15CSE201 : Data Structures and Algorithms

Lecture 1 : Introduction

Ritwik M

Based on the reference materials by Prof. Goodrich, OCW METU and Dr. Vidhya Balasubramanian

Course Outline

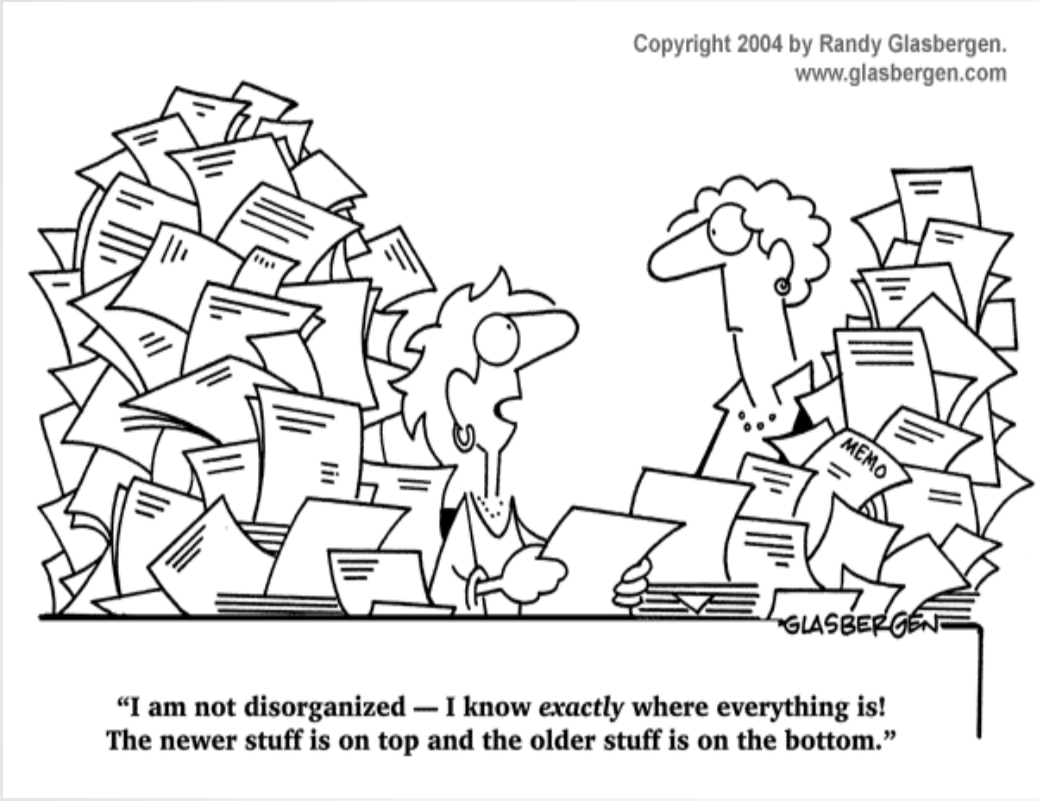
- Introduction to Data Structures
- Introduction to Abstract Data Types
- Linear Data Structures
  - Stacks
  - Queues
  - Vectors and Sequences
  - Lists
- Non-linear Data Structures
  - Trees, Graphs
- Dictionaries and Hashing

Evaluation Pattern

- Theory
  - Goal: Understand data structures and study the application of data structures in problem solving
  - Periodicals : 2 (15 + 20)
  - Quizzes, Tutorials and Assignments : 10
- Lab
  - Goal: Implementation and effective use of data structures
  - Periodical labs – 20+20
  - End Semester Lab – 20
  - Continuous Assessment – 40

Enter !!

Why Data Structures!!!

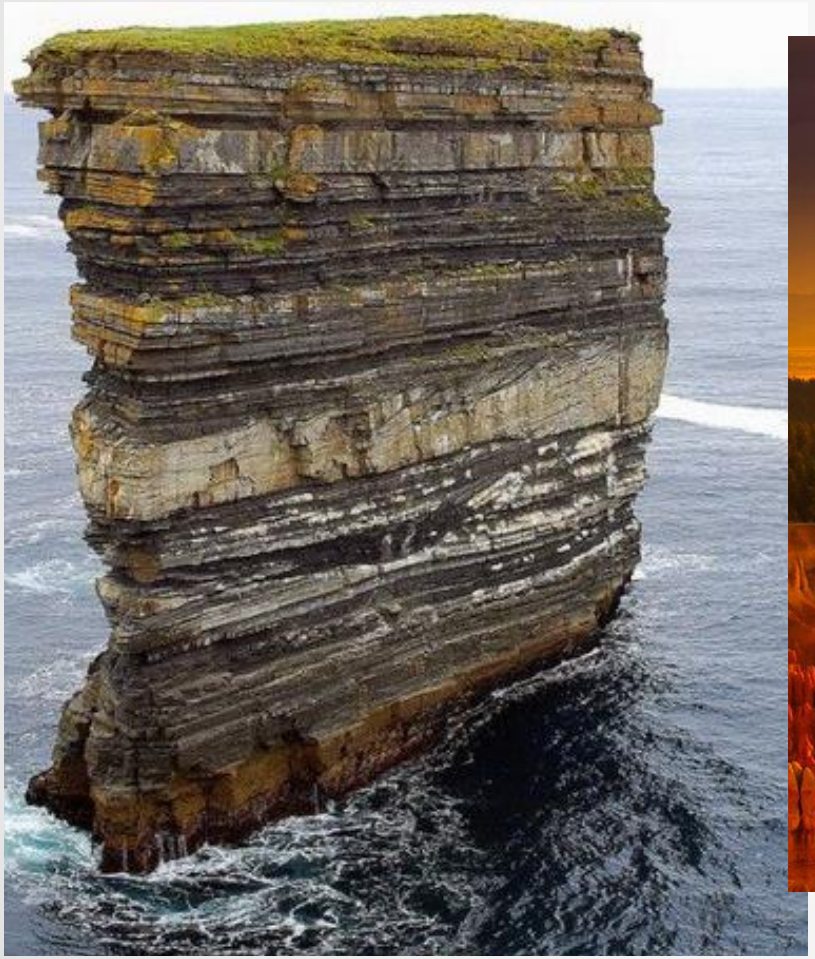


- Huge volumes of data in different formats, need to be organized!!!

1. Organization of data

2. Effective Searching and Retrieval

3. Effectiveness in Modeling



4. Efficiency

Examples

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Philosophy of Data Structures

- Applications getting more complex
  - Need for more efficiency
- What is a Data Structure?
  - is any data representation and its associated operations
  - Used for organizing or structuring a collection of data items
- Need
  - Chosen data structure impacts the running time of program

Efficiency

- A solution is efficient if it solves the problem within the specified constraints
  - Available space
  - Time taken
- Choice of Data Structure depends on the following
  - Are all data items inserted into the data structure at the beginning, or are other operations interspersed with insertions ?
  - Can data items be deleted, and how often are they deleted?
  - Are all data items processed in some well-defined order, or is search for specific data items allowed?

Choice of Data Structure

- Depends on application/modeling requirement
  - Stacks most suitable for recursion
- Space vs time considerations
  - Hash tables are fast but occupy more memory
  - Arrays are not dynamic
- Suitability for disk based access
  - For large volumes of data, the data structure will not fit main memory
  - Is the data structure suitable for disk based storage and access