**Name:**

**ID:**

**Date:**

**ITU, Computer Engineering Dept.**

**BLG527E, Machine Learning HW4**

**Due:** January 10, 2017, 23:00 through Ninova.

# Instructors: Yusuf Yaslan ([yyaslan@itu.edu.tr](mailto: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 |  | Total |
| Grade | Max | 1 | 2 | 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.

Make sure that you have filled up the expected grade table in your report

**You will use the Swiss dataset for this hw.**

**You’ll use Libsvm (** [**http://www.csie.ntu.edu.tw/~cjlin/libsvm/**](http://www.csie.ntu.edu.tw/~cjlin/libsvm/)**) for Support Vector Machines**

**Q1) (1 point)** Partition the dataset into 10 training and validation sets, preserving the class distributions in each fold. Compute kernels using sigmoid, polynomial and radial basis functions. Use Libsvm’s precomputed kernel option to classify the datasets. Give the classification accuracies on training and validation datasets.

**Q2) (2 point)** Analyze the effect of the parameters of the kernels at classification accuracy. i.e obtain different classification accuracies for different c and σ parameters for radial basis function.

**Q3) (1 points)** Write the Multilayer Perceptron (MLP) with 6 inputs, two hidden units, and two outputs code given in Figure 11.11 in Alpaydin's book. Partition the dataset into 10 training and validation sets, preserving the class distributions in each fold. Classify the dataset using MLP. Give the classification accuracy versus training epochs figure as shown in Figure 11.9 in Alpaydin's book (Note that in Figure 11.9 the plot is given for regression problem).

**Q4) (1 points)** Use whole dataset and train a MLP with 6 inputs, two hidden units, and two outputs (class labels). Reduce the dimensionality of the dataset using the outputs of hidden units (Output of the hidden units for each example will be your new feature vector for that example). Plot the reduced dataset in two dimensional spaces (Hidden1 vs Hidden2) as given in Figure 11.18 in Alpaydin's book (Note that in Figure 11.18 the plot is given for 10 class dataset for optdigits dataset).