CARLETON UNIVERSITY
SCHOOL OF COMPUTER SCIENCE
WINTER 2020

COMP 5107 **Assignment III** **Due: Feb. 26, 2020**

Consider the two-class pattern recognition problem in which the class conditional distributions are both normally distributed with **arbitrary** means M_1 and M_2, and covariance matrices Σ_1 and Σ_2 respectively. Assume that you are working in a 3-D space (for example, as in Assignment II) and that the covariance matrices are not equal. Here, you must assume that the means can be submitted as input parameters (and are not constant vectors) so that the classes can be made closer or more distant.

(a) Generate 200 points of each distribution before diagonalization and plot them in the (x_1–x_2) and (x_2–x_3) domains.

(b) Assuming that you know the means and covariance matrices of the two classes, compute the optimal Bayes discriminant function, and plot it for in the (x_1–x_2) and (x_2–x_3) domains.

(c) Generate 200 new points for each class for **testing** purposes, classify them and report the classification accuracy.

(d) Use the original training points after diagonalization and plot them for the in the (x_1–x_2) and (x_2–x_3) domains.

(e) Assuming that you know the means and covariance matrices of the two "transformed" (diagonalized) classes, compute the optimal Bayes discriminant function in the transformed domain, and plot it in the (x_1–x_2) and (x_2–x_3) domains.

(f) Using the same testing points of (c), classify them in the transformed domain, and report the classification accuracy.