

# Fetal cardiotocograms

## Pre-processing Method:

Applied Attribute Selection – Totally 35 attributes. Feature Selection reduces to 19 attributes.

Applied Class Balancer – Number of Classes are very distributed. Could've been biased.

## Classifiers Applied:

K-nearest algorithm

The screenshot shows the Weka Explorer interface with the 'Classify' tab selected. The classifier chosen is 'IBk - K 5 - W 0 - A "weka.core.neighboursearch.LinearNNSearch - A "weka.core.EuclideanDistance - R first-last"'. The 'Test options' section shows 'Cross-validation' with 'Folds' set to 10. The 'Classifier output' pane displays the following results:

```
Time taken to build model: 0 seconds
=== Stratified cross-validation ===
=== Summary ===
Correctly Classified Instances      2126           100 %
Incorrectly Classified Instances      0              0 %
Kappa statistic                      1
Mean absolute error                  0.0002
Root mean squared error              0.0004
Relative absolute error              0.1042 %
Root relative squared error          0.1321 %
Total Number of Instances           2126

=== Detailed Accuracy By Class ===
```

|               | TP Rate | FP Rate | Precision | Recall | F-Measure | MCC   | ROC Area | PRC Area | Class |
|---------------|---------|---------|-----------|--------|-----------|-------|----------|----------|-------|
|               | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 1     |
|               | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 2     |
|               | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 3     |
|               | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 4     |
|               | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 5     |
|               | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 6     |
|               | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 7     |
|               | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 8     |
|               | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 9     |
|               | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 10    |
| Weighted Avg. | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    |       |

The 'Result list' on the left shows two entries: '00:51:46 - lazy.IBk' and '00:52:00 - lazy.IBk'. The 'Status' bar at the bottom indicates 'OK'.

K=5

## Support Vector Machines

The screenshot shows the Weka Explorer interface with the 'Classify' tab selected. The classifier chosen is 'SMO -C 1.0 -L 0.001 -P 1.0E-12 -N 0 -V 1 -W 1 -K "weka.classifiers.functions.supportVector.PolyKernel -E 1.0 -C 250007" -calibrator "weka.classifiers.functions.Logit"'. The test options are set to 'Cross-validation' with 'Folds' set to 10. The classifier output shows the following summary:

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

Correctly Classified Instances      2126      100 %
Incorrectly Classified Instances      0        0 %
Kappa statistic                      1
Mean absolute error                   0.16
Root mean squared error               0.2714
Relative absolute error               88.8871 %
Root relative squared error           90.4504 %
Total Number of Instances           2126
```

The detailed accuracy by class table is as follows:

|               | TP Rate | FP Rate | Precision | Recall | F-Measure | MCC   | ROC Area | PRC Area | Class |
|---------------|---------|---------|-----------|--------|-----------|-------|----------|----------|-------|
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 1     |
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 2     |
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 3     |
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 4     |
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 5     |
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 6     |
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 7     |
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 8     |
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 9     |
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 10    |
| Weighted Avg. | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    |       |

The result list on the left shows the following entries:

- 00:51:46 - lazy.IBk
- 00:52:00 - lazy.IBk
- 00:53:10 - lazy.IBk
- 00:53:20 - trees.J48
- 00:53:59 - functions.SMO

## Decision Tree

The screenshot shows the Weka Explorer interface with the 'Classify' tab selected. The classifier chosen is 'J48 -C 0.25 -M 2'. The test options are set to 'Cross-validation' with 'Folds' set to 10. The classifier output shows the following summary:

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

Correctly Classified Instances      2126      100 %
Incorrectly Classified Instances      0        0 %
Kappa statistic                      1
Mean absolute error                   0
Root mean squared error               0
Relative absolute error               0 %
Root relative squared error           0 %
Total Number of Instances           2126
```

The detailed accuracy by class table is as follows:

|               | TP Rate | FP Rate | Precision | Recall | F-Measure | MCC   | ROC Area | PRC Area | Class |
|---------------|---------|---------|-----------|--------|-----------|-------|----------|----------|-------|
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 1     |
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 2     |
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 3     |
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 4     |
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 5     |
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 6     |
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 7     |
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 8     |
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 9     |
| 1.000         | 0.000   | 1.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 10    |
| Weighted Avg. | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    |       |

The result list on the left shows the following entries:

- 00:51:46 - lazy.IBk
- 00:52:00 - lazy.IBk
- 00:53:10 - lazy.IBk
- 00:53:20 - trees.J48

## Artificial Neural Networks

Weka Explorer

Preprocess Classify Cluster Associate Select attributes Visualize

Classifier

Choose MultilayerPerceptron -L 0.3 -M 0.2 -N 500 -V 0 -S 0 -E 20 -H a

Test options

☐ Use training set  
☐ Supplied test set Set...  
☒ Cross-validation Folds 10  
☐ Percentage split % 66  
More options...

(Nom) Class

Start Stop

Result list (right-click for options)

- 00:51:46 - lazy.IBk
- 00:52:00 - lazy.IBk
- 00:53:10 - lazy.IBk
- 00:53:20 - trees.J48
- 00:53:59 - functions.SMO
- 00:54:42 - functions.MultilayerPerceptron

Classifier output

Time taken to build model: 9.68 seconds

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

|                                  |        |     |   |
|----------------------------------|--------|-----|---|
| Correctly Classified Instances   | 2126   | 100 | % |
| Incorrectly Classified Instances | 0      | 0   | % |
| Kappa statistic                  | 1      |     |   |
| Mean absolute error              | 0.0018 |     |   |
| Root mean squared error          | 0.003  |     |   |
| Relative absolute error          | 0.9744 | %   |   |
| Root relative squared error      | 0.995  | %   |   |
| Total Number of Instances        | 2126   |     |   |

=== Detailed Accuracy By Class ===

|   | TP Rate | FP Rate | Precision | Recall | F-Measure | MCC   | ROC Area | PRC Area | Class |
|---|---------|---------|-----------|--------|-----------|-------|----------|----------|-------|
| 1 | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 1     |
| 2 | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 2     |
| 3 | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 3     |
| 4 | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 4     |
| 5 | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 5     |
| 6 | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 6     |
| 7 | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 7     |
| 8 | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 8     |
| 9 | 1.000   | 0.000   | 1.000     | 1.000  | 1.000     | 1.000 | 1.000    | 1.000    | 9     |

Status

OK Log x0

More Time Consuming than others.