Preamble

1. The work can be carried out in groups with at most 4 members and at least 3 members.
2. All records to be written jointly as a group.
3. The record for each set of experiments is to be submitted as a pdf file by the indicated deadline, failing which no marks will be allotted for that set of experiments. It should contain a section indicating your conclusions.
4. Matlab programs are to be function subprograms, and not script programs. (No marks will be allotted if you submit a program of the latter type when it is possible to make a program of the former type.) Along with these function subprograms a main program — of the script type — is to be included that will generate the results included in your report. If the latter program is not submitted then the submission is deemed incomplete.
5. The Matlab program written for each problem is to be named as follows: For example, the 2nd problem in Laboratory 1 is labelled **L1p2name.m**, where "name" is the last six characters of your SRN.
6. Matlab programs are to be submitted by the deadline.
7. For each experiment, the report and programs are to be combined in a single zipped folder before submitting to **kkgcontrollab@gmail.com**. The name of the zipped file is to be L1name.m, where "name" is the last six characters of your SRN.
8. Accordingly, "name" corresponds to any member who is designated as the correspondent by the members of the group.
9. Further, the members of the group are to be mentioned in the beginning of each report, with the correspondent's name highlighted.
10. Any other instructions will be communicated as and when required.

Mini Project Part 1 **Deadline:** 25 January 2018 2330 Hours

1. Define the problem that you are going to work on for the mini project.
2. Identify the papers (preferably IEEE Journal papers; IEEE Conference Papers from International Joint Conference on Neural Networks; Neural Information Processing Society Conference) and the dataset.
3. Write a one-page write-up with the following:
   (a) Title of the project.
   (b) The names of the people working on this project.
   (c) An abstract of not more than 150 words.
   (d) A brief write-up on what you expect to achieve in this mini project.
   (e) Dataset.
   (f) References.

Term Project Laboratory 1 **Deadline:** 01 February 2018 2330 Hours

Experiments with Function Approximation

Data Generation: Generate the following data sets (Refer Appendix A of [1]).

1. **Data A:** The input values $\{x_n\}$ are generated uniformly in the range $(0, 1)$, and the corresponding target values $\{t_n\}$ are generated as follows:

   $$t_n = \sin 2\pi x_n + \nu_n$$

   where $\{\nu_n\}$ is a sequence of random noise with zero-mean Gaussian distribution with standard deviation 0.3.
2. **Data B:** There are two classes with equal prior probabilities. One class $\mathcal{C}_1$ is generated from a single Gaussian while the other $\mathcal{C}_2$ is generated from mixture of two Gaussians.

Conduct the following experiments using Data A:

1. Repeat the experiments in §1.1, §1.2.5 and §1.2.6 [1] with the polynomial function:

   $$y(t, \mathbf{w}) = w_0 + w_1 x + w_2 x^2 + \cdots + w_M x^M$$

2. Repeat these experiments with a different choice of approximating polynomial function:

$$y(t, \mathbf{w}) = w_1 x - w_2 x^3 + w_3 x^5 - w_4 x^7 + - \cdots + (-1)^{M+1} \, w_M \, x^{2M-1}$$

   How do these results compare with those in [1]?

3. Does the sign matter? That is, repeat these experiments with the polynomial function:

$$y(t, \mathbf{w}) = w_1 x + w_2 x^3 + w_3 x^5 + w_4 x^7 + \cdots + w_M \, x^{2M-1}$$

   How do these results compare with those in [1] and with those generated above?

4. What are your conclusions from these experiments?

References

[1] C. M. Bishop, *Pattern Recognition and Machine Learning*, Springer, 2006.