Problem 4

In this problem, you will implement the backpropagation algorithm and train your first multi-layer perceptron to distinguish between 4 classes. You should implement everything on your own without using existing libraries like TensorFlow, Keras, or PyTorch. You are provided with two files "train data.csv" and "train labels.csv" The dataset contains 24754 samples, each with 784 features divided into 4 classes (0,1,2,3). You should divide this into training, and validation sets (a validation set is used to make sure your network did not overfit). You will then provide your model which will be tested with an unseen test set. Use one input layer, one hidden layer, and one output layer in your implementation. The labels are one-hot encoded. For example, class 0 has a label of [1, 0, 0, 0] and class 2 has a label of [0,0,1,0]. Make sure you use the appropriate activation function in the output layer. You are free to use any number of nodes in the hidden layer. You need to provide one single function that allows us to use the network to predict the test set. This function should output the labels one-hot encoded in a numpy array. Your work will be graded based on the successful implementation of the backpropagation algorithm, the multi-layer perceptron, and the test set accuracy. You may want to thoroughly comment your implementation to allow us to easily understand it.