

Assignments due on **07/02/2022**

Assignment 2a.

- 1) Run the code of 2 layer neural network from <https://stackabuse.com/creating-a-neural-network-from-scratch-in-python-adding-hidden-layers/>
- 2) Go through the code and understand each line.
- 3) Read the dataset as shown there.
- 4) Two classes are there. Label 0 for one class, 1 for another class
- 5) Take 70% data for training. 30% data for testing
- 6) Build a two-layer neural network from scratch where z_o is the output.
 - a) You will have two layers.
 - i) One is hidden layers (use 4 neurons)
 - ii) One output layer (use one output neuron)
 - b) Use sigmoid function as activation function in each neuron.
 - c) Use sum of square error as your loss function.
 - d) Calculate the derivatives for back propagation.
- 7) Write codes training module for 2000 epochs to train the neural network.
- 8) Now classify the test data using the trained neural network.
 - a) During the test, you will do only forward pass.
 - b) If the forward pass score is ≥ 0.5 , make the class label 1. Otherwise 0.
 - c) Report your accuracy.
- 9) Draw data points for training data and also **plot the class boundary** in 3D plot
- 10) Draw data points for test data and also **plot the class boundary** in 3D plot
- 11) You cannot use any built-in deep learning functions

Assignment 2b (same as 2a. But the input is 32X32X3 image instead of 3 numbers.

- ❖ Select any two classes from CIFAR 10 dataset. For example: Airplane, cat.
- ❖ So, airplane means numerical label 0, cat means 1
- ❖ Now, read one image, reshape it to row vector \mathbf{x} . \mathbf{x} is our input data now with dimension 1X3072.
- ❖ \mathbf{x} 's class label would be either 0 or 1.
- ❖ **Now implement the same network architecture as above.**
- ❖ Build a two-layer neural network from scratch where Y_{pred} is the output.
 - ☐ You will have two layers.
 - One is hidden layers (use 4000 neurons)
 - One output layer (use one output neuron)
 - ☐ Use adam initializer to initialize the weights.
 - ☐ Use sigmoid function as activation function in each neuron.
 - ☐ Use the sum of square error as your loss function.
 - ☐ Calculate the derivatives for back propagation.
- ❖ Write codes training module for 10 epochs to train the neural network.
- ❖ Then, use the test images of airplane and cats from the test set.
- ❖ Supply the test images to the trained neural network and classify the images by using the Y_{pred} as follows
 - ☐ If ($y_{pred} < 0.5$) then class label is 0 else class label is 1.

- ❖ Report your accuracy on the test set
- ❖ You cannot use any built-in deep learning functions