Files used for Weka:

- leaf.arff
- nursery.data
- nursery.names

Files used for SK-Learn

- continuous_sklearn_script.py
- leaf.csv
- categorical_sklearn_script.py
- nursery.data

Decision trees are a classification method that constructs a list of rules for categorizing. The most important features for categorizing an object are determined, and rules are constructed so that the depth of the tree is minimized. Decision trees are very useful classifiers because they can be very accurate, and also provide access to the rules used. This allows for a better understanding of the classification model so that one can better understand the relationship between a given feature set and a classification.

A Naïve Bayes classifier calculates the probability of a particular classification given a particular feature value. This is calculated for each feature value for every feature. This technique is considered naïve because each feature value is considered conditionally independent of other feature values. This is often not the case as many measured features are typically associated, but this assumption allows for a model to be constructed with far less data, and the results are often very accurate. Unfortunately, particular classification rules present in decision tree learning are not present in Naïve Bayes; the probabilities calculated can indicate a relationship between feature values and classification, but the overall model of classification is not as clear as with decision tree rules.

I chose the Leaf dataset for my continuous dataset. This dataset provided the species classification of different plants as well as real value data on leave measurements. The features

consisted of 14 real value attributes, and there were 40 possible classes. However, only 30 of the classes were present in the dataset.

I chose the Nursery dataset for my categorical dataset. The dataset provided nursery school application decisions as the classification, with 8 categorical features as attributes. The features were the features actually used to determine admission status. The features were designed to evaluate the parents' employment, the child's nursery status, the family financial structure, and the family's social and health conditions. These were originally used as justification for decisions when the nursery schools of interest had too many applicants. The categorical features had to be converted to dummy binary values to work with SK-Learn because it only works with continuous values.

Table 1 shows the results for the continuous feature "Leaf" dataset. Naïve Bayes performed better than the Decision Tree for both tools. The Scikit Decision Tree performed better than the Weka one, but the Naïve Bayes classifiers performed approximately the same for both tools. The better performance by Naïve Bayes suggests that some features may be conditionally independent, but this is modeled poorly in the decision tree.

Table 2 shows the results for the categorical feature "Nursery" dataset. All methods of classification had stronger accuracy when compared to the continuous feature "Leaf" dataset. This could suggest that these classification methods work better with categorical features, but it is also likely that the association between the features and the classes are stronger in the "Nursery" dataset than the "Leaf" dataset. Both decision trees were very accurate, but the Scikit decision tree performed slightly better. In contrast, the Weka Naïve Bayes classifier performed better than the Scikit Naïve Bayes classifier. Both decision trees performed better than either

Naïve Bayes classifier. The better performance by decision trees suggests that some features are not conditionally independent.

The decision tree produced by Weca for the leaf dataset is much smaller than that for the Nursery data. A rule for prediction a class in the Leaf dataset is that a leaf is classified as an 11 (*Acer palmatum*) if it has an isoperimetric factor <= 0.38426, an aspect ratio <= 1.392, an average intensity <= 0.040254, and a solidity <= 0.57724. Alternatively, a leaf is classified as a 6 (*Crataegus monogyna*) if all of these traits are identical except that the solidity is > 0.57724.

A rule for prediction in the Nursery dataset is that an application is classified as “not recommended” if the family’s health conditions are “not recommended”. A classification of “special priority” is given if the health is “recommended”, the has nursery feature is “very critical” (greatly in need of one), and the family’s social conditions are “problematic”.

The rules for leaf classification agree in that the tree is small because these features are good at distinguishing plant types. I know that plants are often identified by specific leaf characteristics, but I am not familiar with the particular characteristics, so it is difficult for me to say whether the specific rules align with the classifications I would expect. The nursery dataset also aligns with what I would expect, because they want to give priority to families that need a nursery; this would include families with several children, a lack of a nursery, and in poor social and financial situations.

I found it interesting that a “not recommended” health feature alone would classify a child as “not recommended”. I can imagine this is to ensure that other children are not affected, but I would imagine that other features would be considered before making this decision.

With the Naïve Bayes models from Weka, I could use the precision values to determine the best features for the continuous Leaf dataset. The feature with the highest precision was

“Aspect Ratio”, so this feature provided the highest precision of classification. The best categorical Nursery dataset can be determined by looking of the best split, which would provide the highest information gain. Information gain could be calculated for each feature, but health very clearly corresponds to specific classifications.

The

Table 1: Comparison of classification accuracy for Data1: Leaf between Decision tree and Naive Bayes algorithms

	Weka	Scikit
Decision Tree	61.1765%	67.6471%
Naïve Bayes	73.8235%	73.5294%

Table 2: Comparison of classification accuracy for Data2: Nursery between Decision tree and Naive Bayes algorithms

	Weka	Scikit
Decision Tree	97.0525%	99.8457%
Naïve Bayes	90.3241%	85.0309%

Weka Generated Decision Trees

1. Leaf (Continuous) Data Set
   J48 pruned tree

   Isoperimetric_Factor <= 0.38426
   | Aspect_Ratio <= 1.392
   | | Average_Intensity <= 0.040254
   | | | Solidity <= 0.57724: 11 (16.0)
   | | | Solidity > 0.57724: 6 (8.0)
   | | Average_Intensity > 0.040254
   | | | Stochastic_Convexity <= 0.77368: 36 (10.0)
   | | | Stochastic_Convexity > 0.77368: 15 (10.0)
   | Aspect_Ratio > 1.392
   | | Eccentricity <= 0.98853
   | | | Eccentricity <= 0.94058
   | | | | Uniformity <= 0.000139: 7 (2.0)
   | | | | Uniformity > 0.000139: 5 (11.0)
   | | | Eccentricity > 0.94058
   | | | | Maximal_Indentation_Depth <= 0.082108: 8 (11.0)
   | | | | Maximal_Indentation_Depth > 0.082108: 22 (2.0)
   | | Eccentricity > 0.98853

```
|  |  |  Entropy <= 0.49751
|  |  |  |  Eccentricity <= 0.99799: 31 (11.0)
|  |  |  |  Eccentricity > 0.99799: 34 (2.0)
|  |  |  Entropy > 0.49751: 34 (9.0)
Isoperimetric_Factor > 0.38426
|  Aspect_Ratio <= 1.633
|  |  Solidity <= 0.9557
|  |  |  Maximal_Indentation_Depth <= 0.035845
|  |  |  |  Aspect_Ratio <= 1.254
|  |  |  |  |  Eccentricity <= 0.55977
|  |  |  |  |  |  Solidity <= 0.92405: 9 (4.0/1.0)
|  |  |  |  |  |  Solidity > 0.92405
|  |  |  |  |  |  |  Isoperimetric_Factor <= 0.64214: 30 (12.0)
|  |  |  |  |  |  |  Isoperimetric_Factor > 0.64214: 9 (2.0/1.0)
|  |  |  |  |  Eccentricity > 0.55977
|  |  |  |  |  |  Stochastic_Convexity <= 0.97719: 23 (2.0)
|  |  |  |  |  |  Stochastic_Convexity > 0.97719: 3 (9.0)
|  |  |  |  Aspect_Ratio > 1.254
|  |  |  |  |  Solidity <= 0.94687
|  |  |  |  |  |  Lobedness <= 0.058729: 4 (2.0)
|  |  |  |  |  |  Lobedness > 0.058729: 9 (8.0)
|  |  |  |  |  Solidity > 0.94687: 24 (3.0/1.0)
|  |  |  Maximal_Indentation_Depth > 0.035845
|  |  |  |  Stochastic_Convexity <= 0.95263: 23 (8.0)
|  |  |  |  Stochastic_Convexity > 0.95263
|  |  |  |  |  Eccentricity <= 0.68069
|  |  |  |  |  |  Solidity <= 0.89752: 9 (2.0)
|  |  |  |  |  |  Solidity > 0.89752: 10 (13.0)
|  |  |  |  |  Eccentricity > 0.68069: 25 (6.0)
|  |  Solidity > 0.9557
|  |  |  Solidity <= 0.97545
|  |  |  |  Third_moment <= 0.0041
|  |  |  |  |  Maximal_Indentation_Depth <= 0.012913
|  |  |  |  |  |  Average_Intensity <= 0.020258: 24 (2.0)
|  |  |  |  |  |  Average_Intensity > 0.020258: 4 (6.0)
|  |  |  |  |  Maximal_Indentation_Depth > 0.012913: 24 (7.0)
|  |  |  |  Third_moment > 0.0041: 27 (2.0/1.0)
|  |  |  Solidity > 0.97545
|  |  |  |  Eccentricity <= 0.59571: 26 (10.0/2.0)
|  |  |  |  Eccentricity > 0.59571
|  |  |  |  |  Average_Contrast <= 0.10589
|  |  |  |  |  |  Entropy <= 0.77718: 1 (7.0/1.0)
|  |  |  |  |  |  Entropy > 0.77718
|  |  |  |  |  |  |  Uniformity <= 0.000139: 13 (2.0/1.0)
|  |  |  |  |  |  |  Uniformity > 0.000139: 27 (4.0)
|  |  |  |  |  Average_Contrast > 0.10589
```

```
|  |  |  |  |  |  Maximal_Indentation_Depth <= 0.006151: 13 (10.0/1.0)
|  |  |  |  |  |  Maximal_Indentation_Depth > 0.006151
|  |  |  |  |  |  |  Third_moment <= 0.007031: 13 (4.0/1.0)
|  |  |  |  |  |  |  Third_moment > 0.007031: 33 (6.0)
|  Aspect_Ratio > 1.633
|  |  Solidity <= 0.97383
|  |  |  Third_moment <= 0.001433: 29 (12.0)
|  |  |  Third_moment > 0.001433
|  |  |  |  Aspect_Ratio <= 2.0754
|  |  |  |  |  Uniformity <= 0.000361
|  |  |  |  |  |  Uniformity <= 0.000076: 26 (3.0/1.0)
|  |  |  |  |  |  Uniformity > 0.000076
|  |  |  |  |  |  |  Eccentricity <= 0.8728: 7 (8.0)
|  |  |  |  |  |  |  Eccentricity > 0.8728: 5 (2.0/1.0)
|  |  |  |  |  Uniformity > 0.000361: 25 (3.0/1.0)
|  |  |  |  Aspect_Ratio > 2.0754
|  |  |  |  |  Entropy <= 1.0734: 22 (11.0/2.0)
|  |  |  |  |  Entropy > 1.0734
|  |  |  |  |  |  Solidity <= 0.95274: 12 (11.0/1.0)
|  |  |  |  |  |  Solidity > 0.95274
|  |  |  |  |  |  |  Maximal_Indentation_Depth <= 0.010883: 14 (8.0)
|  |  |  |  |  |  |  Maximal_Indentation_Depth > 0.010883
|  |  |  |  |  |  |  |  Aspect_Ratio <= 2.6504: 35 (2.0)
|  |  |  |  |  |  |  |  Aspect_Ratio > 2.6504: 28 (6.0)
|  |  Solidity > 0.97383
|  |  |  Third_moment <= 0.006454
|  |  |  |  Uniformity <= 0.000056: 1 (4.0)
|  |  |  |  Uniformity > 0.000056
|  |  |  |  |  Isoperimetric_Factor <= 0.7686
|  |  |  |  |  |  Eccentricity <= 0.82556: 33 (4.0/1.0)
|  |  |  |  |  |  Eccentricity > 0.82556
|  |  |  |  |  |  |  Elongation <= 0.57721
|  |  |  |  |  |  |  |  Uniformity <= 0.00053
|  |  |  |  |  |  |  |  |  Third_moment <= 0.002305
|  |  |  |  |  |  |  |  |  |  Solidity <= 0.98536: 32 (5.0/1.0)
|  |  |  |  |  |  |  |  |  |  Solidity > 0.98536: 2 (3.0)
|  |  |  |  |  |  |  |  |  Third_moment > 0.002305: 32 (6.0)
|  |  |  |  |  |  |  |  Uniformity > 0.00053: 2 (2.0/1.0)
|  |  |  |  |  |  |  Elongation > 0.57721: 2 (5.0)
|  |  |  |  |  Isoperimetric_Factor > 0.7686: 27 (5.0/1.0)
|  |  |  Third_moment > 0.006454
|  |  |  |  Stochastic_Convexity <= 0.99825: 14 (4.0/1.0)
|  |  |  |  Stochastic_Convexity > 0.99825
|  |  |  |  |  Average_Contrast <= 0.185: 35 (6.0)
|  |  |  |  Average_Contrast > 0.185: 28 (7.0/1.0)
```

2. Nursery (Categorical) Data Set

J48 pruned tree

```
health = recommended
|   has_nurs = proper
|   |   parents = usual
|   |   |   social = nonprob
|   |   |   |   housing = convenient
|   |   |   |   |   finance = convenient: very_recom (16.0/1.0)
|   |   |   |   |   finance = inconv: priority (16.0/5.0)
|   |   |   |   housing = less_conv
|   |   |   |   |   children = 1: very_recom (8.0/2.0)
|   |   |   |   |   children = 2
|   |   |   |   |   |   form = complete: very_recom (2.0)
|   |   |   |   |   |   form = completed: very_recom (2.0)
|   |   |   |   |   |   form = incomplete: priority (2.0)
|   |   |   |   |   |   form = foster: priority (2.0)
|   |   |   |   |   children = 3: priority (8.0)
|   |   |   |   |   children = more: priority (8.0)
|   |   |   |   housing = critical: priority (32.0/2.0)
|   |   |   social = slightly_prob
|   |   |   |   housing = convenient
|   |   |   |   |   finance = convenient: very_recom (16.0/1.0)
|   |   |   |   |   finance = inconv: priority (16.0/5.0)
|   |   |   |   housing = less_conv
|   |   |   |   |   children = 1: very_recom (8.0/2.0)
|   |   |   |   |   children = 2
|   |   |   |   |   |   form = complete: very_recom (2.0)
|   |   |   |   |   |   form = completed: very_recom (2.0)
|   |   |   |   |   |   form = incomplete: priority (2.0)
|   |   |   |   |   |   form = foster: priority (2.0)
|   |   |   |   |   children = 3: priority (8.0)
|   |   |   |   |   children = more: priority (8.0)
|   |   |   |   housing = critical: priority (32.0/2.0)
|   |   |   social = problematic: priority (96.0)
|   |   parents = pretentious
|   |   |   social = nonprob
|   |   |   |   housing = convenient
|   |   |   |   |   finance = convenient: very_recom (16.0)
|   |   |   |   |   finance = inconv: priority (16.0/5.0)
|   |   |   |   housing = less_conv
|   |   |   |   |   children = 1: very_recom (8.0/2.0)
|   |   |   |   |   children = 2
|   |   |   |   |   |   form = complete: very_recom (2.0)
|   |   |   |   |   |   form = completed: very_recom (2.0)
|   |   |   |   |   |   form = incomplete: priority (2.0)
```

```
|  |  |  |  |  |  form = foster: priority (2.0)
|  |  |  |  |  children = 3: priority (8.0)
|  |  |  |  |  children = more: priority (8.0)
|  |  |  |  housing = critical: priority (32.0/2.0)
|  |  |  social = slightly_prob
|  |  |  |  housing = convenient
|  |  |  |  |  finance = convenient: very_recom (16.0)
|  |  |  |  |  finance = inconv: priority (16.0/5.0)
|  |  |  |  housing = less_conv
|  |  |  |  |  children = 1: very_recom (8.0/2.0)
|  |  |  |  |  children = 2
|  |  |  |  |  |  form = complete: very_recom (2.0)
|  |  |  |  |  |  form = completed: very_recom (2.0)
|  |  |  |  |  |  form = incomplete: priority (2.0)
|  |  |  |  |  |  form = foster: priority (2.0)
|  |  |  |  |  children = 3: priority (8.0)
|  |  |  |  |  children = more: priority (8.0)
|  |  |  |  housing = critical: priority (32.0/2.0)
|  |  |  social = problematic: priority (96.0)
|  |  parents = great_pret
|  |  |  social = nonprob: priority (96.0)
|  |  |  social = slightly_prob: priority (96.0)
|  |  |  social = problematic
|  |  |  |  housing = convenient
|  |  |  |  |  finance = convenient: priority (16.0)
|  |  |  |  |  finance = inconv: spec_prior (16.0/5.0)
|  |  |  |  housing = less_conv
|  |  |  |  |  children = 1: priority (8.0/2.0)
|  |  |  |  |  children = 2
|  |  |  |  |  |  form = complete: priority (2.0)
|  |  |  |  |  |  form = completed: priority (2.0)
|  |  |  |  |  |  form = incomplete: spec_prior (2.0)
|  |  |  |  |  |  form = foster: spec_prior (2.0)
|  |  |  |  |  children = 3: spec_prior (8.0)
|  |  |  |  |  children = more: spec_prior (8.0)
|  |  |  |  housing = critical: spec_prior (32.0/2.0)
|  has_nurs = less_proper
|  |  parents = usual
|  |  |  social = nonprob
|  |  |  |  housing = convenient
|  |  |  |  |  finance = convenient: very_recom (16.0)
|  |  |  |  |  finance = inconv: priority (16.0/5.0)
|  |  |  |  housing = less_conv
|  |  |  |  |  children = 1: very_recom (8.0/2.0)
|  |  |  |  |  children = 2
|  |  |  |  |  |  form = complete: very_recom (2.0)
```

```
|   |   |   |   |   |   form = completed: very_recom (2.0)
|   |   |   |   |   |   form = incomplete: priority (2.0)
|   |   |   |   |   |   form = foster: priority (2.0)
|   |   |   |   |   children = 3: priority (8.0)
|   |   |   |   |   children = more: priority (8.0)
|   |   |   |   housing = critical: priority (32.0/2.0)
|   |   |   social = slightly_prob
|   |   |   |   housing = convenient
|   |   |   |   |   finance = convenient: very_recom (16.0)
|   |   |   |   |   finance = inconv: priority (16.0/5.0)
|   |   |   |   housing = less_conv
|   |   |   |   |   children = 1: very_recom (8.0/2.0)
|   |   |   |   |   children = 2
|   |   |   |   |   |   form = complete: very_recom (2.0)
|   |   |   |   |   |   form = completed: very_recom (2.0)
|   |   |   |   |   |   form = incomplete: priority (2.0)
|   |   |   |   |   |   form = foster: priority (2.0)
|   |   |   |   |   children = 3: priority (8.0)
|   |   |   |   |   children = more: priority (8.0)
|   |   |   |   housing = critical: priority (32.0/2.0)
|   |   |   social = problematic: priority (96.0)
|   |   parents = pretentious
|   |   |   social = nonprob
|   |   |   |   housing = convenient
|   |   |   |   |   finance = convenient: very_recom (16.0)
|   |   |   |   |   finance = inconv: priority (16.0/5.0)
|   |   |   |   housing = less_conv
|   |   |   |   |   children = 1: very_recom (8.0/2.0)
|   |   |   |   |   children = 2
|   |   |   |   |   |   form = complete: very_recom (2.0)
|   |   |   |   |   |   form = completed: very_recom (2.0)
|   |   |   |   |   |   form = incomplete: priority (2.0)
|   |   |   |   |   |   form = foster: priority (2.0)
|   |   |   |   |   children = 3: priority (8.0)
|   |   |   |   |   children = more: priority (8.0)
|   |   |   |   housing = critical: priority (32.0/2.0)
|   |   |   social = slightly_prob
|   |   |   |   housing = convenient
|   |   |   |   |   finance = convenient: very_recom (16.0)
|   |   |   |   |   finance = inconv: priority (16.0/5.0)
|   |   |   |   housing = less_conv
|   |   |   |   |   children = 1: very_recom (8.0/2.0)
|   |   |   |   |   children = 2
|   |   |   |   |   |   form = complete: very_recom (2.0)
|   |   |   |   |   |   form = completed: very_recom (2.0)
|   |   |   |   |   |   form = incomplete: priority (2.0)
```

```
|  |  |  |  |  |  form = foster: priority (2.0)
|  |  |  |  |  children = 3: priority (8.0)
|  |  |  |  |  children = more: priority (8.0)
|  |  |  |  housing = critical: priority (32.0/2.0)
|  |  |  social = problematic: priority (96.0)
|  |  parents = great_pret
|  |  |  social = nonprob: priority (96.0)
|  |  |  social = slightly_prob: priority (96.0)
|  |  |  social = problematic
|  |  |  |  housing = convenient
|  |  |  |  |  finance = convenient: priority (16.0)
|  |  |  |  |  finance = inconv: spec_prior (16.0/5.0)
|  |  |  |  housing = less_conv
|  |  |  |  |  children = 1: priority (8.0/2.0)
|  |  |  |  |  children = 2
|  |  |  |  |  |  form = complete: priority (2.0)
|  |  |  |  |  |  form = completed: priority (2.0)
|  |  |  |  |  |  form = incomplete: spec_prior (2.0)
|  |  |  |  |  |  form = foster: spec_prior (2.0)
|  |  |  |  |  children = 3: spec_prior (8.0)
|  |  |  |  |  children = more: spec_prior (8.0)
|  |  |  |  housing = critical: spec_prior (32.0/2.0)
|  has_nurs = improper
|  |  parents = usual
|  |  |  social = nonprob
|  |  |  |  housing = convenient
|  |  |  |  |  finance = convenient: very_recom (16.0)
|  |  |  |  |  finance = inconv: priority (16.0/5.0)
|  |  |  |  housing = less_conv
|  |  |  |  |  children = 1: very_recom (8.0/2.0)
|  |  |  |  |  children = 2
|  |  |  |  |  |  form = complete: very_recom (2.0)
|  |  |  |  |  |  form = completed: very_recom (2.0)
|  |  |  |  |  |  form = incomplete: priority (2.0)
|  |  |  |  |  |  form = foster: priority (2.0)
|  |  |  |  |  children = 3: priority (8.0)
|  |  |  |  |  children = more: priority (8.0)
|  |  |  |  housing = critical: priority (32.0/2.0)
|  |  |  social = slightly_prob
|  |  |  |  housing = convenient
|  |  |  |  |  finance = convenient: very_recom (16.0)
|  |  |  |  |  finance = inconv: priority (16.0/5.0)
|  |  |  |  housing = less_conv
|  |  |  |  |  children = 1: very_recom (8.0/2.0)
|  |  |  |  |  children = 2
|  |  |  |  |  |  form = complete: very_recom (2.0)
```

```
|  |  |  |  |  |  form = completed: very_recom (2.0)
|  |  |  |  |  |  form = incomplete: priority (2.0)
|  |  |  |  |  |  form = foster: priority (2.0)
|  |  |  |  |  children = 3: priority (8.0)
|  |  |  |  |  children = more: priority (8.0)
|  |  |  |  housing = critical: priority (32.0/2.0)
|  |  |  social = problematic: priority (96.0)
|  |  parents = pretentious
|  |  |  social = nonprob: priority (96.0)
|  |  |  social = slightly_prob: priority (96.0)
|  |  |  social = problematic
|  |  |  |  housing = convenient
|  |  |  |  |  finance = convenient: priority (16.0)
|  |  |  |  |  finance = inconv: spec_prior (16.0/5.0)
|  |  |  |  housing = less_conv
|  |  |  |  |  children = 1: priority (8.0/2.0)
|  |  |  |  |  children = 2
|  |  |  |  |  |  form = complete: priority (2.0)
|  |  |  |  |  |  form = completed: priority (2.0)
|  |  |  |  |  |  form = incomplete: spec_prior (2.0)
|  |  |  |  |  |  form = foster: spec_prior (2.0)
|  |  |  |  |  children = 3: spec_prior (8.0)
|  |  |  |  |  children = more: spec_prior (8.0)
|  |  |  |  housing = critical: spec_prior (32.0/2.0)
|  |  parents = great_pret
|  |  |  social = nonprob
|  |  |  |  housing = convenient
|  |  |  |  |  finance = convenient: priority (16.0)
|  |  |  |  |  finance = inconv: spec_prior (16.0/5.0)
|  |  |  |  housing = less_conv
|  |  |  |  |  children = 1: priority (8.0/2.0)
|  |  |  |  |  children = 2
|  |  |  |  |  |  form = complete: priority (2.0)
|  |  |  |  |  |  form = completed: priority (2.0)
|  |  |  |  |  |  form = incomplete: spec_prior (2.0)
|  |  |  |  |  |  form = foster: spec_prior (2.0)
|  |  |  |  |  children = 3: spec_prior (8.0)
|  |  |  |  |  children = more: spec_prior (8.0)
|  |  |  |  housing = critical: spec_prior (32.0/2.0)
|  |  |  social = slightly_prob
|  |  |  |  housing = convenient
|  |  |  |  |  finance = convenient: priority (16.0)
|  |  |  |  |  finance = inconv: spec_prior (16.0/5.0)
|  |  |  |  housing = less_conv
|  |  |  |  |  children = 1: priority (8.0/2.0)
|  |  |  |  |  children = 2
```

```
|  |  |  |  |  |  form = complete: priority (2.0)
|  |  |  |  |  |  form = completed: priority (2.0)
|  |  |  |  |  |  form = incomplete: spec_prior (2.0)
|  |  |  |  |  |  form = foster: spec_prior (2.0)
|  |  |  |  |  children = 3: spec_prior (8.0)
|  |  |  |  |  children = more: spec_prior (8.0)
|  |  |  |  housing = critical: spec_prior (32.0/2.0)
|  |  |  social = problematic: spec_prior (96.0/1.0)
|  has_nurs = critical
|  |  parents = usual
|  |  |  social = nonprob: priority (96.0)
|  |  |  social = slightly_prob: priority (96.0)
|  |  |  social = problematic
|  |  |  |  housing = convenient
|  |  |  |  |  finance = convenient: priority (16.0)
|  |  |  |  |  finance = inconv: spec_prior (16.0/5.0)
|  |  |  |  housing = less_conv
|  |  |  |  |  children = 1: priority (8.0/2.0)
|  |  |  |  |  children = 2
|  |  |  |  |  |  form = complete: priority (2.0)
|  |  |  |  |  |  form = completed: priority (2.0)
|  |  |  |  |  |  form = incomplete: spec_prior (2.0)
|  |  |  |  |  |  form = foster: spec_prior (2.0)
|  |  |  |  |  children = 3: spec_prior (8.0)
|  |  |  |  |  children = more: spec_prior (8.0)
|  |  |  |  housing = critical: spec_prior (32.0/2.0)
|  |  parents = pretentious
|  |  |  social = nonprob
|  |  |  |  housing = convenient
|  |  |  |  |  finance = convenient: priority (16.0)
|  |  |  |  |  finance = inconv: spec_prior (16.0/5.0)
|  |  |  |  housing = less_conv
|  |  |  |  |  children = 1: priority (8.0/2.0)
|  |  |  |  |  children = 2
|  |  |  |  |  |  form = complete: priority (2.0)
|  |  |  |  |  |  form = completed: priority (2.0)
|  |  |  |  |  |  form = incomplete: spec_prior (2.0)
|  |  |  |  |  |  form = foster: spec_prior (2.0)
|  |  |  |  |  children = 3: spec_prior (8.0)
|  |  |  |  |  children = more: spec_prior (8.0)
|  |  |  |  housing = critical: spec_prior (32.0/2.0)
|  |  |  social = slightly_prob
|  |  |  |  housing = convenient
|  |  |  |  |  finance = convenient: priority (16.0)
|  |  |  |  |  finance = inconv: spec_prior (16.0/5.0)
|  |  |  |  housing = less_conv
```

```
|  |  |  |  |  children = 1: priority (8.0/2.0)
|  |  |  |  |  children = 2
|  |  |  |  |  |  form = complete: priority (2.0)
|  |  |  |  |  |  form = completed: priority (2.0)
|  |  |  |  |  |  form = incomplete: spec_prior (2.0)
|  |  |  |  |  |  form = foster: spec_prior (2.0)
|  |  |  |  |  children = 3: spec_prior (8.0)
|  |  |  |  |  children = more: spec_prior (8.0)
|  |  |  |  housing = critical: spec_prior (32.0/2.0)
|  |  |  social = problematic: spec_prior (96.0/1.0)
|  |  parents = great_pret
|  |  |  social = nonprob
|  |  |  |  housing = convenient
|  |  |  |  |  finance = convenient: priority (16.0)
|  |  |  |  |  finance = inconv: spec_prior (16.0/5.0)
|  |  |  |  housing = less_conv
|  |  |  |  |  children = 1: priority (8.0/2.0)
|  |  |  |  |  children = 2
|  |  |  |  |  |  form = complete: priority (2.0)
|  |  |  |  |  |  form = completed: priority (2.0)
|  |  |  |  |  |  form = incomplete: spec_prior (2.0)
|  |  |  |  |  |  form = foster: spec_prior (2.0)
|  |  |  |  |  children = 3: spec_prior (8.0)
|  |  |  |  |  children = more: spec_prior (8.0)
|  |  |  |  housing = critical: spec_prior (32.0/2.0)
|  |  |  social = slightly_prob
|  |  |  |  housing = convenient
|  |  |  |  |  finance = convenient: priority (16.0)
|  |  |  |  |  finance = inconv: spec_prior (16.0/5.0)
|  |  |  |  housing = less_conv
|  |  |  |  |  children = 1: priority (8.0/2.0)
|  |  |  |  |  children = 2
|  |  |  |  |  |  form = complete: priority (2.0)
|  |  |  |  |  |  form = completed: priority (2.0)
|  |  |  |  |  |  form = incomplete: spec_prior (2.0)
|  |  |  |  |  |  form = foster: spec_prior (2.0)
|  |  |  |  |  children = 3: spec_prior (8.0)
|  |  |  |  |  children = more: spec_prior (8.0)
|  |  |  |  housing = critical: spec_prior (32.0/2.0)
|  |  |  social = problematic: spec_prior (96.0/1.0)
|  has_nurs = very_crit
|  |  social = nonprob
|  |  |  housing = convenient
|  |  |  |  finance = convenient: priority (48.0)
|  |  |  |  finance = inconv
|  |  |  |  |  children = 1
```

```
|  |  |  |  |  |  form = complete: priority (3.0)
|  |  |  |  |  |  form = completed: priority (3.0)
|  |  |  |  |  |  form = incomplete: priority (3.0)
|  |  |  |  |  |  form = foster: spec_prior (3.0)
|  |  |  |  |  children = 2
|  |  |  |  |  |  form = complete: priority (3.0)
|  |  |  |  |  |  form = completed: priority (3.0)
|  |  |  |  |  |  form = incomplete: spec_prior (3.0)
|  |  |  |  |  |  form = foster: spec_prior (3.0)
|  |  |  |  |  children = 3: spec_prior (12.0)
|  |  |  |  |  children = more: spec_prior (12.0)
|  |  |  housing = less_conv
|  |  |  |  children = 1
|  |  |  |  |  form = complete: priority (6.0)
|  |  |  |  |  form = completed: priority (6.0)
|  |  |  |  |  form = incomplete: priority (6.0)
|  |  |  |  |  form = foster: spec_prior (6.0)
|  |  |  |  children = 2
|  |  |  |  |  form = complete: priority (6.0)
|  |  |  |  |  form = completed: priority (6.0)
|  |  |  |  |  form = incomplete: spec_prior (6.0)
|  |  |  |  |  form = foster: spec_prior (6.0)
|  |  |  |  children = 3: spec_prior (24.0)
|  |  |  |  children = more: spec_prior (24.0)
|  |  |  housing = critical: spec_prior (96.0/6.0)
|  |  social = slightly_prob
|  |  |  housing = convenient
|  |  |  |  finance = convenient: priority (48.0)
|  |  |  |  finance = inconv
|  |  |  |  |  children = 1
|  |  |  |  |  |  form = complete: priority (3.0)
|  |  |  |  |  |  form = completed: priority (3.0)
|  |  |  |  |  |  form = incomplete: priority (3.0)
|  |  |  |  |  |  form = foster: spec_prior (3.0)
|  |  |  |  |  children = 2
|  |  |  |  |  |  form = complete: priority (3.0)
|  |  |  |  |  |  form = completed: priority (3.0)
|  |  |  |  |  |  form = incomplete: spec_prior (3.0)
|  |  |  |  |  |  form = foster: spec_prior (3.0)
|  |  |  |  |  children = 3: spec_prior (12.0)
|  |  |  |  |  children = more: spec_prior (12.0)
|  |  |  housing = less_conv
|  |  |  |  children = 1
|  |  |  |  |  form = complete: priority (6.0)
|  |  |  |  |  form = completed: priority (6.0)
|  |  |  |  |  form = incomplete: priority (6.0)
```

```
|  |  |  |  |  form = foster: spec_prior (6.0)
|  |  |  |  children = 2
|  |  |  |  |  form = complete: priority (6.0)
|  |  |  |  |  form = completed: priority (6.0)
|  |  |  |  |  form = incomplete: spec_prior (6.0)
|  |  |  |  |  form = foster: spec_prior (6.0)
|  |  |  |  children = 3: spec_prior (24.0)
|  |  |  |  children = more: spec_prior (24.0)
|  |  |  housing = critical: spec_prior (96.0/6.0)
|  |  social = problematic: spec_prior (288.0/3.0)
health = priority
|  has_nurs = proper
|  |  parents = usual: priority (288.0)
|  |  parents = pretentious: priority (288.0)
|  |  parents = great_pret
|  |  |  housing = convenient
|  |  |  |  finance = convenient: priority (48.0)
|  |  |  |  finance = inconv
|  |  |  |  |  children = 1
|  |  |  |  |  |  form = complete: priority (3.0)
|  |  |  |  |  |  form = completed: priority (3.0)
|  |  |  |  |  |  form = incomplete: priority (3.0)
|  |  |  |  |  |  form = foster: spec_prior (3.0)
|  |  |  |  |  children = 2
|  |  |  |  |  |  form = complete: priority (3.0)
|  |  |  |  |  |  form = completed: priority (3.0)
|  |  |  |  |  |  form = incomplete: spec_prior (3.0)
|  |  |  |  |  |  form = foster: spec_prior (3.0)
|  |  |  |  |  children = 3: spec_prior (12.0)
|  |  |  |  |  children = more: spec_prior (12.0)
|  |  |  housing = less_conv
|  |  |  |  children = 1
|  |  |  |  |  form = complete: priority (6.0)
|  |  |  |  |  form = completed: priority (6.0)
|  |  |  |  |  form = incomplete: priority (6.0)
|  |  |  |  |  form = foster: spec_prior (6.0)
|  |  |  |  children = 2
|  |  |  |  |  form = complete: priority (6.0)
|  |  |  |  |  form = completed: priority (6.0)
|  |  |  |  |  form = incomplete: spec_prior (6.0)
|  |  |  |  |  form = foster: spec_prior (6.0)
|  |  |  |  children = 3: spec_prior (24.0)
|  |  |  |  children = more: spec_prior (24.0)
|  |  |  housing = critical: spec_prior (96.0/6.0)
|  has_nurs = less_proper
|  |  parents = usual: priority (288.0)
```

```
|   |   parents = pretentious: priority (288.0)
|   |   parents = great_pret
|   |   |   housing = convenient
|   |   |   |   finance = convenient: priority (48.0)
|   |   |   |   finance = inconv
|   |   |   |   |   children = 1
|   |   |   |   |   |   form = complete: priority (3.0)
|   |   |   |   |   |   form = completed: priority (3.0)
|   |   |   |   |   |   form = incomplete: priority (3.0)
|   |   |   |   |   |   form = foster: spec_prior (3.0)
|   |   |   |   |   children = 2
|   |   |   |   |   |   form = complete: priority (3.0)
|   |   |   |   |   |   form = completed: priority (3.0)
|   |   |   |   |   |   form = incomplete: spec_prior (3.0)
|   |   |   |   |   |   form = foster: spec_prior (3.0)
|   |   |   |   |   children = 3: spec_prior (12.0)
|   |   |   |   |   children = more: spec_prior (12.0)
|   |   |   housing = less_conv
|   |   |   |   children = 1
|   |   |   |   |   form = complete: priority (6.0)
|   |   |   |   |   form = completed: priority (6.0)
|   |   |   |   |   form = incomplete: priority (6.0)
|   |   |   |   |   form = foster: spec_prior (6.0)
|   |   |   |   children = 2
|   |   |   |   |   form = complete: priority (6.0)
|   |   |   |   |   form = completed: priority (6.0)
|   |   |   |   |   form = incomplete: spec_prior (6.0)
|   |   |   |   |   form = foster: spec_prior (6.0)
|   |   |   |   children = 3: spec_prior (24.0)
|   |   |   |   children = more: spec_prior (24.0)
|   |   |   housing = critical: spec_prior (96.0/6.0)
|   has_nurs = improper
|   |   parents = usual: priority (288.0)
|   |   parents = pretentious
|   |   |   housing = convenient
|   |   |   |   finance = convenient: priority (48.0)
|   |   |   |   finance = inconv
|   |   |   |   |   children = 1
|   |   |   |   |   |   form = complete: priority (3.0)
|   |   |   |   |   |   form = completed: priority (3.0)
|   |   |   |   |   |   form = incomplete: priority (3.0)
|   |   |   |   |   |   form = foster: spec_prior (3.0)
|   |   |   |   |   children = 2
|   |   |   |   |   |   form = complete: priority (3.0)
|   |   |   |   |   |   form = completed: priority (3.0)
|   |   |   |   |   |   form = incomplete: spec_prior (3.0)
```

```
|  |  |  |  |  |  form = foster: spec_prior (3.0)
|  |  |  |  |  children = 3: spec_prior (12.0)
|  |  |  |  |  children = more: spec_prior (12.0)
|  |  |  housing = less_conv
|  |  |  |  children = 1
|  |  |  |  |  form = complete: priority (6.0)
|  |  |  |  |  form = completed: priority (6.0)
|  |  |  |  |  form = incomplete: priority (6.0)
|  |  |  |  |  form = foster: spec_prior (6.0)
|  |  |  |  children = 2
|  |  |  |  |  form = complete: priority (6.0)
|  |  |  |  |  form = completed: priority (6.0)
|  |  |  |  |  form = incomplete: spec_prior (6.0)
|  |  |  |  |  form = foster: spec_prior (6.0)
|  |  |  |  children = 3: spec_prior (24.0)
|  |  |  |  children = more: spec_prior (24.0)
|  |  |  housing = critical: spec_prior (96.0/6.0)
|  |  parents = great_pret: spec_prior (288.0/3.0)
|  has_nurs = critical
|  |  parents = usual
|  |  |  housing = convenient
|  |  |  |  finance = convenient: priority (48.0)
|  |  |  |  finance = inconv
|  |  |  |  |  children = 1
|  |  |  |  |  |  form = complete: priority (3.0)
|  |  |  |  |  |  form = completed: priority (3.0)
|  |  |  |  |  |  form = incomplete: priority (3.0)
|  |  |  |  |  |  form = foster: spec_prior (3.0)
|  |  |  |  |  children = 2
|  |  |  |  |  |  form = complete: priority (3.0)
|  |  |  |  |  |  form = completed: priority (3.0)
|  |  |  |  |  |  form = incomplete: spec_prior (3.0)
|  |  |  |  |  |  form = foster: spec_prior (3.0)
|  |  |  |  |  children = 3: spec_prior (12.0)
|  |  |  |  |  children = more: spec_prior (12.0)
|  |  |  housing = less_conv
|  |  |  |  children = 1
|  |  |  |  |  form = complete: priority (6.0)
|  |  |  |  |  form = completed: priority (6.0)
|  |  |  |  |  form = incomplete: priority (6.0)
|  |  |  |  |  form = foster: spec_prior (6.0)
|  |  |  |  children = 2
|  |  |  |  |  form = complete: priority (6.0)
|  |  |  |  |  form = completed: priority (6.0)
|  |  |  |  |  form = incomplete: spec_prior (6.0)
|  |  |  |  |  form = foster: spec_prior (6.0)
```

```
|   |   |   children = 3: spec_prior (24.0)
|   |   |   children = more: spec_prior (24.0)
|   |   |  housing = critical: spec_prior (96.0/6.0)
|   |  parents = pretentious: spec_prior (288.0/3.0)
|   |  parents = great_pret: spec_prior (288.0/3.0)
|  has_nurs = very_crit: spec_prior (864.0/9.0)
health = not_recom: not_recom (4320.0)
```

Naive Bayes Classifiers

1. Continuous Leaf Dataset

Naive Bayes Classifier

Attribute	Class 1 (0.04)	2 (0.03)	3 (0.03)	4 (0.02)	5 (0.04)	6 (0.02)	7 (0.03)	8 (0.03)	9 (0.04)	10 (0.04)	11 (0.05)	12 (0.04)	13 (0.04)	14 (0.04)	15 (0.03)	22 (0.04)	23 (0.03)	24 (0.04)	25 (0.03)	26 (0.04)	27 (0.03)	28 (0.04)	29 (0.04)	30 (0.04)	31 (0.03)	32 (0.03)	33 (0.03)	34 (0.03)	35 (0.03)	36 (0.03)
Eccentricity																														
mean	0.784	0.8923	0.6307	0.5875	0.8849	0.5399	0.8469	0.986	0.5416	0.4466	0.4175	0.8947	0.6866	0.9071	0.4781	0.9081	0.593	0.5239	0.7811	0.5819	0.7548	0.9105	0.8188	0.4136	0.9957	0.8648	0.7166	0.9969	0.9134	0.4145
std. dev.	0.0516	0.0307	0.0628	0.1282	0.0372	0.0844	0.0154	0.0016	0.0776	0.1134	0.0934	0.0289	0.0409	0.0217	0.0874	0.032	0.051	0.1501	0.0409	0.1884	0.075	0.0242	0.0298	0.1094	0.0012	0.0305	0.0578	0.0015	0.0124	0.1442
weight sum	12	10	10	8	12	8	10	11	14	13	16	12	13	12	10	12	11	13	9	12	11	12	12	12	11	11	11	11	11	10
precision	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026
Aspect_Ratio																														
mean	1.6741	2.3284	1.1209	1.3199	1.9539	1.1303	1.7761	6.2369	1.3034	1.1954	1.0931	2.4502	1.4495	2.4277	1.1155	2.6081	1.1913	1.3121	1.5643	1.3582	1.5555	2.6849	1.9178	1.1597	10.2636	2.0872	1.5555	12.2523	2.6385	1.0938
std. dev.	0.2456	0.3347	0.0687	0.1481	0.2684	0.0916	0.1489	0.3678	0.0805	0.0961	0.0393	0.2512	0.088	0.2786	0.0603	0.4812	0.0566	0.1295	0.0825	0.3222	0.1919	0.3695	0.12	0.0562	1.1511	0.1838	0.1387	3.0424	0.1848	0.0531
weight sum	12	10	10	8	12	8	10	11	14	13	16	12	13	12	10	12	11	13	9	12	11	12	12	12	11	11	11	11	11	10
precision	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541	0.0541
Elongation																														
mean	0.4059	0.5699	0.3482	0.282	0.6419	0.6352	0.5236	0.841	0.363	0.3159	0.6613	0.6061	0.3226	0.6005	0.5027	0.6162	0.4057	0.2663	0.4461	0.2726	0.3715	0.6268	0.477	0.2583	0.9226	0.5212	0.3613	0.9158	0.625	0.7805
std. dev.	0.0699	0.0609	0.0273	0.0831	0.0401	0.0744	0.026	0.0092	0.0478	0.0622	0.0309	0.0414	0.0354	0.0455	0.0421	0.0654	0.0801	0.0607	0.0393	0.1488	0.0801	0.0537	0.0332	0.0265	0.0113	0.0454	0.0507	0.0163	0.0265	0.0385
weight sum	12	10	10	8	12	8	10	11	14	13	16	12	13	12	10	12	11	13	9	12	11	12	12	12	11	11	11	11	11	10
precision	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Solidity																														
mean	0.981	0.9829	0.9188	0.9599	0.8342	0.7467	0.881	0.9661	0.9035	0.9326	0.5297	0.9245	0.9857	0.9678	0.756	0.9133	0.9214	0.97	0.9319	0.9791	0.9857	0.9722	0.9564	0.9407	0.8064	0.9843	0.98	0.9043	0.9761	0.6903
std. dev.	0.0037	0.0048	0.0164	0.0136	0.0151	0.049	0.0596	0.0077	0.0248	0.0166	0.0286	0.0285	0.0016	0.0094	0.039	0.0524	0.0159	0.0094	0.0195	0.0065	0.0074	0.0102	0.0112	0.0053	0.0968	0.0033	0.0037	0.0317	0.0123	0.0589
weight sum	12	10	10	8	12	8	10	11	14	13	16	12	13	12	10	12	11	13	9	12	11	12	12	12	11	11	11	11	11	10
precision	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Stochastic_Convexity																														
mean	0.9989	0.9989	0.9961	0.9946	0.8712	0.6443	0.9802	0.9813	0.9865	0.976	0.6525	0.9874	0.9989	0.9966	0.8803	0.9775	0.9081	0.9968	0.9843	0.9978	0.9989	0.9983	0.9949	0.9914	0.9459	0.9977	0.9983	0.9623	0.9945	0.6
std. dev.	0.0012	0.0012	0.0055	0.0069	0.0251	0.1181	0.0152	0.0287	0.0134	0.0083	0.0919	0.0099	0.0012	0.0059	0.0467	0.0278	0.0558	0.0042	0.0129	0.0038	0.0012	0.0019	0.0053	0.0044	0.0377	0.0027	0.002	0.0324	0.0119	0.1145
weight sum	12	10	10	8	12	8	10	11	14	13	16	12	13	12	10	12	11	13	9	12	11	12	12	12	11	11	11	11	11	10
precision	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069
Isoperimetric_Factor																														
mean	0.789	0.6573	0.6485	0.7336	0.3455	0.263	0.5251	0.297	0.5511	0.6004	0.1585	0.4804	0.8092	0.5735	0.2916	0.4914	0.5287	0.7693	0.6473	0.7752	0.7972	0.5718	0.6417	0.5216	0.1548	0.6839	0.7634	0.1518	0.5583	0.144
std. dev.	0.0468	0.0506	0.0468	0.0673	0.0291	0.0484	0.1144	0.016	0.0691	0.0723	0.0236	0.0513	0.0169	0.0601	0.0448	0.0873	0.0835	0.0422	0.0325	0.0852	0.0415	0.0689	0.0465	0.0559	0.0249	0.06	0.0417	0.035	0.0456	0.0396
weight sum	12	10	10	8	12	8	10	11	14	13	16	12	13	12	10	12	11	13	9	12	11	12	12	12	11	11	11	11	11	10
precision	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023	0.0023
Maximal_Indentation_Depth																														
mean	0.0063	0.0061	0.0252	0.0118	0.0494	0.1195	0.027	0.0231	0.03	0.0481	0.1289	0.0381	0.0054	0.0098	0.0776	0.0544	0.0606	0.0159	0.0395	0.0103	0.0075	0.0167	0.0287	0.0194	0.1039	0.0069	0.0099	0.0293	0.0171	0.0907
std. dev.	0.0012	0.0031	0.0057	0.0035	0.0107	0.0146	0.0097	0.007	0.0103	0.0052	0.0103	0.0151	0.0015	0.0066	0.009	0.042	0.0265	0.0043	0.0116	0.0053	0.0038	0.0088	0.0079	0.0036	0.0638	0.0035	0.0035	0.0158	0.0114	0.0183
weight sum	12	10	10	8	12	8	10	11	14	13	16	12	13	12	10	12	11	13	9	12	11	12	12	12	11	11	11	11	11	10
precision	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
Lobedness																														
mean	0.0036	0.0043	0.1236	0.0266	0.4636	2.6325	0.1492	0.1066	0.1827	0.4263	3.0468	0.3091	0.0033	0.0249	1.1106	0.858	0.7964	0.0492	0.3103	0.0195	0.0116	0.0639	0.1599	0.0693	2.7032	0.0097	0.0194	0.2035	0.0756	1.5539
std. dev.	0.0079	0.0128	0.0493	0.0177	0.2317	0.6665	0.0899	0.0692	0.1245	0.0857	0.4889	0.2004	0.0077	0.0451	0.2737	1.2639	0.5739	0.0282	0.1697	0.0238	0.014	0.0645	0.0885	0.0248	2.6251	0.014	0.0212	0.2536	0.1046	0.6709
weight sum	12	10	10	8	12	8	10	11	14	13	16	12	13	12	10	12	11	13	9	12	11	12	12	12	11	11	11	11	11	10
precision	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213	0.0213
Average_Intensity																														
mean	0.0163	0.0299	0.0498	0.0381	0.0528	0.0187	0.0332	0.032	0.0628	0.1225	0.0258	0.0641	0.0595	0.074	0.0825	0.0411	0.0184	0.0336	0.1189	0.0393	0.033	0.0896	0.0073	0.0806	0.0116	0.0312	0.0787	0.0171	0.0861	0.0914
std. dev.	0.0114	0.0118	0.019	0.0168	0.0132	0.0066	0.0116	0.0092	0.0253	0.0296	0.0066	0.0177	0.0245	0.0223	0.0226	0.0139	0.0057	0.0176	0.0138	0.015	0.0102	0.0273	0.0019	0.0369	0.0031	0.0117	0.0317	0.0047	0.0178	0.0253
weight sum	12	10	10	8	12	8	10	11	14	13	16	12	13	12	10	12	11	13	9	12	11	12	12	12	11	11	11	11	11	10
precision	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
Average_Contrast																														
mean	0.0661	0.0883	0.1478	0.0934	0.1351	0.0718	0.1023	0.1003	0.1477	0.2179	0.0865	0.1485	0.1324	0.161	0.1581	0.1318	0.086	0.0905	0.2333	0.1195	0.0933	0.1787	0.044	0.1516	0.061	0.1008	0.1586	0.0714	0.1707	0.1872
std. dev.	0.0258	0.0169	0.0304	0.0243	0.0257	0.0162	0.0239	0.0173	0.0278	0.0374	0.0177	0.0224	0.0248	0.0303	0.0212	0.0297	0.015	0.0262	0.0249	0.0322	0.0149	0.029	0.0093	0.0331	0.0104	0.0232	0.0326	0.0121	0.0149	0.0244
weight sum	12	10	10	8	12	8	10	11	14	13	16	12	13	12	10	12	11	13	9	12	11	12	12	12	11	11	11	11	11	10
precision	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
Smoothness																														
mean	0.005	0.008	0.0222	0.0093	0.0185	0.0054	0.0109	0.0103	0.022	0.0463	0.0077	0.0221	0.0178	0.026	0.0248	0.0179	0.0075	0.0088	0.0521	0.015	0.0088	0.0317	0.002	0.0234	0.0038	0.0106	0.0254	0.0052	0.0285	0.0343
std. dev.	0.0041	0.0034	0.0085	0.0048	0.007	0.0022	0.005	0.0035	0.0078	0.0147	0.0032	0.0062	0.0065	0.0092	0.0062	0.0072	0.0025	0.0047	0.0101	0.0084	0.0026	0.0094	0.0009	0.0097	0.0013	0.0048	0.0093	0.0017	0.0046	0.0082
weight sum	12	10	10	8	12	8	10	11	14	13	16	12	13	12	10	12	11	13	9	12	11	12	12	12	11	11	11	11	11	10
precision	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Third_moment																														
mean	0.0015	0.0021	0.0097	0.0021	0.0064	0.0016	0.0041	0.0032	0.0071	0.0164	0.0024	0.0076	0.005	0.0086	0.0076	0.0077	0.0032	0.0021	0.0213	0.0062	0.0025	0.0102	0.0006	0.0059	0.0012	0.0035	0.0071	0.0017	0.0085	0.0119
std. dev.	0.0014	0.0009	0.0037	0.0012	0.0032	0.0008	0.0021	0.0012	0.0021	0.0077	0.0014	0.0023	0.0016	0.0034	0.0018	0.0037	0.0013	0.0011	0.0064	0.0048	0.0008	0.003	0.0004	0.0019	0.0005	0.0018	0.0022	0.0007	0.0014	0.0032
weight sum	12	10	10	8	12	8	10	11	14	13	16	12	13	12	10	12	11	13	9	12	11	12	12	12	11	11	11	11	11	10
precision	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Uniformity																														
mean	0.0001	0.0002	0.0002	0.0004	0.0003	0.0001	0.0001	0.0002	0.0005	0.0011	0.0001	0.0003	0.0005	0.0004	0.0006	0.0002	0.0001	0.0006	0.0008	0.0002	0.0003	0.0006	0	0.0009	0	0.0002	0.001	0.0001	0.001	0.0007
std. dev.	0.0001	0.0001	0.0001	0.0002	0.0001	0	0.0001	0.0001	0.0004	0.0007	0	0.0001	0.0004	0.0002	0.0003	0.0001	0	0.0005	0.0002	0.0001	0.0002	0.0003	0	0.0007	0	0.0001	0.0006	0	0.0004	0.0004
weight sum	12	10	10	8	12	8	10	11	14	13	16	12	13	12	10	12	11	13	9	12	11	12	12	12	11	11	11	11	11	10
precision	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Entropy																														
mean	0.5139	0.9348	0.9862	1.2478	1.2626	0.6877	1.0874	0.8883	1.276	2.0351	0.8081	1.5819	1.4771	1.5958	2.1061	0.8369	0.4527	0.9179	1.7784	0.9925	1.1109	1.74	0.2991	1.7286	0.3614	0.7529	1.5031	0.586	1.6893	1.6844
std. dev.	0.2461	0.2606	0.2888	0.3241	0.1549	0.2028	0.2408	0.1631	0.4155	0.3694	0.1004	0.353	0.4533	0.3303	0.4312	0.2014	0.1181	0.3673	0.2095	0.2271	0.2801	0.3911	0.0474	0.5733	0.0817	0.1945	0.494	0.1221	0.3896	0.3748
weight sum	12	10	10	8	12	8	10	11	14	13	16	12	13	12	10	12	11	13	9	12	11	12	12	12	11	11	11	11	11	10
precision	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076

2. Categorical Nursery Dataset

Naive Bayes Classifier

Attribute	Class not_recom (0.33)	recommend (0)	very_recom (0.03)	priority (0.33)	spec_prior (0.31)
parents					
usual	1441.0	3.0	197.0	1925.0	759.0
pretentious	1441.0	1.0	133.0	1485.0	1265.0
great_pret	1441.0	1.0	1.0	859.0	2023.0
[total]	4323.0	5.0	331.0	4269.0	4047.0
has_nurs					
proper	865.0	3.0	131.0	1345.0	253.0
less_proper	865.0	1.0	133.0	1345.0	253.0
improper	865.0	1.0	67.0	905.0	759.0
critical	865.0	1.0	1.0	465.0	1265.0
very_crit	865.0	1.0	1.0	211.0	1519.0
[total]	4325.0	7.0	333.0	4271.0	4049.0
form					
complete	1081.0	3.0	119.0	1153.0	889.0
completed	1081.0	1.0	101.0	1093.0	969.0
incomplete	1081.0	1.0	71.0	1039.0	1053.0
foster	1081.0	1.0	41.0	985.0	1137.0
[total]	4324.0	6.0	332.0	4270.0	4048.0
children					
1	1081.0	3.0	149.0	1207.0	805.0
2	1081.0	1.0	101.0	1093.0	969.0
3	1081.0	1.0	41.0	985.0	1137.0
more	1081.0	1.0	41.0	985.0	1137.0
[total]	4324.0	6.0	332.0	4270.0	4048.0
housing					
convenient	1441.0	3.0	209.0	1619.0	1053.0
less_conv	1441.0	1.0	101.0	1397.0	1385.0
critical	1441.0	1.0	21.0	1253.0	1609.0
[total]	4323.0	5.0	331.0	4269.0	4047.0
finance					
convenient	2161.0	3.0	219.0	2245.0	1857.0
inconv	2161.0	1.0	111.0	2023.0	2189.0
[total]	4322.0	4.0	330.0	4268.0	4046.0
social					
nonprob	1441.0	2.0	165.0	1516.0	1201.0
slightly_prob	1441.0	2.0	165.0	1516.0	1201.0
problematic	1441.0	1.0	1.0	1237.0	1645.0
[total]	4323.0	5.0	331.0	4269.0	4047.0
health					
recommended	1.0	3.0	329.0	2413.0	1579.0
priority	1.0	1.0	1.0	1855.0	2467.0
not_recom	4321.0	1.0	1.0	1.0	1.0
[total]	4323.0	5.0	331.0	4269.0	4047.0