

International University

Data Structures and Algorithms

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What are they?

- What is a data structure?
- What is an algorithm?
- Not yet to answer but let's see examples:

Examples

- You have a book-shelf.
 - How to arrange books into the book-shelf?
 - Why ?

- To travel to all famous tourist sights in HCM city.
 - What route and schedule should you follow?
 - Why should you do like that?

What are they?

A data structure is

- an arrangement of data
- in a computer's memory (or sometimes on a disk).

What are they? Algorithms

Are sequences of instructions

- To manipulate the data in these data structures
- in a variety of ways.

Such as

- Insert a new data item
- Delete a specified item
- Iterate through all the items in a data structure
- Sorting in-order all items in a data structure

Who are you? And why?

- Familiar with OOP in Java/.NET
- Basic programming skill in Java/.NET
- Why you learn this course?
 - DSA is one of the most fundamental course in CS and IT.
 - Provide necessary knowledge to learn further: Database, Operating System,....
 - Program = Data Structure + Algorithms

Objectives

- Understand general concepts of analyzing algorithms.
- Can use basic data structures to solve practical problems.
- Know to decide which data structures and/or algorithms should be used in practical problems.
- All of them in Object Oriented Programming (OOP)

Content of the course

- Review of OOP and Java
- Basic data structures:
 - Arrays
 - Queue
 - Stack
 - List
 - Tree
- Advanced data structures:
 - Advanced Tree
 - Graph
- Algorithms:
 - Searching
 - Sorting
 - Graph Algorithms

Week by week topics (*)

- 1. OOP and Java
- 2. Arrays
- 3. Sorting
- 4. Queue, Stack
- 5. List
- 6. Recursion
- Mid-Term
- 7. Advanced Sorting
- 8. Binary Tree
- 9. Hash Table
- 10. Graphs
- 11. Graphs Adv.
- Final-Exam
- 8 LABS

Class rules

- Attendance: on-time (MUST)
- Mobile devices: off
- Private discussion: no
- Internet search/chat: no (screen turn-off)
- Exams/tests/exercises: no make-up (unless special cases)

References

- Class notes
- Robert Lafore, "Data structures and Algorithms in Java", Waite Group Press, 2002.
- Introduction to Algorithms [Hardcover]
 - Thomas H. Cormen, et al. The MIT Press
- Download from book publisher
 - Workshop Applets
 - Example Programs
- www.samspublishing.com
 - Search ISBN: 0672324539

Grading policy

- Assignments + Labs : **30%**
- Mid-term exam : **30%**
- Final exam : **40%**
- You failed if Final_Score < 50!

Projects

- Game 2048
 - With undo feature
- Game Lines
 - With moving path
- Game Battleship
 - Human vs Computer
(with non-random move)
- Interactive chart
 - Zoom in/out
 - Multiple functions

Tasks

- Read and present the game/chart rules
- Design classes
- Implement the game/chart with basic rules (50pts)
- Write report (10pts) – game/chart rules, class diagrams, ...
- Demonstration (10tps)
- **Mandatory**
 - Use Git (10pts) – Commits history
 - Graphical User Interface (10pts)
- **Bonus**
 - Extra features (**+2pts for each**)
 - Applying design patterns (**+5pts for each**)
 - Using C#/Javascript (**5pts**)

Assessment

- DON'T COPY and DON'T ALLOW ANYONE COPY YOURS
 - Zero for all
- Except as otherwise noted, all assignments:
 - Are to be done solo (by yourself). As before,
 - You may discuss the assignments with other students
 - You may help (and get help with) debugging
 - You may not give your source code to anyone
- Late assignments will lose 10 points per day, and are not accepted if more than a week late

Contact

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