Name:
ID:
Date:
ITU, Computer Engineering Dept.
BLG527E, Machine Learning, HW2
Due: October 15, 2014, 10:00pm through Ninova.
Instructors: Zehra Cataltepe (cataltepe@itu.edu.tr), Yusuf Yaslan (yyaslan@itu.edu.tr)
Grading: You must complete the table below according to what you expect to get out of each question.

		Q1	Q2	Q3	Q4	Q5	Total
Grade	Max	1	1	1	1	1	5 pts
	Expected						

Policy:
Please do your homeworks on your own. You are encouraged to discuss the questions with your class mates, but the code and the hw you submitted must be your own work. Cheating is highly discouraged for it could mean a zero or negative grade from the homework.
If a question is not clear, please let us know (via email or in class). Unless we indicate otherwise, do not use libraries for machine learning methods. When in doubt, email us.

There will be 5 homeworks this term. Each hw is worth 5 points and each question will be evaluated on a 0/1 basis.

In order to be able to take the final exam for BLG527E you have to have a **weighted average score of 30 (over 100) for midterm and homeworks.** Otherwise you will get a VF from the course.

QUESTIONS

You will use a subset (optdigits01) of the optdigits dataset by Alpaydin and Kaynak for this hw. The last column of the file shows the label (class 0 or class 1)

Q1) Examine the dataset. The number of features, the number of classes and their probabilities (P(Ci)), types of features, any features that can not be used for classification?

Q2) Partition the dataset into 10 training and validation sets, preserving the class distributions in each fold.

Q3) Assuming that each feature has a different probability of being 0,1,…,16 for each class, compute the discriminant function to discriminate class 0 from class 1. [Hint: Ch5, Discrete-Multinomial Features]

Q4) Assuming that all features have the same probability of being 0,1,…,16 for class1 and all features have the same probability of being 0,1,…,16 for class0 [i.e. $p_{ijk} = p_{ij'k}$ for each feature j and j' in 1:64], compute the discriminant function to discriminate class 0 from class 1. [Hint: remember the simplifications we did for the Gaussian inputs.]

Q5) Should you use the classifier in Q3 or Q4 for best performance? Answer by computing the confusion matrices, classifier validation set accuracies and by comparing them using one of the methods in Chapter 19.