NTNU – Trondheim
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TDT4171 Artificial Intelligence Methods

Assignment 4
Decision Learning Tree

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Tree

After implementing both *IMPORTANCE RANDOM* and *IMPORTANCE ENTROPY* it is possible to see differences in the tree structures. While the *Random* function creates a tree of different depth/size each time, the *entropy* function creates the same tree each time. The tree created with the *Entropy* function can be seen in Figure 1.

The *Entropy* tree have a max depth of five. And the *Random* tree have almost all of the time a depth of seven. In the majority of runs the *Random* function returns a tree of more than twice the size of *Entropy* function tree.

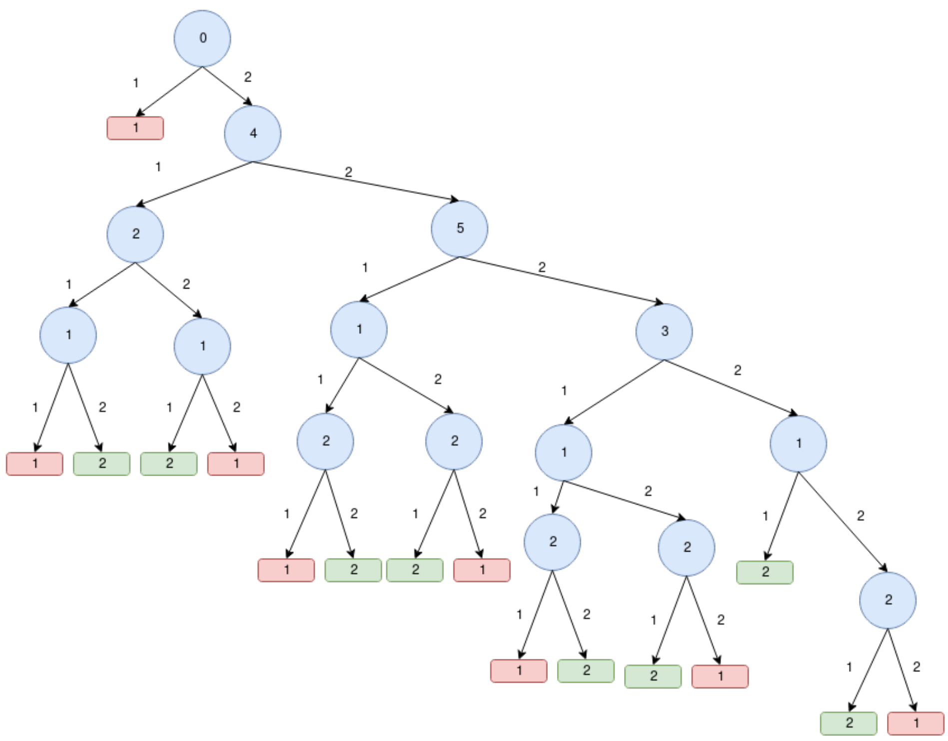

Figure 1: Tree representation from Decision Learning Tree with Entropy Importance

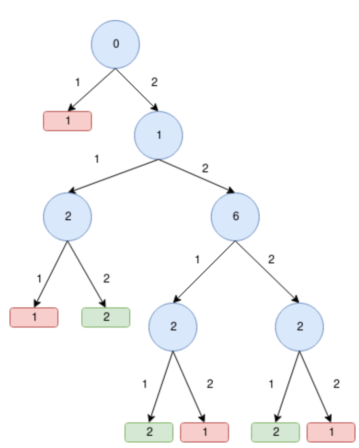

Figure 2: Tree representation from Decision Learning Tree with Random Importance with unusually small tree result

The tree generated by the random function is most of the time too large to practically be displayed graphically. However, sometimes it returns a very small tree such as displayed in Figure 2. However, a smaller tree does not necessarily mean better results.

Measurement

By following the book's way of measuring the training, by creating a tree based on each iterative input of the training set, and then testing the tree against the test set, it was possible to measure the progress of the algorithm.

To my surprise the tree did for a long period achieve 100%, but later changed when the training set size was greater than 92 which can be seen in Figure 3

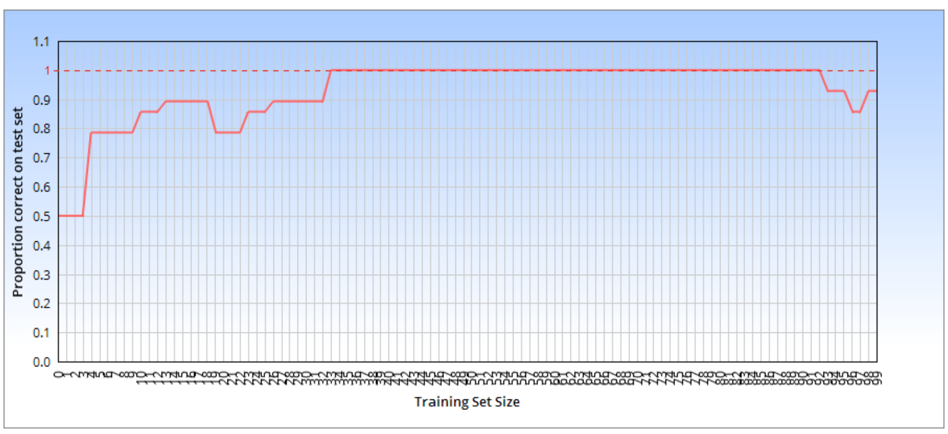

Figure 3: Measurement of tree with entropy importance, increasing the training set iteratively.

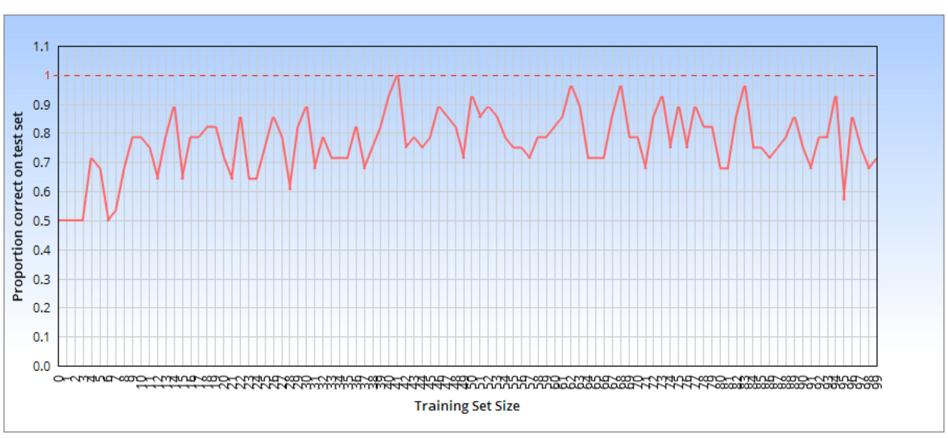

Figure 4: Measurement of tree with random importance, increasing the training set iteratively.

The Figure 4 is the measurement graph when using the random importance function. When overlapping the two graphs from *entropy* and *random* importance function it can be seen that it is possible for the Random function to beat out the entropy around $3 - 5\%$ of the times with some luck.

I see no reason as to why this data set and model should use *random* over *entropy* importance function.