CSC 311 Assignment 2

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(a). Since in data space, the positive and negative region are both convex, if we draw the line segment between two positive example x=3 and x=-1, then this entire line segment must be classified as positive. But the negative example x=1 lied on this line, which means this point must be classified as both positive and negative, which is impossible. Therefore, this dataset is not linearly separable.

(b). In this feature representation, our training set becomes:

We can then write out the inequalities corresponding to each training case:

And we can let (w1, w2) = (-2, 1).

2.1

(a). Please check the code in run\_knn.py, below is the plot of classification rate on the validation set of the corresponding k.

图表, 折线图

描述已自动生成

(b). The best performance of the classifier of validation set is at k = 3, 5, 7. Even not for best performance k, this classifier still has a general high accuracy which is above 0.8.

I would choose k\* = 5 to set my hyperparameter, since it has the highest classification rate for validation set which is 0.86.

For k = 3, k= 7, they have the same validation accuracy 0.86 (see Fig1 in appendix).

The test performance of these k values matches the validation performance, with k =3, 5, 7 have the highest accuracy.

图表, 折线图

描述已自动生成

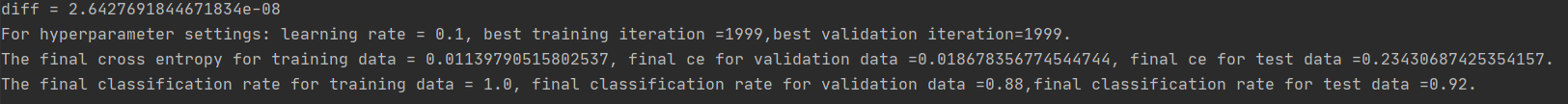
2.2

(a). Please check logistic.py

(b). best hyperparameter setting for mnist\_train:

Learning\_rate = 0.1, num\_iterations = 2000, weights = **0**

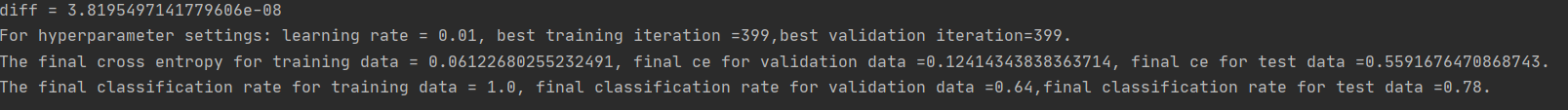
Final cross entropy and classification error on the training, validation and test sets:



Best hyperparameter setting for mnist\_train\_small:

Learning\_rate = 0.01, num\_iterations = 400, weights = **0**

Final cross entropy and classification error on the training, validation and test sets:



(c). As the training progresses, we can check the cross entropy of mnist\_train and mnist\_train\_small.

Whether change several times ?????

图片包含 图表

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图片包含 图表

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2.3

(a). Please check logistic.py

(b). The averaged cross entropy and classification error on the training and validation sets for each lambda are:

电脑萤幕的截图

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文本

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For mnist\_train, the cross-entropy changes as training progresses for each lambda are:

图片包含 图表

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描述已自动生成图片包含 图形用户界面

描述已自动生成图片包含 图表

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For mnist\_train\_small, the cross-entropy changes as training progresses for each lambda are:

图片包含 形状

描述已自动生成图片包含 图形用户界面

描述已自动生成图形用户界面

描述已自动生成图形用户界面

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(c). Two dataset: when increase lambda, the cross entropy of train test ????????, validation set ?????????

Why behave this way?????????

The best lambda = , the test ce and acc for this is??????????? Code!!!!!!!!!!!!!!!!!!!!!!!!!!!

3.

(a). Please check nn.py

(b). The training, validation and test error of default hyperparameters are:

手机屏幕的截图

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图表, 直方图

描述已自动生成图表

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How does performance differ on training and validation?????????????????????????????????

(c). Now hold the other parameters, and try learning rate of 0.001, 0.005, 0.05, 0.1, 0.5

图表, 折线图

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描述已自动生成

图表

描述已自动生成图表, 直方图

描述已自动生成

图表, 折线图

描述已自动生成图表, 直方图

描述已自动生成

图表, 折线图

描述已自动生成图表, 直方图

描述已自动生成

图表

描述已自动生成图表

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How affect convergence property?????????????????????????????????????????????????

Choose what value

Now hold the other parameters, and try mini\_batch size of 10, 50, 500, 700, 1000

图表

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描述已自动生成

图表

描述已自动生成图表, 折线图

描述已自动生成

图表, 直方图

描述已自动生成图表, 直方图

描述已自动生成

图表, 直方图

描述已自动生成图表, 直方图

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图表

描述已自动生成图表

描述已自动生成How affect convergence property?????????????????????????????????????????????????

Choose what value

(d). Now try 3 different combination of hidden units number: (50,32), (16,2), (50,50)

图表

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描述已自动生成

图表, 折线图

描述已自动生成图表

描述已自动生成

图表

描述已自动生成图表, 折线图

描述已自动生成

Comment of convergence and generalization

(e). Randomly present 8 examples where the neural network is not confident of the classification output.

图片包含 应用程序

描述已自动生成图片包含 图形用户界面

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Appendix

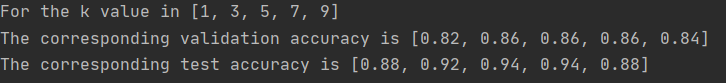


Figure 1

图片包含 图形用户界面

描述已自动生成图表, 折线图

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