

Introduction to Data Structures

Data structures organize and store data efficiently. They improve management and access speed.

Used widely, like in file systems and databases, for better data handling.



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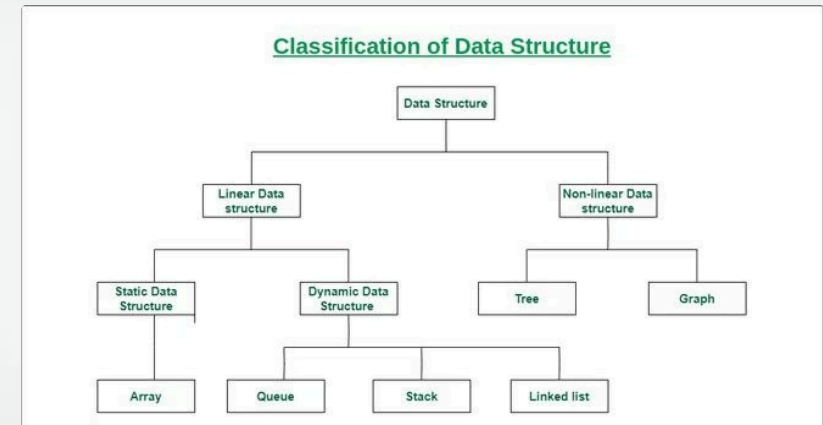
Types of Data Structures (Mind Map)

Linear Structures

Arrays, Linked Lists, Stacks, Queues arranged in sequence.

Non-Linear Structures

Trees, Graphs, Hash Tables showing complex relationships.



Arrays: The Foundation

Key Features

- Continuous memory blocks
- Fixed size
- Fast random access

Common Uses

- List storage
- Matrices representation

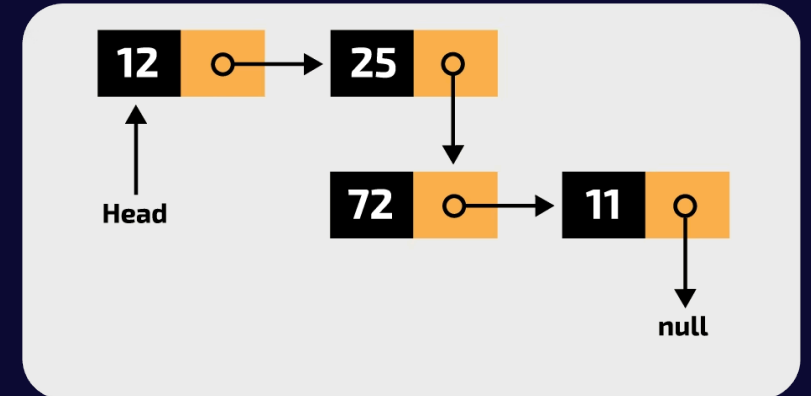
Linked Lists: Dynamic Chains

Features

Dynamic size and efficient insertion/deletion.

Uses

Stacks, queues, and symbol table implementations.



Types of Linked Lists & Applications

- Singly: One-directional traversal
- Doubly: Bidirectional with extra memory
- Circular: Ends connect back to start

Applications

- Dynamic memory management
- Polynomial calculations

Stacks: Last-In, First-Out (LIFO)

1

Push

Add element on top

2

Pop

Remove element from top

3

Peek

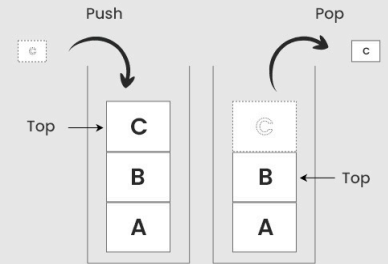
View top element

Used in undo features, expression evaluation, and managing function calls.



Stack

Data Structure



Queues: First-In, First-Out (FIFO)

1

Enqueue

Add element at rear

2

Dequeue

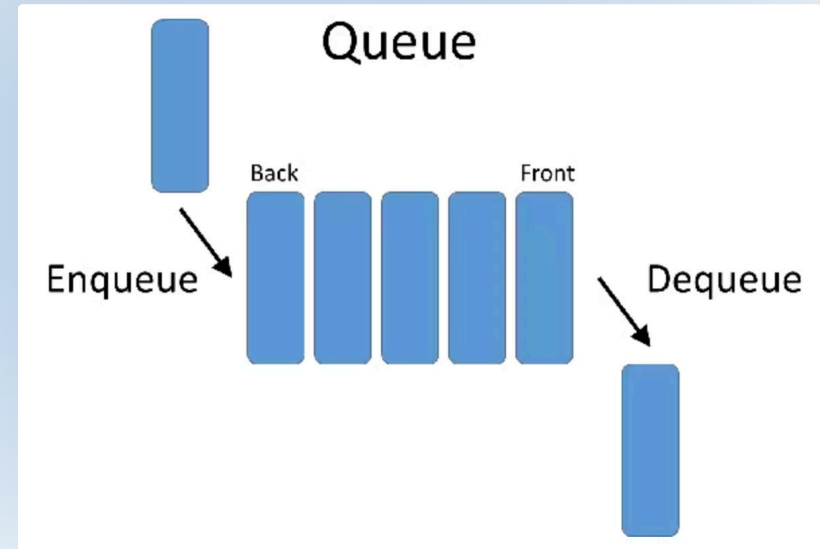
Remove element from front

3

Peek

View front element

Common in print queues, BFS algorithms, and customer support systems.



Stacks vs. Queues: A Detailed Comparison



Access Method	LIFO (Stack)	FIFO (Queue)
Insertion Point	Top	Rear
Deletion Point	Top	Front
Use Case	Function calls, Undo	Task scheduling, BFS

Trees and Graphs: Complex Structures

Trees

Hierarchical data like file directories and XML.

Graphs

Model networks such as social connections and routes.

Conclusion: Data Structures in Action

Summary

We covered arrays, lists, stacks, queues, trees, and graphs.

Importance

Right structures boost efficiency and simplify problem solving.

Next Steps

Explore books, courses, and practice coding exercises.

