Cairo University
Faculty of Computers and Artificial Intelligence

Machine Learning

Assignment 2

Team Members

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Decision Tree:

1. **b) Report of the sizes and accuracies of 25% ratio on five random different splits**.

```
The experiment for 5 times at ratio: 0.25
1 -> Tree Size: 7  With Accuracy: 98.25072886297376
2 -> Tree Size: 6  With Accuracy: 97.8620019436346
3 -> Tree Size: 6  With Accuracy: 97.27891156462584
4 -> Tree Size: 5  With Accuracy: 96.7930029154519
5 -> Tree Size: 6  With Accuracy: 96.01554907677357
```

2. **d) Five different ratios and their sizes and accuracies**

=> statistics at ratio 30%

```
The experiment for 5 times at ratio: 0.3
1 -> Tree Size: 7  With Accuracy: 97.60416666666667
2 -> Tree Size: 8  With Accuracy: 97.5
3 -> Tree Size: 6  With Accuracy: 97.8125
4 -> Tree Size: 7  With Accuracy: 96.97916666666667
5 -> Tree Size: 6  With Accuracy: 96.14583333333333
Min Accuracy:  96.14583333333333
Max Accuracy:  97.8125
Mean Accuracy:  97.20833333333334
Min Tree size:  6
Max Tree size:  8
Mean Tree size:  6.8
```

=> statistics at ratio 40%

```
The experiment for 5 times at ratio: 0.4
1 -> Tree Size: 7  With Accuracy: 98.17739975698665
2 -> Tree Size: 7  With Accuracy: 98.78493317132441
3 -> Tree Size: 7  With Accuracy: 98.42041312272175
4 -> Tree Size: 7  With Accuracy: 97.93438639125152
5 -> Tree Size: 6  With Accuracy: 98.5419198055893
Min Accuracy:  97.93438639125152
Max Accuracy:  98.78493317132441
Mean Accuracy:  98.37181044957472
Min Tree size:  6
Max Tree size:  7
Mean Tree size:  6.8
```

=> statistics at ratio 50%

```
The experiment for 5 times at ratio: 0.5
1 -> Tree Size: 5  With Accuracy: 97.95918367346938
2 -> Tree Size: 7  With Accuracy: 98.54227405247813
3 -> Tree Size: 8  With Accuracy: 97.95918367346938
4 -> Tree Size: 6  With Accuracy: 99.27113702623906
5 -> Tree Size: 6  With Accuracy: 98.83381924198251
Min Accuracy:  97.95918367346938
Max Accuracy:  99.27113702623906
Mean Accuracy:  98.51311953352769
Min Tree size:  5
Max Tree size:  8
Mean Tree size:  6.4
```

=> statistics at ratio 60%

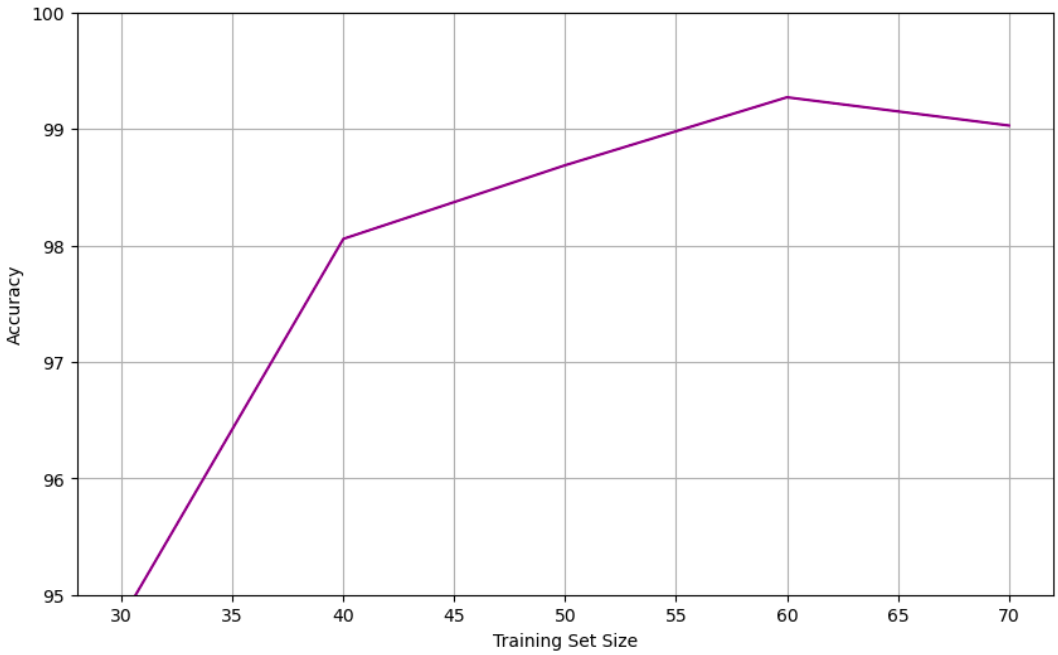
```
The experiment for 5 times at ratio: 0.6
1 -> Tree Size: 7  With Accuracy: 97.99635701275045
2 -> Tree Size: 6  With Accuracy: 97.632058287796
3 -> Tree Size: 6  With Accuracy: 98.1785063752277
4 -> Tree Size: 7  With Accuracy: 98.36065573770492
5 -> Tree Size: 7  With Accuracy: 98.90710382513662
Min Accuracy:  97.632058287796
Max Accuracy:  98.90710382513662
Mean Accuracy:  98.21493624772314
Min Tree size:  6
Max Tree size:  7
Mean Tree size:  6.6
```

=> statistics at ratio 70%

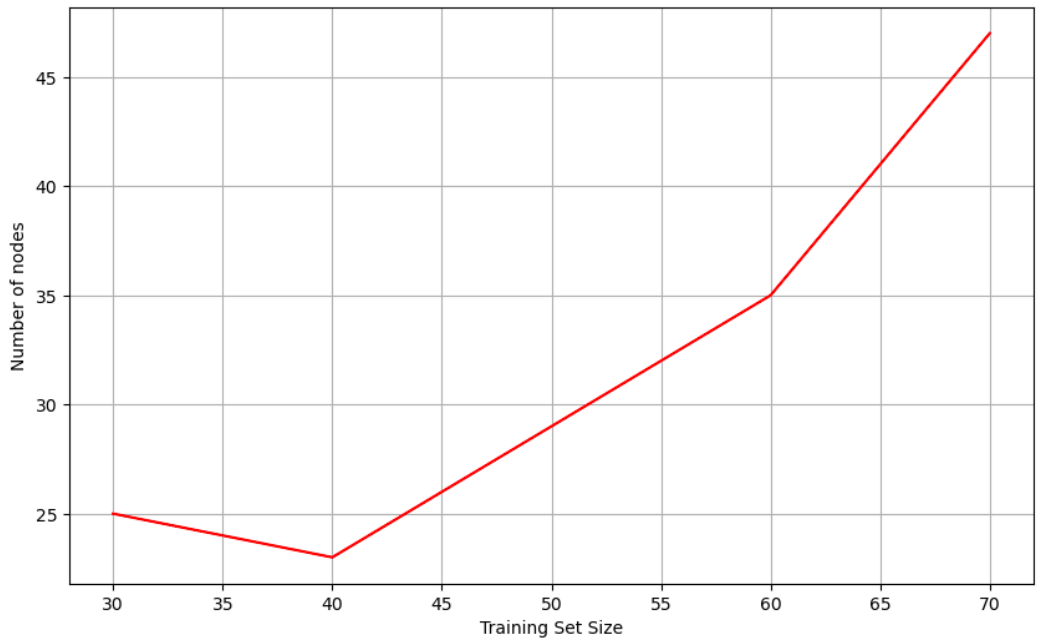
```
The experiment for 5 times at ratio: 0.7
1 -> Tree Size: 7  With Accuracy: 98.54368932038835
2 -> Tree Size: 7  With Accuracy: 99.27184466019418
3 -> Tree Size: 6  With Accuracy: 99.27184466019418
4 -> Tree Size: 7  With Accuracy: 99.51456310679612
5 -> Tree Size: 6  With Accuracy: 99.02912621359224
Min Accuracy:  98.54368932038835
Max Accuracy:  99.51456310679612
Mean Accuracy:  99.12621359223301
Min Tree size:  6
Max Tree size:  7
Mean Tree size:  6.6
```

Plotting:

```
Out[23]: (95.0, 100.0)
```




```
Out[24]: Text(0, 0.5, 'Number of nodes')
```



KNN:

Experiment with different values of k=1,2,3....9

```
k value :  1
Number of correctly classified instances:  412 total number of instances  412
Accuracy :  100.0


k value :  2
Number of correctly classified instances:  412 total number of instances  412
Accuracy :  100.0


k value :  3
Number of correctly classified instances:  412 total number of instances  412
Accuracy :  100.0


k value :  4
Number of correctly classified instances:  412 total number of instances  412
Accuracy :  100.0


k value :  5
Number of correctly classified instances:  412 total number of instances  412
Accuracy :  100.0


k value :  6
Number of correctly classified instances:  412 total number of instances  412
Accuracy :  100.0


k value :  7
Number of correctly classified instances:  412 total number of instances  412
Accuracy :  100.0


k value :  8
Number of correctly classified instances:  412 total number of instances  412
Accuracy :  100.0


k value :  9
Number of correctly classified instances:  412 total number of instances  412
Accuracy :  100.0
```

Trying different values of K

```
k value :  50
Number of correctly classified instances:  408 total number of instances  412
Accuracy :  99.02912621359224


k value :  90
Number of correctly classified instances:  402 total number of instances  412
Accuracy :  97.57281553398059


k value :  140
Number of correctly classified instances:  401 total number of instances  412
Accuracy :  97.33009708737865


k value :  180
Number of correctly classified instances:  404 total number of instances  412
Accuracy :  98.05825242718447
```