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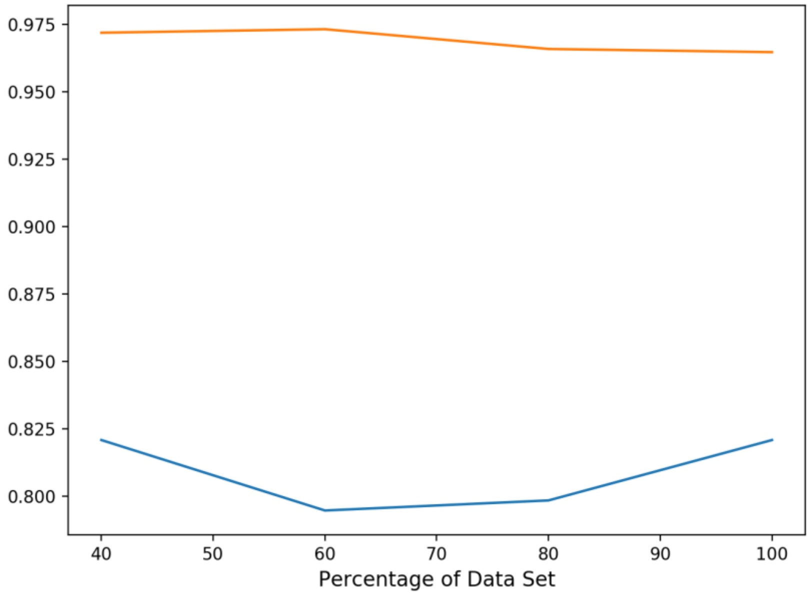
Late Day Used: 1

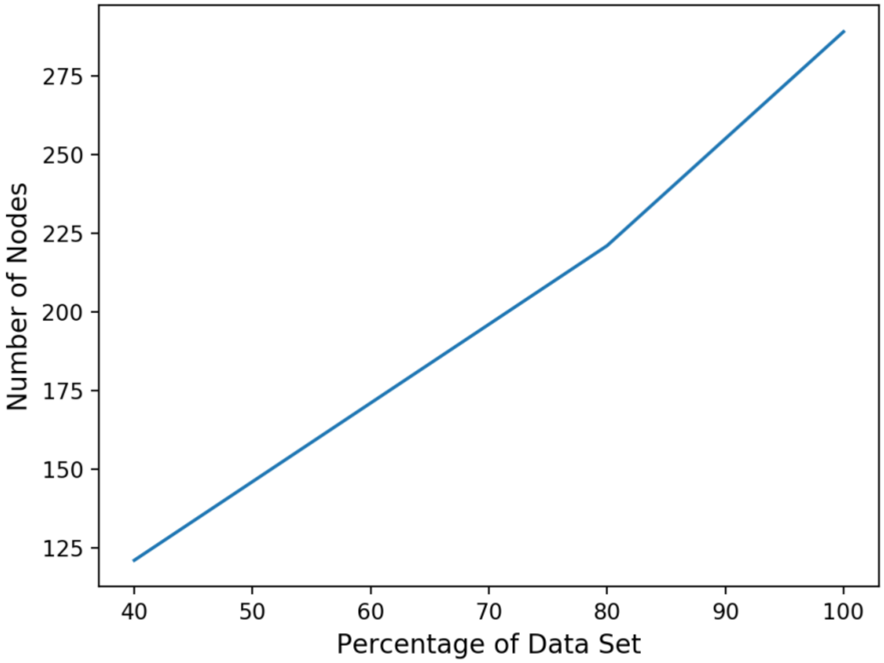
I collaborated with Oscar Dillman and Ishan Kaul. I affirm that I wrote the solutions in my own words and that I understand the solutions I am submitting.

1. Vanilla

Training Set Percentage	Training Set Accuracy	Test Set Accuracy	Number of Nodes
40	97.2	82.1	121
60	97.3	79.5	171
80	96.6	79.9	221
100	96.5	82.1	289

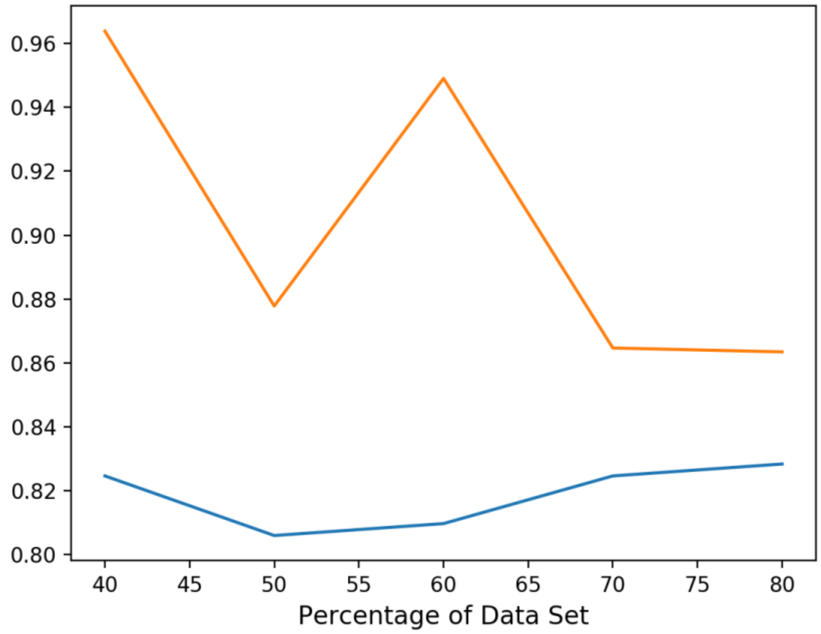


Training Accuracy is the orange line and the Test Accuracy is the blue line

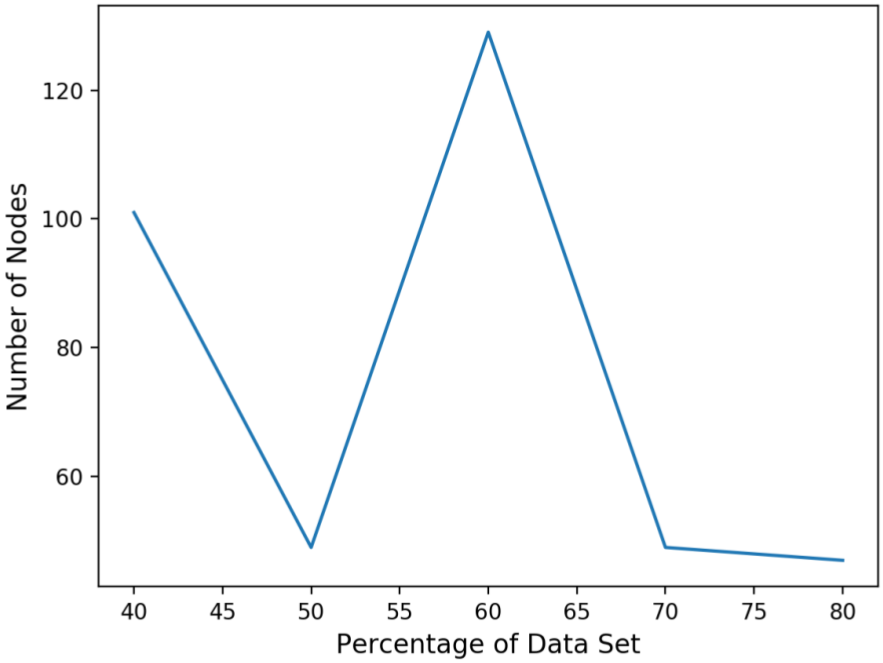


2. Max Depth

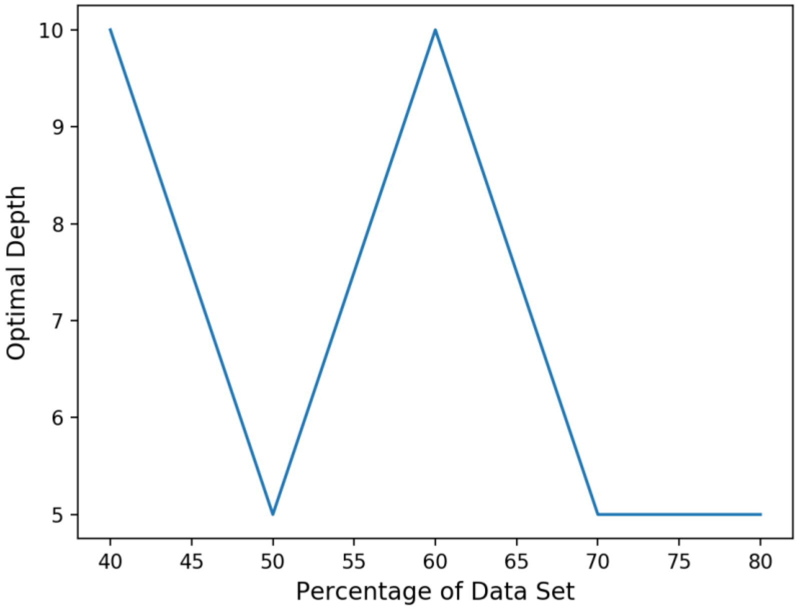
Training Set Percentage	Best Depth Value	Training Set Accuracy	Test Set Accuracy	Number of Nodes
40	10	96.4	82.5	101
50	5	87.8	81.0	49
60	10	94.9	80.6	129
70	5	86.5	82.5	49
80	5	86.3	82.8	47



Training Accuracy is the orange line and the Test Accuracy is the blue line



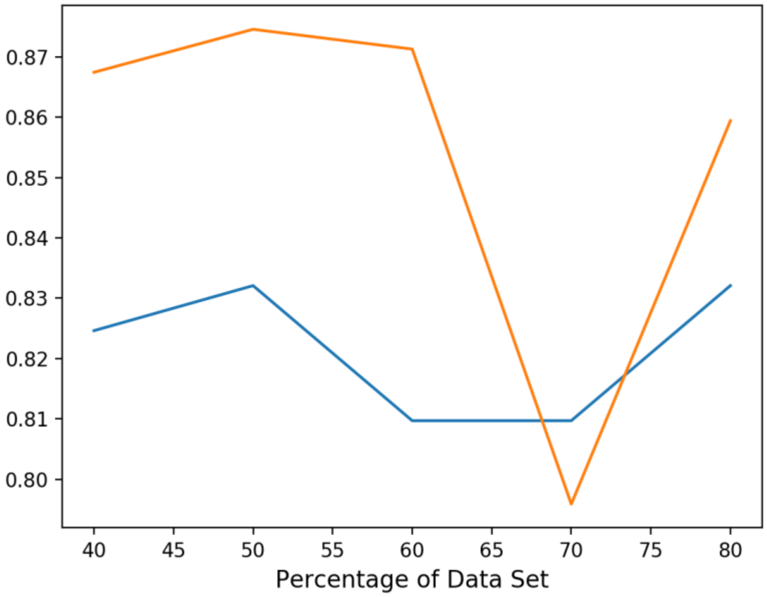
Number of Nodes
120
100
80
60
40
45
50
55
60
65
70
75
80
Percentage of Data Set



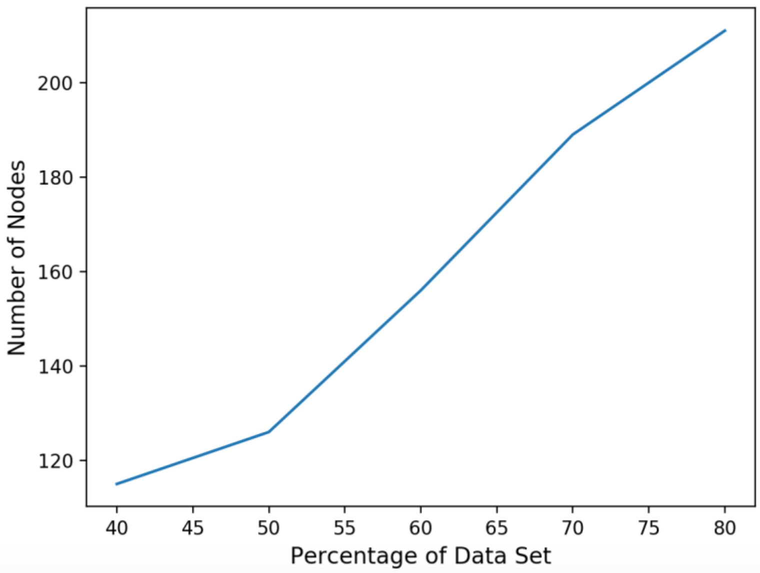
Optimal Depth
10
9
8
7
6
5
40
45
50
55
60
65
70
75
80
Percentage of Data Set

3.Prune

Training Set Percentage	Training Set Accuracy	Test Set Accuracy	Number of nodes
40	86.8	82.5	115
50	87.5	83.2	126
60	87.1	81.0	156
70	79.6	81.0	189
80	85.9	83.2	211



Training Accuracy is the orange line and the Test Accuracy is the blue line



4.

The tree is pruned on a validation set instead of directly on the test set because that would essentially be training and adjusting the tree on the test data. Our goal is to see how well we can train the data to predict the test data correctly, and pruning using the test data would be the opposite of this. Also, the validation set is most likely going to be smaller than the test data, so it will adjust the tree quicker.

5.

In order to convert the decision tree from a classification to a ranking model in the depth and prune cases, I would focus on the leaves that aren't all one values of labels. In these cases, to make a classification model as of now, I list the majority value as the predicted label. To make a ranking model, I would get the frequency of both values in label and then display the predicted label as the percent of that leaf being one value vs the other.