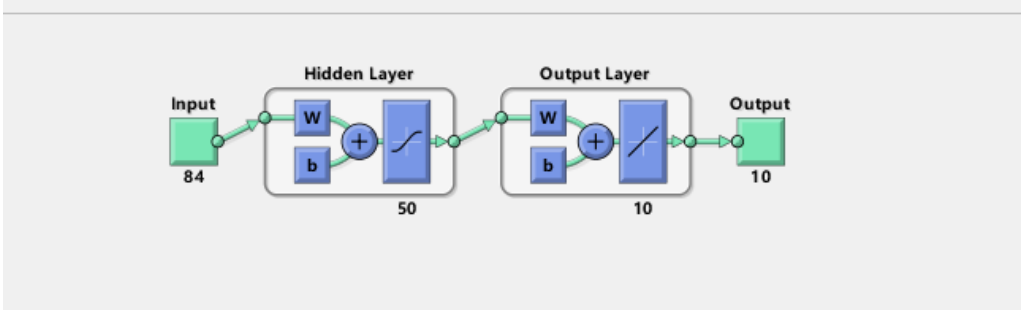
Coursework2 Report

(1)&(3)

The net structure as follows:



In the program, the input parameter is a matrix (train_feature in the program) with 84 rows(84 features) and 4000 columns, this net structure has only one hidden layer and the layer contains a total of 50 neurons, the output dimension of the output layer is 10, and the output parameter is a matrix with 10 rows and 4000 columns.

For the parameter setting:

The neurons in the hidden layer

Training function

net.trainParam.lr(Learning rate)

net.trainParam.goal(Convergence error)

net.trainParam.epochs (The maximum number of convergence)

	1	2	3	4	5	6
Neurons in the hidden layer	50	25	50	25	50	50
Training function	traincgp	traincgp	traincgp	traingd	trainrp	trainrp
Minimum error	0.01	0.01	0.01	0.01	0.01	0.05
Maximum training times	1000	1000	1000	1000	1000	500
Learning rate	0.2	0.2	0.1	0.2	0.1	0.1
Testing accuracy	91.2%	90.1%	91.8%	78.3%	91.2%	79.2%

Group1 is the initial setting.

Group2 change the number of hidden layer to verify whether the number of hidden layer neurons and the accuracy rate are related.

Group3 change learning rate compared with the group1.

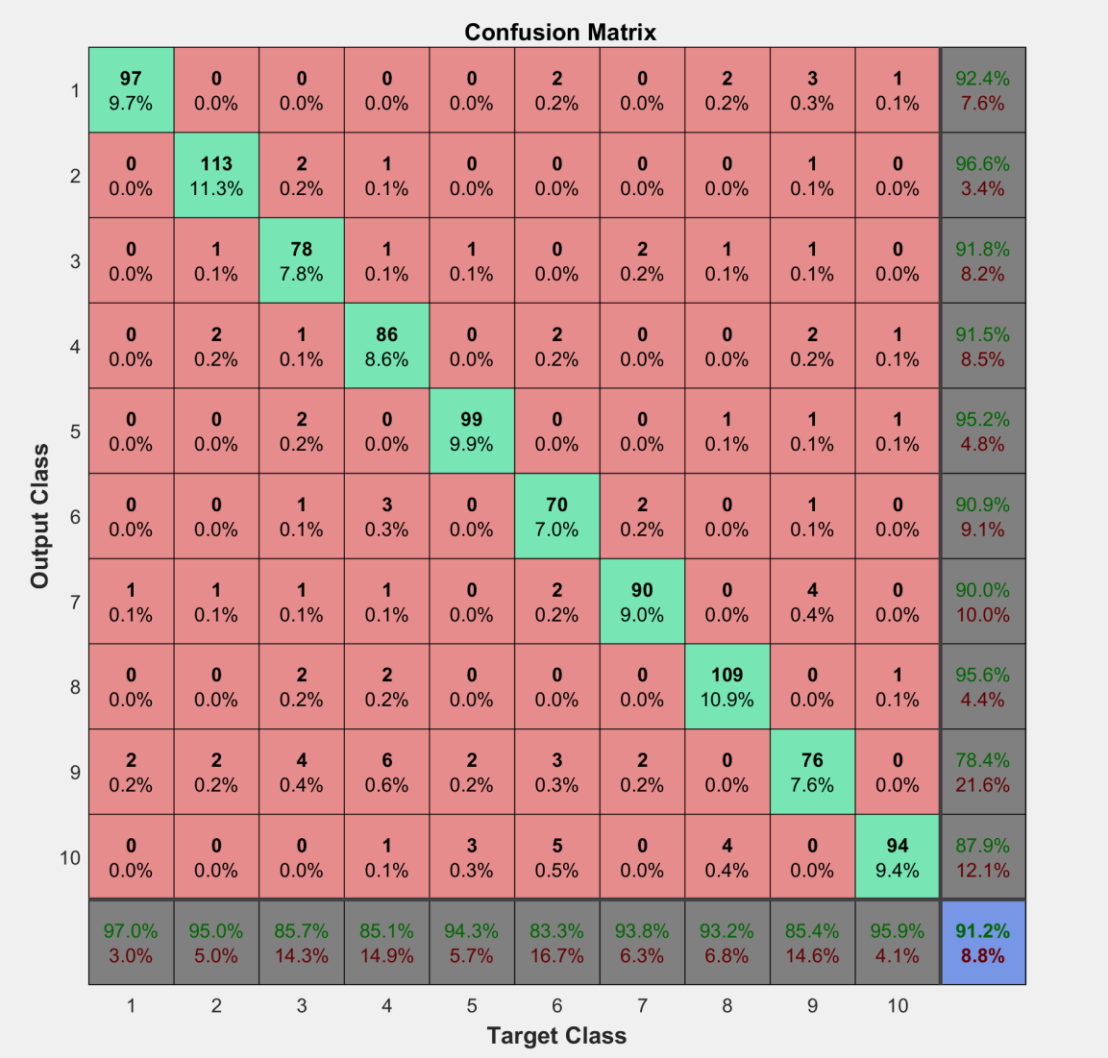
Group4 change the number of hidden layer neurons and the training function compared with group1.

Group5 change the training function and learning rate compared with group1

The testing accuracy and confusion matrix:

Group6 change the minimum error and maximum training times compared with the group5

(2)



For the confusion matrix, the row is the result of the test data(test_feaure in the program) after being tested by the trained neural network model. The column represents the label (test_label in the program) which test data should be assigned. From the confusion matrix, we can find that the highest accuracy rate (97.0%) belongs to the first label and the sixth label have the lowest accuracy rate (83.3%), most accuracy rates exceed 85.0%. The average accuracy rate reached 91.2%. From these data, we can find this model can accurately identify more than 90% of the pictures, and for the number 0, it could identify almost all the picture while for the number 5, it can only identify less than 85% picture, which may not enough to use.

6.

The PCA algorithm is mainly used projecting the sample data from the high-dimensional space into the low-dimensional space. We can use '[pc,score,latent] = pca(_)' function in matlab to perform dimension reduction. The statement 'cumsum(latent)./sum(latent);' can be used to calculate the accuracy of the original data for each dimension. And the by using 'score(:,1:ration_number)' to obtain the number of dimension(ration_number) you want.