Deep Learning for Perception

Assignment # 1

Due Date: 24th Feb 2024

Total Marks: 100

1. [5 Points] List 5 popular tools for implementing DL techniques and the reason for their popularity

2. [5 Points] List 5 popular loss functions used in DL for binary classification, multiclass classification, and regression and briefly explain along with their derivatives.

3. [5 Points] List 5 popular activation functions used in DL along with its derivatives.

4. [30 Points] Draw 3-layer Neural Networks with 2 nodes in each hidden layer and 1 output node. Input size is 3. Write mathematical equations of all hidden and output layer nodes for a forward pass. Write down mathematical equations of the partial derivative of Loss w.r.t. all weights and bias for a backward pass. Simplify all these equations. Use (i) Squared Loss (ii) Cross Entropy Loss

5. [25 Points] Draw 2-layer Neural Networks with 2 nodes in the hidden layer and 1 output node. Input size is 3. The activation function in the hidden layer is Relu while in the output layer, sigmoid is used. Write mathematical equations of all hidden and output layer nodes for a forward pass. Write down mathematical equations of the partial derivative of Loss w.r.t. all weights and bias

for a backward pass. Simplify all these equations. Use (i) Squared Loss (ii) Cross Entropy Loss

6. [30 Points] Complete the following exercise using formulas computed in Question #4 for

weights of L1

W1 = [[0.42, 0.72, 0.21], [0.11, 0.3, 0.65]]

B1 =0.01 (for all neurons)

weights of L2

W2 = [[0.17, 0.29], [0.91, 0.08]]

B1 =0.05 (for all neurons)

weights of L3

W3 = [[0.61, 0.39]] B1 =0.08

Learning rate = 0.7

(i) Squared Loss Function

(ii) Cross Entropy Loss Function

F1	F2	F3	Class
4^{th} digit of student ID + 1	1	6^{th} digit of student ID + 1	A
6	5^{th} digit of student ID + 1	7	A
2	4	7^{th} digit of student ID + 1	B
8	4^{th} digit of student ID + 1	2	B

Be like a neural network. Learn from your mistakes :)