

training        SIZE = 1000

```
#####  
##### training set #####  
#####
```

```
#####  
#####  
#####
```

#1 DEFAULT SETTINGS

=== Run information ===

Scheme:weka.classifiers.trees.J48 -C 0.25 -M 2

Relation:    optraining\_plus\_900

Instances:   1000

Attributes:  55

1  
2  
3  
4  
5  
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62  
63  
64

Test mode:10-fold cross-validation

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

J48 pruned tree

-----

```
36 <= 0
| 13 <= 0
| | 9 <= 1: 6 (5.0/1.0)
| | 9 > 1: 2 (5.0)
| 13 > 0
| | 28 <= 3
| | | 45 <= 1: 5 (6.0)
| | | 45 > 1: 0 (104.0/1.0)
| | 28 > 3
| | | 43 <= 2
| | | | 21 <= 9: 5 (7.0/1.0)
| | | | 21 > 9: 9 (27.0/1.0)
| | | 43 > 2: 4 (2.0/1.0)
36 > 0
| 21 <= 0
| | 42 <= 7
| | | 5 <= 3
| | | | 38 <= 0
| | | | | 13 <= 5
| | | | | | 10 <= 13: 1 (25.0/1.0)
| | | | | | 10 > 13: 2 (15.0)
| | | | | 13 > 5: 5 (2.0)
| | | | 38 > 0
| | | | | 33 <= 0: 3 (10.0/1.0)
| | | | | 33 > 0: 4 (4.0)
| | | 5 > 3
```

|  |  |  |  |                        |
|--|--|--|--|------------------------|
|  |  |  |  | 18 <= 3: 3 (2.0/1.0)   |
|  |  |  |  | 18 > 3: 5 (65.0)       |
|  |  |  |  | 42 > 7                 |
|  |  |  |  | 1 <= 1                 |
|  |  |  |  | 20 <= 7                |
|  |  |  |  | 30 <= 1: 6 (103.0/1.0) |
|  |  |  |  | 30 > 1: 4 (12.0/1.0)   |
|  |  |  |  | 20 > 7                 |
|  |  |  |  | 11 <= 14: 4 (3.0/1.0)  |
|  |  |  |  | 11 > 14: 1 (6.0)       |
|  |  |  |  | 1 > 1: 2 (5.0/1.0)     |
|  |  |  |  | 21 > 0                 |
|  |  |  |  | 2 <= 0                 |
|  |  |  |  | 20 <= 13               |
|  |  |  |  | 62 <= 1                |
|  |  |  |  | 26 <= 1: 7 (3.0/1.0)   |
|  |  |  |  | 26 > 1                 |
|  |  |  |  | 5 <= 10                |
|  |  |  |  | 54 <= 2: 4 (64.0/1.0)  |
|  |  |  |  | 54 > 2: 8 (2.0)        |
|  |  |  |  | 5 > 10                 |
|  |  |  |  | 6 <= 5                 |
|  |  |  |  | 59 <= 2: 4 (6.0)       |
|  |  |  |  | 59 > 2: 9 (3.0/1.0)    |
|  |  |  |  | 6 > 5: 9 (14.0/1.0)    |
|  |  |  |  | 62 > 1                 |
|  |  |  |  | 3 <= 6: 3 (2.0)        |
|  |  |  |  | 3 > 6: 8 (3.0)         |
|  |  |  |  | 20 > 13                |
|  |  |  |  | 28 <= 4: 9 (2.0)       |
|  |  |  |  | 28 > 4                 |
|  |  |  |  | 41 <= 4: 1 (41.0/2.0)  |
|  |  |  |  | 41 > 4                 |
|  |  |  |  | 46 <= 0: 1 (2.0)       |
|  |  |  |  | 46 > 0: 4 (5.0)        |
|  |  |  |  | 2 > 0                  |
|  |  |  |  | 53 <= 0                |
|  |  |  |  | 12 <= 3                |
|  |  |  |  | 5 <= 7: 4 (7.0)        |
|  |  |  |  | 5 > 7: 9 (2.0)         |
|  |  |  |  | 12 > 3                 |
|  |  |  |  | 61 <= 0                |
|  |  |  |  | 29 <= 0                |
|  |  |  |  | 50 <= 7: 1 (2.0/1.0)   |
|  |  |  |  | 50 > 7: 8 (6.0)        |
|  |  |  |  | 29 > 0                 |
|  |  |  |  | 25 <= 5                |
|  |  |  |  | 60 <= 8                |
|  |  |  |  | 18 <= 13: 7 (85.0/1.0) |
|  |  |  |  | 18 > 13                |
|  |  |  |  | 49 <= 0                |
|  |  |  |  | 7 <= 0                 |

[illegible]

```

| | | | | | | 52 <= 13
| | | | | | | 58 <= 8: 8 (5.0)
| | | | | | | 58 > 8: 2 (2.0)
| | | | | | | 52 > 13: 1 (23.0)

```

Number of Leaves : 68

Size of the tree : 135

Time taken to build model: 0.05 seconds

=== Stratified cross-validation ===

=== Summary ===

```

Correctly Classified Instances      835      83.5 %
Incorrectly Classified Instances    165      16.5 %
Kappa statistic                    0.8166
Mean absolute error                 0.0367
Root mean squared error             0.1768
Relative absolute error             20.4161 %
Root relative squared error         58.9488 %
Total Number of Instances          1000

```

=== Detailed Accuracy By Class ===

| TP Rate       | FP Rate | Precision | Recall | F-Measure | ROC Area | Class |
|---------------|---------|-----------|--------|-----------|----------|-------|
| 0.971         | 0.003   | 0.971     | 0.971  | 0.971     | 0.984    | 0     |
| 0.817         | 0.02    | 0.825     | 0.817  | 0.821     | 0.913    | 1     |
| 0.828         | 0.023   | 0.774     | 0.828  | 0.8       | 0.912    | 2     |
| 0.784         | 0.027   | 0.784     | 0.784  | 0.784     | 0.908    | 3     |
| 0.8           | 0.017   | 0.848     | 0.8    | 0.824     | 0.912    | 4     |
| 0.835         | 0.014   | 0.854     | 0.835  | 0.844     | 0.915    | 5     |
| 0.963         | 0.006   | 0.954     | 0.963  | 0.958     | 0.979    | 6     |
| 0.865         | 0.014   | 0.865     | 0.865  | 0.865     | 0.929    | 7     |
| 0.726         | 0.034   | 0.69      | 0.726  | 0.708     | 0.843    | 8     |
| 0.752         | 0.024   | 0.776     | 0.752  | 0.764     | 0.876    | 9     |
| Weighted Avg. | 0.835   | 0.018     | 0.836  | 0.835     | 0.835    | 0.918 |

=== Confusion Matrix ===

```

a b c d e f g h i j <-- classified as
100 0 0 0 0 3 0 0 0 0 | a = 0
0 85 5 0 3 1 0 1 5 4 | b = 1
0 4 72 5 0 0 1 1 3 1 | c = 2
0 2 6 87 0 2 0 3 9 2 | d = 3
0 3 0 1 84 2 4 0 6 5 | e = 4
3 0 4 3 1 76 0 0 3 1 | f = 5
0 0 1 0 2 0 103 0 1 0 | g = 6
0 0 0 2 0 3 0 83 2 6 | h = 7
0 5 4 6 2 1 0 5 69 3 | i = 8
0 4 1 7 7 1 0 3 2 76 | j = 9

```

```
#####  
#####  
#####
```

#2 confidence factor = 0.01

=== Run information ===

Scheme:weka.classifiers.trees.J48 -C 0.01 -M 2

Relation: optraining\_plus\_900

Instances: 1000

Attributes: 55

1  
2  
3  
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60  
61  
62  
63  
64

Test mode:10-fold cross-validation

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

J48 pruned tree

-----

36 <= 0

| 13 <= 0  
| | 9 <= 1: 6 (5.0/1.0)  
| | 9 > 1: 2 (5.0)  
| 13 > 0  
| | 28 <= 3  
| | | 45 <= 1: 5 (6.0)  
| | | 45 > 1: 0 (104.0/1.0)  
| | 28 > 3  
| | | 43 <= 2  
| | | | 21 <= 9: 5 (7.0/1.0)  
| | | | 21 > 9: 9 (27.0/1.0)  
| | | 43 > 2: 4 (2.0/1.0)

36 > 0

| 21 <= 0  
| | 42 <= 7  
| | | 5 <= 3  
| | | | 38 <= 0  
| | | | | 13 <= 5  
| | | | | 10 <= 13: 1 (25.0/1.0)  
| | | | | 10 > 13: 2 (15.0)  
| | | | | 13 > 5: 5 (2.0)  
| | | | 38 > 0  
| | | | | 33 <= 0: 3 (10.0/1.0)  
| | | | | 33 > 0: 4 (4.0)  
| | | 5 > 3  
| | | | 18 <= 3: 3 (2.0/1.0)  
| | | | 18 > 3: 5 (65.0)  
| | 42 > 7

|    |    |                  |
|----|----|------------------|
| 1  | <= | 1                |
| 20 | <= | 7                |
| 30 | <= | 1: 6 (103.0/1.0) |
| 30 | >  | 1: 4 (12.0/1.0)  |
| 20 | >  | 7                |
| 11 | <= | 14: 4 (3.0/1.0)  |
| 11 | >  | 14: 1 (6.0)      |
| 1  | >  | 1: 2 (5.0/1.0)   |
| 21 | >  | 0                |
| 2  | <= | 0                |
| 20 | <= | 13               |
| 62 | <= | 1                |
| 26 | <= | 1: 7 (3.0/1.0)   |
| 26 | >  | 1                |
| 5  | <= | 10               |
| 54 | <= | 2: 4 (64.0/1.0)  |
| 54 | >  | 2: 8 (2.0)       |
| 5  | >  | 10               |
| 6  | <= | 5                |
| 59 | <= | 2: 4 (6.0)       |
| 59 | >  | 2: 9 (3.0/1.0)   |
| 6  | >  | 5: 9 (14.0/1.0)  |
| 62 | >  | 1                |
| 3  | <= | 6: 3 (2.0)       |
| 3  | >  | 6: 8 (3.0)       |
| 20 | >  | 13               |
| 28 | <= | 4: 9 (2.0)       |
| 28 | >  | 4                |
| 41 | <= | 4: 1 (41.0/2.0)  |
| 41 | >  | 4                |
| 46 | <= | 0: 1 (2.0)       |
| 46 | >  | 0: 4 (5.0)       |
| 2  | >  | 0                |
| 53 | <= | 0                |
| 12 | <= | 3                |
| 5  | <= | 7: 4 (7.0)       |
| 5  | >  | 7: 9 (2.0)       |
| 12 | >  | 3                |
| 61 | <= | 0                |
| 29 | <= | 0                |
| 50 | <= | 7: 1 (2.0/1.0)   |
| 50 | >  | 7: 8 (6.0)       |
| 29 | >  | 0                |
| 25 | <= | 5                |
| 60 | <= | 8                |
| 18 | <= | 13: 7 (85.0/1.0) |
| 18 | >  | 13               |
| 49 | <= | 0                |
| 7  | <= | 0: 9 (8.0/2.0)   |
| 7  | >  | 0: 7 (2.0)       |
| 49 | >  | 0: 8 (3.0)       |
| 60 | >  | 8                |



```

| | | | | | | | | 4 <= 13: 1 (4.0/2.0)
| | | | | | | | | 4 > 13: 8 (3.0)
| | | | | | | | 25 > 5: 9 (5.0/1.0)
| | | | | | | 61 > 0: 1 (4.0/1.0)
| | | 53 > 0
| | | | 43 <= 3
| | | | 63 <= 3
| | | | | 42 <= 11
| | | | | 29 <= 14
| | | | | | 18 <= 13: 3 (88.0/3.0)
| | | | | | 18 > 13
| | | | | | 6 <= 0
| | | | | | | 26 <= 6: 3 (3.0)
| | | | | | | 26 > 6: 9 (7.0/1.0)
| | | | | | | 6 > 0: 5 (7.0/1.0)
| | | | | | 29 > 14
| | | | | | 44 <= 12: 9 (32.0)
| | | | | | 44 > 12: 2 (2.0/1.0)
| | | | | 42 > 11
| | | | | | 27 <= 7: 3 (2.0/1.0)
| | | | | | 27 > 7: 8 (11.0)
| | | | | 63 > 3: 2 (4.0)
| | | | 43 > 3
| | | | | 27 <= 9
| | | | | 19 <= 9
| | | | | | 50 <= 1: 7 (4.0/1.0)
| | | | | | 50 > 1
| | | | | | 38 <= 3
| | | | | | 45 <= 14
| | | | | | | 12 <= 8: 8 (5.0/1.0)
| | | | | | | 12 > 8: 2 (53.0/1.0)
| | | | | | | 45 > 14: 3 (2.0)
| | | | | | | 38 > 3: 3 (2.0)
| | | | | | 19 > 9: 1 (3.0/1.0)
| | | | | 27 > 9
| | | | | 20 <= 15
| | | | | 42 <= 1
| | | | | | 59 <= 15: 8 (4.0/1.0)
| | | | | | 59 > 15: 3 (4.0)
| | | | | | 42 > 1: 8 (51.0/1.0)
| | | | | 20 > 15
| | | | | | 52 <= 13
| | | | | | 58 <= 8: 8 (5.0)
| | | | | | 58 > 8: 2 (2.0)
| | | | | | 52 > 13: 1 (23.0)

```

Number of Leaves : 64

Size of the tree : 127

Time taken to build model: 0.05 seconds

```

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

```

```

Correctly Classified Instances      834          83.4 %
Incorrectly Classified Instances    166          16.6 %
Kappa statistic                    0.8155
Mean absolute error                 0.0378
Root mean squared error             0.1768
Relative absolute error             20.9969 %
Root relative squared error         58.9384 %
Total Number of Instances          1000

```

```

=== Detailed Accuracy By Class ===

```

| TP Rate       | FP Rate | Precision | Recall | F-Measure | ROC Area | Class |
|---------------|---------|-----------|--------|-----------|----------|-------|
| 0.971         | 0.003   | 0.971     | 0.971  | 0.971     | 0.984    | 0     |
| 0.817         | 0.02    | 0.825     | 0.817  | 0.821     | 0.916    | 1     |
| 0.805         | 0.024   | 0.761     | 0.805  | 0.782     | 0.904    | 2     |
| 0.784         | 0.028   | 0.777     | 0.784  | 0.78      | 0.907    | 3     |
| 0.81          | 0.017   | 0.85      | 0.81   | 0.829     | 0.917    | 4     |
| 0.835         | 0.015   | 0.844     | 0.835  | 0.84      | 0.915    | 5     |
| 0.963         | 0.006   | 0.954     | 0.963  | 0.958     | 0.979    | 6     |
| 0.875         | 0.015   | 0.857     | 0.875  | 0.866     | 0.933    | 7     |
| 0.716         | 0.032   | 0.701     | 0.716  | 0.708     | 0.842    | 8     |
| 0.752         | 0.023   | 0.784     | 0.752  | 0.768     | 0.867    | 9     |
| Weighted Avg. | 0.834   | 0.834     | 0.834  | 0.834     | 0.834    | 0.917 |

```

=== Confusion Matrix ===

```

```

a b c d e f g h i j <-- classified as
100 0 0 0 0 3 0 0 0 0 | a = 0
0 85 5 1 3 1 0 1 5 3 | b = 1
0 6 70 5 0 0 1 1 3 1 | c = 2
0 1 6 87 0 3 0 3 9 2 | d = 3
0 3 0 1 85 2 4 0 5 5 | e = 4
3 0 4 3 1 76 0 0 3 1 | f = 5
0 0 1 0 2 0 103 0 1 0 | g = 6
0 0 0 2 0 3 0 84 1 6 | h = 7
0 5 4 6 2 1 0 6 68 3 | i = 8
0 3 2 7 7 1 0 3 2 76 | j = 9

```

```

#####
#####
#####
#3 conf fact = 0.1

```

```

=== Run information ===

```

```

Scheme:weka.classifiers.trees.J48 -C 0.1 -M 2

```

Relation: optraining\_plus\_900

Instances: 1000

Attributes: 55

1  
2  
3  
4  
5  
6  
7  
9  
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64

Test mode:10-fold cross-validation

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

J48 pruned tree

-----

36 <= 0

| 13 <= 0

| | 9 <= 1: 6 (5.0/1.0)

| | 9 > 1: 2 (5.0)

| 13 > 0

| | 28 <= 3

| | | 45 <= 1: 5 (6.0)

| | | 45 > 1: 0 (104.0/1.0)

| | 28 > 3

| | | 43 <= 2

| | | | 21 <= 9: 5 (7.0/1.0)

| | | | 21 > 9: 9 (27.0/1.0)

| | | 43 > 2: 4 (2.0/1.0)

36 > 0

| 21 <= 0

| | 42 <= 7

| | | 5 <= 3

| | | | 38 <= 0

| | | | | 13 <= 5

| | | | | 10 <= 13: 1 (25.0/1.0)

| | | | | 10 > 13: 2 (15.0)

| | | | | 13 > 5: 5 (2.0)

| | | | 38 > 0

| | | | | 33 <= 0: 3 (10.0/1.0)

| | | | | 33 > 0: 4 (4.0)

| | | 5 > 3

| | | | 18 <= 3: 3 (2.0/1.0)

| | | | 18 > 3: 5 (65.0)

| | 42 > 7

| | | 1 <= 1

| | | | 20 <= 7

| | | | | 30 <= 1: 6 (103.0/1.0)

| | | | | 30 > 1: 4 (12.0/1.0)

| | | | 20 > 7

| | | | | 11 <= 14: 4 (3.0/1.0)

| | | | | 11 > 14: 1 (6.0)

| | | 1 > 1: 2 (5.0/1.0)

| 21 > 0

| | 2 <= 0

|  |  |  |                        |
|--|--|--|------------------------|
|  |  |  | 20 <= 13               |
|  |  |  | 62 <= 1                |
|  |  |  | 26 <= 1: 7 (3.0/1.0)   |
|  |  |  | 26 > 1                 |
|  |  |  | 5 <= 10                |
|  |  |  | 54 <= 2: 4 (64.0/1.0)  |
|  |  |  | 54 > 2: 8 (2.0)        |
|  |  |  | 5 > 10                 |
|  |  |  | 6 <= 5                 |
|  |  |  | 59 <= 2: 4 (6.0)       |
|  |  |  | 59 > 2: 9 (3.0/1.0)    |
|  |  |  | 6 > 5: 9 (14.0/1.0)    |
|  |  |  | 62 > 1                 |
|  |  |  | 3 <= 6: 3 (2.0)        |
|  |  |  | 3 > 6: 8 (3.0)         |
|  |  |  | 20 > 13                |
|  |  |  | 28 <= 4: 9 (2.0)       |
|  |  |  | 28 > 4                 |
|  |  |  | 41 <= 4: 1 (41.0/2.0)  |
|  |  |  | 41 > 4                 |
|  |  |  | 46 <= 0: 1 (2.0)       |
|  |  |  | 46 > 0: 4 (5.0)        |
|  |  |  | 2 > 0                  |
|  |  |  | 53 <= 0                |
|  |  |  | 12 <= 3                |
|  |  |  | 5 <= 7: 4 (7.0)        |
|  |  |  | 5 > 7: 9 (2.0)         |
|  |  |  | 12 > 3                 |
|  |  |  | 61 <= 0                |
|  |  |  | 29 <= 0                |
|  |  |  | 50 <= 7: 1 (2.0/1.0)   |
|  |  |  | 50 > 7: 8 (6.0)        |
|  |  |  | 29 > 0                 |
|  |  |  | 25 <= 5                |
|  |  |  | 60 <= 8                |
|  |  |  | 18 <= 13: 7 (85.0/1.0) |
|  |  |  | 18 > 13                |
|  |  |  | 49 <= 0                |
|  |  |  | 7 <= 0: 9 (8.0/2.0)    |
|  |  |  | 7 > 0: 7 (2.0)         |
|  |  |  | 49 > 0: 8 (3.0)        |
|  |  |  | 60 > 8                 |
|  |  |  | 25 <= 2                |
|  |  |  | 4 <= 13: 1 (2.0)       |
|  |  |  | 4 > 13: 8 (3.0)        |
|  |  |  | 25 > 2: 7 (2.0/1.0)    |
|  |  |  | 25 > 5: 9 (5.0/1.0)    |
|  |  |  | 61 > 0: 1 (4.0/1.0)    |
|  |  |  | 53 > 0                 |
|  |  |  | 43 <= 3                |
|  |  |  | 63 <= 3                |
|  |  |  | 42 <= 11               |

```

| | | | | | | 29 <= 14
| | | | | | | 18 <= 13: 3 (88.0/3.0)
| | | | | | | 18 > 13
| | | | | | | 6 <= 0
| | | | | | | 26 <= 6: 3 (3.0)
| | | | | | | 26 > 6: 9 (7.0/1.0)
| | | | | | | 6 > 0: 5 (7.0/1.0)
| | | | | | | 29 > 14
| | | | | | | 44 <= 12: 9 (32.0)
| | | | | | | 44 > 12: 2 (2.0/1.0)
| | | | | | 42 > 11
| | | | | | 27 <= 7: 3 (2.0/1.0)
| | | | | | 27 > 7: 8 (11.0)
| | | | | 63 > 3: 2 (4.0)
| | | | 43 > 3
| | | | 27 <= 9
| | | | 19 <= 9
| | | | 50 <= 1: 7 (4.0/1.0)
| | | | 50 > 1
| | | | 38 <= 3
| | | | 45 <= 14
| | | | 12 <= 8: 8 (5.0/1.0)
| | | | 12 > 8: 2 (53.0/1.0)
| | | | 45 > 14: 3 (2.0)
| | | | 38 > 3: 3 (2.0)
| | | | 19 > 9: 1 (3.0/1.0)
| | | | 27 > 9
| | | | 20 <= 15
| | | | 42 <= 1
| | | | 59 <= 15: 8 (4.0/1.0)
| | | | 59 > 15: 3 (4.0)
| | | | 42 > 1: 8 (51.0/1.0)
| | | | 20 > 15
| | | | 52 <= 13
| | | | 58 <= 8: 8 (5.0)
| | | | 58 > 8: 2 (2.0)
| | | | 52 > 13: 1 (23.0)

```

Number of Leaves : 65

Size of the tree : 129

Time taken to build model: 0.04 seconds

=== Stratified cross-validation ===

=== Summary ===

|                                  |        |      |   |
|----------------------------------|--------|------|---|
| Correctly Classified Instances   | 835    | 83.5 | % |
| Incorrectly Classified Instances | 165    | 16.5 | % |
| Kappa statistic                  | 0.8166 |      |   |
| Mean absolute error              | 0.0373 |      |   |

|                             |           |
|-----------------------------|-----------|
| Root mean squared error     | 0.1765    |
| Relative absolute error     | 20.7434 % |
| Root relative squared error | 58.8449 % |
| Total Number of Instances   | 1000      |

=== Detailed Accuracy By Class ===

| TP Rate       | FP Rate | Precision | Recall | F-Measure | ROC Area | Class |
|---------------|---------|-----------|--------|-----------|----------|-------|
| 0.971         | 0.003   | 0.971     | 0.971  | 0.971     | 0.984    | 0     |
| 0.817         | 0.02    | 0.825     | 0.817  | 0.821     | 0.913    | 1     |
| 0.828         | 0.023   | 0.774     | 0.828  | 0.8       | 0.921    | 2     |
| 0.784         | 0.027   | 0.784     | 0.784  | 0.784     | 0.907    | 3     |
| 0.8           | 0.017   | 0.848     | 0.8    | 0.824     | 0.912    | 4     |
| 0.835         | 0.014   | 0.854     | 0.835  | 0.844     | 0.915    | 5     |
| 0.963         | 0.006   | 0.954     | 0.963  | 0.958     | 0.979    | 6     |
| 0.875         | 0.015   | 0.857     | 0.875  | 0.866     | 0.932    | 7     |
| 0.716         | 0.033   | 0.694     | 0.716  | 0.705     | 0.84     | 8     |
| 0.752         | 0.024   | 0.776     | 0.752  | 0.764     | 0.878    | 9     |
| Weighted Avg. | 0.835   | 0.018     | 0.836  | 0.835     | 0.835    | 0.919 |

=== Confusion Matrix ===

```

a b c d e f g h i j <-- classified as
100 0 0 0 0 0 3 0 0 0 0 | a = 0
0 85 5 0 3 1 0 1 5 4 | b = 1
0 4 72 5 0 0 1 1 3 1 | c = 2
0 2 6 87 0 2 0 3 9 2 | d = 3
0 3 0 1 84 2 4 0 6 5 | e = 4
3 0 4 3 1 76 0 0 3 1 | f = 5
0 0 1 0 2 0 103 0 1 0 | g = 6
0 0 0 2 0 3 0 84 1 6 | h = 7
0 5 4 6 2 1 0 6 68 3 | i = 8
0 4 1 7 7 1 0 3 2 76 | j = 9

```

```

#####
#####
#####
#4 conf fact = 0.5 (0.25 is the default)

```

=== Run information ===

```

Scheme:weka.classifiers.trees.J48 -C 0.5 -M 2
Relation:  optraining_plus_900
Instances:  1000
Attributes:  55
1
2
3
4
5

```

6  
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62  
63  
64

Test mode:10-fold cross-validation



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

J48 pruned tree

-----

36 <= 0

| 13 <= 0

| | 9 <= 1: 6 (5.0/1.0)

| | 9 > 1: 2 (5.0)

| 13 > 0

| | 28 <= 3

| | | 45 <= 1: 5 (6.0)

| | | 45 > 1: 0 (104.0/1.0)

| | 28 > 3

| | | 43 <= 2

| | | | 21 <= 9: 5 (7.0/1.0)

| | | | 21 > 9: 9 (27.0/1.0)

| | | 43 > 2: 4 (2.0/1.0)

36 > 0

| 21 <= 0

| | 42 <= 7

| | | 5 <= 3

| | | | 38 <= 0

| | | | | 13 <= 5

| | | | | 10 <= 13: 1 (25.0/1.0)

| | | | | 10 > 13: 2 (15.0)

| | | | | 13 > 5: 5 (2.0)

| | | | 38 > 0

| | | | | 33 <= 0: 3 (10.0/1.0)

| | | | | 33 > 0: 4 (4.0)

| | | 5 > 3

| | | | 18 <= 3: 3 (2.0/1.0)

| | | | 18 > 3: 5 (65.0)

| | 42 > 7

| | | 1 <= 1

| | | | 20 <= 7

| | | | | 30 <= 1: 6 (103.0/1.0)

| | | | | 30 > 1: 4 (12.0/1.0)

| | | | 20 > 7

| | | | | 11 <= 14: 4 (3.0/1.0)

| | | | | 11 > 14: 1 (6.0)

| | | 1 > 1: 2 (5.0/1.0)

| 21 > 0

| | 2 <= 0

| | | 20 <= 13

| | | | 62 <= 1

| | | | | 26 <= 1: 7 (3.0/1.0)

| | | | | 26 > 1

| | | | | 5 <= 10

| | | | | 54 <= 2: 4 (64.0/1.0)

| | | | | 54 > 2: 8 (2.0)

| | | | 5 > 10

|  |  |  |  |  |  |                        |
|--|--|--|--|--|--|------------------------|
|  |  |  |  |  |  | 46 <= 0                |
|  |  |  |  |  |  | 6 <= 5                 |
|  |  |  |  |  |  | 59 <= 2: 4 (4.0)       |
|  |  |  |  |  |  | 59 > 2: 9 (2.0)        |
|  |  |  |  |  |  | 6 > 5: 9 (13.0)        |
|  |  |  |  |  |  | 46 > 0: 4 (4.0/1.0)    |
|  |  |  |  |  |  | 62 > 1                 |
|  |  |  |  |  |  | 3 <= 6: 3 (2.0)        |
|  |  |  |  |  |  | 3 > 6: 8 (3.0)         |
|  |  |  |  |  |  | 20 > 13                |
|  |  |  |  |  |  | 28 <= 4: 9 (2.0)       |
|  |  |  |  |  |  | 28 > 4                 |
|  |  |  |  |  |  | 41 <= 4: 1 (41.0/2.0)  |
|  |  |  |  |  |  | 41 > 4                 |
|  |  |  |  |  |  | 46 <= 0: 1 (2.0)       |
|  |  |  |  |  |  | 46 > 0: 4 (5.0)        |
|  |  |  |  |  |  | 2 > 0                  |
|  |  |  |  |  |  | 53 <= 0                |
|  |  |  |  |  |  | 12 <= 3                |
|  |  |  |  |  |  | 5 <= 7: 4 (7.0)        |
|  |  |  |  |  |  | 5 > 7: 9 (2.0)         |
|  |  |  |  |  |  | 12 > 3                 |
|  |  |  |  |  |  | 61 <= 0                |
|  |  |  |  |  |  | 29 <= 0                |
|  |  |  |  |  |  | 50 <= 7: 1 (2.0/1.0)   |
|  |  |  |  |  |  | 50 > 7: 8 (6.0)        |
|  |  |  |  |  |  | 29 > 0                 |
|  |  |  |  |  |  | 25 <= 5                |
|  |  |  |  |  |  | 60 <= 8                |
|  |  |  |  |  |  | 18 <= 13: 7 (85.0/1.0) |
|  |  |  |  |  |  | 18 > 13                |
|  |  |  |  |  |  | 49 <= 0                |
|  |  |  |  |  |  | 7 <= 0                 |
|  |  |  |  |  |  | 25 <= 0: 9 (5.0)       |
|  |  |  |  |  |  | 25 > 0: 7 (3.0/1.0)    |
|  |  |  |  |  |  | 7 > 0: 7 (2.0)         |
|  |  |  |  |  |  | 49 > 0: 8 (3.0)        |
|  |  |  |  |  |  | 60 > 8                 |
|  |  |  |  |  |  | 25 <= 2                |
|  |  |  |  |  |  | 4 <= 13: 1 (2.0)       |
|  |  |  |  |  |  | 4 > 13: 8 (3.0)        |
|  |  |  |  |  |  | 25 > 2: 7 (2.0/1.0)    |
|  |  |  |  |  |  | 25 > 5: 9 (5.0/1.0)    |
|  |  |  |  |  |  | 61 > 0: 1 (4.0/1.0)    |
|  |  |  |  |  |  | 53 > 0                 |
|  |  |  |  |  |  | 43 <= 3                |
|  |  |  |  |  |  | 63 <= 3                |
|  |  |  |  |  |  | 42 <= 11               |
|  |  |  |  |  |  | 29 <= 14               |
|  |  |  |  |  |  | 18 <= 13               |
|  |  |  |  |  |  | 19 <= 11: 3 (84.0/1.0) |
|  |  |  |  |  |  | 19 > 11                |

```

| | | | | | | | | 3 <= 15: 9 (2.0)
| | | | | | | | | 3 > 15: 3 (2.0)
| | | | | | | | 18 > 13
| | | | | | | | 6 <= 0
| | | | | | | | 26 <= 6: 3 (3.0)
| | | | | | | | 26 > 6: 9 (7.0/1.0)
| | | | | | | | 6 > 0: 5 (7.0/1.0)
| | | | | | | 29 > 14
| | | | | | | 44 <= 12: 9 (32.0)
| | | | | | | 44 > 12: 2 (2.0/1.0)
| | | | | | 42 > 11
| | | | | | 27 <= 7: 3 (2.0/1.0)
| | | | | | 27 > 7: 8 (11.0)
| | | | | 63 > 3: 2 (4.0)
| | | | 43 > 3
| | | | 27 <= 9
| | | | 19 <= 9
| | | | 50 <= 1: 7 (4.0/1.0)
| | | | 50 > 1
| | | | 38 <= 3
| | | | 45 <= 14
| | | | 12 <= 8: 8 (5.0/1.0)
| | | | 12 > 8: 2 (53.0/1.0)
| | | | 45 > 14: 3 (2.0)
| | | | 38 > 3: 3 (2.0)
| | | | 19 > 9: 1 (3.0/1.0)
| | | | 27 > 9
| | | | 20 <= 15
| | | | 42 <= 1
| | | | 59 <= 15: 8 (4.0/1.0)
| | | | 59 > 15: 3 (4.0)
| | | | 42 > 1: 8 (51.0/1.0)
| | | | 20 > 15
| | | | 52 <= 13
| | | | 58 <= 8: 8 (5.0)
| | | | 58 > 8: 2 (2.0)
| | | | 52 > 13: 1 (23.0)

```

Number of Leaves : 69

Size of the tree : 137

Time taken to build model: 0.05 seconds

=== Stratified cross-validation ===

=== Summary ===

|                                  |        |      |   |
|----------------------------------|--------|------|---|
| Correctly Classified Instances   | 835    | 83.5 | % |
| Incorrectly Classified Instances | 165    | 16.5 | % |
| Kappa statistic                  | 0.8166 |      |   |
| Mean absolute error              | 0.0368 |      |   |

Root mean squared error            0.1771  
 Relative absolute error            20.4603 %  
 Root relative squared error        59.0602 %  
 Total Number of Instances        1000

=== Detailed Accuracy By Class ===

| TP Rate       | FP Rate | Precision | Recall | F-Measure | ROC Area | Class |
|---------------|---------|-----------|--------|-----------|----------|-------|
| 0.971         | 0.003   | 0.971     | 0.971  | 0.971     | 0.984    | 0     |
| 0.817         | 0.019   | 0.833     | 0.817  | 0.825     | 0.914    | 1     |
| 0.828         | 0.023   | 0.774     | 0.828  | 0.8       | 0.905    | 2     |
| 0.784         | 0.027   | 0.784     | 0.784  | 0.784     | 0.907    | 3     |
| 0.8           | 0.017   | 0.848     | 0.8    | 0.824     | 0.913    | 4     |
| 0.835         | 0.014   | 0.854     | 0.835  | 0.844     | 0.915    | 5     |
| 0.963         | 0.006   | 0.954     | 0.963  | 0.958     | 0.979    | 6     |
| 0.865         | 0.014   | 0.865     | 0.865  | 0.865     | 0.929    | 7     |
| 0.726         | 0.034   | 0.69      | 0.726  | 0.708     | 0.843    | 8     |
| 0.752         | 0.026   | 0.768     | 0.752  | 0.76      | 0.875    | 9     |
| Weighted Avg. | 0.835   | 0.018     | 0.836  | 0.835     | 0.835    | 0.917 |

=== Confusion Matrix ===

```

a b c d e f g h i j <-- classified as
100 0 0 0 0 0 3 0 0 0 0 | a = 0
0 85 5 0 3 1 0 1 5 4 | b = 1
0 3 72 5 0 0 1 1 3 2 | c = 2
0 2 6 87 0 2 0 3 9 2 | d = 3
0 3 0 1 84 2 4 0 6 5 | e = 4
3 0 4 3 1 76 0 0 3 1 | f = 5
0 0 1 0 2 0 103 0 1 0 | g = 6
0 0 0 2 0 3 0 83 2 6 | h = 7
0 5 4 6 2 1 0 5 69 3 | i = 8
0 4 1 7 7 1 0 3 2 76 | j = 9

```

best conf fact = 0.2 (default)

```

#####
#####
#####
#5 num obj min = 2

```

=== Run information ===

Scheme:weka.classifiers.trees.J48 -C 0.2 -M 2  
 Relation: optraining\_plus\_900  
 Instances: 1000  
 Attributes: 55  
 1  
 2  
 3  
 4

5  
6  
7  
9  
10  
11  
12  
13  
14  
15  
17  
18  
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20  
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51  
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53  
54  
55  
57  
58  
59  
60  
61  
62  
63  
64

Test mode:10-fold cross-validation

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

J48 pruned tree

-----

36 <= 0

| 13 <= 0

| | 9 <= 1: 6 (5.0/1.0)

| | 9 > 1: 2 (5.0)

| 13 > 0

| | 28 <= 3

| | | 45 <= 1: 5 (6.0)

| | | 45 > 1: 0 (104.0/1.0)

| | 28 > 3

| | | 43 <= 2

| | | | 21 <= 9: 5 (7.0/1.0)

| | | | 21 > 9: 9 (27.0/1.0)

| | | 43 > 2: 4 (2.0/1.0)

36 > 0

| 21 <= 0

| | 42 <= 7

| | | 5 <= 3

| | | | 38 <= 0

| | | | | 13 <= 5

| | | | | 10 <= 13: 1 (25.0/1.0)

| | | | | 10 > 13: 2 (15.0)

| | | | | 13 > 5: 5 (2.0)

| | | | 38 > 0

| | | | | 33 <= 0: 3 (10.0/1.0)

| | | | | 33 > 0: 4 (4.0)

| | | 5 > 3

| | | | 18 <= 3: 3 (2.0/1.0)

| | | | 18 > 3: 5 (65.0)

| | 42 > 7

| | | 1 <= 1

| | | | 20 <= 7

| | | | | 30 <= 1: 6 (103.0/1.0)

| | | | | 30 > 1: 4 (12.0/1.0)

| | | | 20 > 7

| | | | | 11 <= 14: 4 (3.0/1.0)

| | | | | 11 > 14: 1 (6.0)

| | | 1 > 1: 2 (5.0/1.0)

| 21 > 0

| | 2 <= 0

| | | 20 <= 13

| | | | 62 <= 1

| | | | | 26 <= 1: 7 (3.0/1.0)

| | | | | 26 > 1

| | | | | 5 <= 10

| | | | | | 54 <= 2: 4 (64.0/1.0)

| | | | | | 54 > 2: 8 (2.0)

|  |  |                        |                       |                 |                     |
|--|--|------------------------|-----------------------|-----------------|---------------------|
|  |  |                        |                       |                 | 5 > 10              |
|  |  |                        |                       |                 | 6 <= 5              |
|  |  |                        |                       |                 | 59 <= 2: 4 (6.0)    |
|  |  |                        |                       |                 | 59 > 2: 9 (3.0/1.0) |
|  |  |                        |                       |                 | 6 > 5: 9 (14.0/1.0) |
|  |  |                        |                       | 62 > 1          |                     |
|  |  |                        |                       | 3 <= 6: 3 (2.0) |                     |
|  |  |                        |                       | 3 > 6: 8 (3.0)  |                     |
|  |  |                        | 20 > 13               |                 |                     |
|  |  |                        | 28 <= 4: 9 (2.0)      |                 |                     |
|  |  |                        | 28 > 4                |                 |                     |
|  |  |                        | 41 <= 4: 1 (41.0/2.0) |                 |                     |
|  |  |                        | 41 > 4                |                 |                     |
|  |  |                        | 46 <= 0: 1 (2.0)      |                 |                     |
|  |  |                        | 46 > 0: 4 (5.0)       |                 |                     |
|  |  | 2 > 0                  |                       |                 |                     |
|  |  | 53 <= 0                |                       |                 |                     |
|  |  | 12 <= 3                |                       |                 |                     |
|  |  | 5 <= 7: 4 (7.0)        |                       |                 |                     |
|  |  | 5 > 7: 9 (2.0)         |                       |                 |                     |
|  |  | 12 > 3                 |                       |                 |                     |
|  |  | 61 <= 0                |                       |                 |                     |
|  |  | 29 <= 0                |                       |                 |                     |
|  |  | 50 <= 7: 1 (2.0/1.0)   |                       |                 |                     |
|  |  | 50 > 7: 8 (6.0)        |                       |                 |                     |
|  |  | 29 > 0                 |                       |                 |                     |
|  |  | 25 <= 5                |                       |                 |                     |
|  |  | 60 <= 8                |                       |                 |                     |
|  |  | 18 <= 13: 7 (85.0/1.0) |                       |                 |                     |
|  |  | 18 > 13                |                       |                 |                     |
|  |  | 49 <= 0                |                       |                 |                     |
|  |  | 7 <= 0                 |                       |                 |                     |
|  |  | 25 <= 0: 9 (5.0)       |                       |                 |                     |
|  |  | 25 > 0: 7 (3.0/1.0)    |                       |                 |                     |
|  |  | 7 > 0: 7 (2.0)         |                       |                 |                     |
|  |  | 49 > 0: 8 (3.0)        |                       |                 |                     |
|  |  | 60 > 8                 |                       |                 |                     |
|  |  | 25 <= 2                |                       |                 |                     |
|  |  | 4 <= 13: 1 (2.0)       |                       |                 |                     |
|  |  | 4 > 13: 8 (3.0)        |                       |                 |                     |
|  |  | 25 > 2: 7 (2.0/1.0)    |                       |                 |                     |
|  |  | 25 > 5: 9 (5.0/1.0)    |                       |                 |                     |
|  |  | 61 > 0: 1 (4.0/1.0)    |                       |                 |                     |
|  |  | 53 > 0                 |                       |                 |                     |
|  |  | 43 <= 3                |                       |                 |                     |
|  |  | 63 <= 3                |                       |                 |                     |
|  |  | 42 <= 11               |                       |                 |                     |
|  |  | 29 <= 14               |                       |                 |                     |
|  |  | 18 <= 13               |                       |                 |                     |
|  |  | 19 <= 11: 3 (84.0/1.0) |                       |                 |                     |
|  |  | 19 > 11                |                       |                 |                     |
|  |  | 3 <= 15: 9 (2.0)       |                       |                 |                     |

```

| | | | | | | | | 3 > 15: 3 (2.0)
| | | | | | | | 18 > 13
| | | | | | | | 6 <= 0
| | | | | | | | 26 <= 6: 3 (3.0)
| | | | | | | | 26 > 6: 9 (7.0/1.0)
| | | | | | | | 6 > 0: 5 (7.0/1.0)
| | | | | | | 29 > 14
| | | | | | | 44 <= 12: 9 (32.0)
| | | | | | | 44 > 12: 2 (2.0/1.0)
| | | | | | 42 > 11
| | | | | | 27 <= 7: 3 (2.0/1.0)
| | | | | | 27 > 7: 8 (11.0)
| | | | | 63 > 3: 2 (4.0)
| | | | 43 > 3
| | | | 27 <= 9
| | | | 19 <= 9
| | | | | 50 <= 1: 7 (4.0/1.0)
| | | | | 50 > 1
| | | | | 38 <= 3
| | | | | 45 <= 14
| | | | | | 12 <= 8: 8 (5.0/1.0)
| | | | | | 12 > 8: 2 (53.0/1.0)
| | | | | | 45 > 14: 3 (2.0)
| | | | | | 38 > 3: 3 (2.0)
| | | | | 19 > 9: 1 (3.0/1.0)
| | | | 27 > 9
| | | | 20 <= 15
| | | | 42 <= 1
| | | | | 59 <= 15: 8 (4.0/1.0)
| | | | | 59 > 15: 3 (4.0)
| | | | | 42 > 1: 8 (51.0/1.0)
| | | | 20 > 15
| | | | | 52 <= 13
| | | | | 58 <= 8: 8 (5.0)
| | | | | 58 > 8: 2 (2.0)
| | | | | 52 > 13: 1 (23.0)

```

Number of Leaves : 68

Size of the tree : 135

Time taken to build model: 0.05 seconds

=== Stratified cross-validation ===

=== Summary ===

|                                  |        |      |   |
|----------------------------------|--------|------|---|
| Correctly Classified Instances   | 835    | 83.5 | % |
| Incorrectly Classified Instances | 165    | 16.5 | % |
| Kappa statistic                  | 0.8166 |      |   |
| Mean absolute error              | 0.0369 |      |   |
| Root mean squared error          | 0.1768 |      |   |



Relative absolute error            20.4874 %  
 Root relative squared error        58.9572 %  
 Total Number of Instances        1000

=== Detailed Accuracy By Class ===

| TP Rate       | FP Rate | Precision | Recall | F-Measure | ROC Area | Class |
|---------------|---------|-----------|--------|-----------|----------|-------|
| 0.971         | 0.003   | 0.971     | 0.971  | 0.971     | 0.984    | 0     |
| 0.817         | 0.02    | 0.825     | 0.817  | 0.821     | 0.913    | 1     |
| 0.828         | 0.023   | 0.774     | 0.828  | 0.8       | 0.912    | 2     |
| 0.784         | 0.027   | 0.784     | 0.784  | 0.784     | 0.908    | 3     |
| 0.8           | 0.017   | 0.848     | 0.8    | 0.824     | 0.912    | 4     |
| 0.835         | 0.014   | 0.854     | 0.835  | 0.844     | 0.915    | 5     |
| 0.963         | 0.006   | 0.954     | 0.963  | 0.958     | 0.979    | 6     |
| 0.865         | 0.014   | 0.865     | 0.865  | 0.865     | 0.928    | 7     |
| 0.726         | 0.034   | 0.69      | 0.726  | 0.708     | 0.842    | 8     |
| 0.752         | 0.024   | 0.776     | 0.752  | 0.764     | 0.873    | 9     |
| Weighted Avg. | 0.835   | 0.018     | 0.836  | 0.835     | 0.835    | 0.917 |

=== Confusion Matrix ===

```

a b c d e f g h i j <-- classified as
100 0 0 0 0 3 0 0 0 0 0 | a = 0
0 85 5 0 3 1 0 1 5 4 | b = 1
0 4 72 5 0 0 1 1 3 1 | c = 2
0 2 6 87 0 2 0 3 9 2 | d = 3
0 3 0 1 84 2 4 0 6 5 | e = 4
3 0 4 3 1 76 0 0 3 1 | f = 5
0 0 1 0 2 0 103 0 1 0 | g = 6
0 0 0 2 0 3 0 83 2 6 | h = 7
0 5 4 6 2 1 0 5 69 3 | i = 8
0 4 1 7 7 1 0 3 2 76 | j = 9

```

```

#####
#####
#####
#6 num obj min = 5

```

=== Run information ===

Scheme:weka.classifiers.trees.J48 -C 0.2 -M 5  
 Relation: optraining\_plus\_900  
 Instances: 1000  
 Attributes: 55  
 1  
 2  
 3  
 4  
 5  
 6  
 7  
 9

10  
11  
12  
13  
14  
15  
17  
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60  
61  
62  
63  
64

Test mode:10-fold cross-validation

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

J48 pruned tree

-----

36 <= 0

| 13 <= 0

| | 2 <= 7: 6 (5.0/1.0)

| | 2 > 7: 2 (5.0)

| 13 > 0

| | 28 <= 3

| | | 45 <= 1: 5 (6.0)

| | | 45 > 1: 0 (104.0/1.0)

| | 28 > 3

| | | 21 <= 9: 5 (8.0/2.0)

| | | 21 > 9: 9 (28.0/2.0)

36 > 0

| 21 <= 0

| | 42 <= 7

| | | 5 <= 3

| | | | 38 <= 0

| | | | | 10 <= 13: 1 (25.0/1.0)

| | | | | 10 > 13: 2 (17.0/2.0)

| | | | 38 > 0

| | | | | 12 <= 13: 4 (5.0/1.0)

| | | | | 12 > 13: 3 (9.0)

| | | | 5 > 3: 5 (67.0/2.0)

| | 42 > 7

| | | 1 <= 1

| | | | 20 <= 7

| | | | | 30 <= 1: 6 (103.0/1.0)

| | | | | 30 > 1: 4 (12.0/1.0)

| | | | 20 > 7: 1 (9.0/3.0)

| | | 1 > 1: 2 (5.0/1.0)

| 21 > 0

| | 2 <= 0

| | | 20 <= 13

| | | | 62 <= 1

| | | | | 5 <= 10: 4 (67.0/4.0)

| | | | | 5 > 10

| | | | | 36 <= 15

| | | | | | 12 <= 10: 9 (10.0)

| | | | | | 12 > 10

| | | | | | | 6 <= 7: 4 (5.0/1.0)

| | | | | | | 6 > 7: 9 (5.0/1.0)

| | | | | | 36 > 15: 7 (5.0/2.0)

| | | | | 62 > 1: 8 (5.0/2.0)

| | | 20 > 13

| | | | 41 <= 4

| | | | | 10 <= 5: 1 (37.0)

| | | | | 10 > 5: 9 (6.0/3.0)

| | | | 41 > 4: 4 (7.0/2.0)

| | 2 > 0

| | | 53 <= 0

| | | | 12 <= 3: 4 (9.0/2.0)

```

| | | | 12 > 3
| | | | 29 <= 0: 8 (9.0/3.0)
| | | | 29 > 0
| | | | 25 <= 5
| | | | 60 <= 8
| | | | 18 <= 13: 7 (85.0/1.0)
| | | | 18 > 13
| | | | 27 <= 9: 7 (5.0/1.0)
| | | | 27 > 9: 9 (8.0/3.0)
| | | | 60 > 8
| | | | 12 <= 11: 8 (5.0/2.0)
| | | | 12 > 11: 1 (5.0/1.0)
| | | | 25 > 5: 9 (5.0/1.0)
| | | 53 > 0
| | | 43 <= 3
| | | 42 <= 11
| | | 29 <= 14
| | | 63 <= 0
| | | 18 <= 13: 3 (87.0/3.0)
| | | 18 > 13
| | | 6 <= 0: 9 (9.0/3.0)
| | | 6 > 0: 5 (7.0/1.0)
| | | 63 > 0: 2 (5.0/2.0)
| | | 29 > 14: 9 (35.0/3.0)
| | | 42 > 11: 8 (13.0/2.0)
| | | 43 > 3
| | | 27 <= 9
| | | 6 <= 2
| | | 51 <= 10: 3 (8.0/5.0)
| | | 51 > 10: 2 (56.0/4.0)
| | | 6 > 2: 7 (5.0/2.0)
| | | 27 > 9
| | | 20 <= 15
| | | 42 <= 1: 3 (8.0/4.0)
| | | 42 > 1: 8 (51.0/1.0)
| | | 20 > 15
| | | 52 <= 13: 8 (7.0/2.0)
| | | 52 > 13: 1 (23.0)

```

Number of Leaves : 45

Size of the tree : 89

Time taken to build model: 0.04 seconds

=== Stratified cross-validation ===

=== Summary ===

|                                  |        |      |   |
|----------------------------------|--------|------|---|
| Correctly Classified Instances   | 826    | 82.6 | % |
| Incorrectly Classified Instances | 174    | 17.4 | % |
| Kappa statistic                  | 0.8066 |      |   |

|                             |           |
|-----------------------------|-----------|
| Mean absolute error         | 0.0434    |
| Root mean squared error     | 0.1726    |
| Relative absolute error     | 24.1133 % |
| Root relative squared error | 57.532 %  |
| Total Number of Instances   | 1000      |

=== Detailed Accuracy By Class ===

| TP Rate       | FP Rate | Precision | Recall | F-Measure | ROC Area | Class |
|---------------|---------|-----------|--------|-----------|----------|-------|
| 0.971         | 0.003   | 0.971     | 0.971  | 0.971     | 0.984    | 0     |
| 0.827         | 0.026   | 0.789     | 0.827  | 0.808     | 0.927    | 1     |
| 0.816         | 0.024   | 0.763     | 0.816  | 0.789     | 0.923    | 2     |
| 0.748         | 0.025   | 0.79      | 0.748  | 0.769     | 0.905    | 3     |
| 0.771         | 0.017   | 0.844     | 0.771  | 0.806     | 0.906    | 4     |
| 0.846         | 0.017   | 0.837     | 0.846  | 0.842     | 0.929    | 5     |
| 0.916         | 0.003   | 0.97      | 0.916  | 0.942     | 0.984    | 6     |
| 0.917         | 0.022   | 0.815     | 0.917  | 0.863     | 0.961    | 7     |
| 0.726         | 0.031   | 0.711     | 0.726  | 0.719     | 0.89     | 8     |
| 0.723         | 0.026   | 0.76      | 0.723  | 0.741     | 0.9      | 9     |
| Weighted Avg. | 0.826   | 0.019     | 0.827  | 0.826     | 0.826    | 0.931 |

=== Confusion Matrix ===

| a   | b  | c  | d  | e  | f  | g  | h  | i  | j  | <-- classified as |
|-----|----|----|----|----|----|----|----|----|----|-------------------|
| 100 | 0  | 0  | 0  | 0  | 0  | 3  | 0  | 0  | 0  | a = 0             |
| 0   | 86 | 5  | 1  | 3  | 1  | 0  | 1  | 6  | 1  | b = 1             |
| 0   | 5  | 71 | 3  | 0  | 0  | 0  | 3  | 4  | 1  | c = 2             |
| 0   | 3  | 4  | 83 | 2  | 3  | 0  | 2  | 9  | 5  | d = 3             |
| 0   | 4  | 2  | 2  | 81 | 2  | 2  | 3  | 2  | 7  | e = 4             |
| 3   | 0  | 3  | 0  | 1  | 77 | 1  | 1  | 3  | 2  | f = 5             |
| 0   | 0  | 4  | 1  | 3  | 0  | 98 | 0  | 1  | 0  | g = 6             |
| 0   | 0  | 0  | 2  | 2  | 1  | 0  | 88 | 1  | 2  | h = 7             |
| 0   | 8  | 2  | 4  | 1  | 1  | 0  | 5  | 69 | 5  | i = 8             |
| 0   | 3  | 2  | 9  | 3  | 4  | 0  | 5  | 2  | 73 | j = 9             |

```
#####
#####
#####
#7 num obj min = 10
```

=== Run information ===

```
Scheme:weka.classifiers.trees.J48 -C 0.2 -M 10
Relation:  optraining_plus_900
Instances:  1000
Attributes:  55
1
2
3
4
5
```

6  
7  
9  
10  
11  
12  
13  
14  
15  
17  
18  
19  
20  
21  
22  
23  
25  
26  
27  
28  
29  
30  
33  
34  
35  
36  
37  
38  
41  
42  
43  
44  
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46  
47  
49  
50  
51  
52  
53  
54  
55  
57  
58  
59  
60  
61  
62  
63  
64

Test mode:10-fold cross-validation

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

J48 pruned tree

-----

```
36 <= 0
| 13 <= 0: 2 (10.0/5.0)
| 13 > 0
| | 28 <= 3
| | | 37 <= 3: 5 (10.0/4.0)
| | | 37 > 3: 0 (100.0/1.0)
| | 28 > 3
| | | 25 <= 2: 9 (26.0/2.0)
| | | 25 > 2: 5 (10.0/4.0)
36 > 0
| 21 <= 0
| | 42 <= 7
| | | 5 <= 3
| | | | 38 <= 0
| | | | | 10 <= 13: 1 (25.0/1.0)
| | | | | 10 > 13: 2 (17.0/2.0)
| | | | 38 > 0: 3 (14.0/5.0)
| | | 5 > 3: 5 (67.0/2.0)
| | 42 > 7
| | | 20 <= 7
| | | | 30 <= 1: 6 (104.0/2.0)
| | | | 30 > 1: 4 (12.0/1.0)
| | | 20 > 7: 1 (13.0/7.0)
| 21 > 0
| | 2 <= 0
| | | 20 <= 13
| | | | 5 <= 8: 4 (66.0/4.0)
| | | | 5 > 8
| | | | | 38 <= 3: 9 (19.0/6.0)
| | | | | 38 > 3: 4 (12.0/5.0)
| | | 20 > 13: 1 (50.0/9.0)
| | 2 > 0
| | | 53 <= 0
| | | | 18 <= 10: 7 (84.0/6.0)
| | | | 18 > 10
| | | | | 50 <= 7
| | | | | 4 <= 9: 4 (10.0/2.0)
| | | | | 4 > 9
| | | | | | 27 <= 8: 7 (10.0/2.0)
| | | | | | 27 > 8: 9 (13.0)
| | | | | 50 > 7: 8 (14.0/2.0)
| | | 53 > 0
| | | | 43 <= 3
| | | | 42 <= 11
| | | | 29 <= 14
| | | | | 18 <= 13: 3 (90.0/5.0)
| | | | | 18 > 13: 9 (18.0/11.0)
```

```

| | | | | 29 > 14: 9 (35.0/3.0)
| | | | | 42 > 11: 8 (13.0/2.0)
| | | | 43 > 3
| | | | | 27 <= 9
| | | | | 54 <= 0: 8 (14.0/10.0)
| | | | | 54 > 0: 2 (55.0/3.0)
| | | | | 27 > 9
| | | | | 20 <= 15: 8 (59.0/6.0)
| | | | | 20 > 15
| | | | | 44 <= 15: 8 (10.0/5.0)
| | | | | 44 > 15: 1 (20.0)

```

Number of Leaves : 30

Size of the tree : 59

Time taken to build model: 0.03 seconds

=== Stratified cross-validation ===

=== Summary ===

|                                  |           |        |
|----------------------------------|-----------|--------|
| Correctly Classified Instances   | 787       | 78.7 % |
| Incorrectly Classified Instances | 213       | 21.3 % |
| Kappa statistic                  | 0.7633    |        |
| Mean absolute error              | 0.0522    |        |
| Root mean squared error          | 0.1805    |        |
| Relative absolute error          | 29.0165 % |        |
| Root relative squared error      | 60.1841 % |        |
| Total Number of Instances        | 1000      |        |

=== Detailed Accuracy By Class ===

| TP Rate       | FP Rate | Precision | Recall | F-Measure | ROC Area | Class |
|---------------|---------|-----------|--------|-----------|----------|-------|
| 0.971         | 0.008   | 0.935     | 0.971  | 0.952     | 0.991    | 0     |
| 0.817         | 0.029   | 0.766     | 0.817  | 0.791     | 0.931    | 1     |
| 0.724         | 0.021   | 0.768     | 0.724  | 0.746     | 0.914    | 2     |
| 0.685         | 0.022   | 0.792     | 0.685  | 0.734     | 0.9      | 3     |
| 0.648         | 0.019   | 0.8       | 0.648  | 0.716     | 0.923    | 4     |
| 0.791         | 0.024   | 0.766     | 0.791  | 0.778     | 0.92     | 5     |
| 0.925         | 0.012   | 0.9       | 0.925  | 0.912     | 0.987    | 6     |
| 0.865         | 0.018   | 0.838     | 0.865  | 0.851     | 0.97     | 7     |
| 0.737         | 0.04    | 0.66      | 0.737  | 0.697     | 0.922    | 8     |
| 0.703         | 0.043   | 0.645     | 0.703  | 0.673     | 0.924    | 9     |
| Weighted Avg. | 0.787   | 0.024     | 0.789  | 0.787     | 0.786    | 0.939 |

=== Confusion Matrix ===

```

a b c d e f g h i j <-- classified as
100 0 0 0 0 3 0 0 0 0 | a = 0
0 85 6 0 3 0 1 2 4 3 | b = 1
0 3 63 6 0 3 6 2 3 1 | c = 2

```



|   |   |   |    |    |    |    |    |    |    |  |       |
|---|---|---|----|----|----|----|----|----|----|--|-------|
| 0 | 5 | 4 | 76 | 1  | 4  | 0  | 1  | 9  | 11 |  | d = 3 |
| 1 | 7 | 0 | 4  | 68 | 1  | 1  | 3  | 10 | 10 |  | e = 4 |
| 5 | 0 | 3 | 1  | 0  | 72 | 2  | 1  | 3  | 4  |  | f = 5 |
| 0 | 0 | 0 | 2  | 2  | 4  | 99 | 0  | 0  | 0  |  | g = 6 |
| 0 | 1 | 1 | 3  | 1  | 1  | 0  | 83 | 1  | 5  |  | h = 7 |
| 0 | 6 | 5 | 2  | 1  | 1  | 1  | 4  | 70 | 5  |  | i = 8 |
| 1 | 4 | 0 | 2  | 9  | 5  | 0  | 3  | 6  | 71 |  | j = 9 |

```
#####  
#####  
#####  
#8 num obj min = 15
```

=== Run information ===

Scheme:weka.classifiers.trees.J48 -C 0.2 -M 15

Relation: optraining\_plus\_900

Instances: 1000

Attributes: 55

1  
2  
3  
4  
5  
6  
7  
9  
10  
11  
12  
13  
14  
15  
17  
18  
19  
20  
21  
22  
23  
25  
26  
27  
28  
29  
30  
33  
34  
35  
36

37  
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41  
42  
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44  
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47  
49  
50  
51  
52  
53  
54  
55  
57  
58  
59  
60  
61  
62  
63  
64

Test mode:10-fold cross-validation

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

J48 pruned tree

-----

```
36 <= 0
| 28 <= 2
| | 37 <= 3: 5 (15.0/9.0)
| | 37 > 3: 0 (101.0/2.0)
| 28 > 2
| | 34 <= 0: 9 (25.0/2.0)
| | 34 > 0: 5 (15.0/10.0)
36 > 0
| 21 <= 0
| | 42 <= 7
| | | 5 <= 3
| | | | 37 <= 8
| | | | | 10 <= 13: 1 (25.0/1.0)
| | | | | 10 > 13: 2 (16.0/1.0)
| | | | 37 > 8: 3 (15.0/6.0)
| | | 5 > 3: 5 (67.0/2.0)
| | 42 > 7
| | | 20 <= 5
| | | | 61 <= 6: 4 (15.0/4.0)
| | | | 61 > 6: 6 (99.0/1.0)
| | | 20 > 5: 1 (15.0/9.0)
```

```

| 21 > 0
| | 2 <= 0
| | | 20 <= 13
| | | | 6 <= 0: 4 (67.0/5.0)
| | | | 6 > 0: 9 (30.0/15.0)
| | | 20 > 13: 1 (50.0/9.0)
| | 2 > 0
| | | 53 <= 0
| | | | 18 <= 10: 7 (84.0/6.0)
| | | | 18 > 10
| | | | 27 <= 8: 7 (18.0/7.0)
| | | | 27 > 8: 9 (29.0/16.0)
| | | 53 > 0
| | | | 43 <= 3
| | | | 42 <= 8
| | | | | 26 <= 5: 3 (89.0/7.0)
| | | | | 26 > 5: 9 (52.0/14.0)
| | | | 42 > 8: 8 (15.0/4.0)
| | | 43 > 3
| | | | 27 <= 9
| | | | | 34 <= 1: 2 (54.0/4.0)
| | | | | 34 > 1: 8 (15.0/10.0)
| | | | 27 > 9
| | | | | 20 <= 15: 8 (59.0/6.0)
| | | | | 20 > 15: 1 (30.0/7.0)

```

Number of Leaves : 24

Size of the tree : 47

Time taken to build model: 0.04 seconds

=== Stratified cross-validation ===

=== Summary ===

|                                  |         |      |   |
|----------------------------------|---------|------|---|
| Correctly Classified Instances   | 769     | 76.9 | % |
| Incorrectly Classified Instances | 231     | 23.1 | % |
| Kappa statistic                  | 0.7431  |      |   |
| Mean absolute error              | 0.0605  |      |   |
| Root mean squared error          | 0.1886  |      |   |
| Relative absolute error          | 33.6556 | %    |   |
| Root relative squared error      | 62.895  | %    |   |
| Total Number of Instances        | 1000    |      |   |

=== Detailed Accuracy By Class ===

| TP Rate | FP Rate | Precision | Recall | F-Measure | ROC Area | Class |
|---------|---------|-----------|--------|-----------|----------|-------|
| 0.961   | 0.019   | 0.853     | 0.961  | 0.904     | 0.988    | 0     |
| 0.788   | 0.023   | 0.796     | 0.788  | 0.792     | 0.901    | 1     |
| 0.713   | 0.022   | 0.756     | 0.713  | 0.734     | 0.898    | 2     |
| 0.694   | 0.036   | 0.706     | 0.694  | 0.7       | 0.887    | 3     |

|               |       |       |       |       |       |       |
|---------------|-------|-------|-------|-------|-------|-------|
| 0.714         | 0.023 | 0.781 | 0.714 | 0.746 | 0.927 | 4     |
| 0.747         | 0.021 | 0.782 | 0.747 | 0.764 | 0.923 | 5     |
| 0.897         | 0.011 | 0.906 | 0.897 | 0.901 | 0.984 | 6     |
| 0.823         | 0.015 | 0.849 | 0.823 | 0.836 | 0.965 | 7     |
| 0.568         | 0.025 | 0.701 | 0.568 | 0.628 | 0.904 | 8     |
| 0.762         | 0.06  | 0.588 | 0.762 | 0.664 | 0.94  | 9     |
| Weighted Avg. | 0.769 | 0.026 | 0.772 | 0.769 | 0.768 | 0.932 |

=== Confusion Matrix ===

```

a b c d e f g h i j <-- classified as
99 0 0 0 0 4 0 0 0 0 | a = 0
1 82 6 2 4 0 2 2 2 3 | b = 1
4 1 62 7 0 1 4 1 5 2 | c = 2
0 4 6 77 2 3 0 4 7 8 | d = 3
2 5 1 4 75 1 2 2 3 10 | e = 4
6 2 2 2 0 68 1 0 2 8 | f = 5
2 0 0 2 4 1 96 0 0 2 | g = 6
0 0 1 4 3 0 0 79 0 9 | h = 7
1 6 4 5 3 5 1 4 54 12 | i = 8
1 3 0 6 5 4 0 1 4 77 | j = 9

```

best num min obj = 2 (default)

```

#####
#####
#####
#9 unpruned = TRUE

```

=== Run information ===

```

Scheme:weka.classifiers.trees.J48 -U -M 15
Relation:  optraining_plus_900
Instances:  1000
Attributes: 55
1
2
3
4
5
6
7
9
10
11
12
13
14
15
17
18
19

```

20  
21  
22  
23  
25  
26  
27  
28  
29  
30  
33  
34  
35  
36  
37  
38  
41  
42  
43  
44  
45  
46  
47  
49  
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51  
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53  
54  
55  
57  
58  
59  
60  
61  
62  
63  
64

Test mode:10-fold cross-validation

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

J48 unpruned tree

-----

```
36 <= 0
| 28 <= 2
| | 37 <= 3: 5 (15.0/9.0)
| | 37 > 3: 0 (101.0/2.0)
| 28 > 2
| | 34 <= 0: 9 (25.0/2.0)
| | 34 > 0: 5 (15.0/10.0)
```

```

36 > 0
| 21 <= 0
| | 42 <= 7
| | | 5 <= 3
| | | | 37 <= 8
| | | | | 10 <= 13: 1 (25.0/1.0)
| | | | | 10 > 13: 2 (16.0/1.0)
| | | | | 37 > 8: 3 (15.0/6.0)
| | | | 5 > 3: 5 (67.0/2.0)
| | 42 > 7
| | | 20 <= 5
| | | | 61 <= 6: 4 (15.0/4.0)
| | | | 61 > 6: 6 (99.0/1.0)
| | | 20 > 5: 1 (15.0/9.0)
| 21 > 0
| | 2 <= 0
| | | 20 <= 13
| | | | 6 <= 0: 4 (67.0/5.0)
| | | | 6 > 0: 9 (30.0/15.0)
| | | 20 > 13: 1 (50.0/9.0)
| | 2 > 0
| | | 53 <= 0
| | | | 18 <= 10: 7 (84.0/6.0)
| | | | 18 > 10
| | | | | 27 <= 8: 7 (18.0/7.0)
| | | | | 27 > 8: 9 (29.0/16.0)
| | | 53 > 0
| | | | 43 <= 3
| | | | | 42 <= 8
| | | | | | 26 <= 5: 3 (89.0/7.0)
| | | | | | 26 > 5: 9 (52.0/14.0)
| | | | | 42 > 8: 8 (15.0/4.0)
| | | | 43 > 3
| | | | | 27 <= 9
| | | | | | 34 <= 1: 2 (54.0/4.0)
| | | | | | 34 > 1: 8 (15.0/10.0)
| | | | | 27 > 9
| | | | | | 20 <= 15: 8 (59.0/6.0)
| | | | | | 20 > 15: 1 (30.0/7.0)

```

Number of Leaves : 24

Size of the tree : 47

Time taken to build model: 0.03 seconds

=== Stratified cross-validation ===

=== Summary ===

|                                  |     |      |   |
|----------------------------------|-----|------|---|
| Correctly Classified Instances   | 769 | 76.9 | % |
| Incorrectly Classified Instances | 231 | 23.1 | % |

Kappa statistic 0.7431  
Mean absolute error 0.0605  
Root mean squared error 0.1886  
Relative absolute error 33.6556 %  
Root relative squared error 62.895 %  
Total Number of Instances 1000

=== Detailed Accuracy By Class ===

| TP Rate       | FP Rate | Precision | Recall | F-Measure | ROC Area | Class |
|---------------|---------|-----------|--------|-----------|----------|-------|
| 0.961         | 0.019   | 0.853     | 0.961  | 0.904     | 0.988    | 0     |
| 0.788         | 0.023   | 0.796     | 0.788  | 0.792     | 0.901    | 1     |
| 0.713         | 0.022   | 0.756     | 0.713  | 0.734     | 0.898    | 2     |
| 0.694         | 0.036   | 0.706     | 0.694  | 0.7       | 0.887    | 3     |
| 0.714         | 0.023   | 0.781     | 0.714  | 0.746     | 0.927    | 4     |
| 0.747         | 0.021   | 0.782     | 0.747  | 0.764     | 0.923    | 5     |
| 0.897         | 0.011   | 0.906     | 0.897  | 0.901     | 0.984    | 6     |
| 0.823         | 0.015   | 0.849     | 0.823  | 0.836     | 0.965    | 7     |
| 0.568         | 0.025   | 0.701     | 0.568  | 0.628     | 0.904    | 8     |
| 0.762         | 0.06    | 0.588     | 0.762  | 0.664     | 0.94     | 9     |
| Weighted Avg. | 0.769   | 0.026     | 0.772  | 0.769     | 0.768    | 0.932 |

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as  
99 0 0 0 0 4 0 0 0 0 | a = 0  
1 82 6 2 4 0 2 2 2 3 | b = 1  
4 1 62 7 0 1 4 1 5 2 | c = 2  
0 4 6 77 2 3 0 4 7 8 | d = 3  
2 5 1 4 75 1 2 2 3 10 | e = 4  
6 2 2 2 0 68 1 0 2 8 | f = 5  
2 0 0 2 4 1 96 0 0 2 | g = 6  
0 0 1 4 3 0 0 79 0 9 | h = 7  
1 6 4 5 3 5 1 4 54 12 | i = 8  
1 3 0 6 5 4 0 1 4 77 | j = 9

#####  
#####  
#####  
#10