

Synopsis of Data Structures Lab PBL

Terminal Data Structures & Algorithms Visualizer

Department: Department of Computer Science & IT

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Brief Description

Terminal Data Structures & Algorithms Visualizer is a text-based tool that shows how common data structures and algorithms work, directly in the terminal. It uses simple block characters and a little color to animate each step. The goal is to make the logic easy to understand and to let students see what happens during inserts, searches, swaps, rotations, and probes.

Main Features

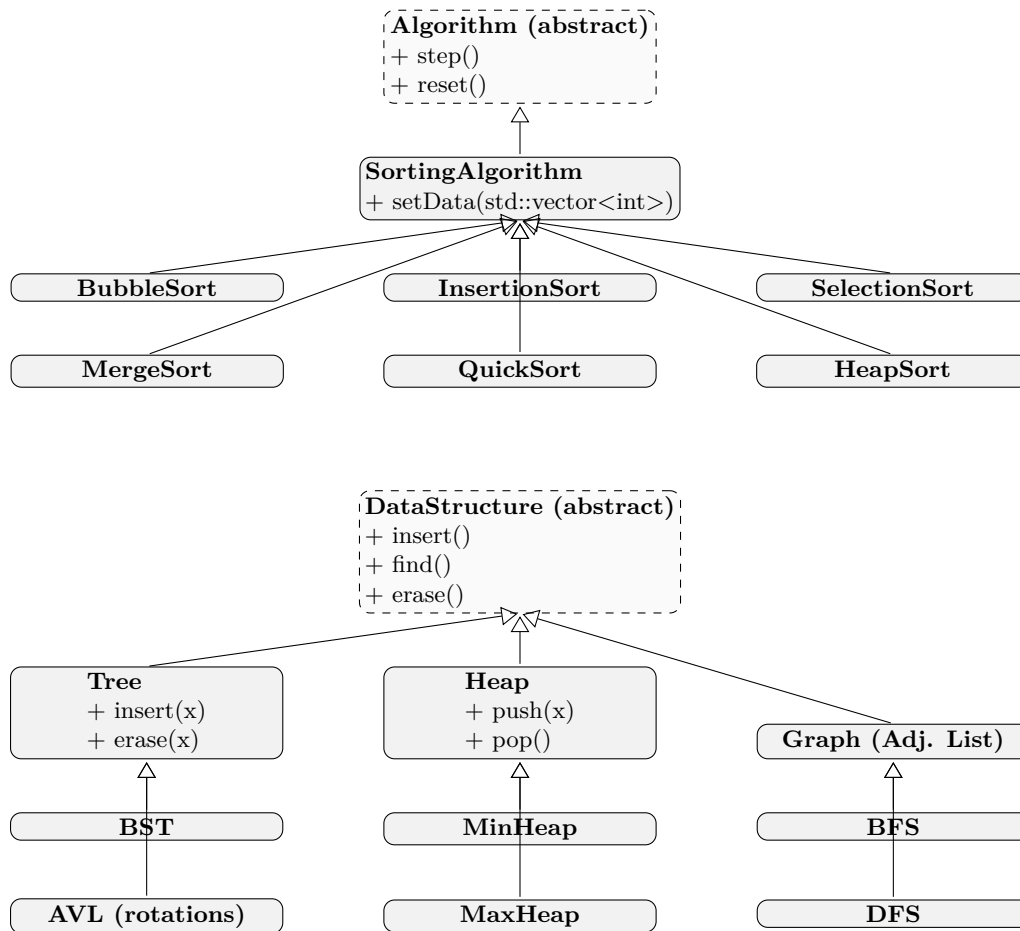
- **Sorting animations:** Bubble, Insertion, Selection, Merge, Quick, and Heap sort. Bars move and swap so we can follow every comparison.
- **Hash map demo:** Insert/search/delete with four collision methods: *separate chaining*, *linear probing*, *quadratic probing*, and *double hashing*. We show probe paths and load factor.
- **Trees & heaps:** Binary Search Tree (BST), AVL (with rotations), and Binary Heap (min/max).
- **Graphs:** BFS and DFS on a small graph (adjacency list).
- **Controls:** Play/pause, single-step, speed, input size, random or custom inputs, fixed seed for repeatable runs.

Mapping to Real-Life Applications

Topic	Where it shows up
Sorting (Quick/Merge/Heap)	Ordering rows in databases, cleaning logs, ranking search results.
Hash Map (Chain- ing/Probing)	Very fast key-value lookups: caches, symbol tables in compilers, routing tables.
BST / AVL	In-memory indexes and range queries with predictable $O(\log n)$ time.
Binary Heap (PQ)	Schedulers and priority queues; Dijkstra/A* shortest path.
Graphs (BFS/DFS)	Network reachability, crawling web pages, finding connections in social graphs.

Data Structures & Algorithms (Class Diagram)

(A) Sorting + Core DS & Graph Algorithms



(B) Hash Map & Collision Strategies

