

Algorithms Assignment 4: Graphs and Trees

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1 Breadth First Graph Traversal

Breadth first graph traversal has an asymptotic run time of $O(n)$. In this case, $n = E + V$, where E = the edges in the graph and V = the vertices in the graph. This is because each vertex is only enqueued and visited once, but the neighbors of that vertex are checked even if they have already been processed.

2 Depth First Graph Traversal

Depth first graph traversal has an asymptotic run time of $O(n)$, where $n = V + E$, or n is equal to the number of vertices of the graph. This is because each vertex is only visited once but its neighbors are checked each time.

3 Binary Search Trees

Searching for an element in a binary search tree has an asymptotic run time of $O(n)$, where n is the height of the BST. This is because no matter where an element is in the BST, it cannot be further than the height of the tree and thus it will not take more time to find it than the height of the tree. The speed of searching through a BST is dependent on the height of the tree and, because of the nature of a BST, the organization of a tree. For example, if an element that is at the start or end of all the elements in the BST is the root of the BST, the tree will be skewed to one side and it would take longer to find an element. The shortest organization of a BST would be if the middle element was the root and so on with each sub-tree.