MSBD6000B Project 1

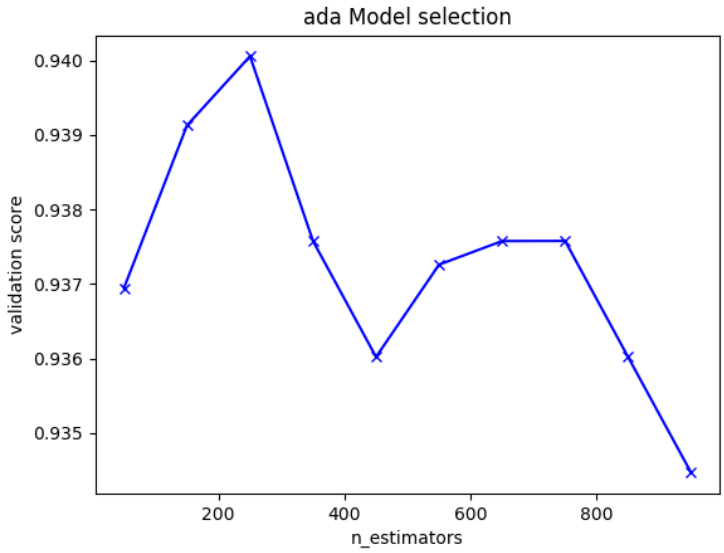
Data Preprocessing

For this dataset , there are large amounts of zeros in there, the feature is really sparse , for some specific feature even almost all rows is zero, so I think it is possible to get a better performance when we shrink the dimension of features, so I tried the some feature selection method, including the PCI and Chi-square test, variance in feature and selection from models. Finally I choose to sure variance and selection the best feature using Logistic regression with L1 Penalty.

Experiment Process:

Adaboost classifier

I tried different estimators number , it turns out the best estimators number when base classifier is decision tree is
The best validation score the Adaboost classifier(weak classifier = decision tree) is 0.941 when we weak estimator number = 200



SVM classifier

For Support vector machine I tried to use grid-search to find out the best gamma and penalty parameters, so I search the 2 parameter in ,

So according to my experiment as we have **Gaussian RBF kernel** the best parameters are:

{'C': 100000, 'gamma': 1e-06} with a validation score of 0.94

the best score Support vector machine can get is around 0.94

Fully connected neutral network classifier

I implemented an 5 layers fully connected neural networks by Keras, After experiments, it is seems that when use the neutral network classifier feature selection is not necessary (feature selection may lead to a worse result).

Do the cross validation the tuning the parameter of networks:

Firstly I tried five layers NN:

For [64,128,128,64,64] six layers structure epoch number =500 :

Drop-out	0	0.3	0.6
Valid score	0. 93581781	0. 94824016	0.93892339

For [64,128,128,128,64] six layers structure epoch number =1000 :

Drop-out	0.3	0.4	0.6
Valid score	0.94927536	0. 95031055	0. 93064183

For [64,128,128,64,64] five layers neutral network, when not use dropout , we can get following learning curve with maximum 0.9919 acc, but only 0.9358 validation score, which may means model is over-fitted, so I tried 0.3 and 0.6 dropout, I turns out 0.3 dropout can get an better validation score.

Then I also tried out some different layer numbers an picked out the best parameter:

[64,128,128,128,64] , Drop-out = 0.4

Figure1: [64,128,128,64,64] , dropout = 0, epoch number =800 (over fitted)

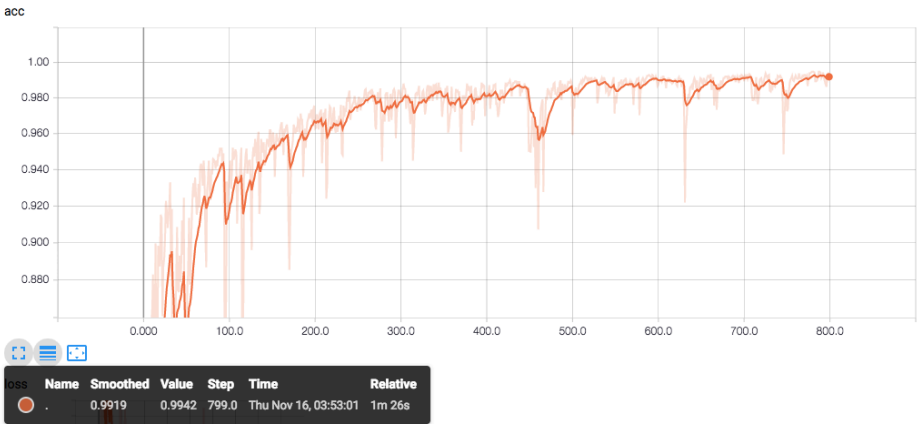
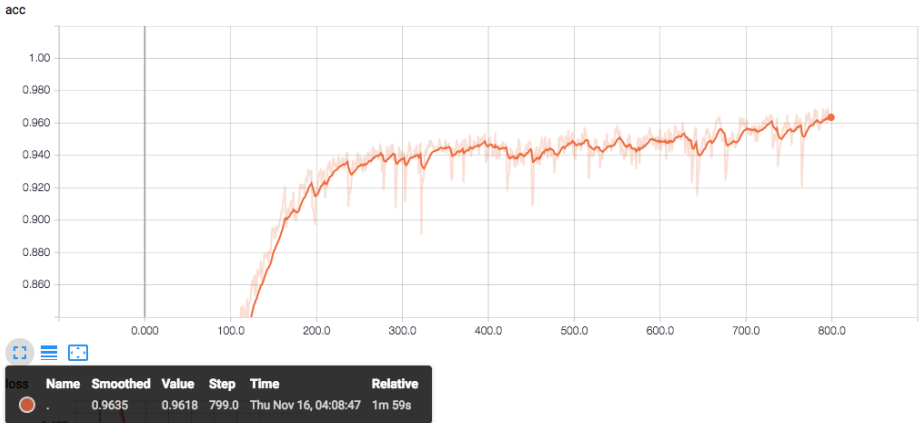


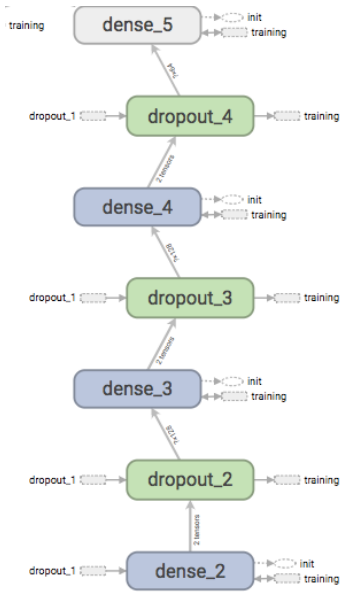
Figure2:[64,128,128,128,64] , dropout = 0.3, epoch number =800 (Under fitted)



So our work is:

(1) Define the 6 layer fully connected neutral network.

(2) search the best dropout percentage(bias and variances balance)



So after I tuned the parameters for these 3 algorithms , it turns out the validation score is quite close , and finally I decide to pick the best one: **Fully connected neutral network classifier.**