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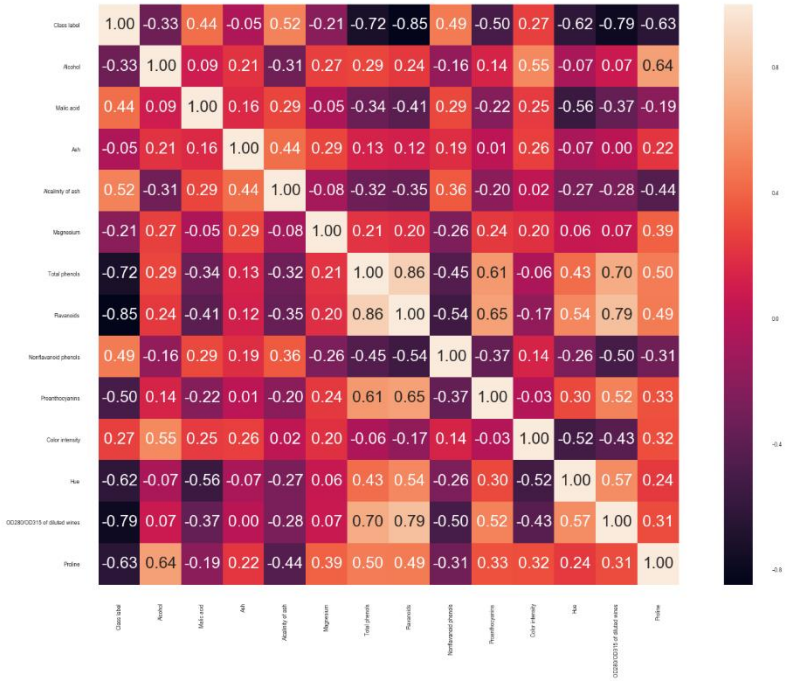
IE598 MLF F18

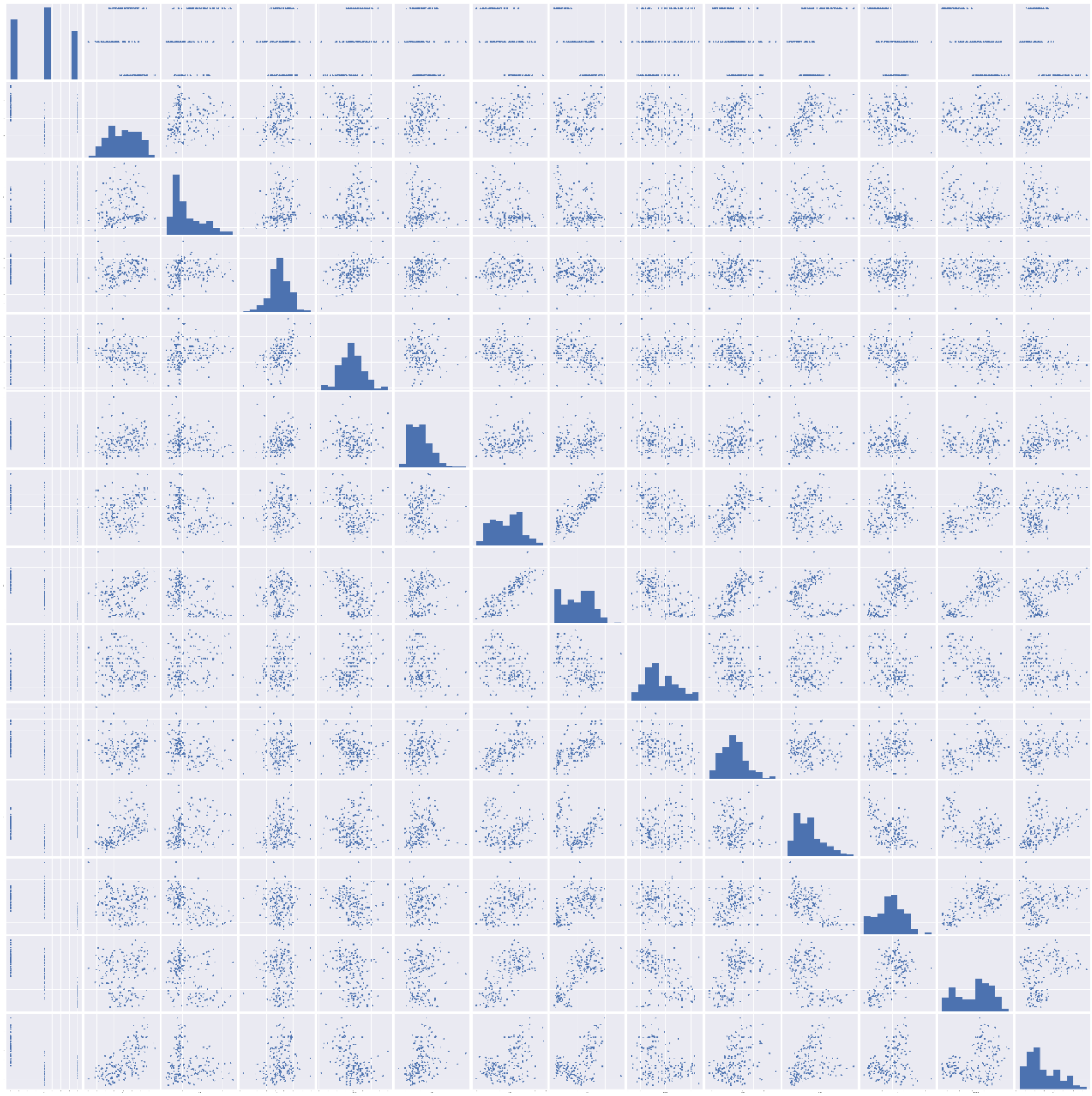
Module 5 Homework (Dimensionality Reduction)

Part 1: Exploratory Data Analysis

The first step is to understand the data base with 178 rows and 14 columns. There are several features and a label. In other to understand to relation between features, we print the correlation matrix and the scatterplot matrix. Those two matrixes are such huge matrixes that I have to submit it in other file to get a clear view.



1.1 Correlation matrix



1.2 Scatterplot matrix(all)

Later, we split data into training and test sets. Use random_state = 42. Use 80% of the data for the training set. Use the same split for all experiments. In this

Part 2: Logistic regression classifier v. SVM classifier - baseline

Fit a logistic classifier model to both datasets using SKlearn. Calculate its accuracy score for both in sample and out of sample (train and test sets). We can get:

(LR_part2_train)score: 1.0000000000

(LR_part2_test)score: 1.0000000000

Fit a SVM classifier model to both datasets using SKlearn. Calculate its accuracy score for both in sample and out of sample (train and test sets). We can get:

(SVM_part2_train)score: 0.9929577465

(SVM_part2_test)score: 0.9722222222

Part 3: Perform a PCA on both datasets

Refit both a logistic and SVM classifier on the PCA transformed datasets. In all those cases, we choose 13 components. Calculate accuracy scores for both in sample and out of sample (train and test sets) on both datasets. We can get:

(LR_part3_train)score: 1.0000000000

(LR_part3_test)score: 1.0000000000

(SVM_part3_train)score: 0.9929577465

(SVM_part3_test)score: 0.9722222222

Part 4: Perform and LDA on both datasets

Refit both a logistic and SVM classifier on the LDA transformed datasets. In all those cases, we choose 13 components. Calculate accuracy scores for both in sample and out of sample (train and test sets) on both datasets. We can get:

(LR_part4_train)score: 1.0000000000

(LR_part4_test)score: 0.9722222222

(SVM_part4_train)score: 1.0000000000

(SVM_part4_test)score: 0.9722222222

Part 5: Perform a kPCA on both datasets

Refit both a logistic and SVM classifier on the kPCA transformed datasets. Use the rbf kernel. Test several different values for Gamma. Calculate accuracy scores for both in sample and out of sample (train and test sets) on both datasets. In this case, we choose gamma form10^(-3)to 1. We can get:

((gamma=0.001)LR_part5_train)score: 0.8450704225

((gamma=0.001)LR_part5_test)score: 0.8611111111

((gamma=0.01)LR_part5_train)score: 0.9788732394

((gamma=0.01)LR_part5_test)score: 0.9444444444

((gamma=0.1)LR_part5_train)score: 0.9929577465(best result)

((gamma=0.1)LR_part5_test)score: 1.0000000000(best result)

((gamma=1.0)LR_part5_train)score: 0.5563380282

((gamma=1.0)LR_part5_test)score: 0.3888888889

((gamma=0.001)SVM_part5_train)score: 0.8732394366

((gamma=0.001)SVM_part5_test)score: 0.8611111111

((gamma=0.01)SVM_part5_train)score: 0.9788732394

((gamma=0.01)SVM_part5_test)score: 0.9444444444

((gamma=0.1)SVM_part5_train)score: 0.9718309859(best result)

((gamma=0.1)SVM_part5_test)score: 0.9722222222(best result)

((gamma=1.0)SVM_part5_train)score: 0.5000000000

((gamma=1.0)SVM_part5_test)score: 0.3888888889

Through all those results the best one of logistic regression is the result when gamma=0.1, the best one of SVM is also when gamma=0.1

Part 6: Conclusions

In this case, the best model of each part all do a good job. Their scores are so high that I am concerning about overfitting.

	Experiment 1 (Wine)			
	Logistic		SVM	
Baseline	Train Acc:	1	Train Acc:	0.992958

	Test Acc:	1	Test Acc:	0.972222
PCA transform	Train Acc:	1	Train Acc:	0.992958
	Test Acc:	1	Test Acc:	0.972222
LDA transform	Train Acc:	1	Train Acc:	1
	Test Acc:	0.972222	Test Acc:	0.972222
kPCA transform	Train Acc:	0.992958	Train Acc:	0.971831
	Test Acc:	1	Test Acc:	0.972222
	(gamma=0.1)		(gamma=0.1)	

1.3 Results worksheet

Part 7: Appendix

https://github.com/yrz437396236/IE598_F18_HW1/tree/master/IE598_F18-HW5

Raw predict scores:

(LR_part2_train)score: 1.0000000000

(LR_part2_test)score: 1.0000000000

(SVM_part2_train)score: 0.9929577465

(SVM_part2_test)score: 0.9722222222

(LR_part3_train)score: 1.0000000000

(LR_part3_test)score: 1.0000000000

(SVM_part3_train)score: 0.9929577465

(SVM_part3_test)score: 0.9722222222

(LR_part4_train)score: 1.0000000000

(LR_part4_test)score: 0.9722222222

(SVM_part4_train)score: 1.0000000000

(SVM_part4_test)score: 0.9722222222

((gamma=0.001)LR_part5_train)score: 0.8450704225

((gamma=0.001)LR_part5_test)score: 0.8611111111

((gamma=0.01)LR_part5_train)score: 0.9788732394

((gamma=0.01)LR_part5_test)score: 0.9444444444

((gamma=0.1)LR_part5_train)score: 0.9929577465

((gamma=0.1)LR_part5_test)score: 1.0000000000

((gamma=1.0)LR_part5_train)score: 0.5563380282

((gamma=1.0)LR_part5_test)score: 0.3888888889

((gamma=0.001)SVM_part5_train)score: 0.8732394366

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((gamma=0.1)SVM_part5_test)score: 0.9722222222

((gamma=1.0)SVM_part5_train)score: 0.5000000000

((gamma=1.0)SVM_part5_test)score: 0.3888888889