



## Ejercicio de Laboratorio 12. Clasificadores Naïve Bayes y Redes Bayesianas

DataSet	Clasificador Naïve Bayes		Clasificador Redes Bayesianas	
	Hold Out 70/30	10-Fold-Cross-Validation	Hold Out 70/30	10-Fold-Cross-Validation
IRIS	95.5556 %	96 %	95.5556 %	92.6667 %
WINE	100 %	96.6292 %	100 %	98.8764 %
BREAST CANCER WISCONSIN	91.8129 %	92.6186 %	94.152 %	95.2548 %



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**NOMBRE:** Cerda García Gustavo  
**Materia:** Inteligencia Artificial



## Clasificador Naïve Bayes

### Hold-Out 70/30

#### IRIS

```
class
Test mode: split 70.0% train, remainder test

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

Naive Bayes Classifier

Attribute      Class
               Iris-setosa Iris-versicolor Iris-virginica
               (0.33)      (0.33)      (0.33)
=====
sepal_length
mean           4.9913      5.9379      6.5795
std. dev.      0.355       0.5042     0.6353
weight sum     50         50         50
precision      0.1059     0.1059     0.1059

sepal_width
mean           3.4015      2.7687     2.9629
std. dev.      0.3925     0.3038     0.3088
weight sum     50         50         50
precision      0.1091     0.1091     0.1091

petal_length
mean           1.4694      4.2452     5.5516
std. dev.      0.1782     0.4712     0.5529
weight sum     50         50         50
precision      0.1405     0.1405     0.1405

petal_width
mean           0.2743      1.3097     2.0343
std. dev.      0.1096     0.1915     0.2646
weight sum     50         50         50
precision      0.1143     0.1143     0.1143

Time taken to build model: 0 seconds
```

```
=== Evaluation on test split ===

Time taken to test model on test split: 0 seconds

=== Summary ===

Correctly Classified Instances      43      95.5556 %
Incorrectly Classified Instances    2      4.4444 %
Kappa statistic                    0.9331
Mean absolute error                 0.0375
Root mean squared error             0.158
Relative absolute error             8.422 %
Root relative squared error         33.4987 %
Total Number of Instances          45
```

#### Matriz de Confusión

$$\begin{bmatrix} 14 & 0 & 0 \\ 0 & 16 & 0 \\ 0 & 2 & 13 \end{bmatrix}$$



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## Wine

=== Classifier model (full training set) ===				flavanoids		
Naive Bayes Classifier				mean	2.983	2.0793
				std. dev.	0.3944	0.7013
				weight sum	59	71
				precision	0.0362	0.0362
				nonflavanoid_phenols		
				mean	0.2908	0.3646
				std. dev.	0.0701	0.1229
				weight sum	59	71
				precision	0.0139	0.0139
				proanthocyanins		
				mean	1.8982	1.631
				std. dev.	0.4095	0.5992
				weight sum	59	71
				precision	0.0317	0.0317
				color_intensity		
				mean	5.5241	3.0796
				std. dev.	1.2265	0.9159
				weight sum	59	71
				precision	0.0895	0.0895
				hue		
				mean	1.0611	1.0559
				std. dev.	0.1151	0.2013
				weight sum	59	71
				precision	0.016	0.016
				OD280/OD315_of_diluted_wines		
				mean	3.1579	2.7843
				std. dev.	0.3543	0.4923
				weight sum	59	71
				precision	0.0226	0.0226
				proline		
				mean	1115.8573	519.8261
				std. dev.	220.0034	154.7719
				weight sum	59	71
				precision	11.6833	11.6833

```
=== Evaluation on test split ===

Time taken to test model on test split: 0 seconds

=== Summary ===

Correctly Classified Instances      53      100    %
Incorrectly Classified Instances    0        0    %
Kappa statistic                    1
Mean absolute error                 0.009
Root mean squared error             0.0494
Relative absolute error             2.0174 %
Root relative squared error         10.2647 %
Total Number of Instances          53
```

## Matriz de Confusión

$$\begin{bmatrix} 19 & 0 & 0 \\ 0 & 16 & 0 \\ 0 & 0 & 18 \end{bmatrix}$$



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## Breast Cancer Wisconsin

=== Classifier model (full training set) ===								
Naive Bayes Classifier			compactness_mean			perimeter_se		
			mean	0.1452	0.0801	mean	4.3246	1.9996
			std. dev.	0.0539	0.0337	std. dev.	2.5631	0.7689
			weight sum	212	357	weight sum	212	357
			precision	0.0006	0.0006	precision	0.0399	0.0399
Attribute	Class							
	M	B						
	(0.37)	(0.63)						
id			concavity_mean			area_se		
mean	37242272.8315	27001033.0939	mean	0.1608	0.0461	mean	72.6586	21.1241
std. dev.	137453392.1591116511855.3606		std. dev.	0.0748	0.0434	std. dev.	61.2051	8.8536
weight sum	212	357	weight sum	212	357	weight sum	212	357
precision	1604422.2394	1604422.2394	precision	0.0008	0.0008	precision	1.0159	1.0159
radius_mean			concave_points_mean			smoothness_se		
mean	17.4618	12.1476	mean	0.088	0.0257	mean	0.0068	0.0072
std. dev.	3.1956	1.7772	std. dev.	0.0343	0.0159	std. dev.	0.0029	0.0031
weight sum	212	357	weight sum	212	357	weight sum	212	357
precision	0.0464	0.0464	precision	0.0004	0.0004	precision	0.0001	0.0001
texture_mean			symmetry_mean			compactness_se		
mean	21.6044	17.9157	mean	0.1929	0.1742	mean	0.0323	0.0214
std. dev.	3.7703	3.9899	std. dev.	0.0276	0.0248	std. dev.	0.0183	0.0163
weight sum	212	357	weight sum	212	357	weight sum	212	357
precision	0.0619	0.0619	precision	0.0005	0.0005	precision	0.0002	0.0002
perimeter_mean			fractal_dimension_mean			concavity_se		
mean	115.3598	78.0707	mean	0.0627	0.0629	mean	0.0418	0.026
std. dev.	21.8046	11.7876	std. dev.	0.0076	0.0067	std. dev.	0.0216	0.0329
weight sum	212	357	weight sum	212	357	weight sum	212	357
precision	0.2778	0.2778	precision	0.0001	0.0001	precision	0.0007	0.0007
area_mean			radius_se			concave_points_se		
mean	978.4195	462.8318	mean	0.609	0.2841	mean	0.0151	0.0099
std. dev.	367.0176	134.1439	std. dev.	0.3443	0.1126	std. dev.	0.0055	0.0057
weight sum	212	357	weight sum	212	357	weight sum	212	357
precision	4.382	4.382	precision	0.0051	0.0051	precision	0.0001	0.0001
smoothness_mean			texture_se			symmetry_se		
mean	0.1029	0.0925	mean	1.2109	1.2205	mean	0.0205	0.0206
std. dev.	0.0126	0.0134	std. dev.	0.482	0.5883	std. dev.	0.01	0.007
weight sum	212	357	weight sum	212	357	weight sum	212	357
precision	0.0002	0.0002	precision	0.0087	0.0087	precision	0.0001	0.0001
fractal_dimension_se			concavity_worst					
mean	0.0041	0.0036	mean	0.4507	0.1663			
std. dev.	0.002	0.0029	std. dev.	0.1811	0.1402			
weight sum	212	357	weight sum	212	357			
precision	0.0001	0.0001	precision	0.0023	0.0023			
radius_worst			concave_points_worst					
mean	21.1354	13.379	mean	0.1822	0.0744			
std. dev.	4.2722	1.98	std. dev.	0.0462	0.0357			
weight sum	212	357	weight sum	212	357			
precision	0.0616	0.0616	precision	0.0006	0.0006			
texture_worst			symmetry_worst					
mean	29.3185	23.516	mean	0.3235	0.2702			
std. dev.	5.4226	5.487	std. dev.	0.0745	0.0417			
weight sum	212	357	weight sum	212	357			
precision	0.0736	0.0736	precision	0.001	0.001			
perimeter_worst			fractal_dimension_worst					
mean	141.3742	87.0012	mean	0.0915	0.0794			
std. dev.	29.3868	13.5041	std. dev.	0.0215	0.0138			
weight sum	212	357	weight sum	212	357			
precision	0.3914	0.3914	precision	0.0003	0.0003			
area_worst			Time taken to build model: 0 seconds					
mean	1422.3622	558.7776						
std. dev.	596.7606	163.3441						
weight sum	212	357						
precision	7.4932	7.4932						
smoothness_worst			Time taken to test model on test split: 0 seconds					
mean	0.1448	0.125						
std. dev.	0.0218	0.02						
weight sum	212	357						
precision	0.0004	0.0004						
compactness_worst			=== Summary ===					
mean	0.3748	0.1827	Correctly Classified Instances			157	91.8129 %	
std. dev.	0.17	0.092	Incorrectly Classified Instances			14	8.1871 %	
weight sum	212	357	Kappa statistic				0.8273	
precision	0.002	0.002	Mean absolute error				0.082	
			Root mean squared error				0.286	
			Relative absolute error				17.4936 %	
			Root relative squared error				58.9136 %	
			Total Number of Instances			171		

## Matriz de Confusión

$$\begin{bmatrix} 59 & 6 \\ 8 & 98 \end{bmatrix}$$



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## 10-Fold-Cross-Validation

### IRIS

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

Naive Bayes Classifier

Attribute          Class
                   Iris-setosa Iris-versicolor Iris-virginica
                   (0.33)      (0.33)      (0.33)
=====
sepal_length
  mean             4.9913      5.9379      6.5795
  std. dev.         0.355       0.5042     0.6353
  weight sum        50          50          50
  precision         0.1059     0.1059     0.1059

sepal_width
  mean             3.4015      2.7687     2.9629
  std. dev.         0.3925     0.3038     0.3088
  weight sum        50          50          50
  precision         0.1091     0.1091     0.1091

petal_length
  mean             1.4694      4.2452     5.5516
  std. dev.         0.1782     0.4712     0.5529
  weight sum        50          50          50
  precision         0.1405     0.1405     0.1405

petal_width
  mean             0.2743      1.3097     2.0343
  std. dev.         0.1096     0.1915     0.2646
  weight sum        50          50          50
  precision         0.1143     0.1143     0.1143

Time taken to build model: 0 seconds

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

Correctly Classified Instances      144      96      %
Incorrectly Classified Instances    6        4      %
Kappa statistic                    0.94
Mean absolute error                 0.0342
Root mean squared error             0.155
Relative absolute error              7.6997 %
Root relative squared error         32.8794 %
Total Number of Instances          150
```

### Matriz de Confusión

$$\begin{bmatrix} 50 & 0 & 0 \\ 0 & 48 & 2 \\ 0 & 4 & 46 \end{bmatrix}$$



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## Wine

=== Classifier model (full training set) ===				flavanoids			
Naive Bayes Classifier				mean	2.983	2.0793	0.7802
				std. dev.	0.3944	0.7013	0.2896
				weight sum	59	71	48
				precision	0.0362	0.0362	0.0362
Attribute	Class	1 class	2 class	3 class			
	(0.33)	(0.4)	(0.27)				
=====					nonflavanoid_phenols		
alcohol				mean	0.2908	0.3646	0.4478
mean	13.7434	12.2782	13.1537	std. dev.	0.0701	0.1229	0.123
std. dev.	0.4587	0.5351	0.5252	weight sum	59	71	48
weight sum	59	71	48	precision	0.0139	0.0139	0.0139
precision	0.0304	0.0304	0.0304				
					proanthocyanins		
malic_acid				mean	1.8982	1.631	1.1518
mean	2.0115	1.9329	3.3334	std. dev.	0.4095	0.5992	0.4046
std. dev.	0.6824	1.0078	1.0749	weight sum	59	71	48
weight sum	59	71	48	precision	0.0317	0.0317	0.0317
precision	0.0383	0.0383	0.0383				
					color_intensity		
ash				mean	5.5241	3.0796	7.3996
mean	2.4555	2.2451	2.4354	std. dev.	1.2265	0.9159	2.2849
std. dev.	0.2253	0.3139	0.1817	weight sum	59	71	48
weight sum	59	71	48	precision	0.0895	0.0895	0.0895
precision	0.024	0.024	0.024				
					hue		
alcalinity_of_ash				mean	1.0611	1.0559	0.6836
mean	17.0506	20.2594	21.4208	std. dev.	0.1151	0.2013	0.1129
std. dev.	2.5279	3.3209	2.2327	weight sum	59	71	48
weight sum	59	71	48	precision	0.016	0.016	0.016
precision	0.3129	0.3129	0.3129				
					OD280/OD315_of_diluted_wines		
magnesium				mean	3.1579	2.7843	1.6842
mean	106.3338	94.5915	99.2981	std. dev.	0.3543	0.4923	0.2688
std. dev.	10.4831	16.6495	10.8441	weight sum	59	71	48
weight sum	59	71	48	precision	0.0226	0.0226	0.0226
precision	1.7692	1.7692	1.7692				
					proline		
total_phenols				mean	1115.8573	519.8261	629.683
mean	2.8396	2.2618	1.681	std. dev.	220.0034	154.7719	113.0791
std. dev.	0.3357	0.5412	0.3553	weight sum	59	71	48
weight sum	59	71	48	precision	11.6833	11.6833	11.6833
precision	0.0302	0.0302	0.0302				

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

```
=== Summary ===
```

```
Correctly Classified Instances      172          96.6292 %
Incorrectly Classified Instances      6          3.3708 %
Kappa statistic                     0.9489
Mean absolute error                  0.0217
Root mean squared error              0.1294
Relative absolute error              4.9371 %
Root relative squared error          27.6176 %
Total Number of Instances           178
```

## Matriz de Confusión

$$\begin{bmatrix} 56 & 3 & 0 \\ 0 & 68 & 3 \\ 0 & 0 & 48 \end{bmatrix}$$



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## Breast Cancer Wisconsin

Classifier model (full training set)				compactness_mean		perimeter_se		
Naive Bayes Classifier				mean	0.1452	0.0801	mean	
				std. dev.	0.0539	0.0337	std. dev.	
				weight sum	212	357	weight sum	
				precision	0.0006	0.0006	precision	
Attribute	Class	M	B					
	(0.37)	(0.63)						
=====								
id			concavity_mean		area_se			
	mean	37242272.8315	27001033.0939	mean	0.1608	0.0461	mean	
	std. dev.	137453392.1591116511855.3606		std. dev.	0.0748	0.0434	std. dev.	
	weight sum	212	357	weight sum	212	357	weight sum	
	precision	1604422.2394	1604422.2394	precision	0.0008	0.0008	precision	
radius_mean			concave_points_mean		smoothness_se			
	mean	17.4618	12.1476	mean	0.088	0.0257	mean	
	std. dev.	3.1956	1.7772	std. dev.	0.0343	0.0159	std. dev.	
	weight sum	212	357	weight sum	212	357	weight sum	
	precision	0.0464	0.0464	precision	0.0004	0.0004	precision	
texture_mean			symmetry_mean		compactness_se			
	mean	21.6044	17.9157	mean	0.1929	0.1742	mean	
	std. dev.	3.7703	3.9899	std. dev.	0.0276	0.0248	std. dev.	
	weight sum	212	357	weight sum	212	357	weight sum	
	precision	0.0619	0.0619	precision	0.0005	0.0005	precision	
perimeter_mean			fractal_dimension_mean		concavity_se			
	mean	115.3598	78.0707	mean	0.0627	0.0629	mean	
	std. dev.	21.8046	11.7876	std. dev.	0.0076	0.0067	std. dev.	
	weight sum	212	357	weight sum	212	357	weight sum	
	precision	0.2778	0.2778	precision	0.0001	0.0001	precision	
area_mean			radius_se		concave_points_se			
	mean	978.4195	462.8318	mean	0.609	0.2841	mean	
	std. dev.	367.0176	134.1439	std. dev.	0.3443	0.1126	std. dev.	
	weight sum	212	357	weight sum	212	357	weight sum	
	precision	4.382	4.382	precision	0.0051	0.0051	precision	
smoothness_mean			texture_se		symmetry_se			
	mean	0.1029	0.0925	mean	1.2109	1.2205	mean	
	std. dev.	0.0126	0.0134	std. dev.	0.482	0.5883	std. dev.	
	weight sum	212	357	weight sum	212	357	weight sum	
	precision	0.0002	0.0002	precision	0.0087	0.0087	precision	
	fractal_dimension_se				concavity_worst			
	mean	0.0041	0.0036	mean	0.4507	0.1663		
	std. dev.	0.002	0.0029	std. dev.	0.1811	0.1402		
	weight sum	212	357	weight sum	212	357		
	precision	0.0001	0.0001	precision	0.0023	0.0023		
	radius_worst				concave_points_worst			
	mean	21.1354	13.379	mean	0.1822	0.0744		
	std. dev.	4.2722	1.98	std. dev.	0.0462	0.0357		
	weight sum	212	357	weight sum	212	357		
	precision	0.0616	0.0616	precision	0.0006	0.0006		
	texture_worst				symmetry_worst			
	mean	29.3185	23.516	mean	0.3235	0.2702		
	std. dev.	5.4226	5.487	std. dev.	0.0745	0.0417		
	weight sum	212	357	weight sum	212	357		
	precision	0.0736	0.0736	precision	0.001	0.001		
	perimeter_worst				fractal_dimension_worst			
	mean	141.3742	87.0012	mean	0.0915	0.0794		
	std. dev.	29.3868	13.5041	std. dev.	0.0215	0.0138		
	weight sum	212	357	weight sum	212	357		
	precision	0.3914	0.3914	precision	0.0003	0.0003		
area_worst								
mean	1422.3622	558.7776						
std. dev.	596.7606	163.3441						
weight sum	212	357						
precision	7.4932	7.4932						
				Time taken to build model: 0 seconds				
				=== Stratified cross-validation ===				
				=== Summary ===				
compactness_worst				Correctly Classified Instances		527	92.6186 %	
				Incorrectly Classified Instances		42	7.3814 %	
				Kappa statistic		0.8418		
				Mean absolute error		0.0732		
				Root mean squared error		0.2648		
mean		0.3748	0.1827	Relative absolute error		15.6565 %		
std. dev.		0.17	0.092	Root relative squared error		54.7597 %		
weight sum		212	357	Total Number of Instances		569		
precision		0.002	0.002					

## Matriz de Confusión

$$\begin{bmatrix} 190 & 22 \\ 20 & 337 \end{bmatrix}$$



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## Clasificador Redes Bayesianas

### Hold-Out 70/30

#### IRIS

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

Bayes Network Classifier
not using ADTree
#attributes=5 #classindex=4
Network structure (nodes followed by parents)
sepal_length(3): class
sepal_width(3): class
petal_length(3): class
petal_width(3): class
class(3):
LogScore Bayes: -481.00632967833803
LogScore BDeu: -525.3834868062277
LogScore MDL: -536.5317339418378
LogScore ENTROPY: -471.39347511858665
LogScore AIC: -497.39347511858665

Time taken to build model: 0.01 seconds

=== Evaluation on test split ===

Time taken to test model on test split: 0 seconds

=== Summary ===

Correctly Classified Instances      43          95.5556 %
Incorrectly Classified Instances    2           4.4444 %
Kappa statistic                    0.9331
Mean absolute error                 0.0289
Root mean squared error             0.1171
Relative absolute error              6.493 %
Root relative squared error         24.8235 %
Total Number of Instances          45
```

#### Matriz de Confusión

$$\begin{bmatrix} 14 & 0 & 0 \\ 0 & 16 & 0 \\ 0 & 2 & 13 \end{bmatrix}$$





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## Wine

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

Bayes Network Classifier
not using ADTree
#attributes=14 #classindex=0
Network structure (nodes followed by parents)
class(3):
alcohol(3): class
malic_acid(3): class
ash(2): class
alcalinity_of_ash(2): class
magnesium(2): class
total_phenols(3): class
flavanoids(4): class
nonflavanoid_phenols(2): class
proanthocyanins(2): class
color_intensity(3): class
hue(4): class
OD280/OD315_of_diluted_wines(3): class
proline(4): class
LogScore Bayes: -1559.0178085419468
LogScore BDeu: -1692.2081832288502
LogScore MDL: -1715.4574777922194
LogScore ENTROPY: -1523.731486431412
LogScore AIC: -1597.731486431412

Time taken to build model: 0 seconds

=== Evaluation on test split ===

Time taken to test model on test split: 0 seconds

=== Summary ===

Correctly Classified Instances      53          100   %
Incorrectly Classified Instances    0           0   %
Kappa statistic                     1
Mean absolute error                 0.0074
Root mean squared error             0.0466
Relative absolute error             1.6636 %
Root relative squared error         9.6863 %
Total Number of Instances          53
```

## Matriz de Confusión

$$\begin{bmatrix} 19 & 0 & 0 \\ 0 & 16 & 0 \\ 0 & 0 & 18 \end{bmatrix}$$



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## Breast Cancer Wisconsin

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

Bayes Network Classifier
not using ADTree
#attributes=32 #classindex=1
Network structure (nodes followed by parents)
id(4): diagnosis
diagnosis(2):
radius_mean(4): diagnosis
texture_mean(2): diagnosis
perimeter_mean(4): diagnosis
area_mean(4): diagnosis
smoothness_mean(2): diagnosis
compactness_mean(3): diagnosis
concavity_mean(4): diagnosis
concave_points_mean(4): diagnosis
symmetry_mean(3): diagnosis
fractal_dimension_mean(1): diagnosis
radius_se(4): diagnosis
texture_se(1): diagnosis
perimeter_se(4): diagnosis
area_se(4): diagnosis
smoothness_se(1): diagnosis
compactness_se(3): diagnosis
concavity_se(3): diagnosis
concave_points_se(3): diagnosis
symmetry_se(2): diagnosis
fractal_dimension_se(2): diagnosis
radius_worst(4): diagnosis
texture_worst(3): diagnosis
perimeter_worst(4): diagnosis
area_worst(4): diagnosis
smoothness_worst(2): diagnosis
compactness_worst(4): diagnosis
concavity_worst(3): diagnosis
concave_points_worst(4): diagnosis
symmetry_worst(3): diagnosis
fractal_dimension_worst(2): diagnosis
LogScore Bayes: -13259.63987799013
LogScore BDeu: -13459.83037740858
LogScore MDL: -13492.267533944321
LogScore ENTROPY: -13083.08724594317
LogScore AIC: -13212.08724594317
```

```
Time taken to build model: 0.02 seconds

=== Evaluation on test split ===

Time taken to test model on test split: 0 seconds

=== Summary ===

Correctly Classified Instances      161          94.152 %
Incorrectly Classified Instances    10           5.848 %
Kappa statistic                    0.8766
Mean absolute error                 0.0577
Root mean squared error             0.2355
Relative absolute error             12.2981 %
Root relative squared error         48.4966 %
Total Number of Instances          171
```

## Matriz de Confusión

$$\begin{bmatrix} 61 & 4 \\ 6 & 100 \end{bmatrix}$$



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## 10-Fold-Cross-Validation

### IRIS

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

Bayes Network Classifier
not using ADTree
#attributes=5 #classindex=4
Network structure (nodes followed by parents)
sepal_length(3): class
sepal_width(3): class
petal_length(3): class
petal_width(3): class
class(3):
LogScore Bayes: -481.00632967833803
LogScore BDeu: -525.3834868062277
LogScore MDL: -536.5317339418378
LogScore ENTROPY: -471.39347511858665
LogScore AIC: -497.39347511858665

Time taken to build model: 0 seconds

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

Correctly Classified Instances      139           92.6667 %
Incorrectly Classified Instances    11            7.3333 %
Kappa statistic                     0.89
Mean absolute error                  0.0454
Root mean squared error              0.1828
Relative absolute error              10.2111 %
Root relative squared error          38.7793 %
Total Number of Instances           150
```

### Matriz de Confusión

$$\begin{bmatrix} 50 & 0 & 0 \\ 0 & 44 & 6 \\ 0 & 5 & 45 \end{bmatrix}$$



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## Wine

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

Bayes Network Classifier
not using ADTree
#attributes=14 #classindex=0
Network structure (nodes followed by parents)
class(3):
alcohol(3): class
malic_acid(3): class
ash(2): class
alcalinity_of_ash(2): class
magnesium(2): class
total_phenols(3): class
flavanoids(4): class
nonflavanoid_phenols(2): class
proanthocyanins(2): class
color_intensity(3): class
hue(4): class
OD280/OD315_of_diluted_wines(3): class
proline(4): class
LogScore Bayes: -1559.0178085419468
LogScore BDeu: -1692.2081832288502
LogScore MDL: -1715.4574777922194
LogScore ENTROPY: -1523.731486431412
LogScore AIC: -1597.731486431412

Time taken to build model: 0 seconds

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

Correctly Classified Instances      176           98.8764 %
Incorrectly Classified Instances     2            1.1236 %
Kappa statistic                    0.983
Mean absolute error                 0.0134
Root mean squared error             0.0906
Relative absolute error             3.0527 %
Root relative squared error        19.3467 %
Total Number of Instances          178
```

## Matriz de Confusión

$$\begin{bmatrix} 59 & 0 & 0 \\ 1 & 69 & 1 \\ 0 & 0 & 48 \end{bmatrix}$$



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## Breast Cancer Wisconsin

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

Bayes Network Classifier
not using ADTree
#attributes=32 #classindex=1
Network structure (nodes followed by parents)
id(4): diagnosis
diagnosis(2):
radius_mean(4): diagnosis
texture_mean(2): diagnosis
perimeter_mean(4): diagnosis
area_mean(4): diagnosis
smoothness_mean(2): diagnosis
compactness_mean(3): diagnosis
concavity_mean(4): diagnosis
concave_points_mean(4): diagnosis
symmetry_mean(3): diagnosis
fractal_dimension_mean(1): diagnosis
radius_se(4): diagnosis
texture_se(1): diagnosis
perimeter_se(4): diagnosis
area_se(4): diagnosis
smoothness_se(1): diagnosis
compactness_se(3): diagnosis
concavity_se(3): diagnosis
concave_points_se(3): diagnosis
symmetry_se(2): diagnosis
fractal_dimension_se(2): diagnosis
radius_worst(4): diagnosis
texture_worst(3): diagnosis
perimeter_worst(4): diagnosis
area_worst(4): diagnosis
smoothness_worst(2): diagnosis
compactness_worst(4): diagnosis
concavity_worst(3): diagnosis
concave_points_worst(4): diagnosis
symmetry_worst(3): diagnosis
fractal_dimension_worst(2): diagnosis
LogScore Bayes: -13259.63987799013
LogScore BDeu: -13459.83037740858
LogScore MDL: -13492.267533944321
LogScore ENTROPY: -13083.08724594317
LogScore AIC: -13212.08724594317
```

=== Stratified cross-validation ===

=== Summary ===

Correctly Classified Instances	542	95.2548 %
Incorrectly Classified Instances	27	4.7452 %
Kappa statistic	0.8984	
Mean absolute error	0.054	
Root mean squared error	0.218	
Relative absolute error	11.5364 %	
Root relative squared error	45.0832 %	
Total Number of Instances	569	

## Matriz de Confusión

$$\begin{bmatrix} 198 & 14 \\ 13 & 344 \end{bmatrix}$$