CS242-CS252
Data Structures

Introduction to Data Structures

Course Information

Credit Hours	4 hours regular lecturer 2 hours lab
Instructor	
Assessment	Class Quizzes 15% Lab exam 15% Lab evaluations 10% Midterm Exams 20% Final Exam 40%
Text Book	Data Structures and Algorithm Analysis in Java, Third Edition, Mark Allen Weiss, Publisher: Pearson, 2012, ISBN-13: 978-0132576277, ISBN-10: 0132576279.

What CS242 is about

- Core data structures and algorithms that underlie most software
- You will learn fundamental data structures and algorithms for organizing and processing information
- Classic data structures and algorithms: lists, staks, queues, trees, graphs, sorting, searching etc.
- Analyse their efficiency
- Determine when to use them

Data Structures

- Ways to organize information to enable efficient computation over that information
  - The goal of the next lecture is introducing asymptotic analysis to describe efficient use of time and space

- Examples for data structures:
  - Lists, stacks, queues, trees, and graphs

- A data structure supports certain operations, each with a:
  - Meaning: what does the operation do/return
  - Performance: how efficient is the operation
  - Example: List with operations insert and delete

Trade-offs

- A data structure strives to provide many useful, efficient operations

- But there are unavoidable trade-offs:
  - Time performance vs. space usage
  - Getting one operation to be more efficient makes others less efficient
  - Generality vs. simplicity vs. performance

Terminology

- Algorithm
  - A high level, language-independent description of a step-by-step process
- Abstract Data Type (ADT)
  - Collection of data and a set of allowed operations (actions) that are used to define and manipulate the data
- Implementation of a data structure
  - A specific implementation in a specific language on a specific machine (both matter!)
  - A given ADT can have multiple implementations.