Assignment 7
Name: Sina Ainesazi Dovom
Student number: 597196
Date: 12 March 2023

Feedforward Neural Network

The code has been implemented simply containing comments. There are 2 input units, 2 hidden units and 1 output unit. The sigmoid function has been used. The weights W1 and W2 have been randomly generated using the units' dimensions for each transfer between the first, input layer and hidden layer and second, hidden layer and the output layer. Firstly, the training phase starts with the forward phase, using the X_train and then error for the output layer being calculated using the derivative of the loss function. Then in the backward phase using the error calculated for the output layer and the derivative of the sigmoid function, error for the hidden layer being calculated and both the w1 and w2 are being updated using batch form and "np.outer" function and a learning rate which both 0.1 and 0.01 have been used. Then the total loss using the MSE is being calculated on all the training samples until the last epoch and then the last weights are being used on the test set and the total MSE for all the samples in the test set being calculated. Three different number of epochs and learning rates have been tested to check on the total training error and total testing error. Which are as follows:

1. Using 0.1 as learning rate and 1000 epochs the training error and test error are respectively: 0.018444483459492095 and 0.019408869126804618.
2. Using 0.01 as learning rate and 1000 epochs the training error and test error are respectively: 0.018256985348965343 and 0.01885975021917887.
3. Using 0.01 as learning rate and 3000 epochs the training error and test error are respectively: 0.01826026111308161 and 0.018859536811414536.