COMP4660/8420 Lab 3
Neural Networks Adv.

Q1. **Use pseudocode to describe the backpropagation learning algorithm and how it works**

Q2. **For the neural network shown in Figure 1, with sigmoid activation functions for both the hidden and output neurons and a squared error loss function, perform one pass of backpropagation and calculate the new weights. Assume the target is 1 and the learning rate is 1.**

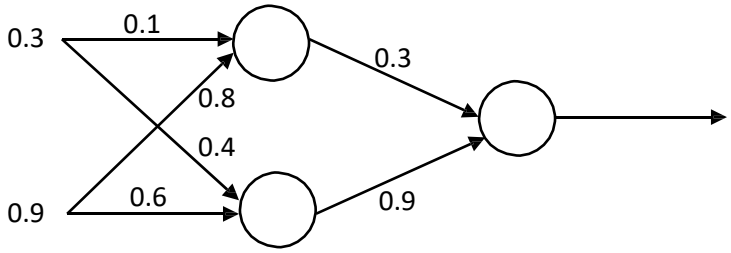
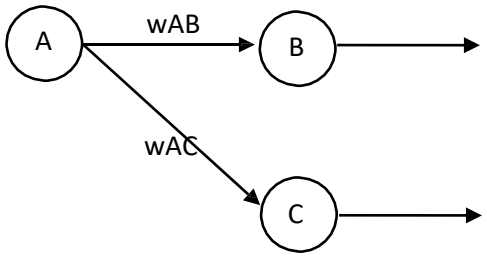


Figure 1. **A multilayer feedforward neural network**

Hint:



Loss function:

$\frac{1}{2}\sum_i(Target_i - Output_i)^2$

Output error:

$\frac{dL}{dOutput_B} = -(Target_B - Output_B)$

$\frac{dL}{dZ_B} = Output_B * (1 - Output_B) * (Output_B - Target_B)$

Calculate new weights:

$W_{AB} = W_{AB} - \eta * Output_A * \frac{dL}{dZ_B}$

Hidden layer error: $\frac{dL}{dZ_A} = Output_A * (1 - Output_A) * \left(\frac{dL}{dZ_B} * W_{AB} + \frac{dL}{dZ_C} * W_{AC}\right)$

Programming Task - Using PyTorch for Regression

In this lab, you will build a model to perform regression using PyTorch. The script given is an example of building a regression model using PyTorch. It aims to build a regression model for y = 3x + 3.

Task

Your task now is to construct a regression model for the Wine Quality data set: https://archive.ics.uci.edu/ml/datasets/Wine+Quality

Familiarise yourself with the data set and perform any pre-processing or normalisation needed. Use PyTorch to implement a regression model for the wine quality dataset and find the average error of predictions. Work on making your predictor as accurate as possible.

Q1. How does regression differ from classifications?

Q2. What does your output look like?

Q3. Where should you define your regression model?

Q4. In the previous tasks we were calculating misclassification error. What error value might you use for a regression task?