N = 2000;
Dmap = task2_2(Xtrn(1:N,:), Ytrn(1:N), k, ‘task1_3_evecs.mat’, ’task1_3_evals.mat’, mean(Xtrn), 200);

k = 1

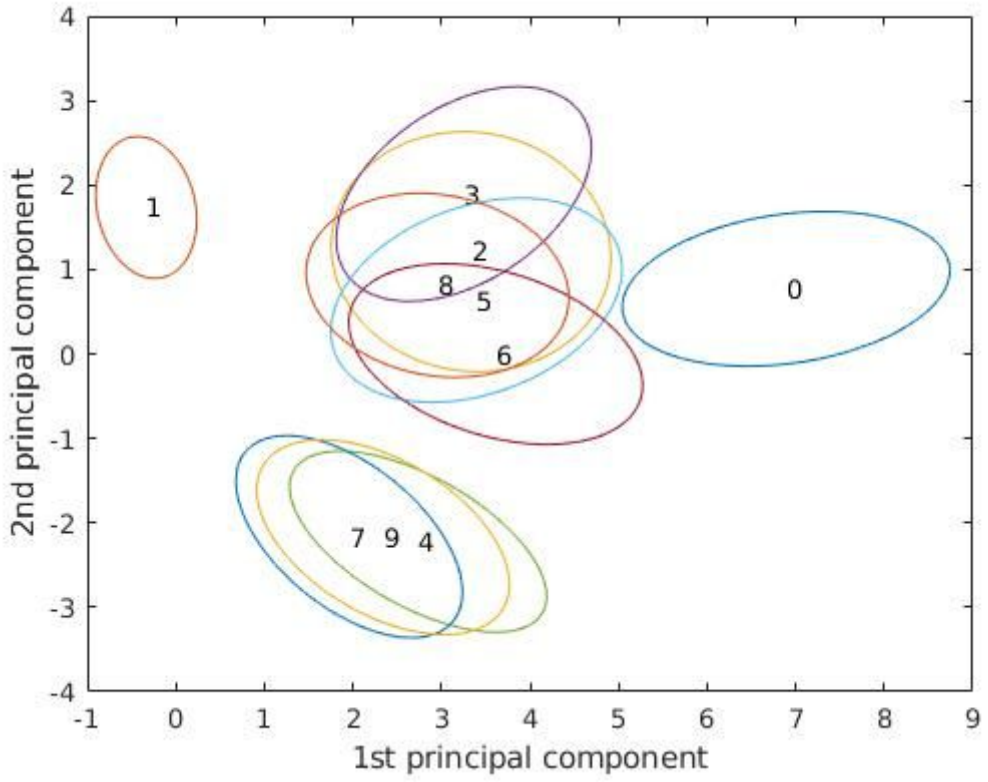


k = 3



Task 2.3

Contour of Gaussian distribution for each class after transforming data to 2D PCA



Task 2.4

Correlation r12 on 2D PCA for each class and all classes

k = 1	0.234849617418761
k = 2	-0.171383864517968
k = 3	-0.0492594554621084
k = 4	0.425478859573818
k = 5	-0.604093998326147
k = 6	0.305344908401131
k = 7	-0.347761918791256
k = 8	-0.550406624500068
k = 9	-0.135873875846673
k = 10	-0.485649153900341
Correlation for all classes	1.16756437305762e-16

Task 2.5

Calling the classification function with epsilon = 0.01, the total elapsed time is 2.181291 seconds.

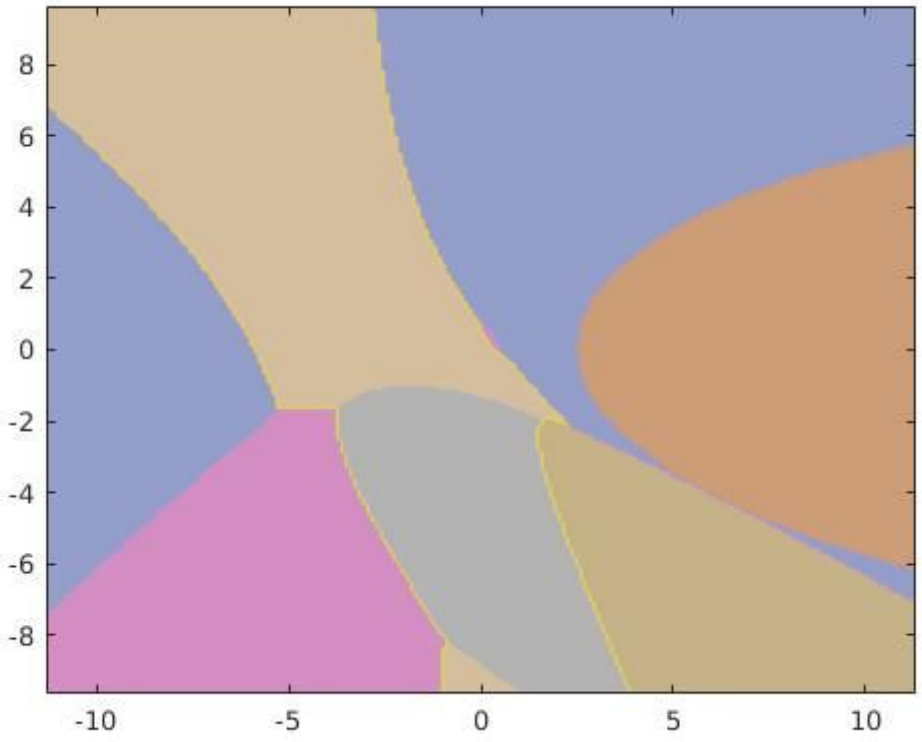
Confusion matrix

379	0	2	2	0	2	2	0	9	0
0	400	15	0	0	0	2	0	45	0
1	0	405	0	0	0	0	0	13	0
1	0	3	377	0	3	0	0	17	3
0	0	4	0	381	0	1	3	4	1
1	0	1	8	0	322	3	1	18	0
1	0	3	0	0	5	369	0	8	0
0	0	6	2	7	1	0	375	5	8
1	0	4	5	0	0	0	1	387	0
2	0	1	5	9	0	0	3	13	363

Number of test samples N = 4013
Number of wrongly classified test samples Nerrs = 255
Accuracy acc = 0.9365

Task 2.6

Cross section visualisation of decision regions of the Gaussian classifiers with a 2D PCA plane.



Task 2.7

For each ratio, the variation on the confusion matrix is minimal, which explains why the accuracy varies slightly.

Ratio = 0.9 acc = 0.9367	Ratio = 0.8 acc = 0.9370
Ratio = 0.7 acc = 0.9372	Ratio = 0.6 acc = 0.9370

Ratio = 0.5 acc = 0.9372 Ratio = 0.3 acc = 0.9375	Ratio = 0.4 acc = 0.9360

Task 2.8