Report on assignment 2

In order to see the effect the number of hidden layers and the number of nodes each layer has on the overall accuracy of a Multi-Layer Perceptron Classifier the code contains different implementations of it so we can observe the difference in a practical way.

After importing all the necessary libraries and loading the dataset, we take some time to visualize the data and better understand it. Then, we split it into training data and test data.

mlp1 is a classifier with only one hidden layer which has 15 nodes and a learning rate of .05
mlp2 also has one layer with 15 nodes but a much higher learning rate of .5
mlp3 has two hidden layers with 15 and 10 nodes and a learning rate of .05
mlp4 has two hidden layers with 150 and 100 nodes with the same learning rate of .05
mlp5 has a single hidden layer with 1000 and learning rate of .05
mlp6 has the same parameters as mlp1 but this gets trained by the test data and tested with the train data.

Out of all, the best accuracy is mlp5.
The fact that mlp3 and mlp4 have a lower accuracy than the mlp with a single hidden layer comes to support the theory that in most cases a single hidden layer is sufficient and that there are very few problems that benefit from having multiple hidden layers. However, getting the number of nodes right is important. There is a pretty big accuracy difference between the two which is given only by the change in the number of nodes.
Picking the right number of nodes is really important, however even if from this example it might seem like the more nodes we have, the better, that is not always the case. If mlp1 would have 19 nodes instead of 15 its accuracy would actually be lower.

Learning rate is also a really important factor when it comes to the performance of a classifier. Changing the learning rate between mlp1 and mlp2 resulted in mlp2 having an accuracy almost half of the one mlp1 has.

When we switch the training and testing sets, we also see the importance of having a big training dataset. The more examples the mlp has available in order to train the better the results we are going to get once it is ready.

In order to get the Multi-Level Classifier to be as accurate as possible all these details have to be considered.