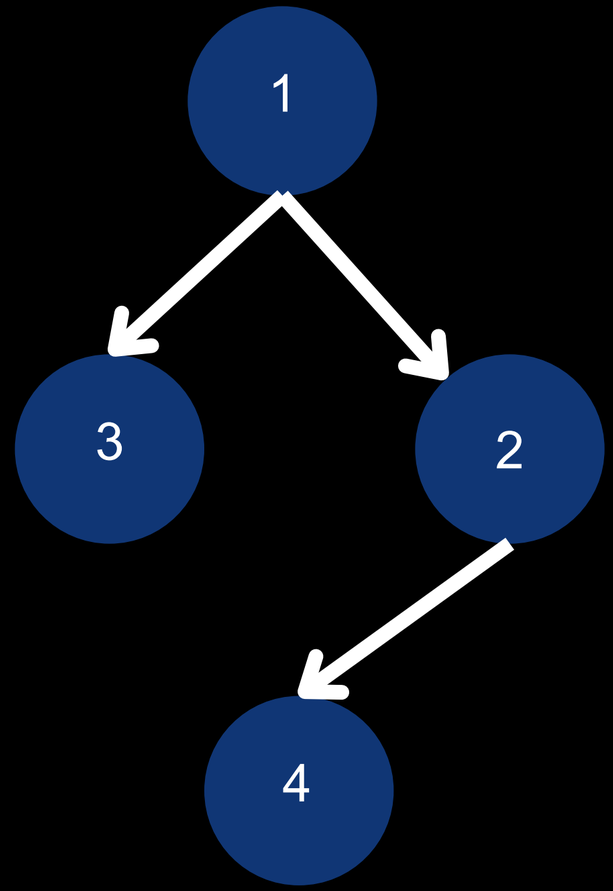
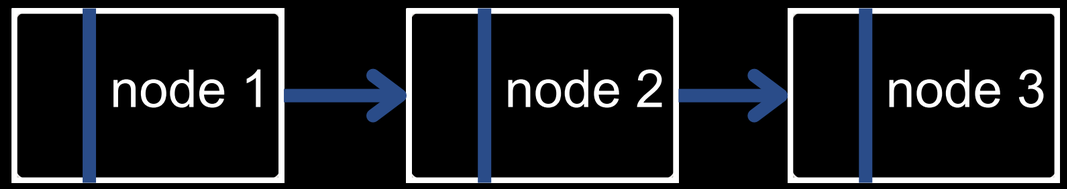
DATA STRUCTURE





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Sub-quadratic Sorting

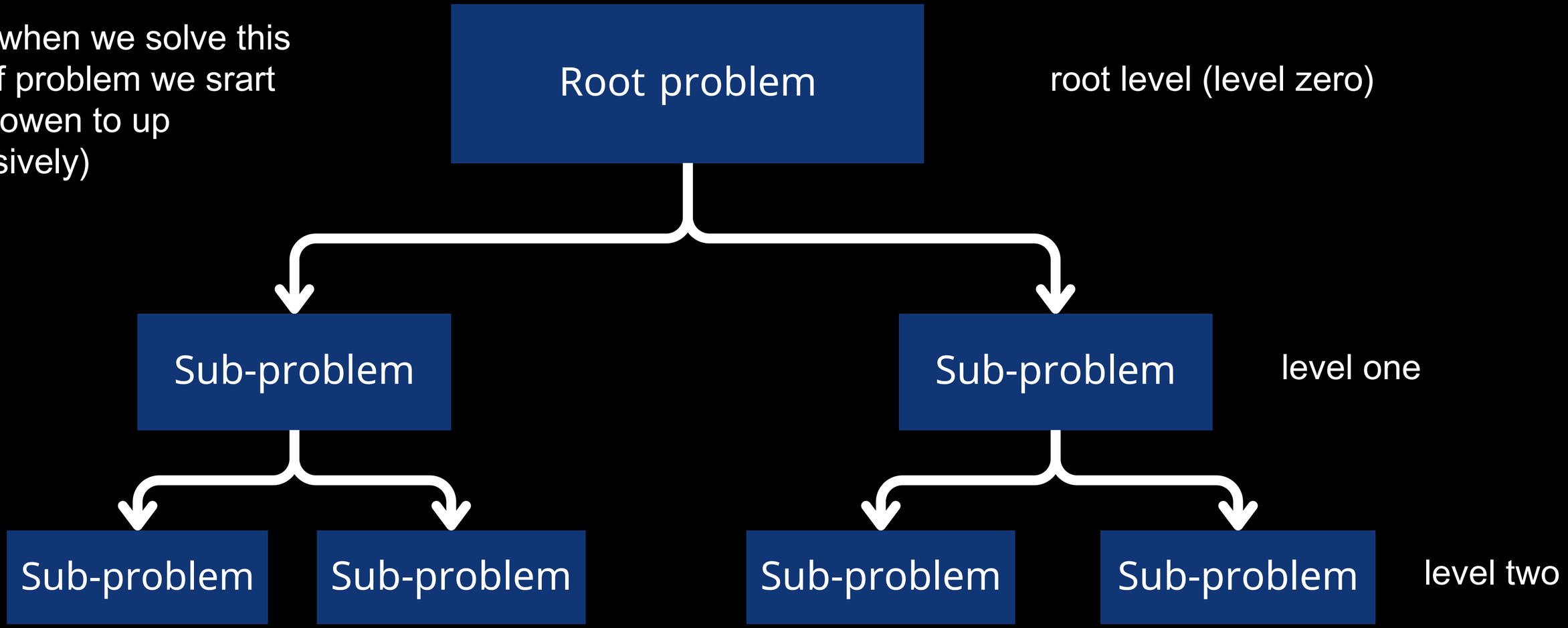
Divide and Conquer

We have a big problem , we divide it into small problems.

We have four steps to do that.

- Base Case, solve the problem directly if it is small enough.
- Divide the problem into two or more similar and smaller subproblems.
- Recursively solve the subproblems
- Combine solutions to the subproblems.

note : when we solve this type of problem we srart form dowen to up (recursively)



Shell Sort

shell sort is just a modified type of insertaion sort

gap sequence : its all about making sub-arrays of the original array

we initialize gap by divide n(array size) by 2 each time we loop in the array

and then we make insertation sort in each sub array untill the original array is sorted

algo for shell sort

first : Using the gap sequence as a guide, divide the array into subarrays.

second: Perform an insertion sort on each subarray.

third: Execute a final insertion sort on the entire array after reducing the gap until it equals 0 or 1

Merge Sort

merge sort it all about divide and conquer and recursive operations

Merge sort steps

1. Divide Step
Recursively divide the array into two halves until each subarray contains a single element.

2. Merge Step
Combine two sorted subarrays back into a single sorted subarray.

3. Base Case
If the array contains one or zero elements, it is already sorted.

Quick Sort

Quick Sort : its all about pivot , divide and conquer , recursive operations

what is pivot : the pivot is a key element used to divide the array into two parts

Partitioning the Array:

The pivot acts as a reference point.

All elements smaller than the pivot are placed to its left.

All elements larger than the pivot are placed to its right.

Steps of Quick Sort

1. Divide (Partitioning)
Select a pivot element (commonly the last element in the array).
Rearrange the array so that:
All elements smaller than the pivot are on its left.
All elements larger than the pivot are on its right.

2. Conquer (Recursive Sorting)
Recursively apply Quick Sort to the left and right partitions until the subarrays are of size 1 or 0 (already sorted).

Thanks

All code and examples can be found on GitHub https://github.com/ESSAMMOHAMED1