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*Pi*. The measurements are made at equi-spaced points and are corrupted with noise coming from a normal distribution with zero mean and unit variance. Create a plot of the data.
    - The model equation to be used is $y_i = a_0 + a_1 x_i + a_2 x_i^2 + a_3 x_i^3$
    - The model will be constructed using gradient search along the lines as described under the following link:
    - 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. Comment on your results.

2. 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 *optim* 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. Implement in PyTorch 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

4. This exercise is to perform digit recognition using logistic regression. You will use sci-kit learn for this. The link below provides step by step directions for this task.

https://towardsdatascience.com/logistic-regression-using-python-sklearn-numpy-mnist-handwriting-recognition-matplotlib-a6b31e2b166a

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