

Lecture I: Introduction to Data Structures

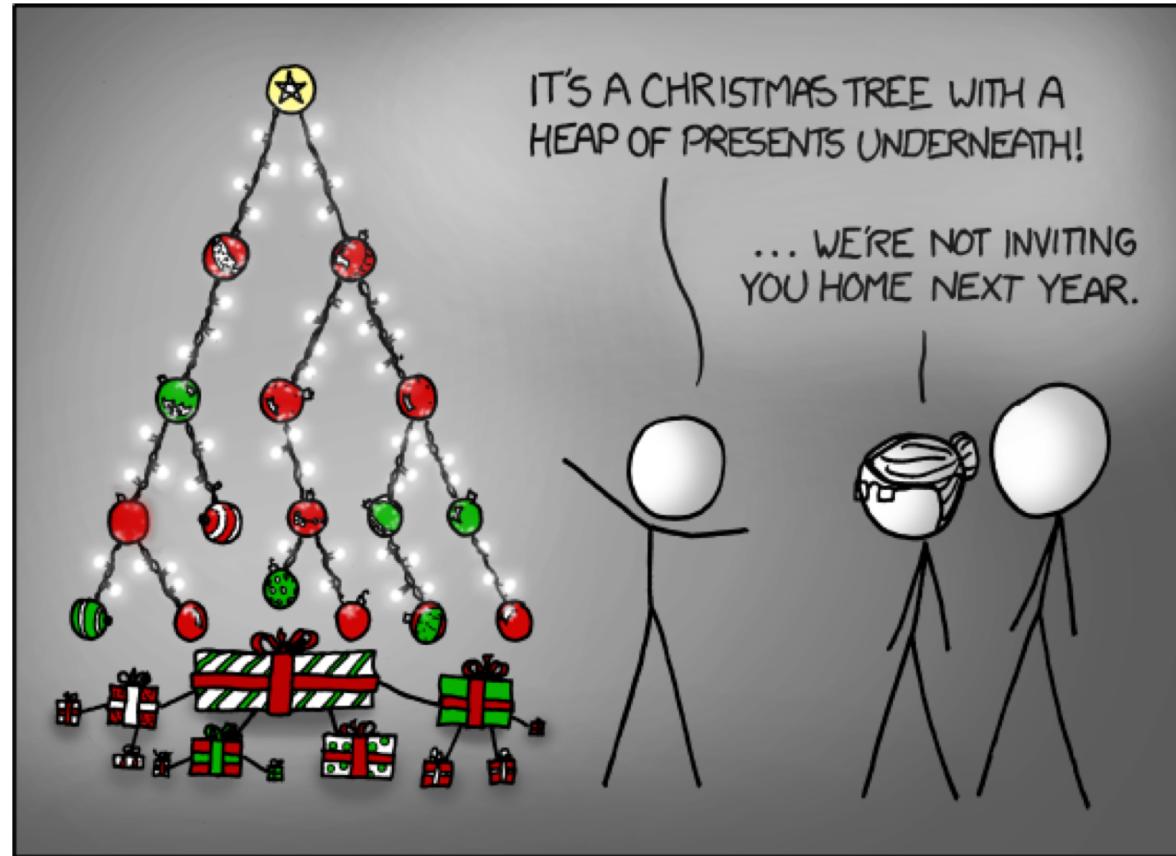
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Acknowledgment: The content of this file is based on the slides of
the textbook as well as the slides provided
by Prof. Won-Ki Jeong, Prof. Tsz-Chiu Au and Myeongjae Jeon.

Welcome to CSE221 class!

- Building blocks of computer science



xkcd.com

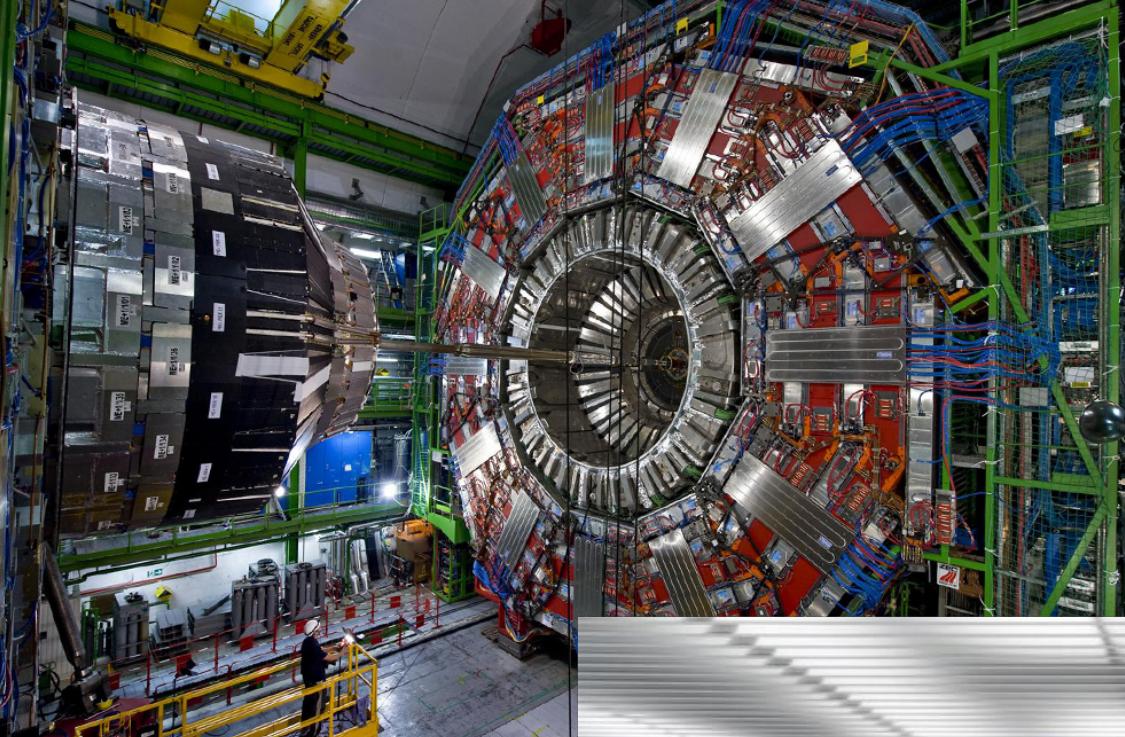
Outline

- What
- How
- Basic concepts

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- How
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Data



CERN Large Hadron Collider (LHC)

- 600 Million collisions / sec
- 10 Gigabytes / sec at max
- 30 Petabytes / year





2000 Hours of video play / sec



4000 Tweets / sec



50000 Likes / sec

How much data?

Digital Universe

2010: 1.2 zettabytes

2013: 4.4 zettabytes

2020: ~40 zettabytes

zettabyte \approx 1,000,000,000,000,000,000 or 10^{21}

200x all words ever spoken by humans

Types of Data

- Numbers
- Texts
- Images
- Videos
- ...

Spatial v.s. Non-spatial

Relational v.s. Non-relational

Real-world Problem

emerge (ĕ-mûrj') *v.* **emerged**, **emerging**.
 1. To rise up or come forth into view; appear. 2. To come into existence. 3. To become known or evident. [Lat. *emergere*.]
—em'er'gence *n.* —**em'er'gent** *adj.*

emergency (l-mûr'jô-n-sé) *n.*, *pl.* -ies. An unexpected situation or occurrence that demands immediate attention.

emeritus (i-mér'i-tôs) *adj.* Retired but retaining an honorary title: *a professor emeritus*. [Lat., p.p. of *emeriri*, to earn by service.]

emery (ĕm'a-rē, ĕm'rē) *n.* A fine-grained impure corundum used for grinding and polishing. [< Gk *smuris*.]

emet'ic (i-mĕt'ik) *adj.* Causing vomiting. [< Gk. *emein*, to vomit.] —**emet'ic**, *n.*

-emia suff. Blood: leukemia. [< Gk. *haima*, blood.]

emigrate (ĕm'i-grăt') *v.* **-grat'ed**, **-grat'ing**. To leave one country or region to settle in another. [Lat. *emigrare*.] —**em'i-grant** *n.* —**em'i-gra'tion** *n.*

émi-gré (ĕm'i-grá') *n.* An emigrant, esp. a refugee from a revolution. [Fr.]

eminen^ce (ĕm'a-nĕns) *n.* 1. a position of great distinction or superiority. 2. A rise or elevation of ground; hill.

eminen^tt (ĕm'a-nĕnt) *adj.* 1. Outstanding, as in reputation; distinguished. 2. Towering above others; projecting. [< Lat. *eminēre*, to stand out.] —**em'i-nently** *adv.*

emphatic (ĕm-făt'ik) *adj.* Expressed or performed with emphasis. [< Gk. *emphatikos*.] —**emphat'i-cally** *adv.*

emphysema (ĕm'fi-sé'mô) *n.* A disease in which the air sacs of the lungs lose their elasticity, resulting in an often severe loss of breathing ability. [< Gk. *emphusēma*.]

empire (ĕm'pir') *n.* 1. A political unit, usu. larger than a kingdom and often comprising a number of territories or nations, ruled by a single central authority. 2. Imperial dominion, power, or authority. [< Lat. *imperium*.]

empirical (ĕm-pîr'i-kôl) *adj.* Also **empiric** (-pir'ik). 1. Based on observation or experiment. 2. Relying on practical experience rather than theory. [< Gk. *empeirikos*, experienced.] —**empir'i-cally** *adv.*

empiricism (ĕm-pîr'i-siz'mô) *n.* 1. The view that experience, esp. of the senses, is the only source of knowledge. 2. The employment of empirical methods, as in science. —**empir'icist** *n.*

emplacem^tt (ĕm-plăs'mônt) *n.* 1. A prepared position for guns within a fortification. 2. Placement. [Fr.]

employ (ĕm-ploï') *v.* 1. To engage or use the services of. 2. To put to service; use. 3. To devote or apply (one's time or energies) to an activity. —*n.* Employment. [< Lat. *implicare*, to involve.] —**employ'a^ble** *adj.*

employee (ĕm-ploï'ĕ, ĕm'ploï-ĕ') *n.* Also **em'ploye**. One who works for another.

ă pat ă pay ă care ă father ĕ pet ĕ be ī pit ī tie ī pier ō pot ō toe ō paw, for ō noise
 ōō took ōō boot ōu out th̄ thin th̄ this ū cut ū urge yoo abuse zh̄ vision ə about, item,
 edible, gallop, circus

- Key-value list
- Sorting

Real-world Problem



- Graph
- Shortest path

CSE221 Data Structures Class

- Data structure
 - Organization of data
(Array, queue, stack, linked list, tree, graph, etc)
- Algorithm
 - Outline of computational procedure
(Sorting, searching, hashing, etc)
- Language (by assignments)
 - Tool to implement data structures and algorithms
- We will study **data structures and algorithms using C++** in this class!

Outline

- What
- How
 - Course outline
 - Administrative matters
- Basic concepts

Course Logistics

- Class time: Tue/Thr 9:00am-10:45am
- Lecture notes will be posted on the class Gitlab:
 - <https://class.unicss.org/cse221-2019-spring/cse221-2019-spring/>
- Reading assignment
 - Students are expected to read the corresponding chapter before the class

Instructor

- Instructor: Hyungon Moon
 - (hyungon@unist.ac.kr)
 - Office hour: by email
 - Best timing to send an email: ~ 8am in the morning.
 - Office: 106-601-3

Teaching Assistants

- Seon Ha
- Alisheri Anvar
- TBD1
- TBD2
- TBD3

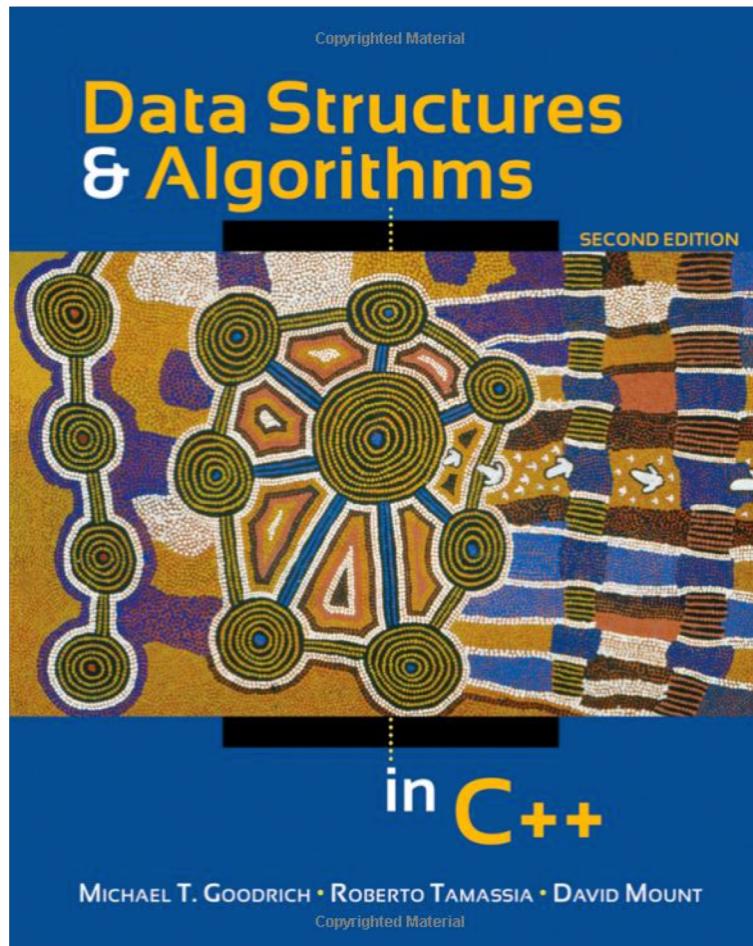
Prerequisites

- Object oriented programming (CSE241)
- C++
- Linux, gcc (or clang/llvm)

Class Structure

- Lectures
- Programming assignments
 - 6+1 assignments
- Midterm, Final exams

Textbook



- Data Structures and Algorithms in C++ (2th Edition)
 - Michael T. Goodrich, Roberto Tamassia, David M. Mount

Grading Policy

- General rule
 - Assignments : 40%
 - Midterm Exam : 25%
 - Final Exam: 30%
 - Class participation : 5%
 - Doesn't include the attendance.
- Special Rule
 - Fail this course if missing more than 8 classes
 - Not submitting more than two assignments make your grade c+ or lower.

The official ECE rule on the Academic Integrity

- **On the 1st violation**
 - **Zero grade on the item** involved (e.g., homework, midterm, etc.).
 - **Lower the final grade by at least one letter grade** (e.g., B+ --> C+).
 - Attain a “**signed**” **personal letter from the student** stating this will not happen again, and he/she is well aware of consequence if it does.
 - **Provide a written report** of the student and violation **to School Head and ECE education committee**.
- **On the 2nd violation**
 - **Give an F on the course.**
 - **Share the identity of the student** with the entire faculty.
 - **Report to the University Student Scholarship Counseling Committee** for further disciplinary action.

Getting Help

- Class Gitlab: [**https://class.unicss.org/cse221-2019-spring**](https://class.unicss.org/cse221-2019-spring)
- General questions:
 - Create/check issues on the master repository.
 - [**https://class.unicss.org/cse221-2019-spring**](https://class.unicss.org/cse221-2019-spring)
- Private questions:
 - You are not likely to have this.
 - Send an email or create an issue on your submission repository.
- Blackboard or Piazza
 - We won't be using Blackboard or Piazza for the course

Gitlab showcase

- There are plenty of resources that you can follow.
- The steps you are going to follow:
 - Create a password and login
 - Read the syllabus (README.md file on the master repository)
 - Create and register your ssh key
 - <https://docs.gitlab.com/ee/ssh/>

Questions?