LECTURE-4

Linear Data Structures

Linked Lists

CS202: Data Structures (Fall 2025)

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Quick Recap

AbstractDataType is mathematical model of a data structure.

OR

AbstractDataType is a **contract** of a data structure.

List ADT is an ordered collection of items

Agenda

- Dynamic Arrays (A hack for arrays being fixed size!)
- Linked Lists

List ADT

```
template <typename T>
class List {
Public:
        virtual void insert( const T& element) = 0;

        virtual void delete( const T& element) = 0;

        virtual Node * find( const T& element) = 0;

        virtual T get( int index) = 0;

        virtual bool isEmpty() = 0;

        virtual bool size() = 0;
```

List ADT

List ADT is agnostic of implementation!

We will now debate various possible implementations of a List ADT:

- Array
- Linked List

List (Array)

- Private data members?
- Implementation of the List functions?
- Can we run out of space in this list?

List (Array)

- Pros:
  - O(1) indexing
  - Easy addition to end of list.
  - Memory locality: Contiguous memory and prefetching

- Cons:
  - Pre-allocated space: Rigid in size (used or unused)
  - Have to make space in array to add something to the middle.
  - we can run out of space. So we allocate **extra** space!