**Task Management System**

**Understand Linked Lists**

**Singly Linked List:**

* A singly linked list consists of nodes where each node contains data and a reference (or link) to the next node in the sequence.
* Operations like insertion and deletion are generally efficient as they do not require shifting elements like in arrays.

**Doubly Linked List:**

* A doubly linked list consists of nodes where each node contains data, a reference to the next node, and a reference to the previous node.
* It allows traversal in both directions, forward and backward.
* It uses more memory due to the additional reference to the previous node.

**Analysis**

**Time Complexity:**

* **Add Task:** O(n) in the worst case (when the list is traversed to the end).
* **Search Task:** O(n) in the worst case (when the task is at the end or not found).
* **Traverse:** O(n) as it visits each node once.
* **Delete Task:** O(n) in the worst case (when the task is at the end or not found).

**Advantages of Linked Lists over Arrays:**

* **Dynamic Size:** Linked lists can easily grow and shrink in size by adding or removing nodes without reallocating or re-organizing the entire structure.
* **Efficient Insertions/Deletions:** Adding or removing elements in linked lists does not require shifting elements, making these operations faster than in arrays, especially for large datasets.
* **Memory Utilization:** Linked lists use memory proportional to the number of elements, without pre-allocating extra space, unlike arrays which may allocate more memory than necessary to allow for growth.