Tuesday Feb 18, 2025

In-class Handout

COSC 410A Applied Machine Learning

Prof. Forrest Davis

Name:

Discuss and complete the following questions with the person nearest you. You **may** be asked to share your thoughts with the class.

1. You have decided to build a neural network with 3 layers each using ReLU as the non-linear activation function. The input has 128 dimensions. Each layer halves the dimensions, so layer 1 has 64 nodes, layer 2 32 nodes, and layer 3 16 nodes. The aim is to classify an input into 4 outputs. Give the equation that represents this network, including relevant activation functions, and describe the shapes of each matrix or vector.

$$\mathbf{l_1}^{64\times 1} = \text{ReLU}(\mathbf{W_1}^{64\times 128} \cdot \mathbf{x}^{128\times 1}) \tag{1}$$
$$\mathbf{l_2}^{32\times 1} = \text{ReLU}(\mathbf{W_2}^{32\times 64} \cdot \mathbf{l_1}^{64\times 1}) \tag{2}$$
$$\mathbf{l_3}^{16\times 1} = \text{ReLU}(\mathbf{W_3}^{16\times 32} \cdot \mathbf{l_2}^{32\times 1}) \tag{3}$$
$$\mathbf{o}^{4\times 1} = \text{Softmax}(\mathbf{Z}^{4\times 16} \cdot \mathbf{l_3}^{16\times 1}) \tag{4}$$
$$\tag{5}$$