CSE 246: Algorithms

Course Introduction

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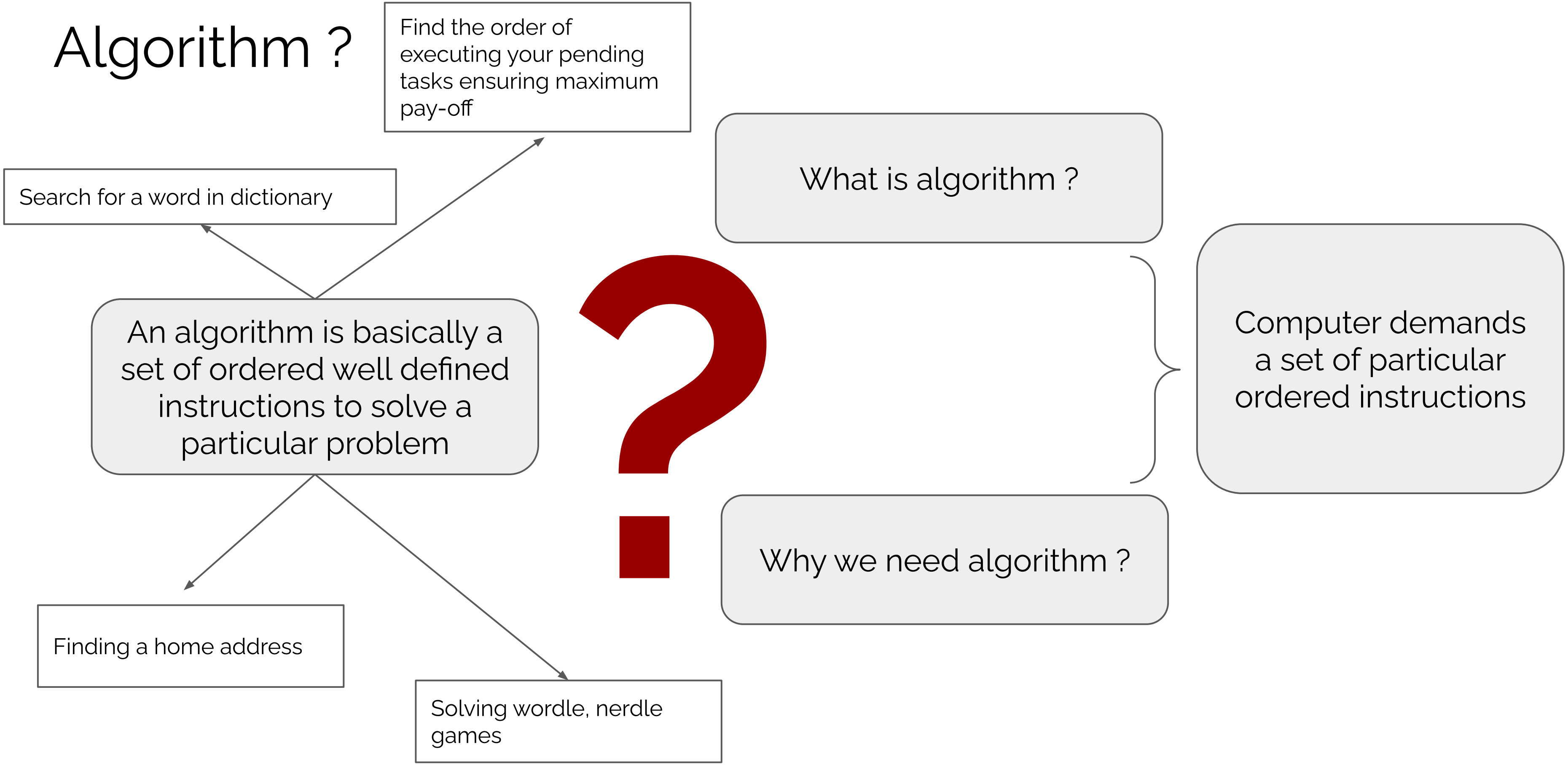
Algorithm ?



An algorithm is basically a set of ordered well defined instructions to solve a particular problem

Search for a word in dictionary

Find the order of executing your pending tasks ensuring maximum pay-off

Finding a home address

Solving wordle, nerdle games

What is algorithm ?

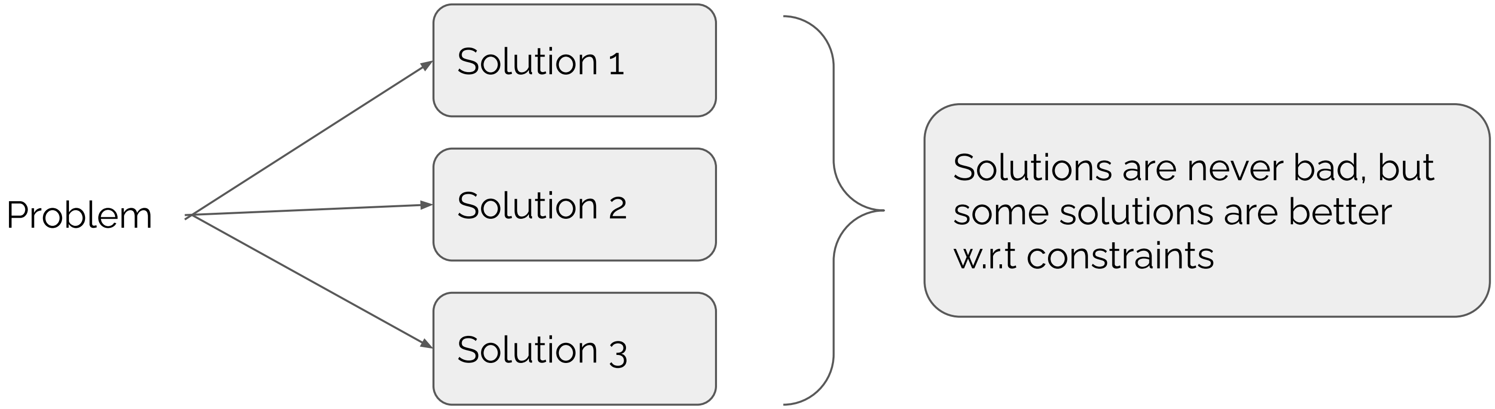
Why we need algorithm ?

Computer demands a set of particular ordered instructions

Solution of a Problem

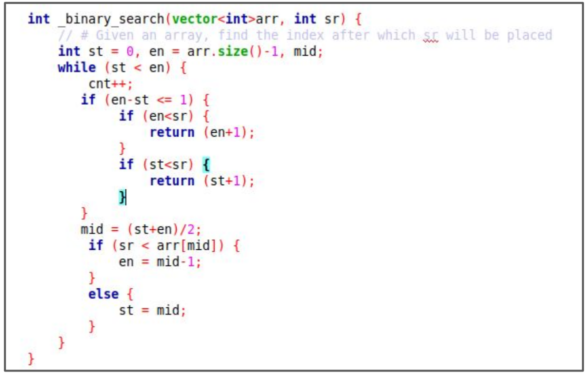
Generic

- An algorithm/set of ordered well defined instructions
- The complexity of the algorithm
  - Run time Complexity: The number of instructions need to be executed (E.g, 1+2+3+..+10)
  - Memory Complexity: The memory usage (E.g., repeat count in array)

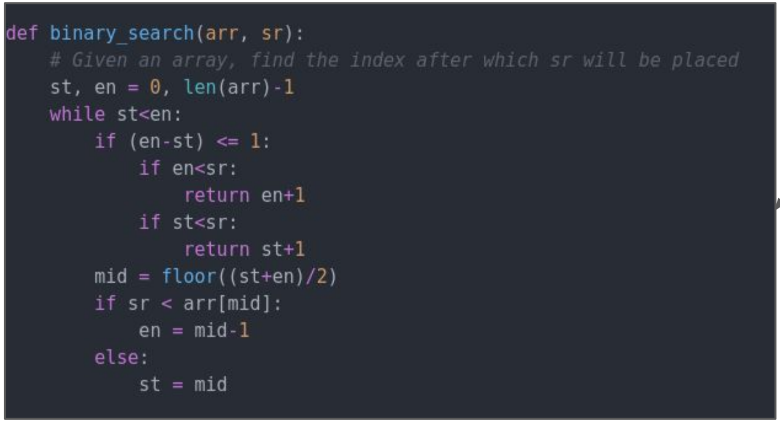


Solutions are never bad, but some solutions are better w.r.t constraints

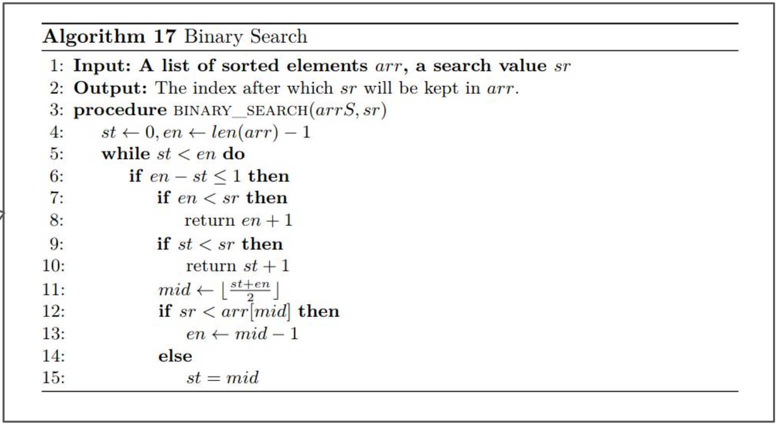
Visualization of Algorithms: Pseudocode



```cpp
int _binary_search(vector<int>arr, int sr) {
    // # Given an array, find the index after which sr will be placed
    int st = 0, en = arr.size()-1, mid;
    while (st < en) {
        cnt++;
        if (en-st <= 1) {
            if (en<sr) {
                return (en+1);
            }
            if (st<sr) {
                return (st+1);
            }
        }
        mid = (st+en)/2;
         if (sr < arr[mid]) {
            en = mid-1;
         }
         else {
            st = mid;
         }
    }
}
```



```python
def binary_search(arr, sr):
    # Given an array, find the index after which sr will be placed
    st, en = 0, len(arr)-1
    while st<en:
        if (en-st) <= 1:
            if en<sr:
                return en+1
            if st<sr:
                return st+1
        mid = floor((st+en)/2)
        if sr < arr[mid]:
            en = mid-1
        else:
            st = mid
```



Algorithm 17 Binary Search

```
Input: A list of sorted elements $arr$, a search value $sr$
Output: The index after which $sr$ will be kept in $arr$.
procedure BINARY_SEARCH($arrS, sr$)
    $st \leftarrow 0, en \leftarrow len(arr) - 1$
    while $st < en$ do
        if $en - st \leq 1$ then
            if $en < sr$ then
                return $en + 1$
            if $st < sr$ then
                return $st + 1$
        $mid \leftarrow \lfloor \frac{st+en}{2} \rfloor$
        if $sr < arr[mid]$ then
            $en \leftarrow mid - 1$
        else
            $st = mid$
```

Approach

- Learn/Understand an algorithm
- Implement it
- Solve problems
- Read Blogs/Tutorials, Ask friends, **But Never Cheat**

Visualization of Algorithms: Flowchart

https://www.visual-paradigm.com/tutorials/flowchart-tutorial/

Thank You