Ionian University

Informatics Department

Decision Support Systems

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Index

1. Introduction

Here is my report where I study the occurrence of Hepatitis in a person, following a number of different attributes, using WEKA (Waikato Environment for Knowledge Analysis) software.

Hepatitis is an inflammation of the liver. The condition can be self-limiting or can progress to fibrosis (scarring), cirrhosis or liver cancer. Hepatitis viruses are the most common cause of hepatitis in the world but other infections, toxic substances (e.g. alcohol, certain drugs), and autoimmune diseases can also cause hepatitis. (1)

2. Decision Support Systems

A decision support system (DSS) is a computerized information system used to support decision-making in an organization or a business. A DSS lets users sift through and analyse massive amounts of data, and compile information that can be used to solve problems and make better decisions. Decision support systems allow for more informed decision-making, timely problem-solving, and improved efficiency for dealing with problems with rapidly changing variables. (2)

3. Weka

Weka is a collection of machine learning algorithms for data mining tasks. It contains tools for data preparation, classification, regression, clustering, association rules mining, and visualization. (3)

Using this software, I uploaded a dataset (4) containing 19 attributes (20 when including the class attribute) and 155 instances. After testing different algorithms, I concluded that the J48 tree algorithm was the one that allowed me to reach the greatest number of Correctly Classified Instances. Despite having 19 attributes available for the search, the J48 algorithm only used 8 of them to get its result: Age, Sex, tested_negativeR_BIG, tested_negativeR_FIRM, Spiders, Ascites, SGOT, and Albumin.

Figure 1.

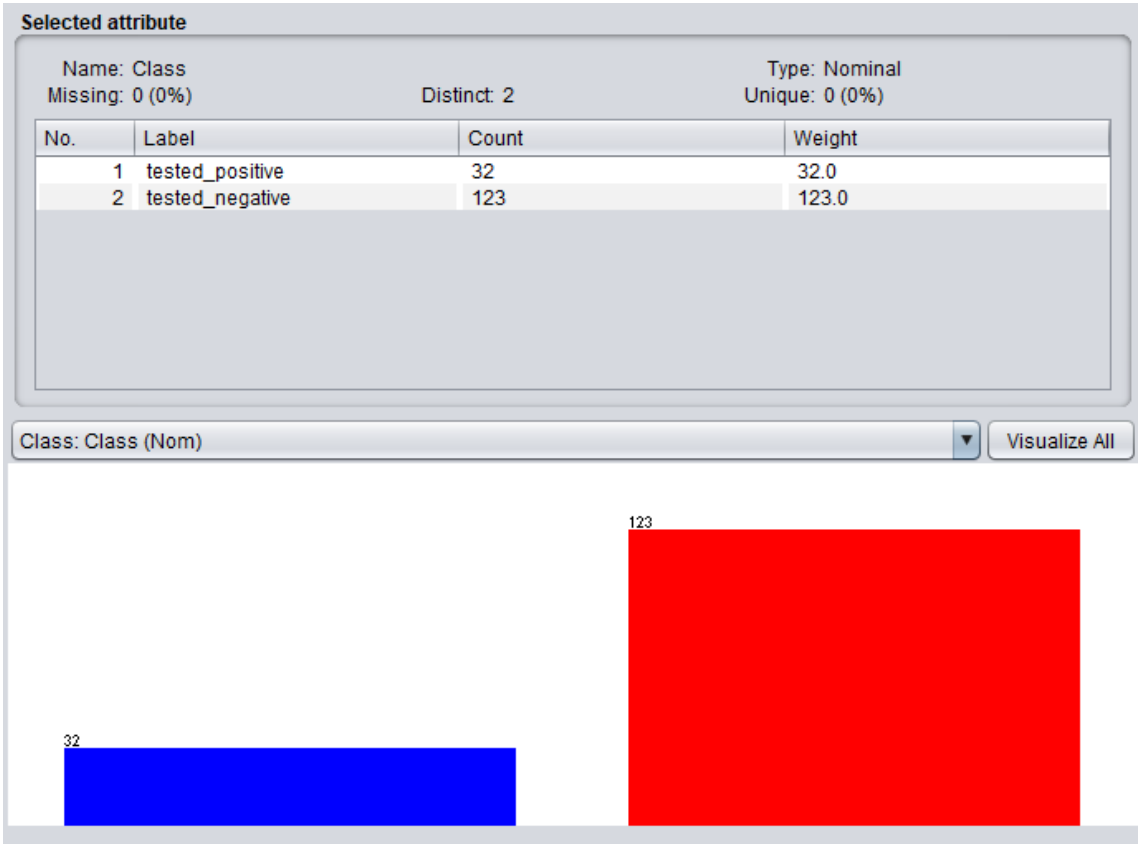
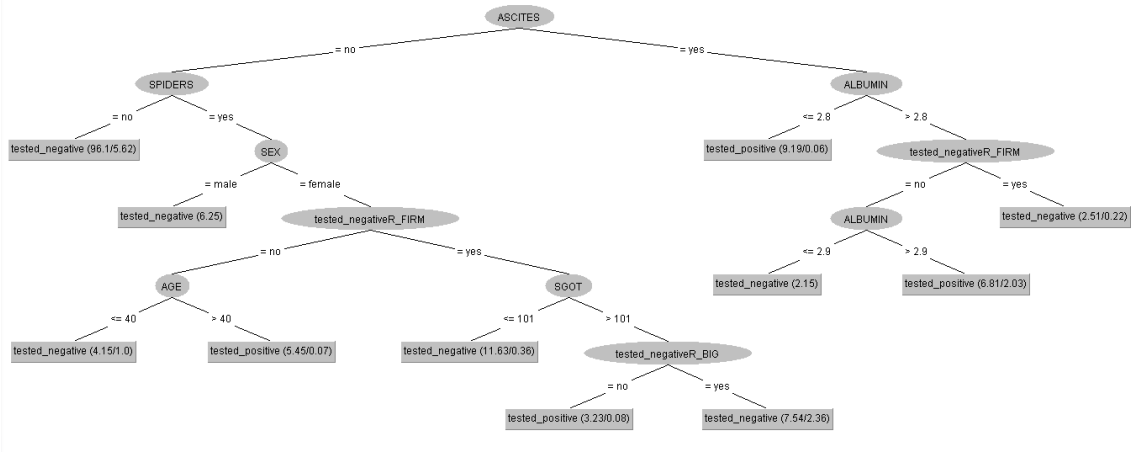


Figure 2.

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

Correctly Classified Instances         130               83.871  %
Incorrectly Classified Instances        25               16.129  %
Kappa statistic                          0.436
Mean absolute error                      0.2029
Root mean squared error                  0.363
Relative absolute error                 61.4384 %
Root relative squared error             89.6358 %
Total Number of Instances              155

=== Detailed Accuracy By Class ===

                 TP Rate  FP Rate  Precision  Recall   F-Measure  MCC      ROC Area  PRC Area  Class
                 0,438    0,057    0,667      0,438    0,528      0,450    0,708     0,585     tested_positive
                 0,943    0,563    0,866      0,943    0,903      0,450    0,708     0,856     tested_negative
Weighted Avg.    0,839    0,458    0,825      0,839    0,825      0,450    0,708     0,800

=== Confusion Matrix ===

   a   b   <-- classified as
  14  18 |   a = tested_positive
   7 116 |   b = tested_negative
```

Figure 3: Resulting tree.



4. Implementation

I developed a HTML Web Page that consists in a form that allows the user (Patient or Doctor) to input the data regarding the patient's information and its symptoms in order to identify the existence (or not) of Hepatitis.

Each get function receives a String value, according to the input, that will be used to calculate the result of the test.

Function list and possible values:

- getAge() – ("1-20", "21-40", "41-60", "61-80", "81-100")
- getSex() – ("male", "female")
- getBig() – ("no", "yes")
- getFirm() – ("no", "yes")
- getSpiders() – ("no", "yes")
- getAscites() – ("no", "yes")
- getSgot() – ("<= 101", "> 101")
- getAlbumin() – ("<= 2.8", "2.9", "> 2.9")
- display() – calculates the result according to the input given.

5. Final Result

Figure 4: The Web Page.

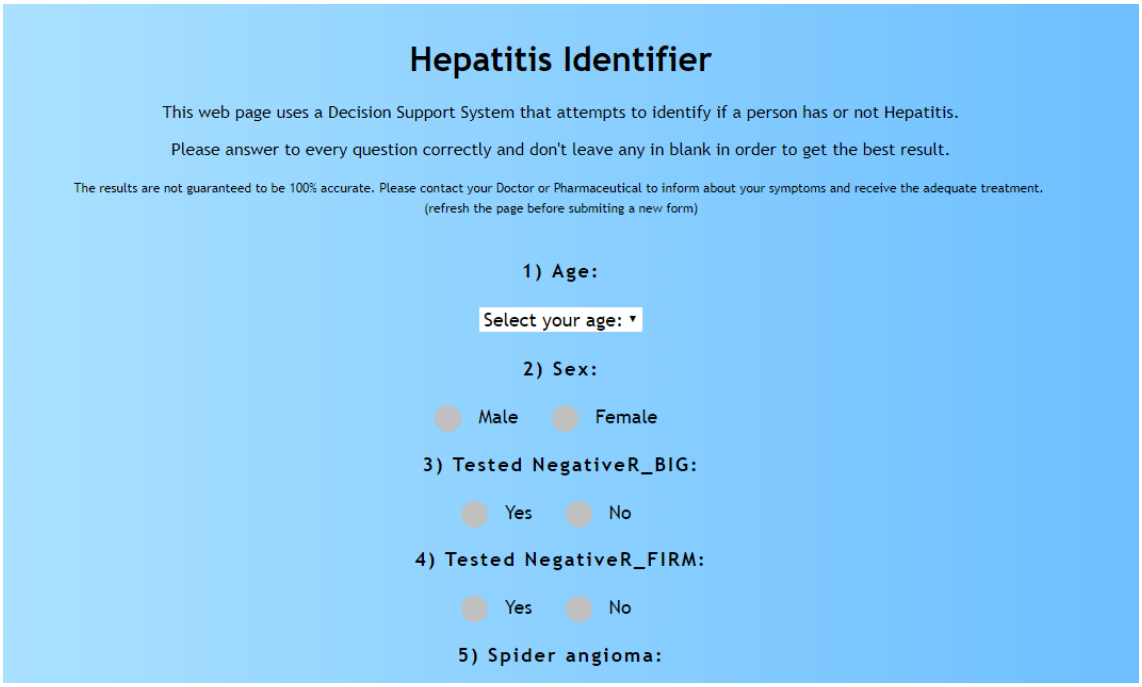
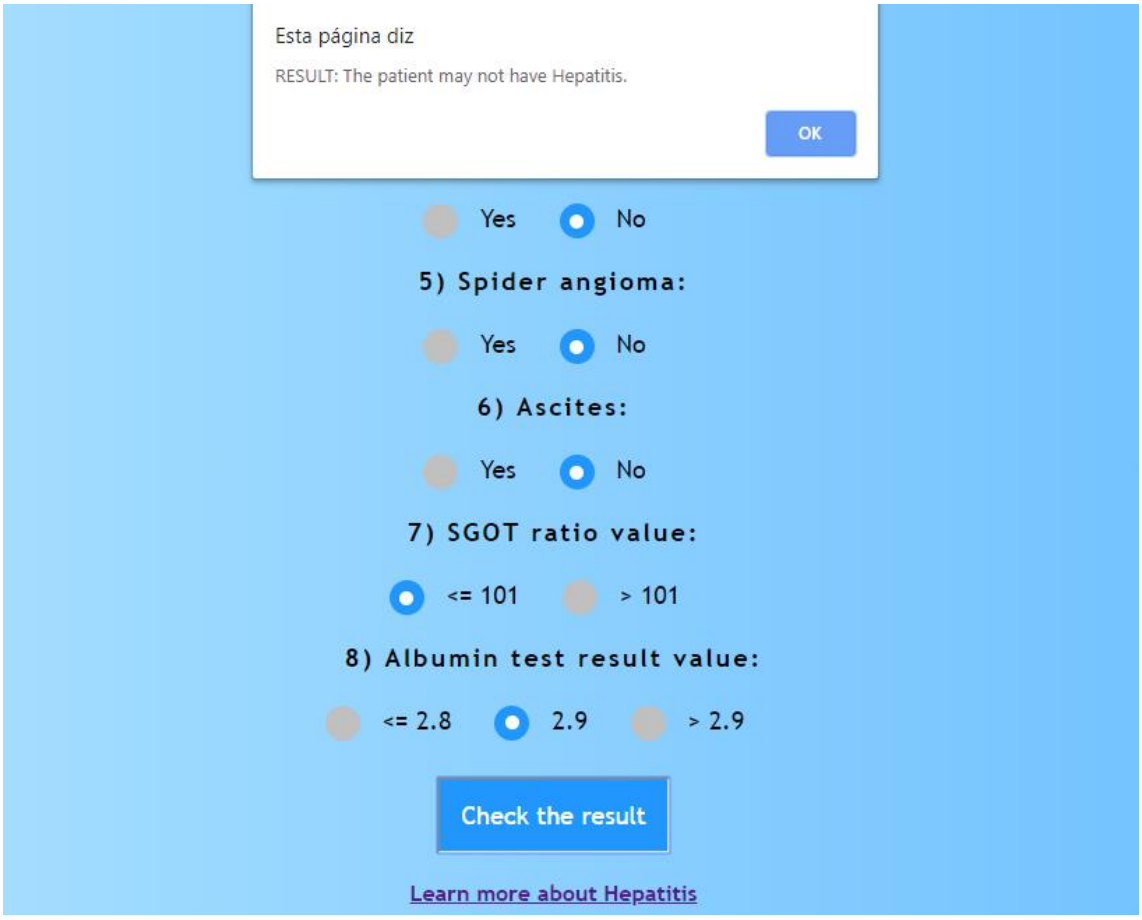


Figure 5: The Result.



6. Bibliography

(1) Information regarding Hepatitis:
"https://www.who.int/features/qa/76/en/"
(2) Information regarding DSS:
"https://www.investopedia.com/terms/d/decision-support-system.asp"
(3) Information regarding WEKA:
"https://www.cs.waikato.ac.nz/ml/weka/"
(4) The dataset:
"https://github.com/renatopp/arff-datasets/blob/master/classification/hepatitis.arff"
(5) My git-hub repository:
"https://github.com/Sdacm/DSS"
(6) The code:
"https://github.com/Sdacm/DSS/blob/master/DSS-Hepatitis.html"