

[CSED233-01] Data Structure  
**Introduction & Fast Forward**

Jaesik Park



# Instructor

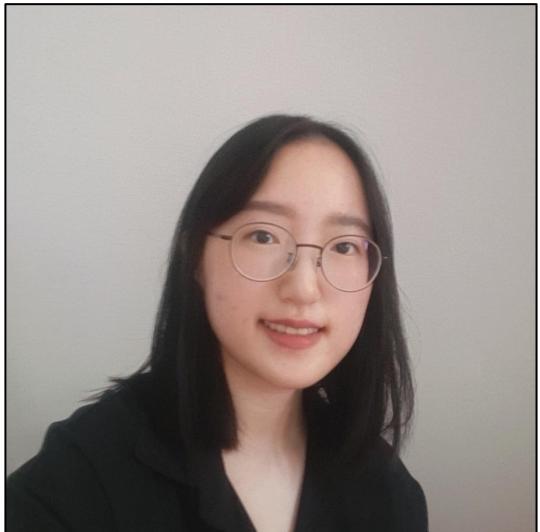
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- Jaesik Park (박재식)
  - Associate professor @ POSTECH CSE, GSAI
  - <http://jaesik.info/>
- Research Interests
  - Computer vision, machine learning, computer graphics
- Contact
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- Special thanks to Prof. Seung-Hwan Baek who teaches the same class in the fall semester ☺

# Teaching Assistants

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# PLMS

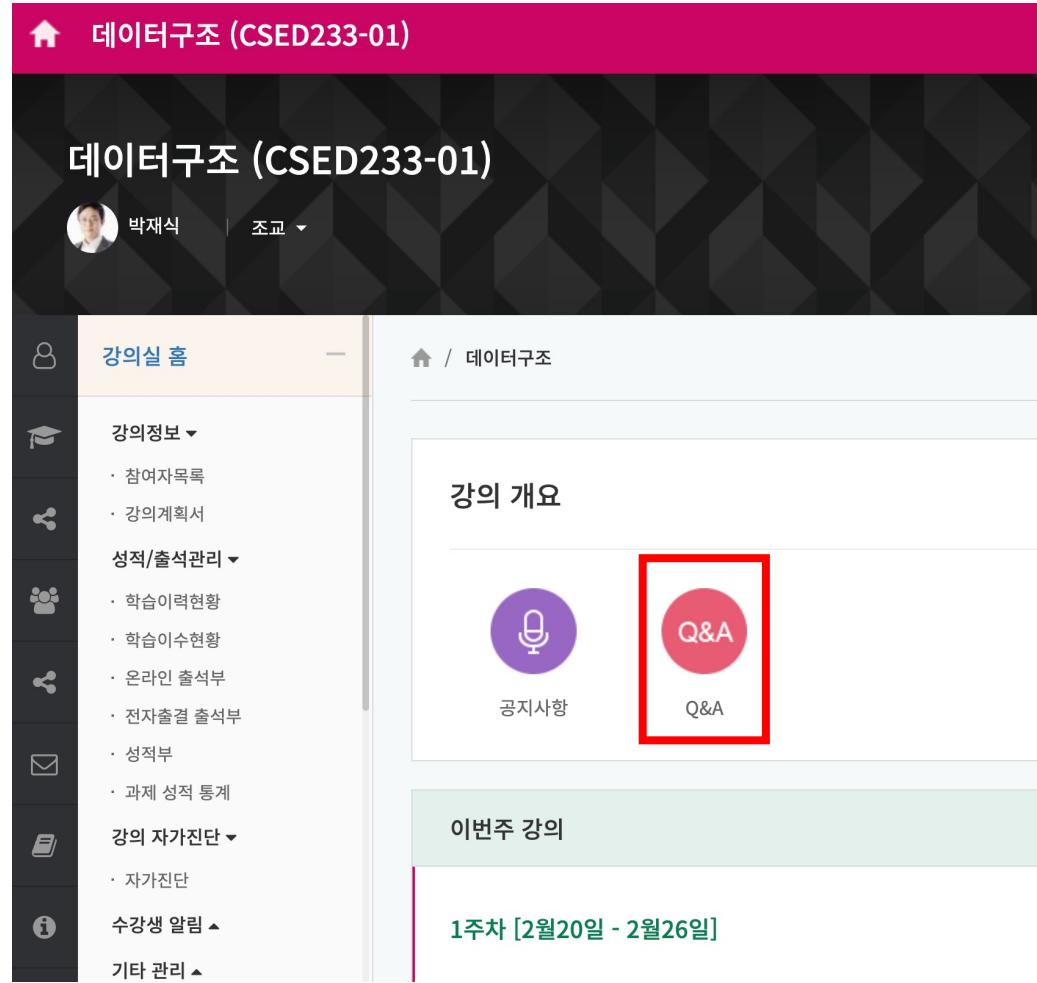
- We will use PLMS as the main platform for lecture materials
- Please regularly check our PLMS page

The screenshot shows the homepage of the PLMS system for the course CSED233-01. The top navigation bar is pink and displays the course name "데이터구조 (CSED233-01)". Below the header, there is a dark banner with a geometric pattern. On the left, a sidebar menu lists various sections: 강의정보 (with links to 참여자목록 and 강의계획서), 성적/출석관리 (with links to 학습이력현황, 학습이수현황, 온라인 출석부, 전자출결 출석부, 성적부, and 과제 성적 통계), 강의 자가진단 (with a link to 자가진단), 수강생 알림 (with a link to 기타 관리), and 기타 관리.

The main content area has a light gray background. It features a section titled "강의 개요" with two circular icons: a purple one labeled "공지사항" and a red one labeled "Q&A". Below this, there is a green box titled "이번주 강의" containing the text "1주차 [2월20일 - 2월26일]".

# Questions

- Please do not ask questions via email
  - Note that more than **90 students** are taking this course
  - Instead, use PLMS
    - <http://plms.postech.ac.kr>
    - Ask questions in Q&A
      - Answered Q&A may help others
      - Feel free to participate
    - Recommended to make a study group
      - Learn ideas and concepts
      - But do not share your precious PAs
    - Check notifications



# Introduction

# Course Information: CSED233-01

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- Data Structure
  - LG Cooperative EE Bldg. Autorium Hall / LG연구동 강당
- Dates
  - 9:30 AM – 10:45 AM, Tuesday and Thursday
  - 4/11 9AM~11AM: Midterm Exam
  - 6/8 9AM~11AM: Final Exam
- We will provide course recording
- Recommended courses prior to this course  
(at least taking the relevant course in parallel)
  - C++
  - Object oriented programming

# Why are we taking this course?

- Programs solve problems by processing information
  - Information needs to be organized
    - Data structures
  - Programs carry out tasks
    - Algorithms



Program = Data structures + Algorithms

- Need to be *correct & efficient*

# Why are we taking this course?

- There are tons of open-sourced resources
  - The C++ Standard Template Library (STL)
  - Other open-sourced implementations
    - Trees
    - Graphs
- You will need your own data structure for specific problems you are solving
- This requires at least understanding and implementing modifying existing data structure



# Why are we taking this course?

*“I will, in fact, claim that the difference between a bad programmer and a good one is whether [they] consider [their] code or [their] data structures more important.*

*Bad programmers worry about the code.*

*Good programmers worry about **data structures** and their relationships.”*



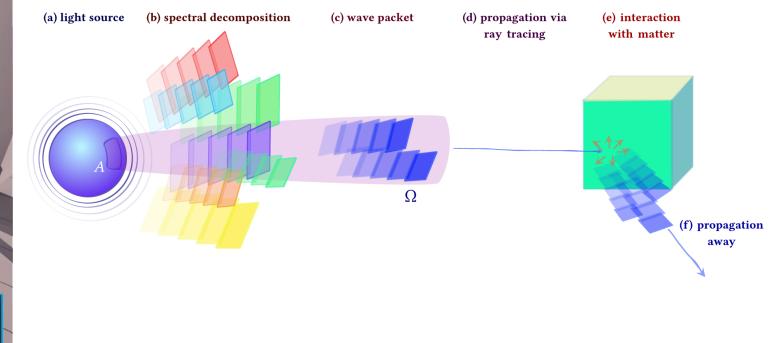
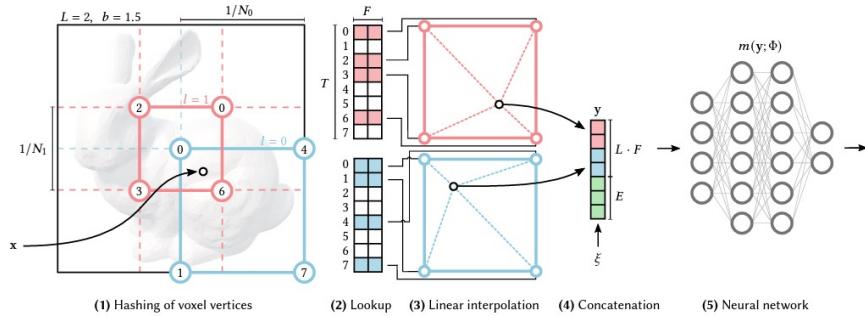
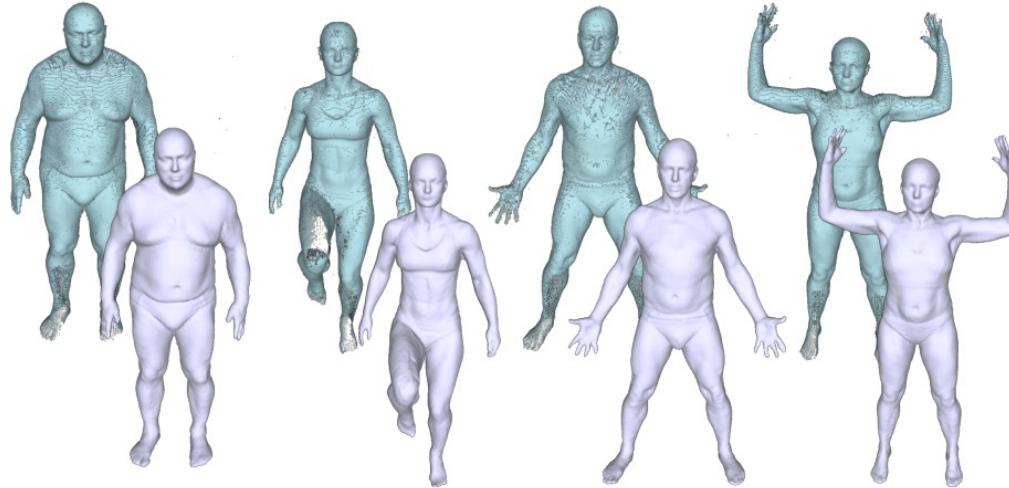
— *Linus Torvalds (architect of Linux and git)*

# Why are we taking this course?

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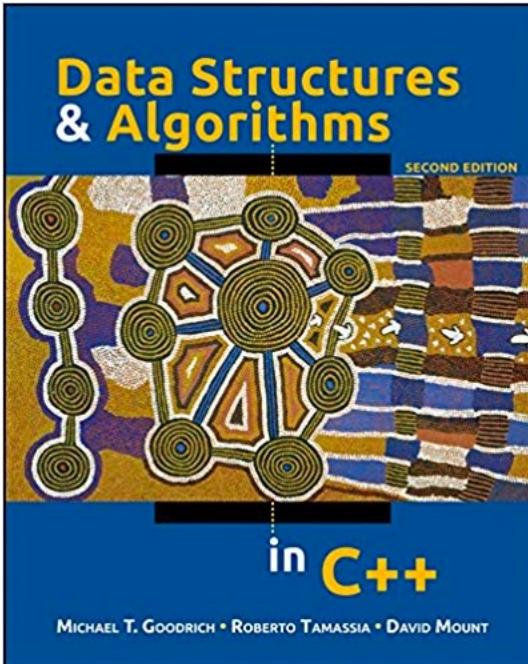
# Data Structure in My Fields (Graphics, Vision)



# Textbook

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- Michael T. Goodrich et al.
  - *Data Structures and Algorithms in C++ (2<sup>nd</sup> Edition)*, John Wiley & Sons, 2011  
(ISBN : 978-0-470-38327-8)



# References

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- Sartaj Sahni
  - *Data Structures, Algorithms, and Applications in C++ (2<sup>nd</sup> Ed.)*, Silicon Press, 2004
  - <http://www.cise.ufl.edu/~sahni/dsaac/>
- Clifford A. Shaffer
  - *A Practical Introduction to Data Structures and Algorithm Analysis (2<sup>nd</sup> Ed.)*, Prentice-Hall, 2001
  - <http://people.cs.vt.edu/shaffer/Book>
    - 3<sup>rd</sup> edition available (free of charge)
- Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman
  - *Data Structures and Algorithms*, Addison-Wesley, 1983

# Grading

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- Grade (total: 140 pts)
  - Program assignments (PA):  $15 \text{ pts} * 4 = 60 \text{ pts}$
  - Midterm: 30 pts
  - Final: 30 pts
  - Hidden bonus: 10 pts or more
    - Can be found in PAs and exams
  - Course participation: 10 pts
- Grade ratio might be adjusted based on the overall course attitude
  - Your passion
- If you are taking this course again
  - You would get the grade up-to **B+**
- For the students taking this class under S/U evaluation
  - You would need to earn the score that is **better than the half of the students**

# Be polite and respect others

- Professor and TAs
  - We will try to help
  - Please use polite words
- Please respect others
  - Your friend



<https://kidshelpline.com.au/teens/issues/all-about-respect>

# Office Hour

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- Office hour
  - Will be announced
  - Via Zoom
- Stay in the virtual classroom and ask questions

# Assignments and Exams

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- Programming assignments (Pas)
  - Four programming assignments in C++
  - Implement the concepts taught in the classes
  - Submit though PLMS
  - Program assignments (PA):  $15 \text{ pts} * 4 = 60 \text{ pts}$
- Exams
  - Midterm: 30 pts
  - Final: 30 pts

# Tentative Fast Forward

# C++ Review

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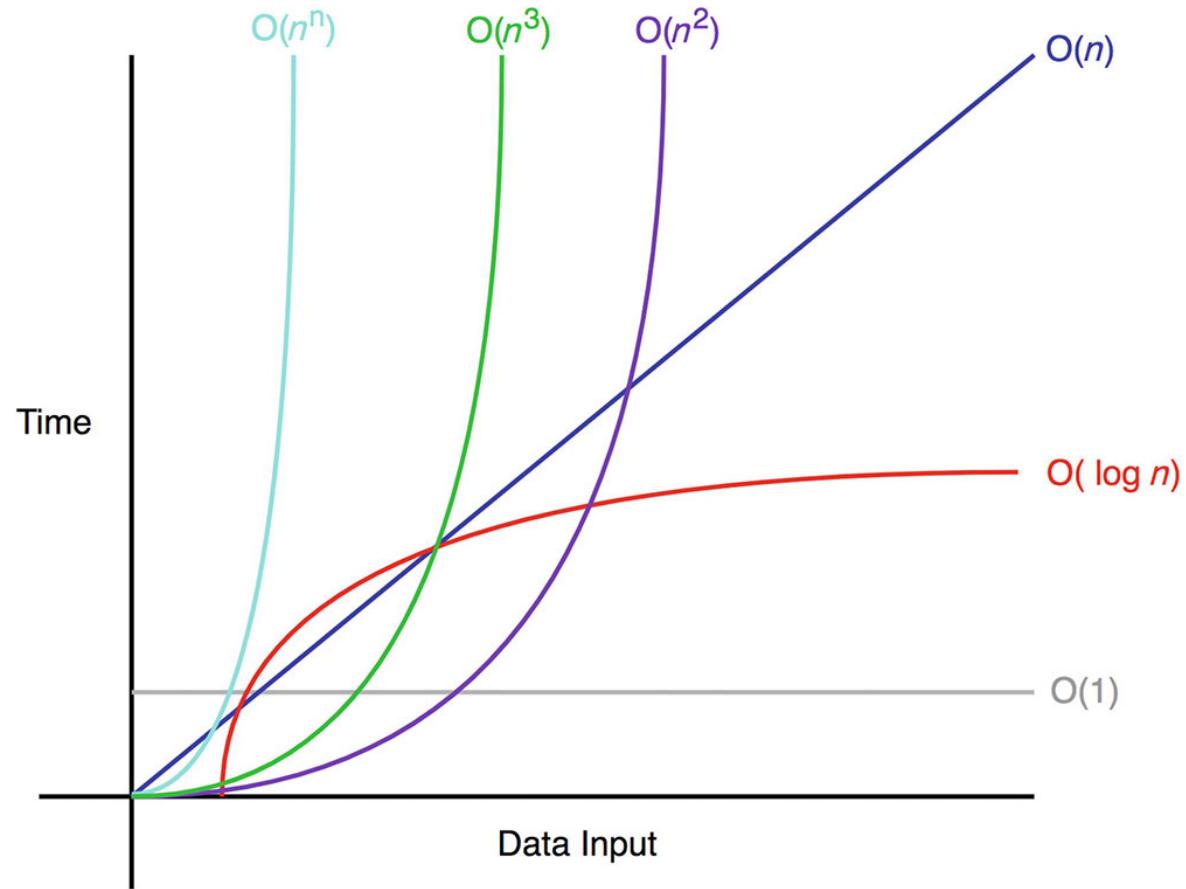
- Remind yourself about C++
- Play with C++ and get ready to do assignments
- [https://www.w3schools.com/cpp/cpp\\_exercises.asp](https://www.w3schools.com/cpp/cpp_exercises.asp)



# Algorithm Analysis

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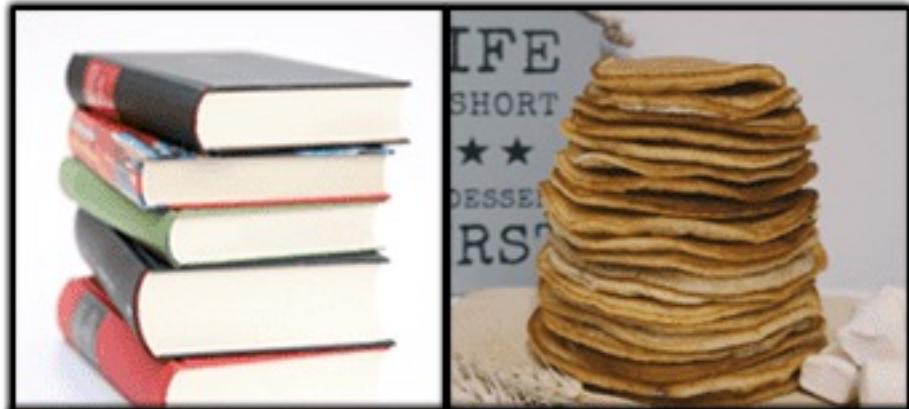
- Which algorithm is better regardless of the computer spec. you are using?



# List, Stack, Queue

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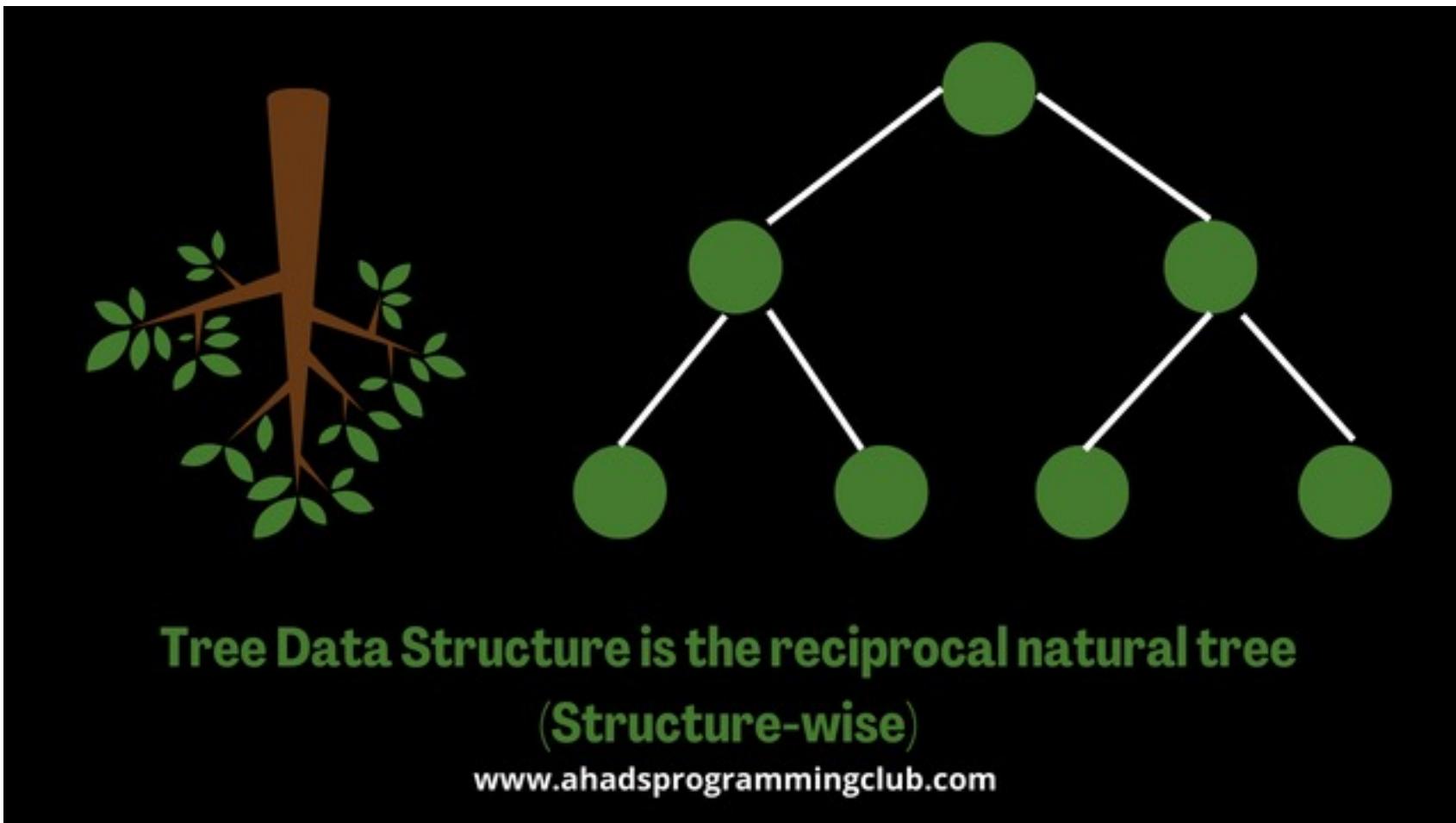
- List, stack, queue “something” as the names suggest ☺



# Tree

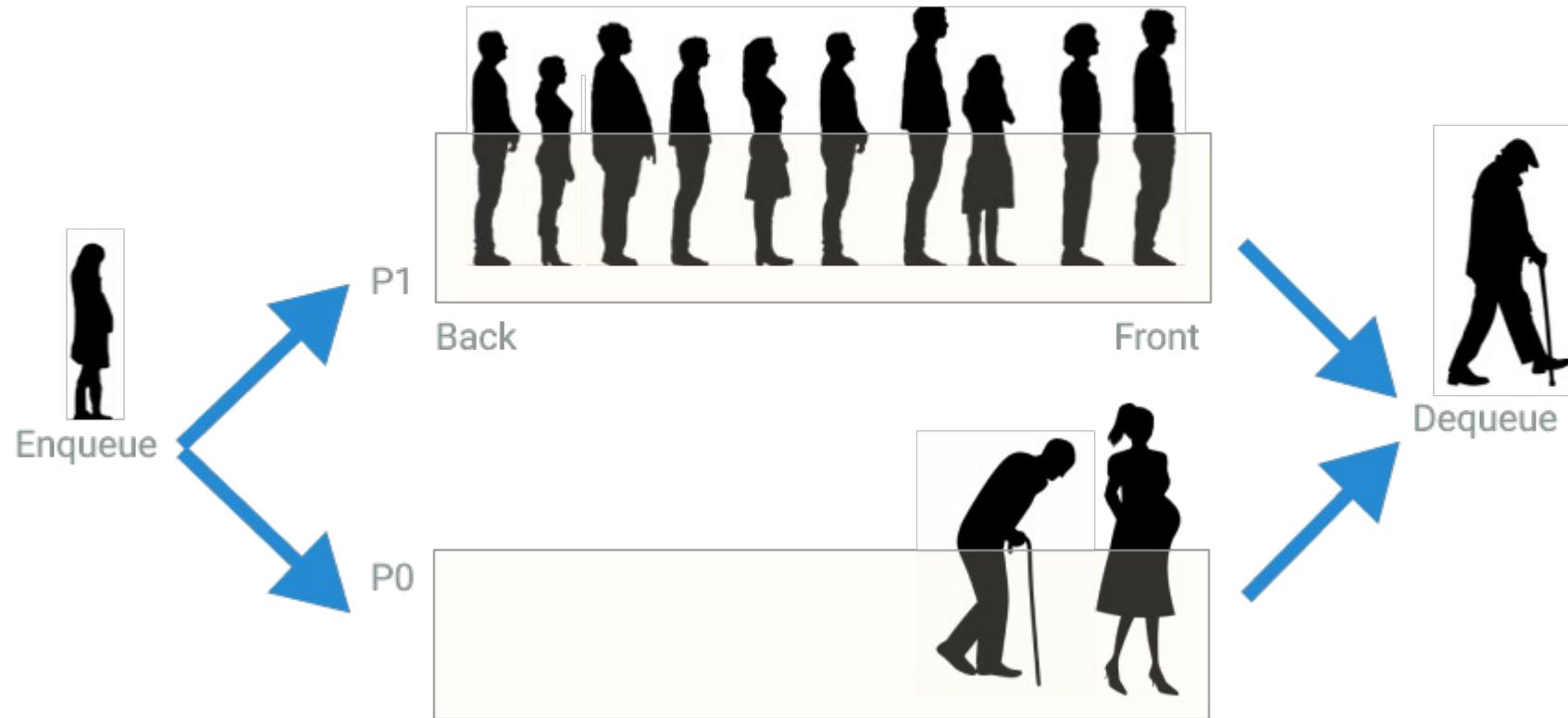
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- Tree data structure looks like a (upside-down) tree
  - Family tree, academic tree, ...



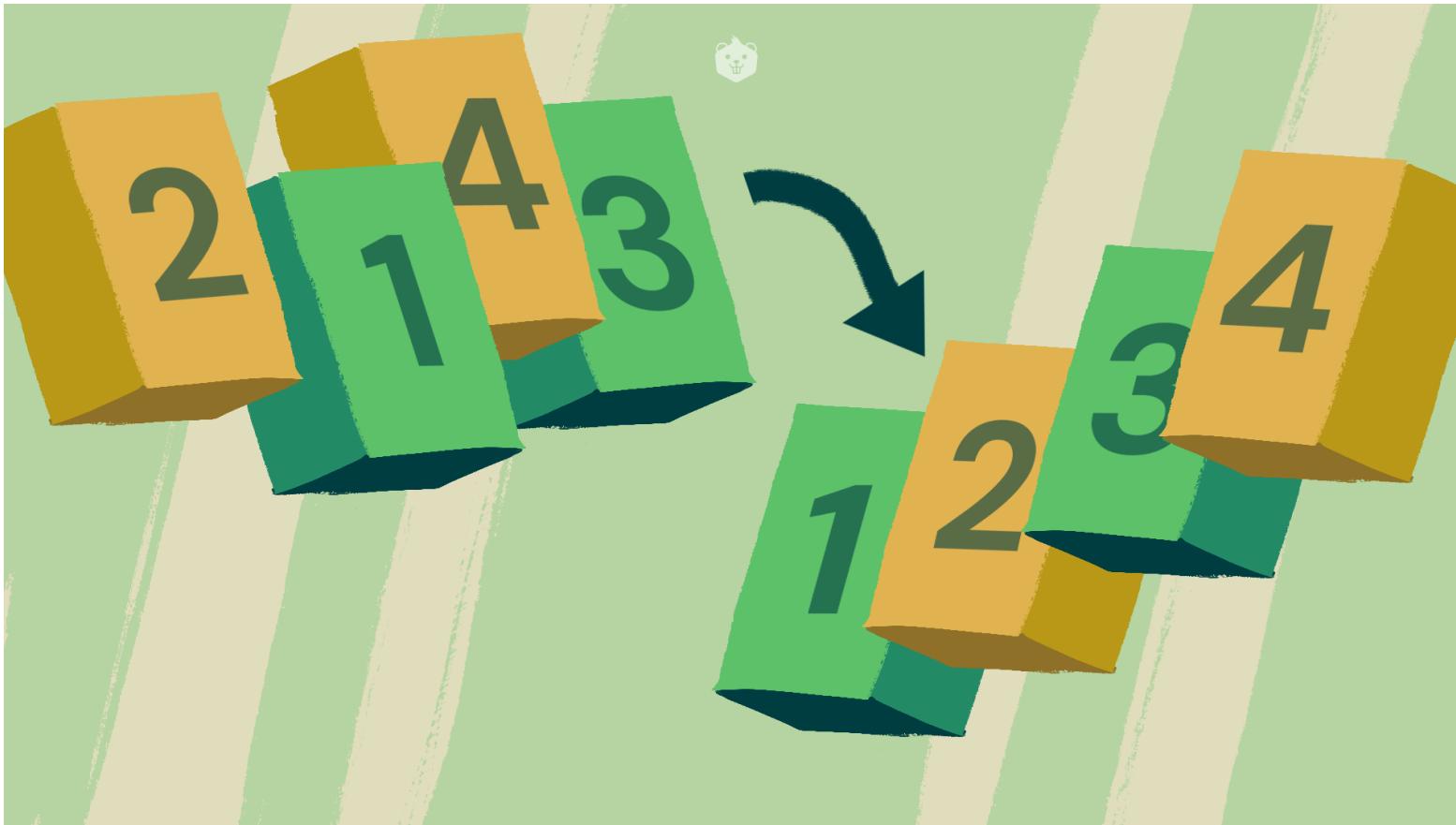
# Priority Queue, Heap

- Priority does matter in our life



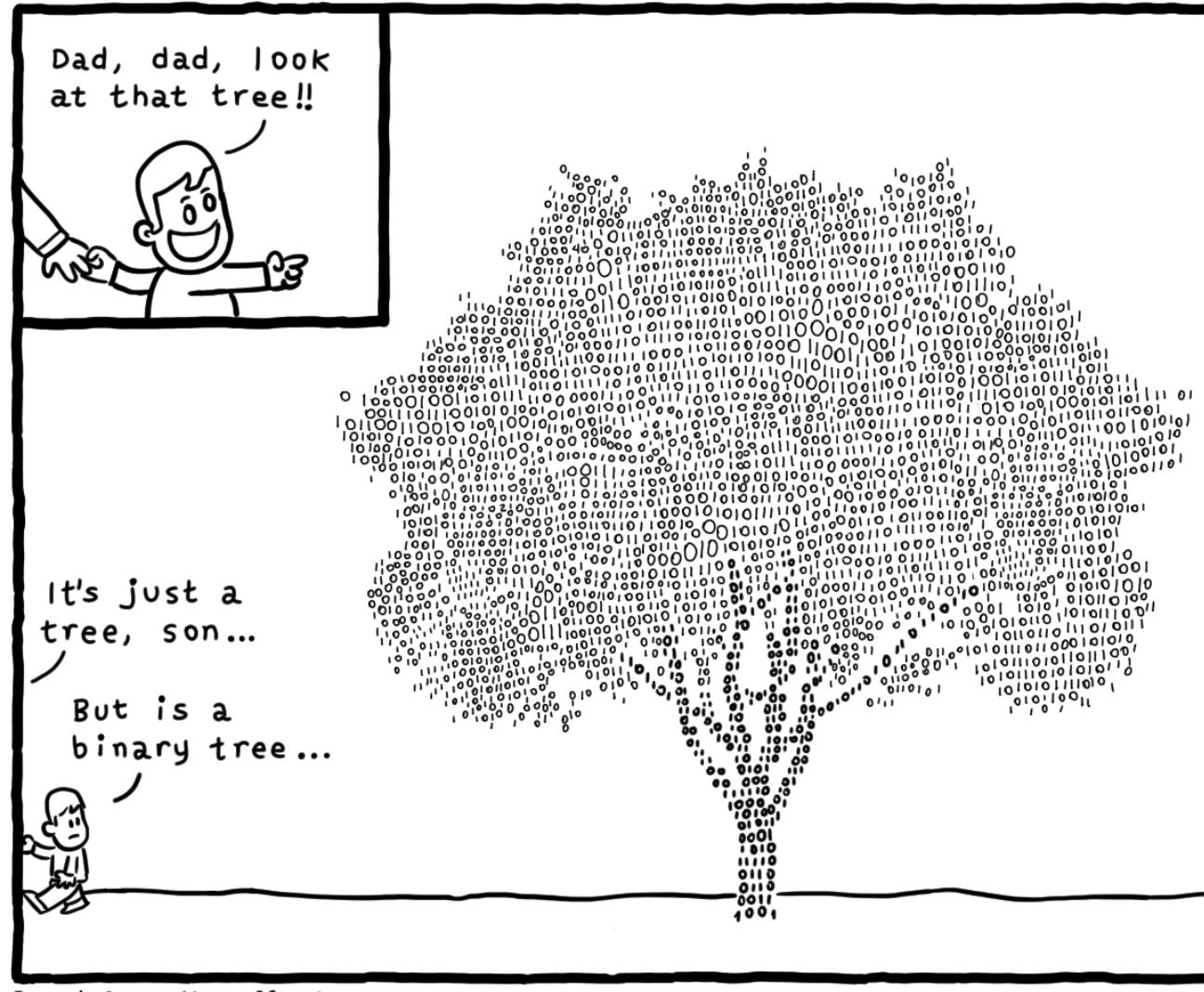
# Sorting

- How to computationally make things ordered?



# Binary Search Tree, AVL Tree, B Tree

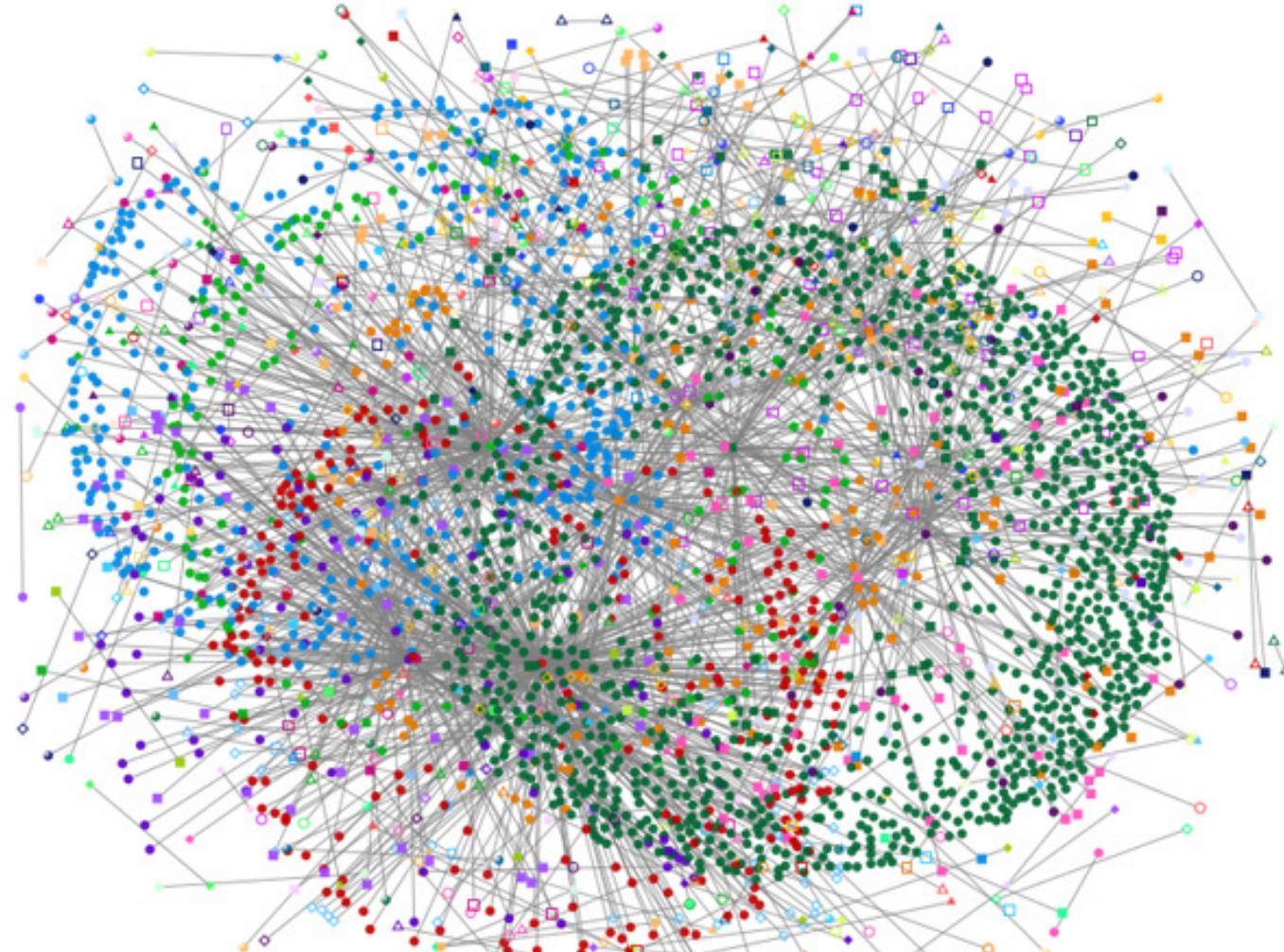
- There are many special trees that could be useful



# Graph

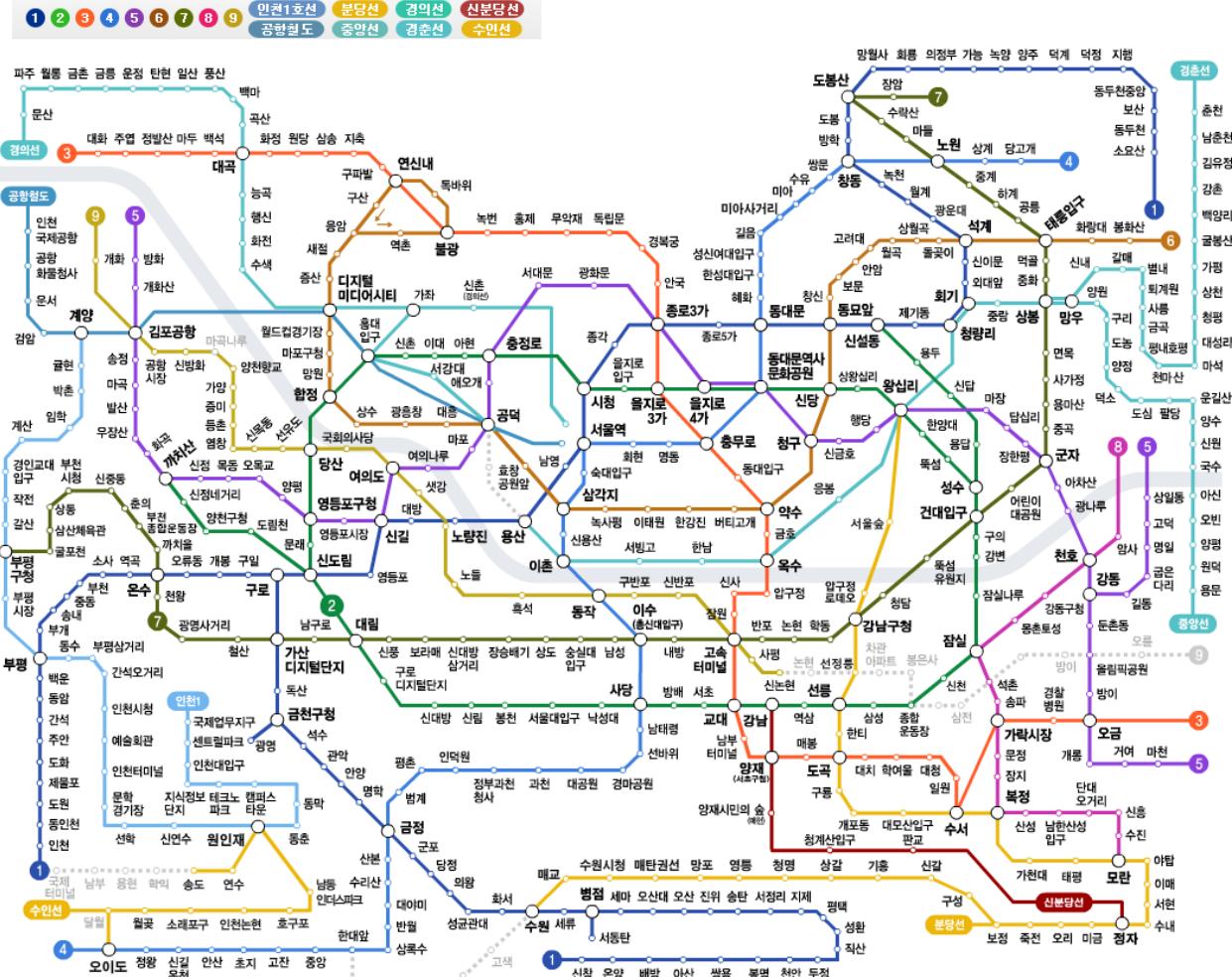
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- Hierarchy may not exist, and anything can be connected



# Shortest Path Finding

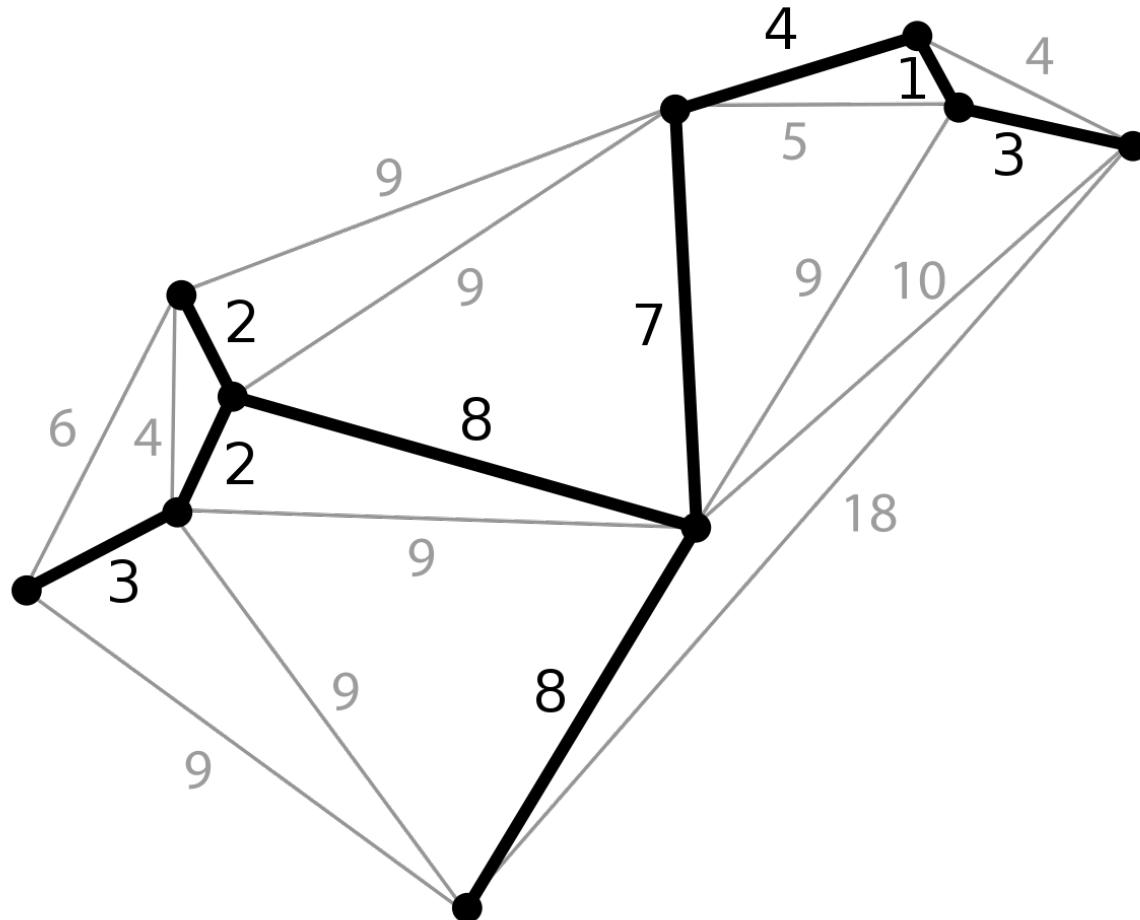
- You want to go from A to B, in a fastest way



# Minimum Spanning Tree

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- How to connect all the places with minimum cost?



# References

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- Further reading list and references
  - [https://en.wikipedia.org/wiki/Data\\_structure](https://en.wikipedia.org/wiki/Data_structure)
  - Steinberg et al., Towards Practical Physical-Optics Rendering, TOG 2022
  - Muller et al., Instant Neural Graphics Primitives with a Multiresolution Hash Encoding, TOG 2022
  - Wang et al., Dual Octree Graph Networks for Learning Adaptive Volumetric Shape Representations, TOG 2022
- Slide credit
  - Jaesik Park
  - Seung-Hwan Baek
  - Jong-Hyeok Lee