ENSF 594 – Principles of Software Development II
Summer 2022

Project outline

The objectives of this module:

- Create a library for common data structures
1. linear data structures
    a. Linked Lists with variations
    b. Stack
    c. Queue
2. Tree structures
    a. Binary search Trees
    b. AVL Trees
3. Vector based Heaps
4. Graph algorithms

Project outline

In this project, you will develop your own library of data structures with their associated algorithms

There library has multilevel structure to separate each group of data structures into groups based on their class.

The library will be created with a package name "myLib" and will have the following underlying structure
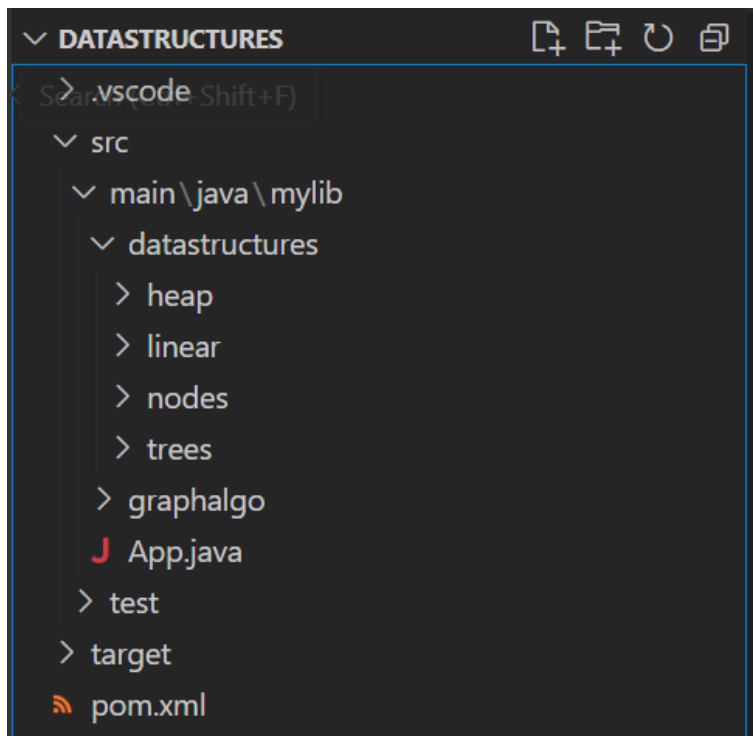
As shown in the figure above, your library will split into 2 main subfolders
- *Datastructures*

Will contain subfolders for each class of data structures we are implementing
- **Linear**
  Has the class implementations of all the linear data structures stated below (you can use the short Acronyms)
  - SinglyLinkedList (SLL)
  - DoublyLinkedList (DLL)
  - CircularLinkedList (CSLL)
  - CircularDoublyLinkedList (CDLL)
  - Stack
  - Queue
- **Trees**
  Has the implementations of the following tree structures
  - BinarySearchTrees (BST)
  - AVL

- o **Heaps**
  Has the implementation of the vector-based heap class (VBH)
  - ▪ The class has heapsort static function
    Receives an array, creates a heap structure, and sorts it, then returns it
- o **Nodes**
  Has the implementation of all the different node classes needed for the data structures mentioned above

- *Graphalgo*

This folder will have a static class with static methods that apply the different graph algorithms mentioned below
- o Graphalgo
  - ▪ BFS
  - ▪ DFS
  - ▪ Dijkstra

NOTE: all data structures will be implemented for integer data types as the data member. You extend on your work by making the structures work with generic data types for a Bonus as will be shown in the final project rubric evaluation

You will need to test all functionalities of the data structure by either:
1- Writing a main app program that will comprehensively test the data structures by creating objects of them and testing all the possible functionalities
2- Using Junit tests that will be written in the test subfolder of your project

Project finalization

To finalize and complete your project, you will build the project using maven to generate a myLibrary.jar file. This will be your compiled library that you can copy into any project and import it to use your data structure implementations whenever needed.
The TAs will be testing your Project by Importing your library jar file into a tester program to run some tests so it is very important that you adhere to naming conventions that will be published in each module separately

Project submission and deadline

The deadline for the project final submission is:
- Monday 8th of August at 12:00 PM

After which you will demo your work to your TAs in the lab on that day. The demo will be a short 5 minutes discussion that will be used to assess your understanding of the code, concepts, and design decisions made