



DATA STRUCTURES AND ALGORITHMS

Sari Widya Sihwi

INTRODUCTION

What is Data Structure?

- A data structure is an arrangement of data in a computer's memory (or sometimes on a disk).
- We can also say.. data structure is a method of organizing large amounts of data,
- Data structures include arrays, linked lists, stacks, binary trees, hash tables, etc

What is Algorithm?

- An algorithm is thus a sequence of computational steps that transform the input into the output.
- We can also view an algorithm as a tool (method) for solving a well-specified computational problem.

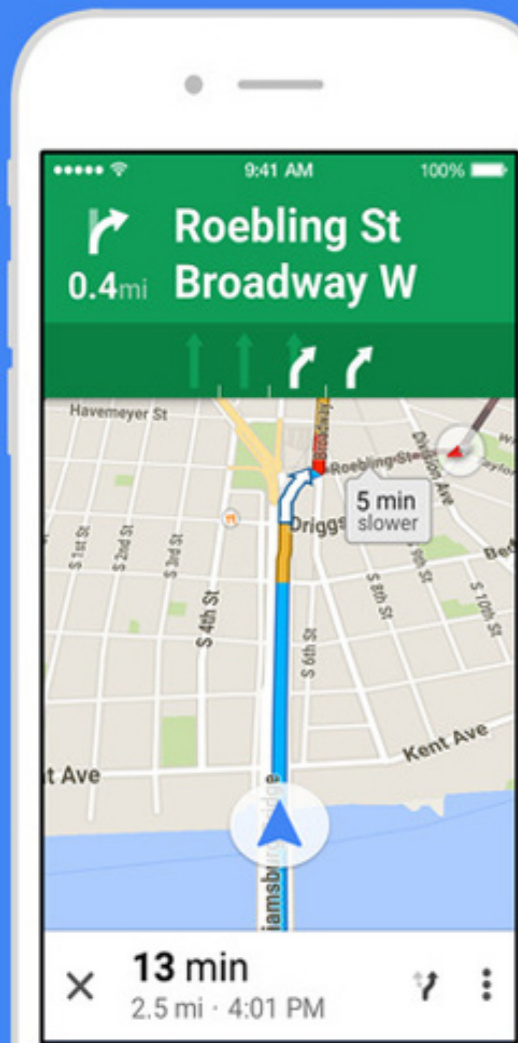
We use algorithms in our daily life....

- Cooking an instant noodle
- Cleaning the bedroom
- Going to campus from our home
- Etc ...

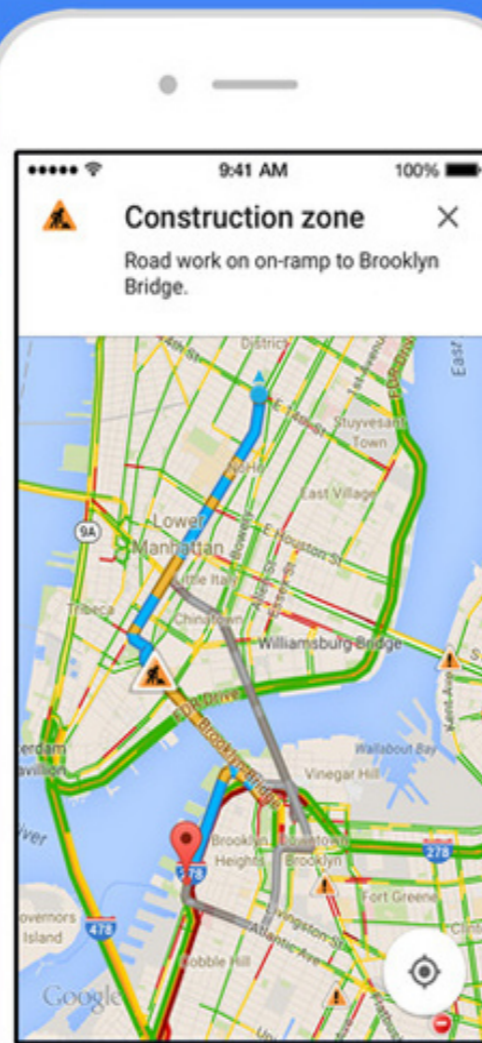
However, we can do more by Algorithms in
Computer Science... 😊

How Google and Apple can do this?

Navigate with ease



Outsmart traffic

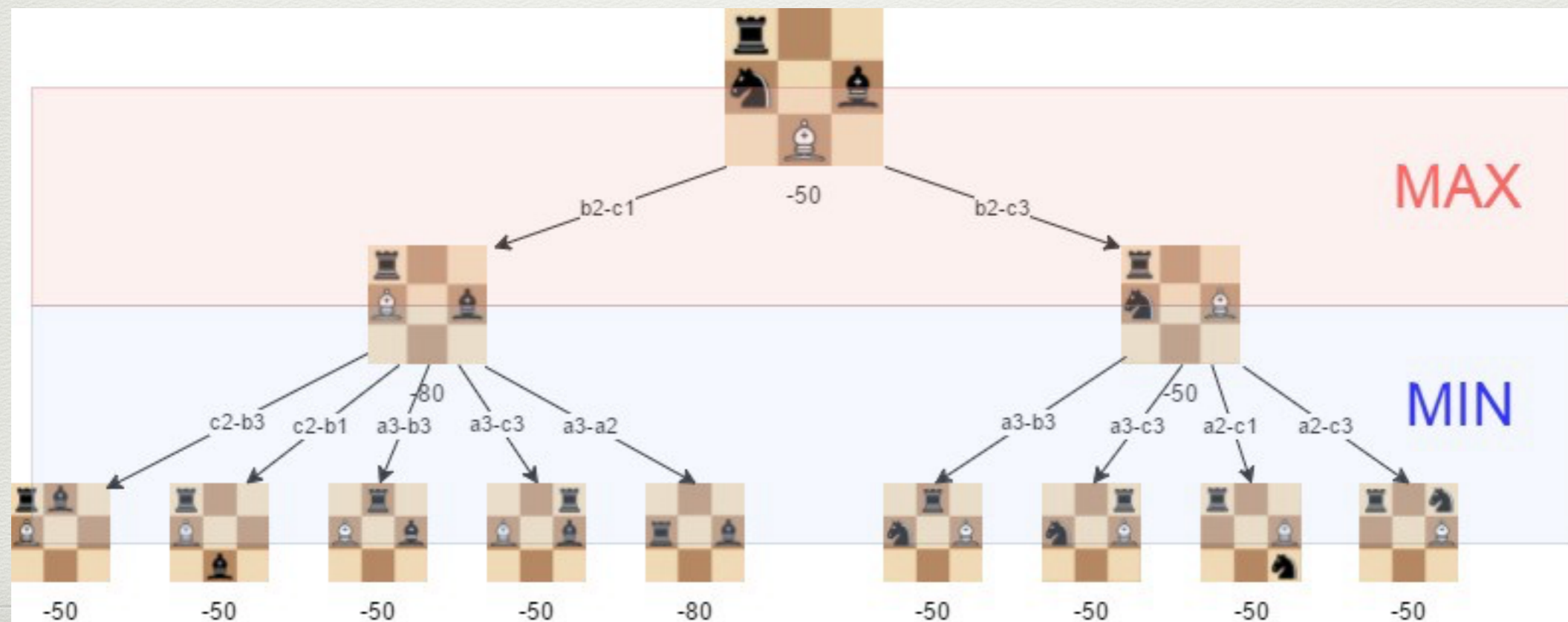


- There are Amazing Algorithm behind Google Maps and Apple Maps
- Along ago... in 1956, when a programmer named Edsger W. Dijkstra needed to come up with a solvable problem as a means to showcase the power of a new ARMAC computer.
- The algorithm itself was highlighted in a [published paper](#) from 1959 and is appropriately called [Dijkstra's algorithm](#)
- Nowadays, it become the basic mapping functionality in many programs, was something he said he came up with while casually drinking coffee.
- Dijkstra himself is a bit of a computing legend, having received the Turing Award in 1972.

How to develop an unbreakable games?



- Minimax is a kind of [backtracking](#) algorithm that is used in decision making and game theory to find the optimal move for a player, assuming that your opponent also plays optimally. It is widely used in two player turn-based games such as Tic-Tac-Toe, Backgammon, Mancala, Chess, etc.
- In Minimax the two players are called maximizer and minimizer. The **maximizer** tries to get the highest score possible while the **minimizer** tries to do the opposite and get the lowest score possible.



Why study algorithms ?

- Their impact is broad and far-reaching.
- Old root, new opportunities
- To solve problems that could not otherwise to be addressed
- For intellectual stimulation
- To become a proficient programmer
- They may unlock the secrets of life and of the universe
- For fun and profit
- Everybody else is doing it

“For me, great algorithms are the poetry of
computation. Just
like verse, they can be terse, allusive, dense, and
even mysterious. But once unlocked, they cast a
brilliant new light on some
aspect of computing. ”

— *Francis Sullivan*

“I will, in fact, claim that the difference between a bad programmer and a good one is whether he considers his code or his data structures more important. Bad programmers worry about the code. Good programmers worry about data structures and their relationships. ”

— *Linus Torvalds (creator of Linux)*

“Computer models mirroring real life have become crucial for most advances made in chemistry today.... Today the computer is just as important a tool for chemists as the test tube.”

— *Royal Swedish Academy of Sciences (Nobel Prize in Chemistry 2013)*