# Deep Learning: Assignment # 1

This assignment consists of the following tasks:

1. You will build a linear regression model as per the following details:

* The training data consists of 20 pairs of x and y values, representing noisy measurements made on a sine function in the interval of 0-2*P*i. The measurements are made at equally spaced points and are corrupted with noise coming from a normal distribution with zero mean and unit variance. Generate data and create a plot of the data.
* The model equation to be used is yi = a0 + a1xi + a2xi2 + a3 xi3
* The model will be constructed using gradient search along the lines as described under the following link with numpy:
* [PyTorch: Tensors](http://pytorch.org/tutorials/beginner/pytorch_with_examples.html#pytorch-tensors)
* After the model has been trained, you will plot the predicted *y* values against *x* values.
* Play with the choice of learning rate as well as changing the degree of polynomial in the model equation to 2 and 4. Plot and discuss your results.

1. Build a model to predict corn yield with two independent variables fertilizers and insecticides. The data for this task is as follows. Again, you will build the model using the gradient search and not using the any package.

Corn Fertilizer Insecticides

40 6 4

44 10 4

46 12 5

48 14 7

52 16 9

58 18 12

60 22 14

68 24 20

74 26 21

80 32 24

3.

1. Implement in Python the pseudo-inverse approach and determine the prediction model for the data in #2 above. How different are model parameters obtained in exercise #2 with #3?
2. This exercise is to perform a recognition task using logistic regression. You will use sklearn library for this. The dataset for this task is [Fashion-MNIST](https://pytorch.org/docs/stable/torchvision/datasets.html#fashion-mnist) dataset. You will partition the dataset into training and test using the 80/20 ratio. The results should be presented in the form of a confusion matrix.
3. In this exercise, you will use k-NN classifier to perform recognition. You will use the same training/test set partitioning as done in exercise #4. This will allow for comparison. You will use k=3, 5, and 7 in your work.

All work must be submitted in a Jupyter notebook as a pdf/html document. **Only one single file should be uploaded. Submissions in the form of a zip file will not be graded.**