January-May 2022 Semester

CS6910: Fundamentals of Deep Learning

Programming Assignment I

Date: **February 22, 2022**
Deadline for submission of PDF file of report: **Monday, March 14, 2022**

I. Tasks:

(1) Function approximation on 2-d input
(2) Single-label multi-class classification: (a) 2-d input, (b) Image data

II. Model : Multi-layer feedforward neural network with 2 hidden layers and tanh as the activation function for the hidden nodes

III. Learning mode: Pattern mode

Function approximation task :

- Weight update rule: Generalized delta rule
- Report should include the following: (1) Plot of average error on training data vs Epoch, (2) Scatter plot (Model output vs Desired output) for training data after the model is trained, (3) Plots of the desired function and the approximated function after the epochs 1, 2, 10 and 50, and training is stopped .
-

Classification task for 2-d data:

- Loss function : Cross-entropy
- Weight update rule : Generalized delta rule
- Report should include the following: (a) Surfaces of outputs of nodes in hidden layers and output layer after Epochs 1, 2, 10, 50 and training is stopped (b) Decision region plot after the model is trained

Classification task for image data:

- Loss function : Cross-entropy
- Weight update rules : (1) Delta rule, (2) Generalized delta rule, (3) Adam
    - Use the same value of learning rate parameter
    - Use the same initial random values of weights
- For each rule of weight update, report should include the following : (a) Plot of average error on training data vs Epoch, (b) Confusion matrix for training data and test data
- Compare the number of epochs taken for the convergence for different update rules.

Report should also include your observations.