Assignment

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Fractal-3 Assignment
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IIT JODHPUR

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Note:

1. **Due date:** April 20, 2023: 11:55 PM (firm deadline). **No extension will be given.**

2. Submit a brief report and Github link of your implementation with proper details.

Problem 1: Perceptron [30 points]

Following training samples are given:

x_1	x_2	Class
1	1	+1
-1	-1	-1
0	0.5	-1
0.1	0.5	-1
0.2	0.2	+1
0.9	0.5	+1

Table 1: Sample data

Assuming weight vector of initial decision boundary $\mathbf{w}^T\mathbf{x} = 0$ as w=[1, 1], solve the following:

1. In how many steps perception learning algorithm will converge.

2. What will be the final decision boundary? Show step-wise-step update of weight vector using computation as well as hand-drawn plot.

Problem 2: Learning to implement Neural Network [30 points]

1. **Gurmukhi Handwritten Digit Classification:** Gurmukhi is one of the popular Indian scripts widely used in Indian state of Punjab. In this part of the assignment, our goal is to develop a neural network solution (a simple NN, not a CNN) for classifying Gurmukhi digits. We provide you Handwritten Gurmukhi digit dataset here:

Modify the code provided in here and a video tutorial here, and develop a robust neural network to classify the Gurmukhi digits. Higher performance on test set will have bonus point. Briefly write your observation and submit your code so that we can evaluate your implementation at our end. (10 points)

Problem 3: Chart Image Classification using CNN [40 point]

Problem statement: You have to develop a CNN based classification architecture for classifying a given chart image to one of five chart classes, namely "Line","Dot Line","Horizontal Bar","Vertical Bar", and "Pie" chart.
Task 1: Download the dataset from drive link given below.

Use train and val images for training and validation in an appropriate ratio (e.g., 80% for training and 20 % for validating). The CSV file contains corresponding labels for the images.

Task 2: Implement a two-layer Convolutional Neural Network, and calculate accuracy, loss and plot the obtained loss. Briefly write your observation and submit your code so that we can4 evaluate your implementation at our end.
Task 3: Finetune a pretrained network (e.g., AlexNet) for this task and report the results.