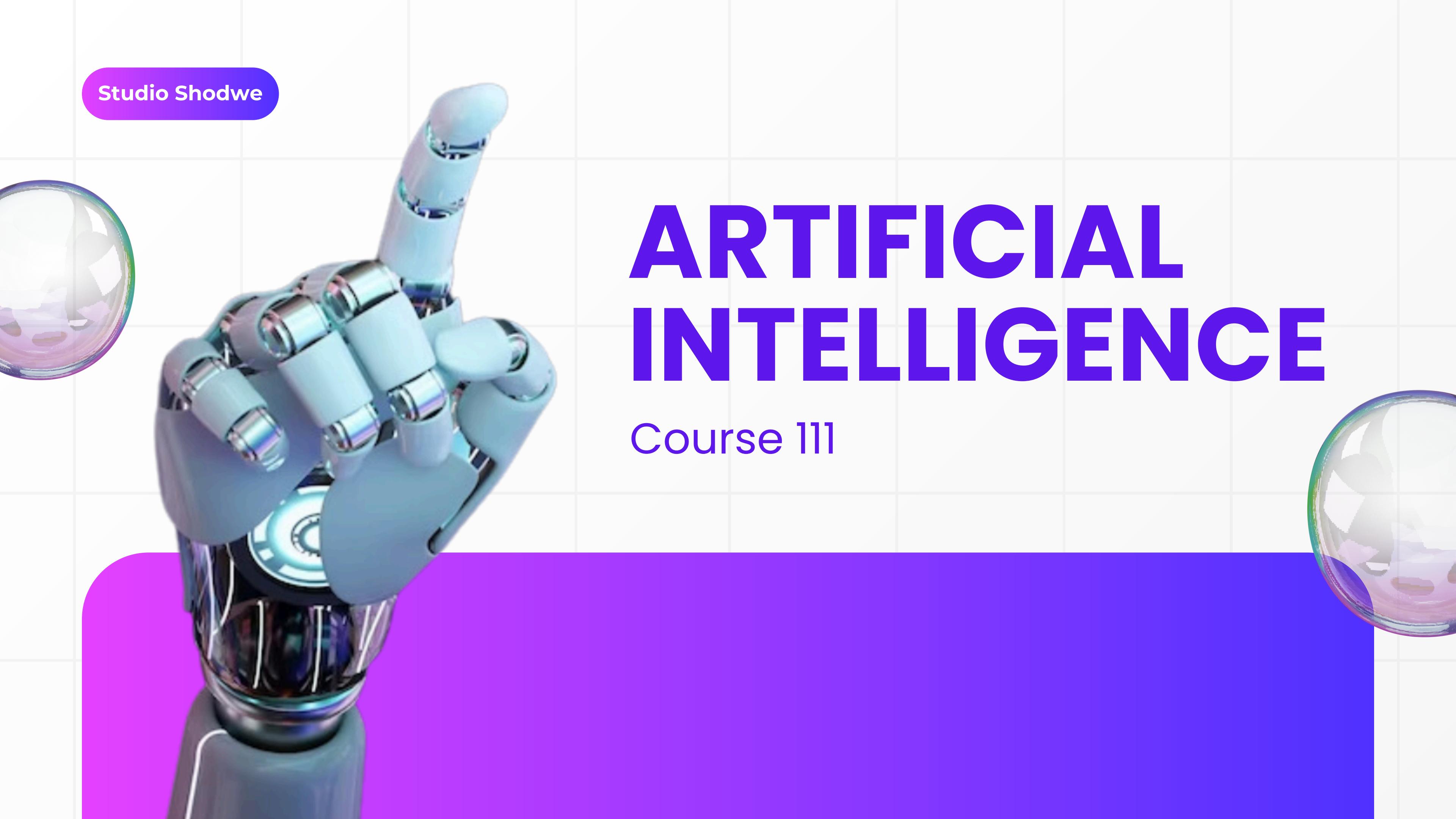


Studio Shodwe



ARTIFICIAL INTELLIGENCE

Course 111

1. What is Complexity?

IComplexity refers to the amount of resources required to execute an algorithm, such as time (Time Complexity) and memory (Space Complexity)



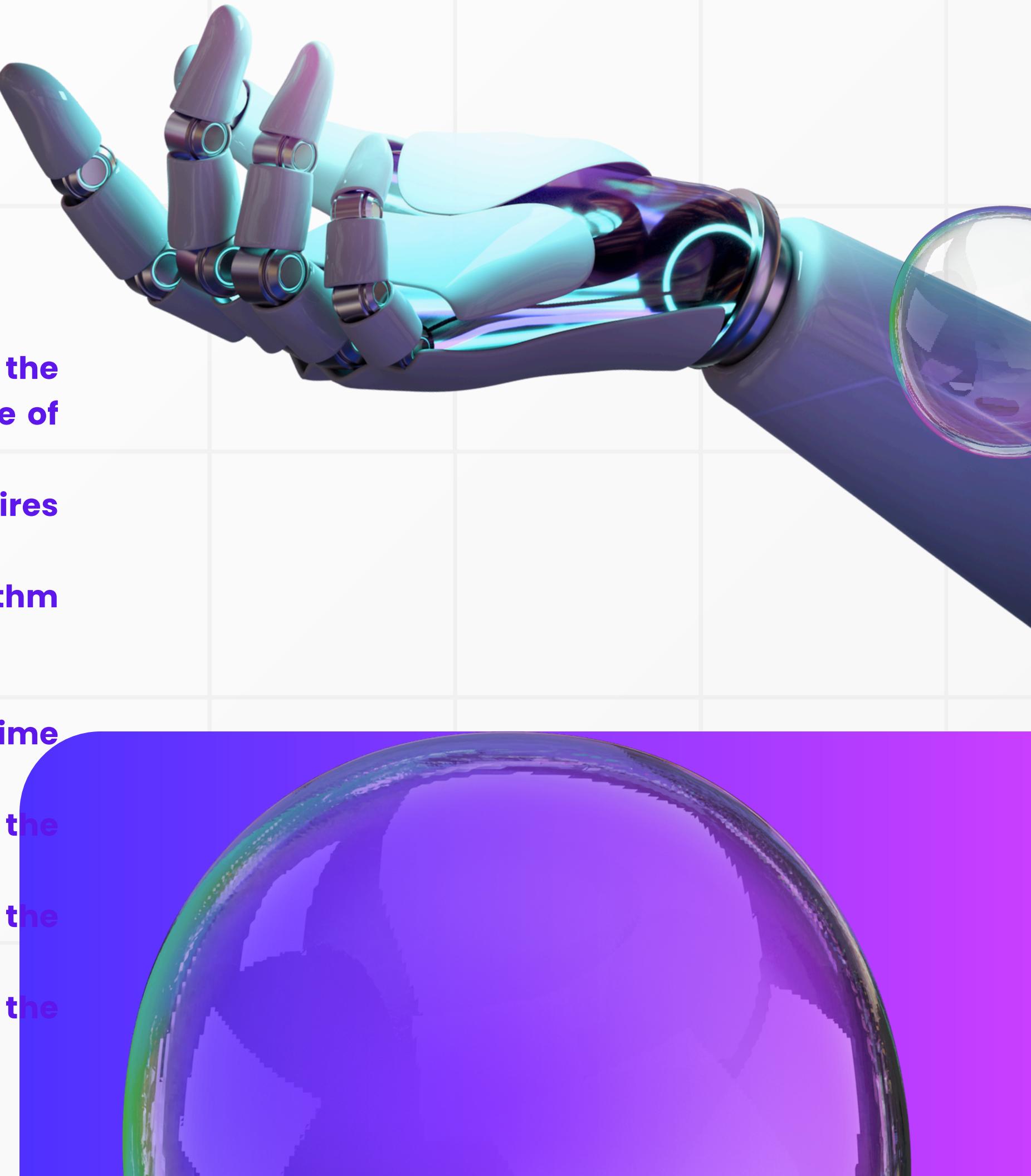
2. How To Calculate Complexity

To calculate the complexity of an algorithm, we analyze the number of basic operations or steps it takes relative to the size of the input. There are two main scenarios:

- **Best Case:** Describes the scenario where the algorithm requires the fewest operations.
- **Worst Case:** Describes the scenario where the algorithm requires the maximum number of operations.

Common Complexities:

- **$O(1)$:** Constant time, the algorithm takes a fixed amount of time regardless of the input size.
- **$O(n)$:** Linear time, the time increases linearly with the size of the input.
- **$O(\log n)$:** Logarithmic time, the time increases slowly with the size of the input.
- **$O(n^2)$:** Quadratic time, the time increases significantly with the size of the input.



3. Complexity of Binary Search

worst Case = $O(\log n)$
Best Case = $O(1)$



4 .Complexity Of Linear Search

worst Case = $O(n)$

Best Case = $O(1)$



5. Types OF Search

1. Hash Search:

This type of search uses a data structure called a hash table. Elements are stored in the table based on a hash function that converts values into specific positions in the table. It allows very fast access to the elements.

Complexity:

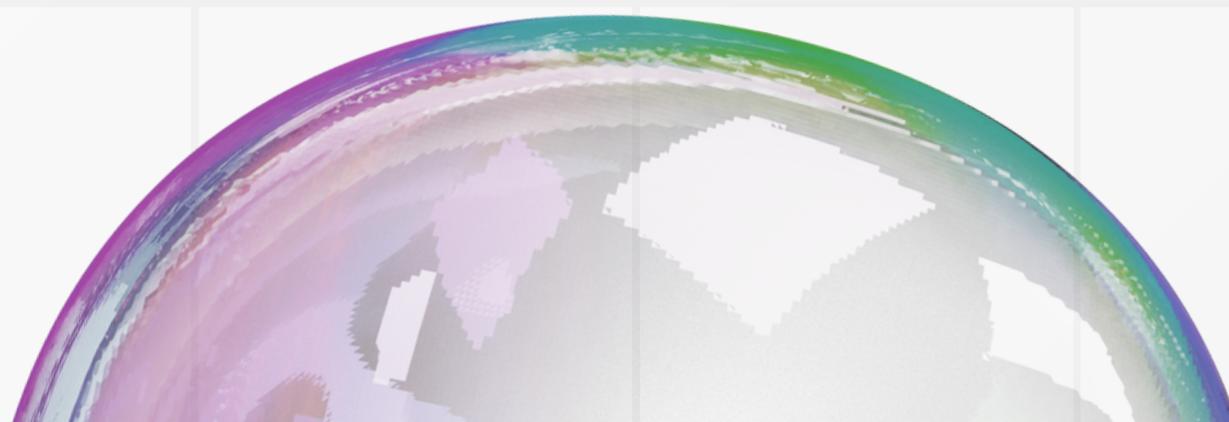
- **Best Case: $O(1)$** – Direct access to the location.
- **Worst Case: $O(n)$** – In the case of significant collisions in the table.

2. Tree Search:

Tree search is used in data structures like Binary Search Trees (BST) or AVL Trees. The search process involves comparing the desired element with the current node and moving left or right until the element is found or a null node is reached.

Complexity:

- **Best Case: $O(\log n)$** – If the tree is balanced.
- **Worst Case: $O(n)$** – If the tree is unbalanced and degenerates into a linked list.



Thank You.

