# CSC 340 Software Development Project 1

23 January

Due: 11:59 PM, 8 February 2018

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1. Find the *mean* *vectors* **m**1 and **m**2 for each of the classes.

Mean vector **m1** of Class 1:

Mean vector **m2** of Class 2:

1. Find the covariance matrices ****1 and ****2 for the classes.

Covariance matrix **1**of Class 1:   
  
Covariance matrix **2**of Class 2:

1. Find and report the ***determinants***, |****1| and |****2|, of the covariance matrices ****1 and ****2 for the classes.

Determinant |****1| of Class 1: 1.0692535232196974  
  
Determinant |****2| of Class 2: 2.594915428625533

1. Find and report the ***inverses***, ****1-1 and ****2-1, of the covariance matrices ****1 and ****2 for the classes. WRONG

Inverse matrix ****1-1 of Class 1:   
  
Inverse matrix ****2-1 of Class 2:

1. Find and report the discriminant functions g1(**x**) and g2(**x**) for the classes? Report these with the right-hand side of each equation ***in matrix form***.
2. Into which classes would your classifier place the points **m**1 and **m**2?

|  |  |  |
| --- | --- | --- |
|  | m1 | m2 |
| g1(x) | -0.7266275621388192 | -12.105113163981919 |
| g2(x) | -7.248803117155587 | -1.1699241435408188 |

Point m1 would be in class 1

Point m2 would be in class 2

1. Use your personally implemented matrix manipulation tools to determine how many classification errors occur when you apply the discriminant functions to the example data for each class?
   1. List the ***misclassified*** points separately for each class and provide the values of both discriminant functions g1(**x**) and g2(**x**) for each point (example vector) **x**. (Use a table showing **x**, g1(**x**), and g2(**x**) for each misclassified point **x** to organize this response.)
   2. Summarize your findings by presenting a table of the tallies of correctly and incorrectly classified items. The table should contain one row and one column for each class. In the table, the entry in row j and column k should report the number of objects in class j that the classifier indicates would be in class k.)
      1. How many examples are correctly identified for each class?
      2. How many examples are incorrectly identified for each class?
2. Estimate and plot the boundary contour generated by the classifier.
3. Linear systems:
   1. If one a solution exists, use your implementation of Gauss-Jordan Elimination Algorithm to ***estimate the*** ***solution*** for the following linear system:

**Matrix A8x8: 2.0 1.0 -1.0 -1.0 1.0 0.0 -1.0 -1.0**

**1.0 0.0 2.0 0.0 -1.0 -2.0 2.0 2.0**

**0.0 -2.0 5.0 4.0 -1.0 0.0 3.0 1.0**

**1.0 1.0 -7.0 3.0 2.0 1.0 -1.0 0.0**

**1.0 1.0 2.0 3.0 -2.0 2.0 2.0 9.0**

**0.0 -3.0 -2.0 2.0 0.0 2.0 4.0 -5.0**

**-2.0 5.0 -1.0 1.0 1.0 3.0 0.0 -2.0**

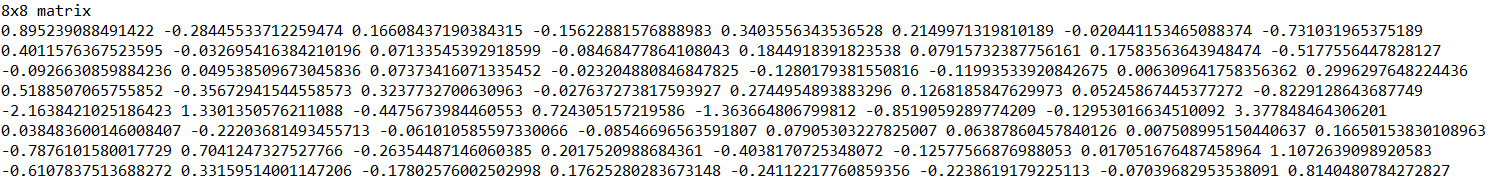
**1.0 0.0 1.0 1.0 0.0 2.0 1.0 1.0**

Please supply your response with the variables in the order [x, y, z, w, a, b, c, d].

|  |  |
| --- | --- |
| x | 5.042759555717787 |
| y | 3.8362621890806685 |
| z | -1.145851801637378 |
| w | 5.52291807894874 |
| a | -21.40251342754341 |
| b | -0.28101371434530775 |
| c | -7.617301976325806 |
| d | -5.240496428012723 |

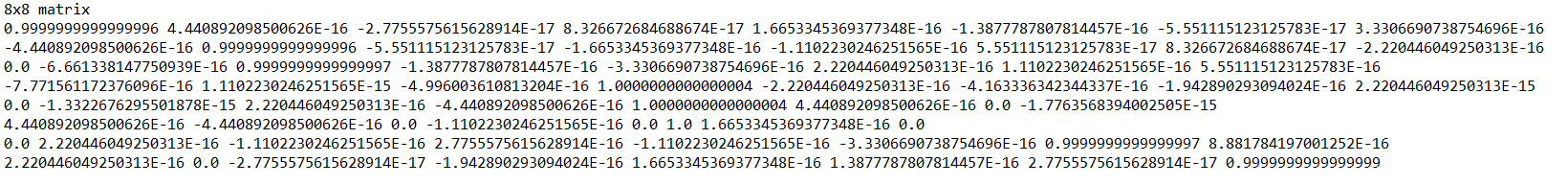
* 1. What is the determinant of the coefficient matrix A?

|****A| = 19177.000000000004

* 1. If they exist, what are
     1. The inverse of the coefficient matrix A-1,
     2. The determinant of A-1

A-1 = 5.2145799655837684E-5

* + 1. The product of the determinants of A and A-1?   
       0.9999999999999994 1
  1. If A-1 exists, check your system solution results by performing the appropriate matrix multiplication and reporting the results.



1. If it exists, what is the ***condition number*** for the coefficient matrix for the system given in problem 9?