Project 2 Report *

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1 Dataset and Problem Statement

1.1 Part A

Number of documents in Recreational Activity are 2389 and number of documents in Computer Technology are 2343

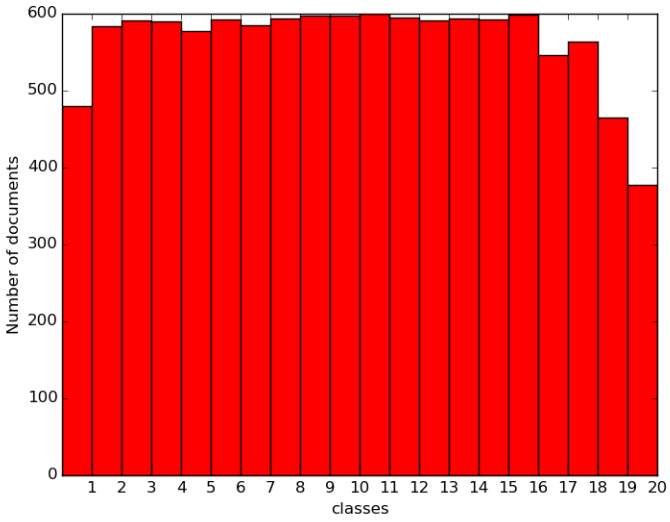

Figure 1: Histogram for the number of documents

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2 Modeling Text Data and Feature Extraction

2.1 Part B

Final number of terms extracted are 34792.

2.2 Part C

Ten Most significant features with TFICF scores are shown in Table 1

Index	comp.sys.ibm.pc.hardware	comp.sys.max.hardware	misc.forsale	soc.religion.christian
1	scsi	mac	dos	god
2	drive	use	new	christian
3	use	scsi	sale	jesus
4	mb	appl	offer	church
5	ide	drive	use	christ
6	card	mb	includ	peopl
7	disk	simm	ship	say
8	control	problem	price	bibl
9	dos	quadra	wolverin	believ
10	jumper	nubus	sell	think

Table 1: Ten most significant words.

3 Feature Selection

3.1 Part D

On applying LSI to the TFIDF matrix with k = 50, each document was mapped to a 50 dimensional vector.

4 Learning Algorithms

4.1 Part E: Linear SVM

The ROC curve for Linear SVM is shown below.

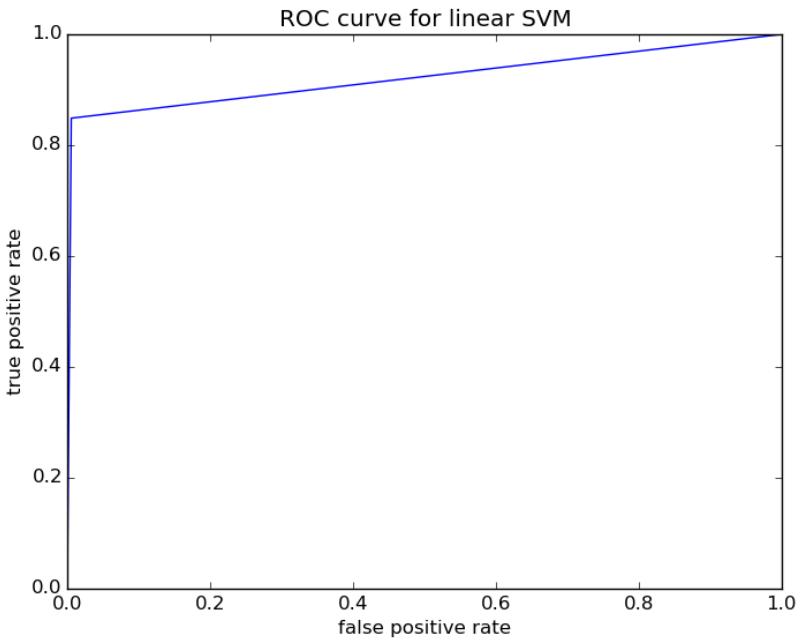


Figure 2: ROC curve for linear SVM

The confusion matrix for Linear SVM is shown below.

	Predicted Computer Technology	Predicted Recreation Activity
Actual Computer Technology	1581	9
Actual Recreation Activity	236	1324

Table 2: Confusion Matrix: Linear SVM

Accuracy, Precision and Recall for Linear SVM are shown below

Learning Algorithm	Accuracy	Precision	Recall
Linear SVM	92.22	99.32	84.87

Table 3: Liner SVM

4.2 Part F: Soft Margin SVM

The ROC curve for Soft Margin SVM is shown below.

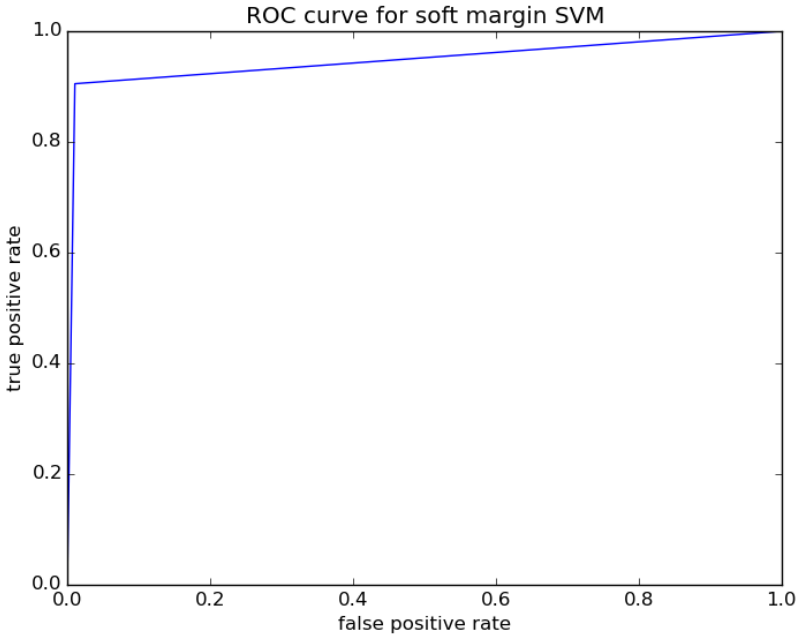


Figure 3: ROC curve for Soft Margin SVM

The confusion matrix for Soft Margin SVM is shown below.

	Predicted Computer Technology	Predicted Recreation Activity
Actual Computer Technology	1573	17
Actual Recreation Activity	148	1412

Table 4: Confusion Matrix: Soft Margin SVM

Accuracy, Precision and Recall for Soft Margin SVM are shown below

Learning Algorithm	Accuracy	Precision	Recall
Soft margin SVM	94.76	98.81	90.51

Table 5: Soft Margin SVM

4.3 Part G Naive Bayes

The ROC curve for Naive Bayes is shown below.

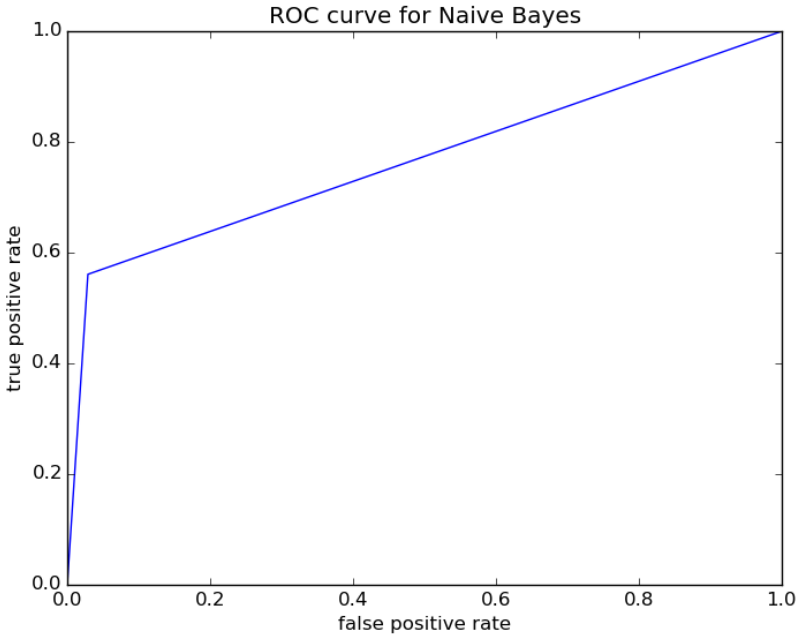


Figure 4: ROC curve for Naive Bayes

The confusion matrix for Naive Bayes is shown below.

	Predicted Computer Technology	Predicted Recreation Activity
Actual Computer Technology	1544	46
Actual Recreation Activity	685	875

Table 6: Confusion Matrix: Naive Bayes

Accuracy, Precision and Recall for Naive Bayes are shown below

Learning Algorithm	Accuracy	Precision	Recall
Gaussian Naive Bayes	76.79	95.00	56.08

Table 7: Naive Bayes

4.4 Part H Logistic Regression

ROC curve for Logistic Regression is shown below

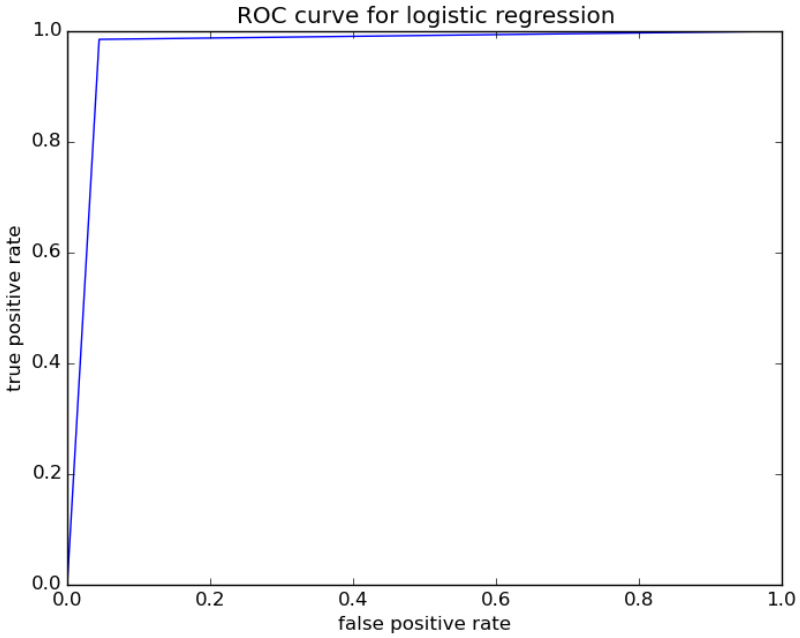


Figure 5: ROC curve for Logistic Regression

The confusion matrix for Logistic Regression is shown below.

	Accuracy Predicted Computer Technology	Predicted Recreation Activity
Actual Computer Technology	1519	71
Actual Recreation Activity	23	1537

Table 8: Confusion Matrix: Logistic Regression

Accuracy, Precision and Recall for Logistic Regression are shown below

Learning Algorithm	Accuracy	Precision	Recall
Logistic Regression	97.01	95.58	98.52

Table 9: Logistic Regression

5 Multi-class Classification

5.1 Part I

The results for Multi-class classification are shown in the tables below. Table 10 contains the results for One vs Rest method and Table 11 contains the results for One vs One method.

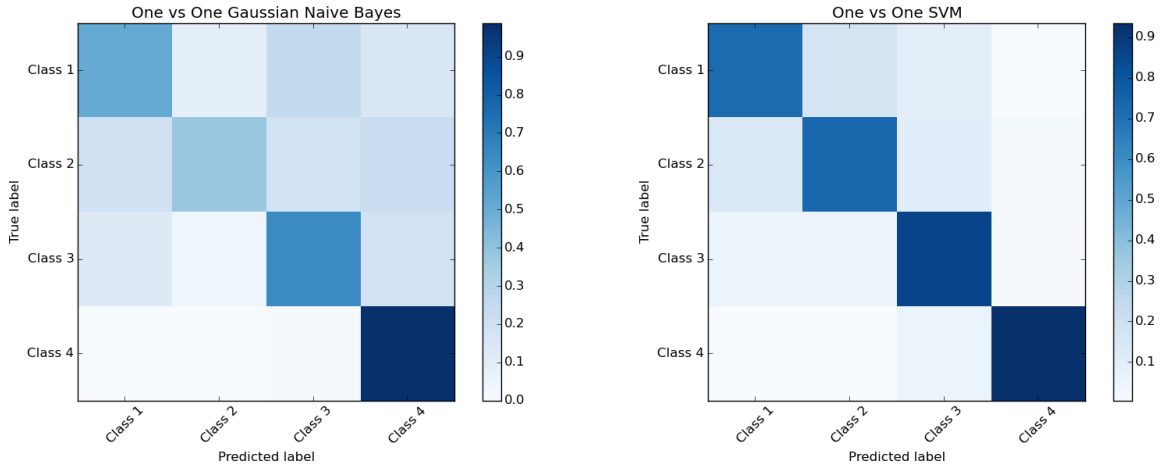
Learning Algorithm	Accuracy	Precision	Recall
Gaussian Naive Bayes	63.32	64.50	63.32
Linear SVM	81.40	81.50	81.40

Table 10: One vs Rest

Learning Algorithm	Accuracy	Precision	Recall
Gaussian Naive Bayes	64.53	65.47	64.53
Linear SVM	80.89	81.28	80.89

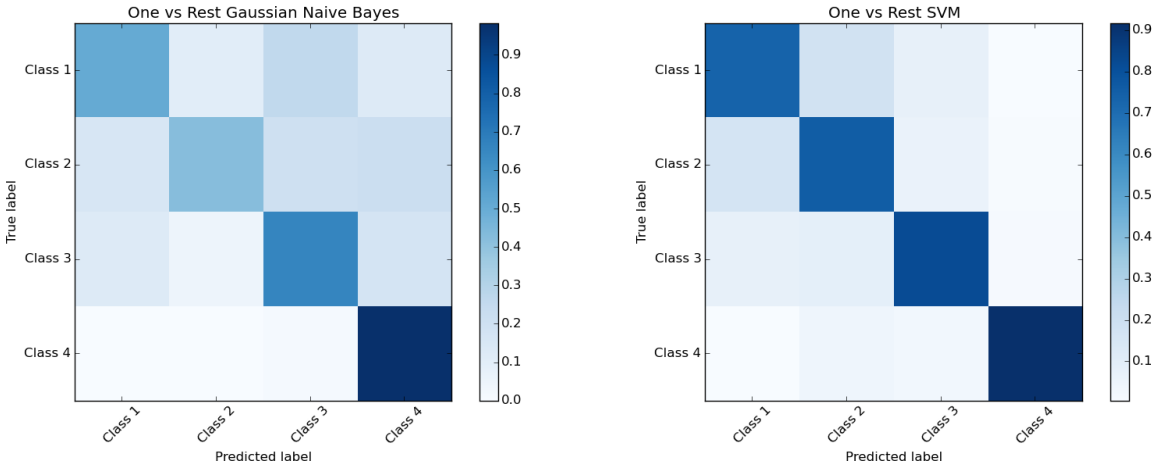
Table 11: One vs One

The confusion matrix for One vs One methods are shown below in figure 6 and Confusion matrix for One vs Rest methods are in figure 7



(a) Gaussian Naive Bayes (b) Linear SVM

Figure 6: Confusion Matrix for One vs One Method



(a) Gaussian Naive Bayes (b) Linear SVM

Figure 7: Confusion Matrix for One vs Rest Method