CSC148 *Intro. to Computer Science*

Lecture 5: *Linked Lists*

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Review

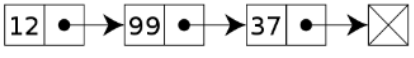
- So far
  - Class design and implementation
  - Composition and inheritance
  - Inheriting, extending, and overriding
  - Specific examples:
    - Shape: square, right angled triangle
    - Container: stack, sack
  - Intro to linked lists
- Today
  - More on inked lists
  - Wrappers and helpers

Regular lists vs. linked lists

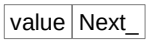
- Regular Python lists:
  - pro(s): it can efficiently be accessed
  - con(s): they allocate large blocks of contiguous memory, which becomes increasingly difficult as memory is in use.
- Linked list nodes reserve just enough memory for the object value they want to refer to, a reference to it, and a reference to the next node in the list
  - Pro(s): it can efficiently grow and shrink, as needed

Linked list

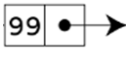
- For now, we implement a linked list as objects (nodes) with a value and a reference to other similar objects



Helper: Node



- Examples:



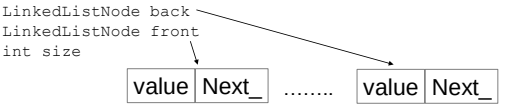
Helper: LinkedListNode class

```
class LinkedListNode:
    """
    Node to be used in linked list

    === Attributes ===
    @param LinkedListNode next_: successor to this LinkedListNode
    @param object value: data this LinkedListNode represents
    """
    def __init__(self, value, next_=None):
        """
        Create LinkedListNode self with data value and successor
next_.

        @param LinkedListNode self: this LinkedListNode
        @param object value: data of this linked list node
        @param LinkedListNode|None next_: successor to this
LinkedListNode.
        @rtype: None
        """
        self.value= value
        self.next_= next_
```

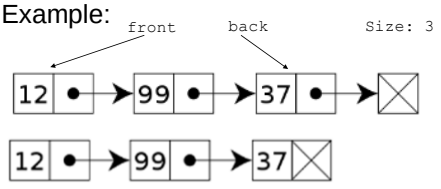
Helper: LinkedListNode class

What other methods does class node, ie. LinkedListNode need?

Wrapper: LinkedList



- Example:



Wrapper: LinkedList class

```
class LinkedList:
    """
    Collection of LinkedListNodes

    === Attributes ==
    @param: LinkedListNode front: first node of this LinkedList
    @param LinkedListNode back: last node of this LinkedList
    @param int size: number of nodes in this LinkedList
                     a non-negative integer
    """
    def __init__(self):
        """
        Create an empty linked list.

        @param LinkedList self: this LinkedList
        @rtype: None
        """
        self.front, self.back = None, None
        self.size = 0
```


Wrapper: LinkedList class

What other methods does class LinkedList need?