

February-June 2023 Semester
CS671: Deep Learning and Applications
Programming Assignment I

Date: February 13, 2023

Deadline for submission of code and report: Tuesday, February 21, 2023, 10:00 PM

Classification tasks

Datasets:

Dataset 1: Linearly separable classes: 3 classes, 2-dimensional linearly separable data is given. Each class has 500 data points.

Dataset 2: Nonlinearly separable classes: 2-dimensional data of 2 or 3 classes that are nonlinearly separable. The number of examples in each class and their order is given at the beginning of each file.

Divide the data from each class into training, and test data. From each class, train, and test split should be 70% and 30% respectively.

Model: Perceptron with sigmoidal activation function for each of the datasets. Use one-against-one approach for 3-class classification. Implement gradient descent method for perceptron learning algorithm.

Presentation of results:

- 1) Plot of average error (y-axis) vs epochs (x-axis).
- 2) Decision region plot **superimposed by training data only** for each of the datasets. Give the decision region plot between each pair of classes and also give the decision region plot after combining.
- 3) Confusion matrix and classification accuracy.
- 4) Inferences on the plots and inferences on the results observed.

Regression tasks

Datasets

Dataset 1: 1-dimensional (Univariate) input data

Dataset 2: 2-dimensional (Bivariate) input data

Divide the data into training and test data. Train and test split should be 70% and 30% respectively.

Model: Perceptron with linear activation function for each of the datasets. Implement gradient descent method for perceptron learning algorithm.

Presentation of Results:

1. Plot of average error (y-axis) vs epochs (x-axis).
2. Plots of the values of mean squared error (MSE) on training data and test data.
3. Plots of model output and target output for training data and test data.
4. Scatter plot with target output on x -axis and model output on y -axis, for training data and test data.
5. Inferences on the plots and inferences on the results observed.

Each group of students must use the dataset identified for that group only.

Expectation of the assignment is to implement perceptron from scratch using Python or MATLAB or any other programming language.

Note: You are not supposed to use libraries of perceptron, neural network, gradient descent etc.

Report should be in **PDF** form and report by a team should also include the observations about the results of studies.

Instruction:

Upload in Moodle all your codes in a single zip file. Note that code(s) should be in a .py file, if you are coding in Python.

- **Give the name of the code folder as Group<number>_Assignment1_code**
Example: Group01_Assignment1_code.
- **Give the name of the zip file as Group<number>_Assignment1_code.zip**
Example: Group01_Assignment1_code.zip

Upload the report as PDF file.

- **Give the name to the report file as Group<number>_Assignment1_report.pdf**
Example: Group01_Assignment1_report.pdf

We will not accept the submission if you don't follow the above instructions.