Report

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1 Part 1: Decision Tree

1.1 Information Gain

Test result accuracy for information gain is 0.9490740740740741
You can find tree diagram in infogain.pdf file.

1.2 Gain Ratio

Test result accuracy for gain ratio is 0.9513888888888888
You can find tree diagram in gainratio.pdf file.

1.3 Average Gini Index

Test result accuracy for gain ratio is 0.9490740740740741
You can find tree diagram in avgginiindex.pdf file.

1.4 Gain Ratio with Chi-squared Pre-pruning

Test result accuracy for gain ratio with chi-squared pre-pruning is 0.9502314814814815. You can find tree diagram in gainratiopreprun.pdf file.

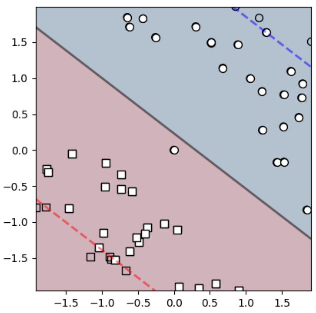
1.5 Gain Ratio with Reduced Error Post-pruning

Test results and referring to the tree diagram.

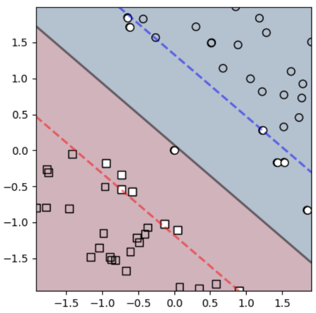
2 Part 2: Support Vector Machine

2.1 First Part

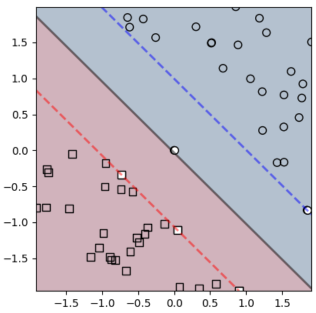
Small C values will result in a large margin at cost of misclassifying some data points.Large C values will result in narrow margin and makes constraints hard to ignore.



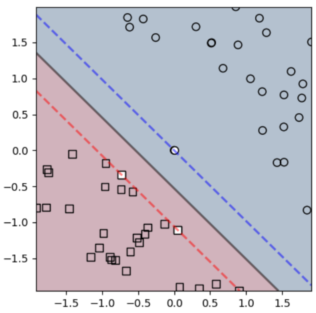
svm first part C=0.01



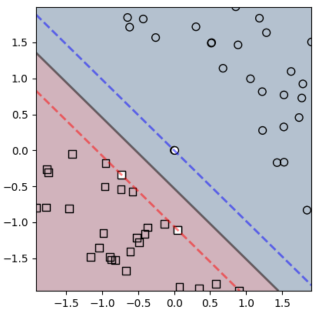
svm first part C=0.1



svm first part C=1



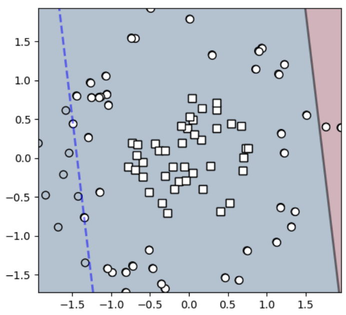
svm first part C=10



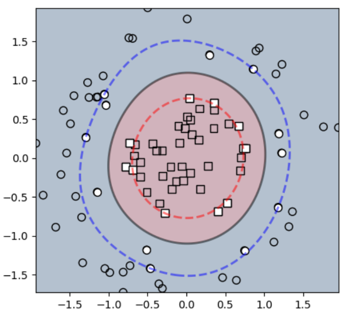
svm first part C=100

2.2 Second Part

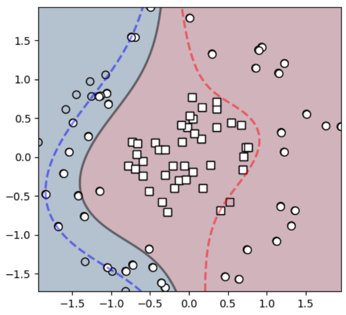
Since data is not linearly seperable linear kernel is not suitable to our data.Rbf kernel was best for our data as it find better hyperplane that separate our data very well. Polynomial kernel separate our data from the point where density increased but was not successful on separating data well. Sigmoid kernel produced meaningless results on our data.



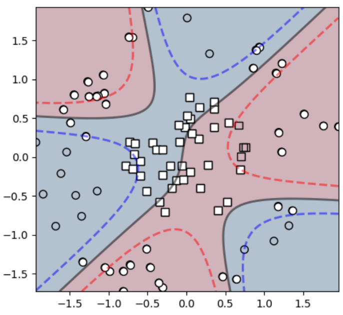
svm second part linear kernel



svm second part rbf kernel



svm second part poly kernel



svm second part sigmoid kernel

2.3 Third Part

Best hyperparameters of model was kernel=rbf gamma=0.01 and C=10,100
My model gave 0.8095238095238095 accuracy on test data set.

gamma	C				
	0.01	0.1	1	10	100
-	0.638	0.644	0.698	0.707	0.707

Table 1: Linear kernel

gamma	C				
	0.01	0.1	1	10	100
0.00001	0.538	0.538	0.538	0.564	0.627
0.0001	0.538	0.538	0.557	0.623	0.667
0.001	0.538	0.551	0.633	0.690	0.728
0.01	0.538	0.538	0.734	0.742	0.742
0.1	0.538	0.538	0.710	0.710	0.710
1	0.538	0.538	0.710	0.710	0.710

Table 2: RBF kernel

gamma	C				
	0.01	0.1	1	10	100
0.00001	0.538	0.538	0.538	0.538	0.538
0.0001	0.538	0.538	0.538	0.538	0.562
0.001	0.538	0.561	0.612	0.692	0.731
0.01	0.692	0.731	0.731	0.727	0.727
0.1	0.727	0.727	0.727	0.727	0.727
1	0.727	0.727	0.727	0.727	0.727

Table 3: Polynomial kernel

gamma	C				
	0.01	0.1	1	10	100
0.00001	0.538	0.538	0.539	0.539	0.609
0.0001	0.538	0.538	0.539	0.610	0.635
0.001	0.538	0.538	0.568	0.543	0.540
0.01	0.538	0.536	0.495	0.472	0.472
0.1	0.538	0.538	0.538	0.538	0.538
1	0.538	0.538	0.538	0.538	0.538

Table 4: Sigmoid kernel

2.4 Fourth part

2.4.1 Without handling the imbalance problem

Accuracy result on test data is 0.8333333333333334.No,it can lead misunderstanding such as when dataset is imbalanced accuracy will be more dependent of dominant data.

2.4.2 Oversampling the minority class

Report your test accuracy, confusion matrix and comment on them.

2.4.3 Undersampling the majority class

Report your test accuracy, confusion matrix and comment on them.

2.4.4 Setting the class_weight to balanced

Report your test accuracy, confusion matrix and comment on them.