

## ID3 Implementation

### Introduction

The following text shows the result of applying the knowledge about the ID3 algorithm about decision trees.

### What is ID3?

ID3 is an algorithm that chooses the best node (attribute) to expand next based on the value of its entropy. Depending on which node gives the most information as possible from the tree is the one to be expanded

- Explain the advantages and disadvantages of writing a program on your own vs using a pre-created suite such as WEKA.

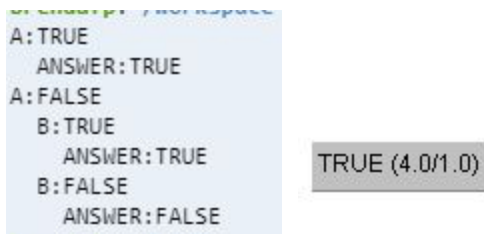
Creating a program on our own can help us to improve our understanding of the ID3 algorithm and our programming skills, also it can help us to see some improvements that can be done to our implementation in order to make it more efficiently. The WEKA tool can be of great help if we don't know how to start modeling our tree.

- Explain what criteria you followed to choose the datasets for your tree and the WEKA tests.

In our program each node corresponds to an attribute and each branch to the possible value of the attribute and we split the data taking into account the information gain of the features, the best feature to choose is the one that have more information gain. We use the entropy concept to measure the information gain of each node.

Weka calculates the value of the information gain by a candidate rule(or branch of the tree) and then it calculates the overall improvement that a branch provides.

- Include the graphics of the trees or part of the trees you generated in WEKA and your own program. Are they different, and if so, why?



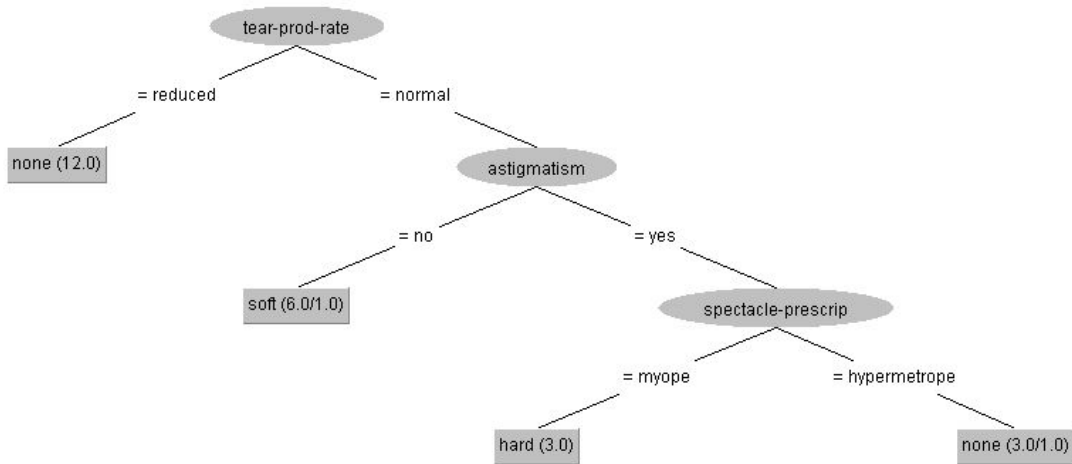
```
A: TRUE  
  ANSWER: TRUE  
A: FALSE  
  B: TRUE  
    ANSWER: TRUE  
  B: FALSE  
    ANSWER: FALSE
```

TRUE (4.0/1.0)

```

tear-prod-rate:reduced
  ANSWER:none
tear-prod-rate:normal
  astigmatism:no
    age:young
      ANSWER:soft
    age:pre-presbyopic
      ANSWER:soft
    age:presbyopic
      spectacle-prescrip:myope
        ANSWER:none
      spectacle-prescrip:hypermetrope
        ANSWER:soft
  astigmatism:yes
    spectacle-prescrip:myope
      ANSWER:hard
    spectacle-prescrip:hypermetrope
      age:young
        ANSWER:hard
      age:pre-presbyopic
        ANSWER:none
      age:presbyopic
        ANSWER:none

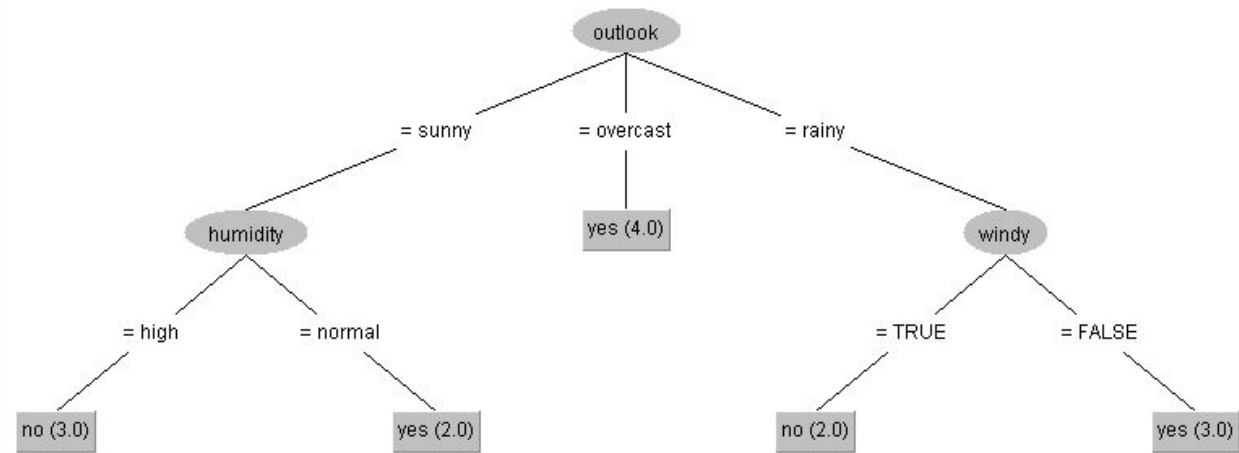
```



```

outlook:sunny
  humidity:high
    ANSWER:no
  humidity:normal
    ANSWER:yes
outlook:overcast
  ANSWER:yes
outlook:rainy
  windy:TRUE
    ANSWER:no
  windy:FALSE
    ANSWER:yes

```



WEKA tool defines the probability of error on each attribute, by going deeper the error between the previous node and the next has to be minimized in order to keep expanding the nodes, this is the classification that follows J48 or C45. the difference with our algorithm is that it will calculate the information gain of the best attribute to be expanded giving more information to the user. J48 will make a simpler version of the tree making the error between nodes less.

- Based in what you have learned so far where would you use decision trees?

Decision trees are great when you have some classified data and you want to predict whether something is going to happen or not.

Mostly for medical diagnostics of different diseases, also making some kind of prediction to give a treatment to the patient

Another one could be on a music store, giving the kind of bands and musical genres you like it will give you some recommendations to buy.

## References:

Vizcaino P. (2008) APLICACIÓN DE TÉCNICAS DE INDUCCIÓN DE ÁRBOLES DE DECISIÓN A PROBLEMAS DE CLASIFICACIÓN MEDIANTE EL USO DE WEKA (WAIKATO ENVIRONMENT FOR KNOWLEDGE ANALYSIS). Retrieved from [http://www.konradlorenz.edu.co/images/stories/suma\\_digital\\_sistemas/2009\\_01/final\\_paula\\_andrea.pdf](http://www.konradlorenz.edu.co/images/stories/suma_digital_sistemas/2009_01/final_paula_andrea.pdf)