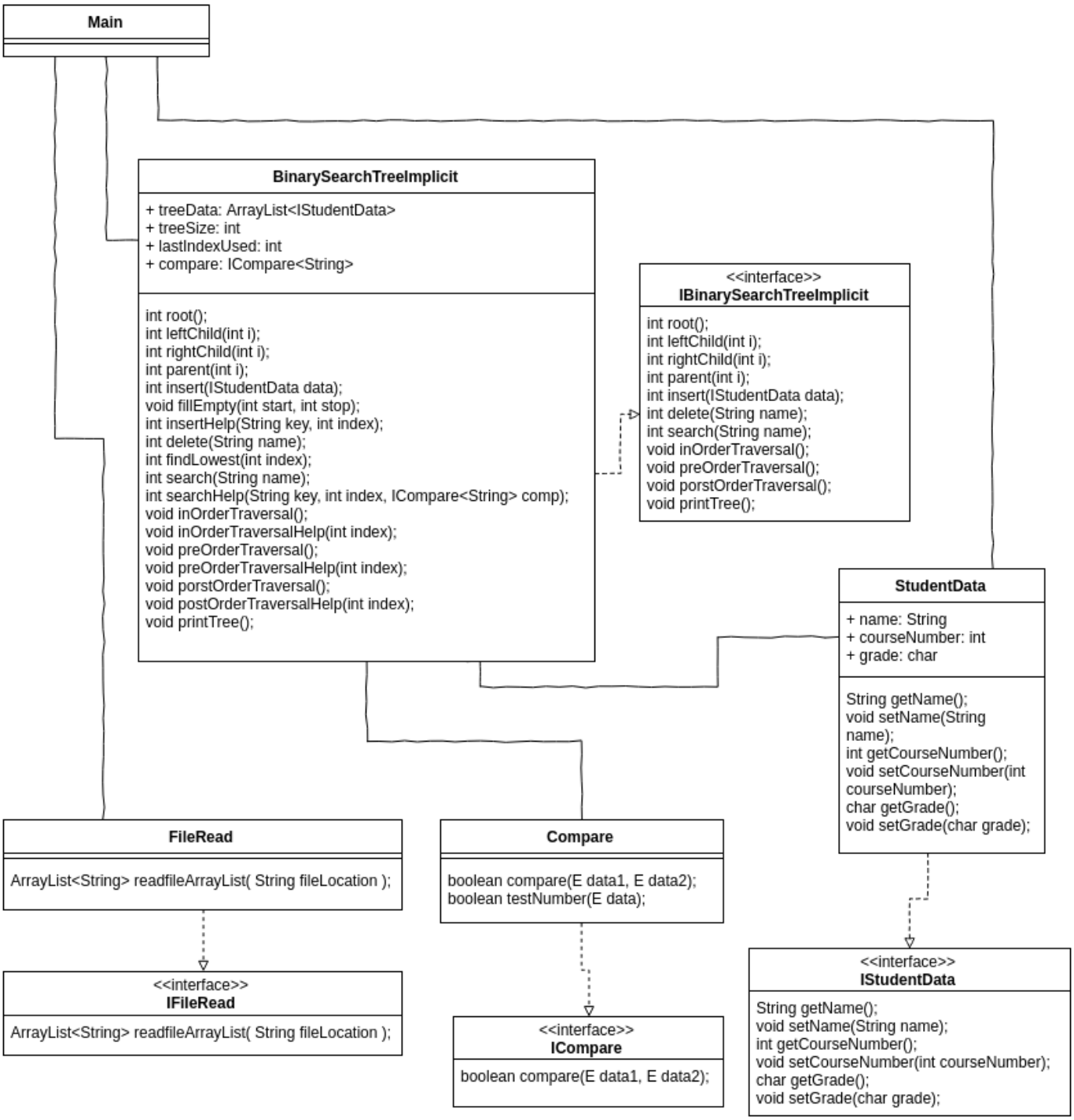
CS 3310 - Data and File Structures
Instructor: Ajay Gupta, Western Michigan University
Lab TA: Yu Guo

Tyler Thompson

# Homework Assignment 5 Part 2 Due: December 1st, 2016

"I do NOT give permission to the instructor to share my solution(s) with the class."



## DESIGN JUSTIFICATION

The design of my program is laid out in the UML diagram above. The main method does not show an methods because those methods are irrelevant to understanding the structure of the program. In reality the main method runs various tests through the different sorting algorithms.

## THEORETICAL COMPLEXITY ANALYSIS

- **Insert**
  The runtime of the insert function runs in O(x), where x is how many empty nodes the function has to create to insert the new node. This value will be different depending on the data being inserted and the data already in the tree.
- **Delete**
  The runtime of the delete function is O(h), where h is the height of the tree. The function has to search for the value to delete, which is O(h), and then finds the value to replace it with, which in the worse case is O(h -1). Finally the function deletes the value and replaces it with the minimum value of the right subtree, which runs in O(1).
- **Search**
  The runtime of the search function in the worst case is O(h), where h is the height of the tree. The function recursively follows the path from the root node to the search node.
- **Inorder / Preorder / Postorder Traversal**
  The runtime of all the traversal functions is O(n), where n is the number of nonempty nodes in the tree. The functions recursively “jump” from one node to the next until all the noded have been “touched”.