

Assignment-1 Part-2(Report)

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The implemented ID3 algorithm does binary classification of the data provided to it and predicts the output label of the target class in order to predict which class a given instance belongs to and thus calculating the accuracy with which it predicted the class

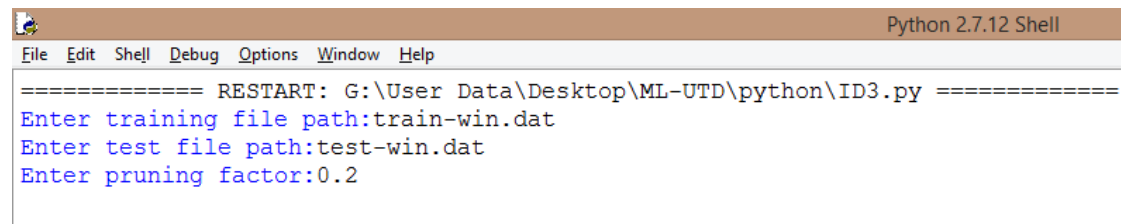
By implementing the ID3 algorithm we learnt the supervised machine learning method of **classification** and thus got clarity on how we train the machine with respect to the task (in this case classification given to it) and see the improved performance it gives by getting trained on more data.

We also learnt how to do level order traversal to find the next splitting attribute and how a same attribute cannot be repeated along the path

Thus, we got an exposure to how a machine learning algorithm works in practical.

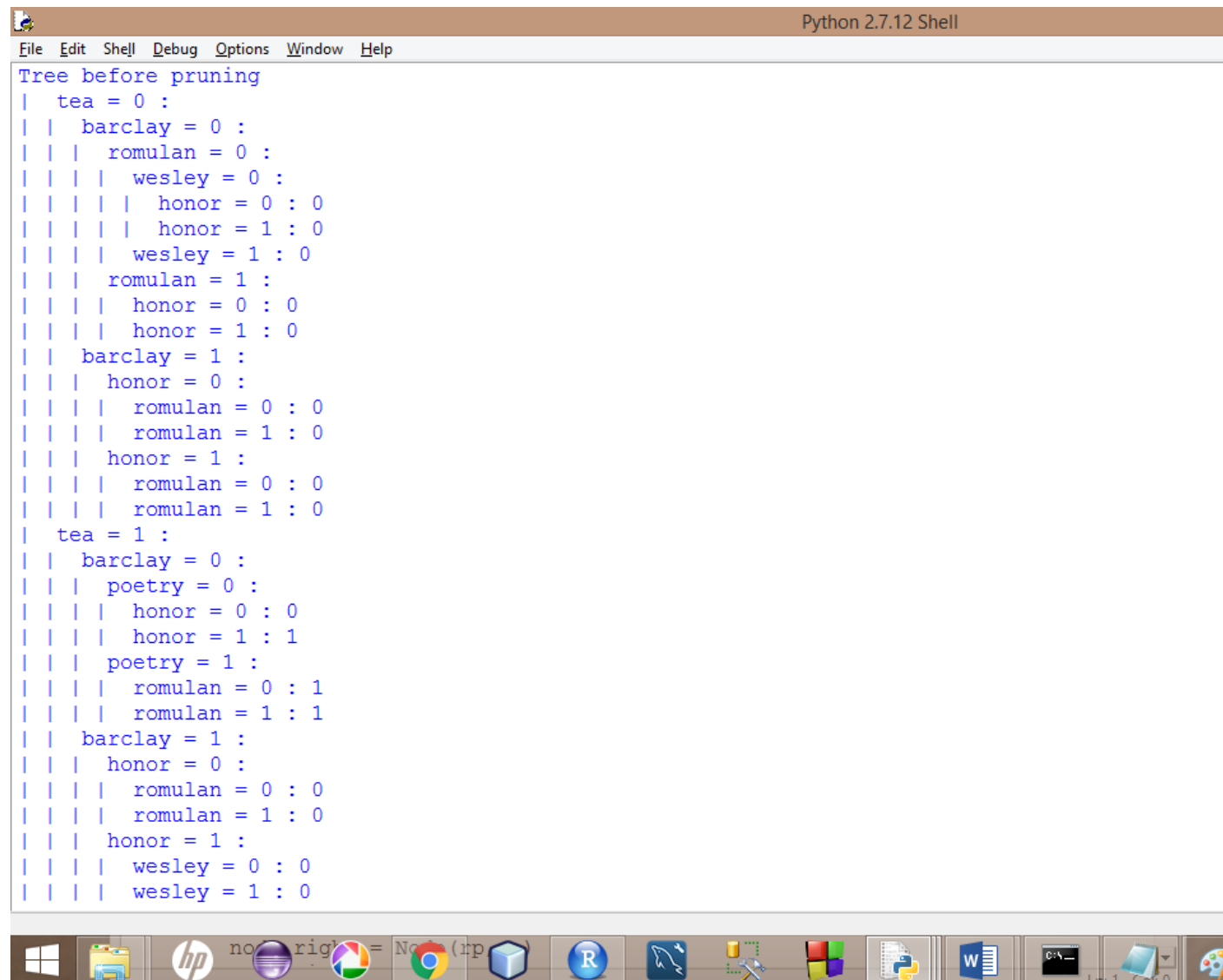
Screenshots:

Taking inputs from the user



```
Python 2.7.12 Shell
File Edit Shell Debug Options Window Help
===== RESTART: G:\User Data\Desktop\ML-UTD\python\ID3.py =====
Enter training file path:train-win.dat
Enter test file path:test-win.dat
Enter pruning factor:0.2
```

Printing the decision tree



The screenshot shows a Python 2.7.12 Shell window with a menu bar (File, Edit, Shell, Debug, Options, Window, Help) and a toolbar. The main text area displays a decision tree structure for a classification task. The tree is rooted at 'tea = 0' and branches based on 'barclay', 'romulan', 'wesley', and 'honor' attributes. The bottom of the window shows a Windows taskbar with various application icons.

```
Tree before pruning
| tea = 0 :
| | barclay = 0 :
| | | romulan = 0 :
| | | | wesley = 0 :
| | | | | honor = 0 : 0
| | | | | honor = 1 : 0
| | | | wesley = 1 : 0
| | | romulan = 1 :
| | | | honor = 0 : 0
| | | | honor = 1 : 0
| | | barclay = 1 :
| | | | honor = 0 :
| | | | romulan = 0 : 0
| | | | romulan = 1 : 0
| | | | honor = 1 :
| | | | romulan = 0 : 0
| | | | romulan = 1 : 0
| | tea = 1 :
| | | barclay = 0 :
| | | | poetry = 0 :
| | | | | honor = 0 : 0
| | | | | honor = 1 : 1
| | | | poetry = 1 :
| | | | | romulan = 0 : 1
| | | | | romulan = 1 : 1
| | | barclay = 1 :
| | | | honor = 0 :
| | | | romulan = 0 : 0
| | | | romulan = 1 : 0
| | | | honor = 1 :
| | | | | wesley = 0 : 0
| | | | | wesley = 1 : 0
```

Pre-pruned accuracy

Pre-Pruned Accuracy

```
-----
('Number of training instances = ', 800)
('Number of training attributes(including label) = ', 7)
('Total number of nodes in the tree = ', 33)
('Number of leaf nodes in the tree = ', 22)
('Accuracy of the model on the training dataset = ', 81.25)

('Number of testing instances = ', 203)
('Number of testing attributes = ', 6)
('Accuracy of the model on the testing dataset = ', 76.84729064039408)
```

Pruned Tree

```
Python 2.7.12 Shell
File Edit Shell Debug Options Window Help

Tree after pruning
| tea = 0 :
| | barclay = 0 :
| | | romulan = 0 :
| | | | wesley = 0 :
| | | | | honor = 0 : 0
| | | | | honor = 1 : 0
| | | | | wesley = 1 : 0
| | | | romulan = 1 :
| | | | | honor = 0 : 0
| | | | | honor = 1 : 0
| | | barclay = 1 :
| | | | honor = 0 :
| | | | | romulan = 0 : 0
| | | | | romulan = 1 : 0
| | | | | honor = 1 :
| | | | | | romulan = 0 : 0
| | | | | | romulan = 1 : 0
| | tea = 1 :
| | | barclay = 0 :
| | | | poetry = 0 : 1
| | | | poetry = 1 : 1
| | | barclay = 1 :
| | | | honor = 0 : 0
| | | | honor = 1 : 0

Ln: 175 Col: 4
```

Post pruned accuracy

```
Post-Pruned Accuracy
-----
('Number of training instances = ', 800)
('Number of training attributes(including label) = ', 7)
('Total number of nodes in the tree = ', 33)
('Number of leaf nodes in the tree = ', 22)
('Accuracy of the model on the training dataset = ', 77.125)

('Number of testing instances = ', 203)
('Number of testing attributes = ', 6)
('Accuracy of the model on the testing dataset = ', 72.9064039408867)
>>>

Ln: 175 Col: 4
```