WEKA CLASSIFICATION REPORT

Using the Rubine features for classification is classic “TO DO” approach, which helps us to understand how really the features are helping for classification and how does different features help.

I have tried 6 different classifiers for the classification. I have listed the Weka output of all the classifiers.

I was pleased with the accuracy I got from different classifiers. Among all the classifiers, Random Forest did the best classification.

It also helped to see the effect of using different features which are more useful and also it helped to see how the classification is confused between different letters. The one which all classifiers missed classified is letter “h” and “n”. Since there are many similarities between these two letters so the classifier got confused in between which one to choose. Few features didn’t add too much to the tally as the F13 didn’t help much in majority of the cases.

During the implementation part, I really got involved into the small errors of taking all the data correctly. Moreover, I didn’t want to loop over the data again and again, so I implemented different features which were looping around all the data values in one function so that time complexity is reduced.

As far as Weka part is concerned, it was super easy and I liked trying almost all the classifiers.

Following I have included different classifiers and their outputs (Accuracy, Confusion Matrix, Recall, Precision , f-measure and all other rates).

1. **Naïve Bayes**

=== Run information ===

Scheme: weka.classifiers.bayes.NaiveBayes
Relation: new_letters-features
Instances: 520
Attributes: 14
Label
F1
F2
F3
F4
F5
F6
F7

F8
F9
F10
F11
F12
F13

Test mode: 10-fold cross-validation

=== Classifier model (full training set) ===

Naive Bayes Classifier

=== Stratified cross-validation ===

=== Summary ===

Correctly Classified Instances	399	76.7308 %
Incorrectly Classified Instances	121	23.2692 %
Kappa statistic	0.758	
Mean absolute error	0.0194	
Root mean squared error	0.1228	
Relative absolute error	26.2821 %	
Root relative squared error	63.8425 %	
Total Number of Instances	520	

=== Detailed Accuracy By Class ===

TP Rate	FP Rate	Precision	Recall	F-Measure	MCC	ROC Area	PRC Area	Class
0.850	0.016	0.680	0.850	0.756	0.750	0.952	0.836	a
0.750	0.014	0.682	0.750	0.714	0.703	0.900	0.719	b
0.800	0.004	0.889	0.800	0.842	0.837	0.991	0.902	c
0.850	0.022	0.607	0.850	0.708	0.705	0.893	0.736	d
0.750	0.002	0.938	0.750	0.833	0.833	0.984	0.910	e
0.850	0.020	0.630	0.850	0.723	0.719	0.984	0.598	f
0.700	0.018	0.609	0.700	0.651	0.638	0.981	0.662	g
0.450	0.014	0.563	0.450	0.500	0.486	0.822	0.432	h
0.850	0.000	1.000	0.850	0.919	0.919	0.944	0.888	i
0.750	0.008	0.789	0.750	0.769	0.761	0.906	0.842	j
0.500	0.028	0.417	0.500	0.455	0.433	0.958	0.557	k
0.850	0.006	0.850	0.850	0.850	0.844	0.944	0.882	l
0.850	0.004	0.895	0.850	0.872	0.867	0.952	0.884	m
0.550	0.010	0.688	0.550	0.611	0.601	0.867	0.627	n
0.800	0.006	0.842	0.800	0.821	0.814	0.926	0.874	o
0.900	0.002	0.947	0.900	0.923	0.920	0.992	0.935	p
0.850	0.012	0.739	0.850	0.791	0.784	0.944	0.859	q
0.850	0.010	0.773	0.850	0.810	0.803	0.950	0.746	r

0.850	0.000	1.000	0.850	0.919	0.919	0.987	0.941	s
0.800	0.002	0.941	0.800	0.865	0.863	0.983	0.886	t
0.850	0.008	0.810	0.850	0.829	0.823	0.893	0.812	u
0.500	0.008	0.714	0.500	0.588	0.585	0.913	0.551	v
0.800	0.014	0.696	0.800	0.744	0.735	0.963	0.658	w
0.850	0.004	0.895	0.850	0.872	0.867	0.974	0.944	x
0.700	0.004	0.875	0.700	0.778	0.775	0.946	0.722	y
0.850	0.006	0.850	0.850	0.850	0.844	0.920	0.821	z
Weighted Avg.	0.767	0.009	0.781	0.767	0.769	0.763	0.941	0.778

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	<-- classified as
17	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	a = a
0	15	0	0	0	0	0	0	0	0	3	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	b = b
1	0	16	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	c = c
0	0	0	17	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	d = d
0	0	0	1	15	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	e = e
1	0	0	0	0	17	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	f = f
1	0	0	0	0	1	14	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	g = g
0	0	0	0	0	0	2	9	0	2	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	1	h = h
1	0	1	0	0	0	0	0	17	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	i = i
0	0	0	2	0	2	0	1	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	j = j
0	3	0	3	0	0	1	2	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	k = k
0	0	0	0	1	1	0	0	0	0	0	17	0	0	0	0	1	0	0	0	0	0	0	0	0	0	l = l
0	0	0	0	0	1	0	0	0	0	0	0	17	1	0	0	0	0	0	0	0	0	1	0	0	0	m = m
1	0	0	0	0	0	1	3	0	1	0	0	0	11	0	0	0	1	0	0	1	0	0	0	0	1	n = n
0	0	0	0	0	2	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	1	1	0	0	o = o
0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	18	0	0	0	0	0	0	0	0	0	p = p
0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	q = q
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	17	0	0	0	2	0	0	0	r = r
1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	s = s
0	0	0	2	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	t = t
0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	1	0	0	0	u = u
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4	0	0	2	10	3	0	0	0	v = v
0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	1	16	0	0	0	w = w
1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	17	0	0	x = x
0	1	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	14	0	y = y
1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	17	z = z

1. Bayes Net

=== Run information ===

Scheme: weka.classifiers.bayes.BayesNet -D -Q weka.classifiers.bayes.net.search.local.K2 -- -P 1 -S BAYES -E weka.classifiers.bayes.net.estimate.SimpleEstimator -- -A 0.5
Relation: new_letters-features
Instances: 520
Attributes: 14
Label
F1
F2
F3
F4
F5
F6
F7
F8
F9
F10
F11
F12
F13
Test mode: 10-fold cross-validation

=== Classifier model (full training set) ===

Bayes Network Classifier
=== Stratified cross-validation ===
=== Summary ===

Correctly Classified Instances	390	75 %
Incorrectly Classified Instances	130	25 %
Kappa statistic	0.74	
Mean absolute error	0.0216	
Root mean squared error	0.1174	
Relative absolute error	29.1774 %	
Root relative squared error	61.0551 %	
Total Number of Instances	520	

=== Detailed Accuracy By Class ===

TP Rate	FP Rate	Precision	Recall	F-Measure	MCC	ROC Area	PRC Area	Class
0.700	0.010	0.737	0.700	0.718	0.707	0.989	0.849	a
0.700	0.010	0.737	0.700	0.718	0.707	0.980	0.842	b
0.700	0.006	0.824	0.700	0.757	0.751	0.970	0.787	c
0.700	0.012	0.700	0.700	0.700	0.688	0.930	0.669	d

	0.800	0.008	0.800	0.800	0.800	0.792	0.985	0.895	e
	0.750	0.010	0.750	0.750	0.750	0.740	0.974	0.772	f
	0.750	0.024	0.556	0.750	0.638	0.629	0.986	0.660	g
	0.500	0.006	0.769	0.500	0.606	0.608	0.950	0.684	h
	0.900	0.002	0.947	0.900	0.923	0.920	0.964	0.921	i
	0.800	0.008	0.800	0.800	0.800	0.792	0.983	0.904	j
	0.650	0.016	0.619	0.650	0.634	0.619	0.983	0.731	k
	0.850	0.010	0.773	0.850	0.810	0.803	0.987	0.891	l
	0.750	0.022	0.577	0.750	0.652	0.642	0.972	0.781	m
	0.550	0.014	0.611	0.550	0.579	0.564	0.901	0.644	n
	0.700	0.004	0.875	0.700	0.778	0.775	0.972	0.844	o
	0.900	0.004	0.900	0.900	0.900	0.896	0.973	0.913	p
	0.750	0.008	0.789	0.750	0.769	0.761	0.991	0.863	q
	0.700	0.004	0.875	0.700	0.778	0.775	0.990	0.910	r
	0.800	0.006	0.842	0.800	0.821	0.814	0.993	0.933	s
	0.850	0.004	0.895	0.850	0.872	0.867	0.997	0.931	t
	0.700	0.012	0.700	0.700	0.700	0.688	0.972	0.790	u
	0.700	0.010	0.737	0.700	0.718	0.707	0.985	0.818	v
	0.900	0.026	0.581	0.900	0.706	0.710	0.994	0.886	w
	0.800	0.006	0.842	0.800	0.821	0.814	0.986	0.892	x
	0.800	0.010	0.762	0.800	0.780	0.772	0.987	0.862	y
	0.800	0.008	0.800	0.800	0.800	0.792	0.995	0.919	z
Weighted Avg.	0.750	0.010	0.761	0.750	0.751	0.744	0.976	0.830	

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	<-- classified as
14	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	1	1	0	0	a = a
0	14	0	1	0	0	0	0	0	0	3	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	b = b
1	0	14	3	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	c = c
0	2	0	14	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	d = d
0	0	0	0	16	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	e = e
0	0	0	0	0	15	0	0	0	1	0	2	0	0	0	1	0	0	1	0	0	0	0	0	0	0	f = f
0	0	0	0	0	0	15	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	2	0	1	0	g = g
0	0	0	0	0	0	1	10	0	1	2	0	1	3	0	0	0	0	0	0	0	0	0	0	0	2	h = h
0	0	2	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	i = i
0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	1	0	0	0	1	2	0	0	0	0	0	j = j
0	1	0	1	0	0	1	1	0	0	13	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	k = k
0	0	0	0	0	2	1	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	l = l
0	1	0	0	0	0	1	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	2	0	0	1	m = m
0	0	0	0	0	0	1	1	0	0	0	0	0	4	11	0	0	0	0	0	0	1	0	1	0	1	0	n = n
2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	14	0	0	0	1	0	1	0	0	1	0	0	o = o
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	18	0	1	0	0	0	0	0	0	0	0	p = p
0	0	0	1	0	2	2	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	q = q

0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	14	0	0	0	3	0	0	0	0	|	r = r
0	0	1	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	16	0	0	0	0	0	0	0	|	s = s
0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	17	0	0	0	0	1	0	|	t = t
0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	14	2	1	0	0	0	|	u = u
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	14	4	0	0	0	|	v = v
0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	18	0	0	|	w = w
1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	16	0	0	|	x = x
0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	16	0	|	y = y
1	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	16	|	z = z

2. Multi Layer Perceptron

=== Run information ===

Scheme: weka.classifiers.functions.MultilayerPerceptron -L 0.3 -M 0.2 -N 500 -V 0 -S 0 -E 20 -H a
Relation: new_letters-features
Instances: 520
Attributes: 14
Label
F1
F2
F3
F4
F5
F6
F7
F8
F9
F10
F11
F12
F13
Test mode: 10-fold cross-validation

=== Stratified cross-validation ===
=== Summary ===

Correctly Classified Instances	438	84.2308 %

Incorrectly Classified Instances	82	15.7692 %
Kappa statistic	0.836	
Mean absolute error	0.017	
Root mean squared error	0.0977	
Relative absolute error	23.0443 %	
Root relative squared error	50.7829 %	
Total Number of Instances	520	

=== Detailed Accuracy By Class ===

TP Rate	FP Rate	Precision	Recall	F-Measure	MCC	ROC Area	PRC Area	Class
0.900	0.012	0.750	0.900	0.818	0.814	0.998	0.948	a
0.800	0.006	0.842	0.800	0.821	0.814	0.899	0.827	b
0.700	0.006	0.824	0.700	0.757	0.751	0.943	0.837	c
0.800	0.008	0.800	0.800	0.800	0.792	0.900	0.704	d
0.900	0.006	0.857	0.900	0.878	0.873	0.997	0.923	e
0.650	0.002	0.929	0.650	0.765	0.770	0.918	0.829	f
0.950	0.012	0.760	0.950	0.844	0.843	0.997	0.903	g
0.600	0.002	0.923	0.600	0.727	0.737	0.903	0.720	h
0.900	0.002	0.947	0.900	0.923	0.920	0.975	0.951	i
0.850	0.002	0.944	0.850	0.895	0.892	0.897	0.856	j
0.800	0.006	0.842	0.800	0.821	0.814	0.995	0.887	k
0.800	0.006	0.842	0.800	0.821	0.814	0.971	0.764	l
0.900	0.008	0.818	0.900	0.857	0.852	0.971	0.909	m
0.600	0.008	0.750	0.600	0.667	0.659	0.976	0.770	n
0.950	0.002	0.950	0.950	0.950	0.948	1.000	0.991	o
0.900	0.004	0.900	0.900	0.900	0.896	0.983	0.884	p
0.900	0.008	0.818	0.900	0.857	0.852	0.997	0.902	q
0.900	0.006	0.857	0.900	0.878	0.873	0.987	0.944	r
1.000	0.004	0.909	1.000	0.952	0.952	1.000	1.000	s
0.850	0.008	0.810	0.850	0.829	0.823	0.981	0.879	t
0.800	0.002	0.941	0.800	0.865	0.863	0.931	0.844	u
0.800	0.012	0.727	0.800	0.762	0.753	0.948	0.792	v
0.900	0.004	0.900	0.900	0.900	0.896	0.972	0.862	w
0.950	0.006	0.864	0.950	0.905	0.902	0.992	0.950	x
0.850	0.014	0.708	0.850	0.773	0.766	0.994	0.789	y
0.950	0.008	0.826	0.950	0.884	0.881	0.977	0.910	z
Weighted Avg. 0.842	0.006	0.848	0.842	0.840	0.837	0.965	0.868	

=== Confusion Matrix ===

```
 a b c d e f g h i j k l m n o p q r s t u v w x y z  <-- classified as
18 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 |  a = a
 0 16 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 1 0 0 0 0 0 1 |  b = b
```

1	0	14	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	c = c
1	0	0	16	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	d = d
0	0	0	1	18	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	e = e
1	0	1	0	0	13	2	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	f = f
0	0	0	0	0	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	g = g
0	0	0	0	0	0	0	12	0	0	3	0	0	2	0	0	0	0	0	0	0	0	0	0	2	1	h = h
0	0	2	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	i = i
0	0	0	0	0	0	2	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	j = j
0	2	0	1	0	0	0	1	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	k = k
0	0	0	0	1	1	0	0	0	0	0	16	0	0	0	0	0	1	0	0	0	0	1	0	0	0	l = l
0	0	0	0	0	0	0	0	0	0	0	0	18	1	0	0	0	0	0	0	0	1	0	0	0	0	m = m
1	0	0	0	0	0	0	0	0	0	0	0	2	12	0	0	0	0	0	0	0	2	0	0	2	1	n = n
0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0	0	0	0	0	1	0	0	0	0	0	o = o
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	0	1	0	0	0	0	0	0	1	0	p = p
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	18	0	0	0	0	0	0	0	0	q = q
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	18	0	0	0	1	0	0	0	r = r
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	s = s
0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	17	0	0	0	1	0	0	t = t
0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	16	1	0	0	0	u = u
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	16	0	0	0	1	v = v
0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	18	0	0	0		w = w
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0	0	x = x
0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	17	0		y = y
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	z = z

3. Random Forest

=== Run information ===

Scheme: weka.classifiers.trees.RandomForest -P 100 -I 100 -num-slots 1 -K 0 -M 1.0 -V 0.001 -S 1

Relation: new_letters-features

Instances: 520

Attributes: 14

Label

F1

F2

F3

F4

F5

F6

F7

F8

F9

F10

F11
F12
F13
Test mode: 10-fold cross-validation

=== Classifier model (full training set) ===

RandomForest

Bagging with 100 iterations and base learner

weka.classifiers.trees.RandomTree -K 0 -M 1.0 -V 0.001 -S 1 -do-not-check-capabilities

Time taken to build model: 0.55 seconds

=== Stratified cross-validation ===
=== Summary ===

Correctly Classified Instances	443	85.1923 %
Incorrectly Classified Instances	77	14.8077 %
Kappa statistic	0.846	
Mean absolute error	0.0307	
Root mean squared error	0.104	
Relative absolute error	41.4414 %	
Root relative squared error	54.0576 %	
Total Number of Instances	520	

=== Detailed Accuracy By Class ===

TP Rate	FP Rate	Precision	Recall	F-Measure	MCC	ROC Area	PRC Area	Class
0.900	0.004	0.900	0.900	0.900	0.896	0.996	0.944	a
0.850	0.002	0.944	0.850	0.895	0.892	0.988	0.950	b
0.800	0.004	0.889	0.800	0.842	0.837	0.996	0.934	c
0.850	0.014	0.708	0.850	0.773	0.766	0.988	0.884	d
0.900	0.008	0.818	0.900	0.857	0.852	0.997	0.932	e
0.900	0.008	0.818	0.900	0.857	0.852	0.997	0.935	f
0.750	0.010	0.750	0.750	0.750	0.740	0.997	0.921	g
0.650	0.008	0.765	0.650	0.703	0.694	0.967	0.816	h
0.900	0.002	0.947	0.900	0.923	0.920	0.968	0.942	i
0.900	0.008	0.818	0.900	0.857	0.852	0.984	0.945	j
0.850	0.008	0.810	0.850	0.829	0.823	0.996	0.931	k
0.800	0.008	0.800	0.800	0.800	0.792	0.995	0.918	l
0.900	0.002	0.947	0.900	0.923	0.920	0.998	0.966	m
0.650	0.006	0.813	0.650	0.722	0.717	0.924	0.735	n

0.950	0.004	0.905	0.950	0.927	0.924	0.989	0.934	o
0.850	0.002	0.944	0.850	0.895	0.892	0.998	0.969	p
0.750	0.006	0.833	0.750	0.789	0.783	0.995	0.922	q
0.900	0.006	0.857	0.900	0.878	0.873	0.996	0.929	r
0.850	0.004	0.895	0.850	0.872	0.867	0.997	0.943	s
0.850	0.002	0.944	0.850	0.895	0.892	0.994	0.944	t
0.850	0.004	0.895	0.850	0.872	0.867	0.989	0.921	u
0.850	0.006	0.850	0.850	0.850	0.844	0.993	0.891	v
0.950	0.006	0.864	0.950	0.905	0.902	0.988	0.947	w
0.900	0.004	0.900	0.900	0.900	0.896	0.985	0.950	x
0.900	0.010	0.783	0.900	0.837	0.832	0.994	0.931	y
0.950	0.008	0.826	0.950	0.884	0.881	0.998	0.954	z
Weighted Avg. 0.852	0.006	0.855	0.852	0.851	0.846	0.989	0.923	

=== Confusion Matrix ===

```
 a b c d e f g h i j k l m n o p q r s t u v w x y z  <-- classified as
18 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 |  a = a
 0 17 0 0 0 0 0 0 0 0 1 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 |  b = b
 0 0 16 3 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 |  c = c
 0 0 0 17 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 |  d = d
 0 0 0 0 18 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 |  e = e
 0 0 0 0 0 18 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 |  f = f
 0 0 0 1 0 1 15 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 2 0 |  g = g
 0 0 0 0 0 0 0 13 0 0 2 0 0 3 0 0 0 0 0 0 0 0 0 1 1 |  h = h
 0 0 2 0 0 0 0 0 18 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |  i = i
 0 0 0 0 0 0 1 0 1 18 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |  j = j
 0 0 0 0 0 0 0 2 0 0 17 0 0 0 0 0 0 0 0 0 0 0 0 1 0 |  k = k
 0 0 0 0 3 1 0 0 0 0 0 16 0 0 0 0 0 0 0 0 0 0 0 0 0 |  l = l
 0 0 0 0 0 0 0 0 0 2 0 0 18 0 0 0 0 0 0 0 0 0 0 0 0 |  m = m
 0 0 0 0 0 0 0 1 0 0 0 0 0 13 0 0 0 1 0 0 0 0 1 0 1 3 |  n = n
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 19 0 0 0 0 0 1 0 0 0 0 0 |  o = o
 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 17 0 0 0 0 0 0 0 0 0 0 |  p = p
 1 1 0 1 0 0 2 0 0 0 0 0 0 0 0 0 15 0 0 0 0 0 0 0 0 0 |  q = q
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 18 0 0 0 1 0 0 0 0 |  r = r
 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 0 17 0 0 0 0 1 0 0 |  s = s
 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 17 0 0 0 0 0 0 |  t = t
 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 17 1 0 0 0 0 |  u = u
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 1 0 17 0 0 0 0 |  v = v
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 19 0 0 0 |  w = w
 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 18 0 0 |  x = x
 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 18 0 |  y = y
 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 19 |  z = z
```

4. MultiClass Classifier

=== Run information ===

Scheme: weka.classifiers.meta.MultiClassClassifier -M 0 -R 2.0 -S 1 -W weka.classifiers.functions.Logistic -- -R 1.0E-8 -M -1 -num-decimal-places 4
Relation: new_letters-features
Instances: 520
Attributes: 14
Label
F1
F2
F3
F4
F5
F6
F7
F8
F9
F10
F11
F12
F13
Test mode: 10-fold cross-validation

=== Stratified cross-validation ===
=== Summary ===

Correctly Classified Instances	396	76.1538 %
Incorrectly Classified Instances	124	23.8462 %
Kappa statistic	0.752	
Mean absolute error	0.0242	
Root mean squared error	0.123	
Relative absolute error	32.7694 %	
Root relative squared error	63.9827 %	
Total Number of Instances	520	

=== Detailed Accuracy By Class ===

TP Rate	FP Rate	Precision	Recall	F-Measure	MCC	ROC Area	PRC Area	Class
0.950	0.008	0.826	0.950	0.884	0.881	0.994	0.941	a
0.750	0.030	0.500	0.750	0.600	0.594	0.881	0.615	b
0.850	0.006	0.850	0.850	0.850	0.844	0.956	0.891	c
0.600	0.006	0.800	0.600	0.686	0.682	0.945	0.749	d

0.850	0.016	0.680	0.850	0.756	0.750	0.988	0.654	e
0.750	0.012	0.714	0.750	0.732	0.721	0.920	0.598	f
0.600	0.014	0.632	0.600	0.615	0.601	0.962	0.710	g
0.750	0.018	0.625	0.750	0.682	0.671	0.922	0.540	h
0.900	0.000	1.000	0.900	0.947	0.947	0.998	0.967	i
0.700	0.008	0.778	0.700	0.737	0.728	0.988	0.753	j
0.850	0.010	0.773	0.850	0.810	0.803	0.991	0.761	k
0.800	0.008	0.800	0.800	0.800	0.792	0.835	0.768	l
0.800	0.008	0.800	0.800	0.800	0.792	0.979	0.891	m
0.750	0.018	0.625	0.750	0.682	0.671	0.888	0.631	n
0.800	0.008	0.800	0.800	0.800	0.792	0.994	0.752	o
0.850	0.004	0.895	0.850	0.872	0.867	0.996	0.948	p
0.550	0.010	0.688	0.550	0.611	0.601	0.875	0.578	q
0.700	0.016	0.636	0.700	0.667	0.653	0.978	0.671	r
0.950	0.000	1.000	0.950	0.974	0.974	1.000	1.000	s
0.850	0.004	0.895	0.850	0.872	0.867	0.990	0.901	t
0.750	0.012	0.714	0.750	0.732	0.721	0.883	0.774	u
0.600	0.004	0.857	0.600	0.706	0.708	0.908	0.797	v
0.700	0.012	0.700	0.700	0.700	0.688	0.940	0.827	w
0.750	0.002	0.938	0.750	0.833	0.833	0.994	0.915	x
0.700	0.008	0.778	0.700	0.737	0.728	0.914	0.704	y
0.700	0.006	0.824	0.700	0.757	0.751	0.897	0.702	z
Weighted Avg. 0.762	0.010	0.774	0.762	0.763	0.756	0.947	0.771	

=== Confusion Matrix ===

```
 a b c d e f g h i j k l m n o p q r s t u v w x y z  <-- classified as
19 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 |  a = a
 0 15 0 0 1 0 0 0 0 0 1 1 0 0 0 0 1 0 0 0 0 0 0 1 0 0 |  b = b
 0 1 17 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |  c = c
 0 2 1 12 2 0 0 0 0 0 1 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 |  d = d
 0 0 0 0 17 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 |  e = e
 0 0 0 0 0 15 3 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 |  f = f
 1 1 0 0 0 1 12 1 0 0 0 0 0 0 0 1 2 0 0 0 0 0 0 0 1 0 |  g = g
 0 1 0 0 0 0 0 15 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 2 |  h = h
 0 0 1 0 0 0 0 0 18 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 |  i = i
 0 2 0 0 0 2 0 0 0 14 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 |  j = j
 0 0 0 0 0 0 0 0 1 0 0 17 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 |  k = k
 0 0 0 0 0 1 2 0 0 0 0 0 16 0 0 0 0 0 1 0 0 0 0 0 0 0 0 |  l = l
 0 0 0 0 0 0 0 0 1 0 0 1 0 16 1 0 0 0 0 0 0 0 0 1 0 0 0 |  m = m
 0 0 0 0 0 0 0 0 1 0 0 0 0 2 15 0 0 0 0 0 0 1 0 0 0 0 1 |  n = n
 0 1 0 0 1 0 0 0 0 0 0 1 0 1 16 0 0 0 0 0 0 0 0 0 0 0 |  o = o
 0 1 0 0 0 0 0 0 0 0 0 1 1 0 0 0 17 0 0 0 0 0 0 0 0 0 0 |  p = p
 2 1 1 1 0 0 3 0 0 0 0 0 0 1 0 0 11 0 0 0 0 0 0 0 0 0 |  q = q
```

```
 0  0  0  0  0  0  0  1  0  1  0  0  0  0  0  1  0 14  0  0  0  0  2  0  1  0 |  r = r
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0 19  0  0  0  0  0  0  0 |  s = s
 0  2  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0 17  0  0  0  0  0  0 |  t = t
 0  0  0  0  1  0  0  0  0  1  0  1  0  0  1  0  0  0  0  0 15  1  0  0  0  0 |  u = u
 0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  4  0  1  0 12  2  0  0  0 |  v = v
 0  0  0  0  1  0  0  1  0  0  0  0  1  0  0  0  0  1  0  0  1  1 14  0  0  0 |  w = w
 1  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  0 15  0  0 |  x = x
 0  0  0  0  0  0  1  1  0  0  0  0  0  2  0  0  0  1  0  0  1  0  0  0 14  0 |  y = y
 0  2  0  0  1  0  0  1  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0 14 |  z = z
```

5. Simple Logistic

```
=== Run information ===

Scheme:       weka.classifiers.functions.SimpleLogistic -I 0 -M 500 -H 50 -W 0.0
Relation:     new_letters-features
Instances:    520
Attributes:   14
              Label
              F1
              F2
              F3
              F4
              F5
              F6
              F7
              F8
              F9
              F10
              F11
              F12
              F13
Test mode:    10-fold cross-validation

=== Stratified cross-validation ===
=== Summary ===

Correctly Classified Instances         430               82.6923 %
Incorrectly Classified Instances        90               17.3077 %
Kappa statistic                          0.82
Mean absolute error                      0.0213
Root mean squared error                  0.1035
Relative absolute error                 28.769  %
Root relative squared error             53.8272 %
Total Number of Instances              520
```

=== Detailed Accuracy By Class ===

TP Rate	FP Rate	Precision	Recall	F-Measure	MCC	ROC Area	PRC Area	Class
0.900	0.006	0.857	0.900	0.878	0.873	0.983	0.854	a
0.650	0.014	0.650	0.650	0.650	0.636	0.933	0.634	b
0.850	0.006	0.850	0.850	0.850	0.844	0.995	0.924	c
0.750	0.006	0.833	0.750	0.789	0.783	0.954	0.842	d
0.800	0.008	0.800	0.800	0.800	0.792	0.994	0.909	e
0.750	0.004	0.882	0.750	0.811	0.807	0.981	0.774	f
0.800	0.004	0.889	0.800	0.842	0.837	0.991	0.834	g
0.650	0.010	0.722	0.650	0.684	0.673	0.966	0.736	h
0.900	0.000	1.000	0.900	0.947	0.947	0.991	0.959	i
0.900	0.004	0.900	0.900	0.900	0.896	0.961	0.843	j
0.600	0.010	0.706	0.600	0.649	0.638	0.987	0.757	k
0.750	0.012	0.714	0.750	0.732	0.721	0.928	0.736	l
0.850	0.006	0.850	0.850	0.850	0.844	0.990	0.905	m
0.700	0.010	0.737	0.700	0.718	0.707	0.918	0.801	n
0.850	0.006	0.850	0.850	0.850	0.844	0.994	0.923	o
0.950	0.006	0.864	0.950	0.905	0.902	0.999	0.986	p
0.950	0.012	0.760	0.950	0.844	0.843	0.995	0.884	q
0.850	0.010	0.773	0.850	0.810	0.803	0.985	0.852	r
0.950	0.000	1.000	0.950	0.974	0.974	1.000	1.000	s
0.950	0.004	0.905	0.950	0.927	0.924	0.996	0.942	t
0.850	0.006	0.850	0.850	0.850	0.844	0.930	0.838	u
0.700	0.008	0.778	0.700	0.737	0.728	0.944	0.810	v
0.900	0.006	0.857	0.900	0.878	0.873	0.985	0.869	w
0.950	0.000	1.000	0.950	0.974	0.974	0.993	0.961	x
0.850	0.014	0.708	0.850	0.773	0.766	0.989	0.795	y
0.900	0.008	0.818	0.900	0.857	0.852	0.948	0.848	z
Weighted Avg.	0.827	0.007	0.829	0.827	0.826	0.820	0.974	0.854

=== Confusion Matrix ===

```
 a b c d e f g h i j k l m n o p q r s t u v w x y z  <-- classified as
18 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 |  a = a
 0 13 0 0 0 0 0 1 0 0 3 1 0 0 0 0 1 0 0 0 0 0 0 0 0 1 |  b = b
 1 1 17 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 |  c = c
 0 1 0 15 1 0 0 0 0 0 0 0 0 2 0 1 0 0 0 0 0 0 0 0 0 0 |  d = d
 0 0 0 1 16 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 1 0 0 0 0 |  e = e
 1 0 0 0 0 15 1 0 0 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |  f = f
 0 0 0 0 0 0 16 0 0 0 0 1 0 0 0 1 2 0 0 0 0 0 0 0 0 0 |  g = g
 0 2 0 0 0 0 0 13 0 1 1 0 0 1 0 0 0 0 0 0 0 0 0 1 1 |  h = h
 0 0 2 0 0 0 0 0 18 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |  i = i
```

```
 0  0  0  0  0  0  0  0  0 18  0  0  0  0  0  1  0  0  0  0  0  0  0  0  1  0 |  j = j
 0  1  0  2  0  0  0  1  0  0 12  0  0  0  0  0  2  0  0  0  0  0  0  0  2  0 |  k = k
 0  0  0  0  1  1  0  0  0  0  1 15  0  0  0  1  0  1  0  0  0  0  0  0  0  0 |  l = l
 0  0  0  0  0  0  0  1  0  0  0  0 17  2  0  0  0  0  0  0  0  0  0  0  0  0 |  m = m
 0  0  0  0  0  0  0  0  0  0  0  0  2 14  0  0  0  1  0  0  1  0  0  0  1  1 |  n = n
 0  0  0  0  0  0  0  0  0  0  0  1  0  0 17  0  0  0  0  1  0  0  1  0  0  0 |  o = o
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 19  0  0  0  0  0  0  0  0  1  0 |  p = p
 0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0 19  0  0  0  0  0  0  0  0  0 |  q = q
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 17  0  0  0  2  0  0  1  0 |  r = r
 0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0 19  0  0  0  0  0  0  0 |  s = s
 0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 19  0  0  0  0  0  0 |  t = t
 0  1  0  0  2  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 17  0  0  0  0  0 |  u = u
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  3  0  1  0 14  1  0  0  1 |  v = v
 0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  1 18  0  0  0 |  w = w
 1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 19  0  0 |  x = x
 0  0  0  0  0  0  0  2  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0 17  0 |  y = y
 0  0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0 18 |  z = z
```

6. **Logistic**

```
=== Run information ===

Scheme:       weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4
Relation:     new_letters-features
Instances:    520
Attributes:   14
              Label
              F1
              F2
              F3
              F4
              F5
              F6
              F7
              F8
              F9
              F10
              F11
              F12
              F13
Test mode:    10-fold cross-validation

=== Stratified cross-validation ===
=== Summary ===
```

Correctly Classified Instances	410	78.8462 %
Incorrectly Classified Instances	110	21.1538 %
Kappa statistic	0.78	
Mean absolute error	0.0162	
Root mean squared error	0.1239	
Relative absolute error	21.8702 %	
Root relative squared error	64.4047 %	
Total Number of Instances	520	

=== Detailed Accuracy By Class ===

TP Rate	FP Rate	Precision	Recall	F-Measure	MCC	ROC Area	PRC Area	Class
0.900	0.008	0.818	0.900	0.857	0.852	0.993	0.902	a
0.700	0.018	0.609	0.700	0.651	0.638	0.945	0.717	b
0.900	0.010	0.783	0.900	0.837	0.832	0.995	0.884	c
0.700	0.004	0.875	0.700	0.778	0.775	0.990	0.886	d
0.850	0.008	0.810	0.850	0.829	0.823	0.985	0.867	e
0.800	0.006	0.842	0.800	0.821	0.814	0.975	0.863	f
0.650	0.008	0.765	0.650	0.703	0.694	0.981	0.715	g
0.750	0.012	0.714	0.750	0.732	0.721	0.944	0.770	h
0.750	0.004	0.882	0.750	0.811	0.807	0.982	0.860	i
0.850	0.012	0.739	0.850	0.791	0.784	0.988	0.883	j
0.850	0.006	0.850	0.850	0.850	0.844	0.993	0.914	k
0.700	0.008	0.778	0.700	0.737	0.728	0.948	0.651	l
0.750	0.016	0.652	0.750	0.698	0.687	0.987	0.859	m
0.650	0.012	0.684	0.650	0.667	0.654	0.931	0.673	n
0.950	0.006	0.864	0.950	0.905	0.902	0.997	0.948	o
0.850	0.004	0.895	0.850	0.872	0.867	0.994	0.907	p
0.700	0.010	0.737	0.700	0.718	0.707	0.993	0.777	q
0.750	0.006	0.833	0.750	0.789	0.783	0.955	0.808	r
0.950	0.004	0.905	0.950	0.927	0.924	0.999	0.978	s
0.750	0.004	0.882	0.750	0.811	0.807	0.990	0.815	t
0.700	0.012	0.700	0.700	0.700	0.688	0.937	0.791	u
0.850	0.010	0.773	0.850	0.810	0.803	0.949	0.730	v
0.850	0.008	0.810	0.850	0.829	0.823	0.977	0.788	w
0.850	0.004	0.895	0.850	0.872	0.867	0.996	0.932	x
0.750	0.012	0.714	0.750	0.732	0.721	0.974	0.796	y
0.750	0.008	0.789	0.750	0.769	0.761	0.954	0.679	z
Weighted Avg. 0.788	0.008	0.792	0.788	0.788	0.781	0.975	0.823	

=== Confusion Matrix ===

```
 a b c d e f g h i j k l m n o p q r s t u v w x y z  <-- classified as
18 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 |  a = a
```

```
 0 14  0  1  0  0  0  1  0  1  1  1  0  0  0  0  0  0  0  0  0  0  0  1  0  0 |  b = b
 1  1 18  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  c = c
 0  1  0 14  0  0  0  0  0  0  0  0  0  0  2  0  1  0  1  0  0  0  0  1  0  0 |  d = d
 0  0  0  0 17  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  1  0  1  0  0  0 |  e = e
 0  0  1  0  0 16  1  0  0  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  f = f
 0  0  0  0  0  0 13  1  0  0  0  1  0  1  0  1  2  0  0  0  0  0  0  0  1  0 |  g = g
 0  1  0  0  0  0  0 15  0  0  1  0  0  1  0  0  0  0  0  0  0  0  0  1  1 |  h = h
 0  0  2  1  0  0  0  0 15  1  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0 |  i = i
 0  0  0  0  0  1  0  0  0 17  0  0  0  0  0  1  0  0  0  0  0  0  0  1  0 |  j = j
 0  0  0  0  0  0  0  2  0  0 17  0  0  0  0  0  1  0  0  0  0  0  0  0  0 |  k = k
 0  1  0  0  1  1  0  0  0  1  0 14  0  0  0  0  0  0  0  0  0  2  0  0  0 |  l = l
 0  0  0  0  0  0  0  0  0  0  0  0 15  2  0  0  0  0  1  0  0  0  1  0  0  1 |  m = m
 0  0  0  0  0  0  0  0  1  0  0  0  2 13  1  0  0  0  0  0  1  0  0  0  0  2 |  n = n
 0  0  0  0  1  0  0  0  0  0  0  0  0  0 19  0  0  0  0  0  0  0  0  0  0  0 |  o = o
 0  0  0  0  0  0  1  0  0  1  0  0  0  0  0 17  0  1  0  0  0  0  0  0  0  0 |  p = p
 1  1  1  0  1  0  2  0  0  0  0  0  0  0  0  0 14  0  0  0  0  0  0  0  0  0 |  q = q
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 15  0  0  0  2  0  0  3  0 |  r = r
 0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0 19  0  0  0  0  0  0  0 |  s = s
 0  1  0  0  0  1  0  0  0  1  0  0  0  0  0  0  0  0  0 15  2  0  0  0  0  0 |  t = t
 0  0  0  0  1  0  0  0  1  0  1  0  1  0  0  0  0  0  0  0 14  2  0  0  0  0 |  u = u
 0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  1  1 17  0  0  0  0 |  v = v
 0  0  0  0  0  0  0  0  0  0  0  0  1  1  0  0  0  1  0  0  0  0 17  0  0  0 |  w = w
 1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0 17  0  0 |  x = x
 0  1  0  0  0  0  0  0  0  0  0  0  1  1  0  0  0  1  0  0  1  0  0  0 15  0 |  y = y
 1     1  0  0  0  0  0  1  0  0  0  0  2  0  0  0  0  0  0  0  0  0  0  0  0 15 |  z = z
```

So having tried various classifiers we came to conclusion that even though the accuracy is greater than 85% in some cases, the features are not enough to go for classification which can provide us results greater than 95%.