



CCCS 104 - Data Structures and Algorithms **LEARNING TASK (LINEAR DATA STRUCTURE - LIST)**

GROUP NO: 9

SECTION: BSCS 2A

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RATIONALE

Explain briefly List Linear Data Structure, how it works? What are the common examples? Its applications?

- *Data structures such as List Linear Data Structure is a specific way of organizing data in a specialized format on a computer so that the information can be organized, processed, stored, and retrieved quickly and effectively. A linked list is a linear data structure where each element is a separate object. It is made up of two items that are data and a reference to the next node. A reference to the next node is given with the help of pointers and data is the value of a node. Each node contains data and links to the other nodes. It is an ordered collection of data elements called a node and the linear order is maintained by pointers. List Linear Data Structure are mostly utilized in software development and there are application for list linear data structure which are the implementation of stack and queue, implementation of graph, dynamic memory allocation, performing arithmetic operations on long integers and many more.*

Introduce your develop Python program, what can it do?

- *The Python Program that we developed implements List Data Structure using Linked List. It also has a Menu that has many choices that are going to perform data structures operations like insertion, deletion, and search. The program also asks for user input such as the value to be inserted, and the position or the index of a given integer. It is also capable of looping in which the menu's choices are possible to be selected and the user's inputs are possible to be stored in every loop.*



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USER GUIDE

Step by step instructions on how to use your program. Include images for easily visualization

Step 1

Enter the user input from 1-10

Image 1

```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\marcc> & C:/Users/marcc/AppData/Local/Programs/Python/Python310/python.exe "d:/CSPC-2ND YEAR.1ST SEM/CCCS 104 -DATA STRUCTURES/LEARNING TASK/linked_list_latest1.py"

LinkedList Main Menu:
[1] Insert at Start
[2] Insert at End
[3] Insert at Position
[4] Delete at Start
[5] Delete at End
[6] Delete at Position
[7] Delete Number
[8] Search Number
[9] Display Number At Position
[10] Display Linked List
[0] Exit

Enter choice: 
```

Step 2

-Select [1] to insert at start by typing 1
-input the integer to be inserted.

Image 2

```
LinkedList Main Menu:
[1] Insert at Start
[2] Insert at End
[3] Insert at Position
[4] Delete at Start
[5] Delete at End
[6] Delete at Position
[7] Delete Number
[8] Search Number
[9] Display Number At Position
[10] Display Linked List
[0] Exit

Enter choice: 1
Enter integer to insert: 2
Data is inserted at beginning

LinkedList Main Menu:
[1] Insert at Start
[2] Insert at End
[3] Insert at Position
[4] Delete at Start
[5] Delete at End
[6] Delete at Position
[7] Delete Number
[8] Search Number
[9] Display Number At Position
[10] Display Linked List
[0] Exit

Enter choice: 1
Enter integer to insert: 4
Data is inserted at beginning
```



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```
LinkedList Main Menu:
[1] Insert at Start
[2] Insert at End
[3] Insert at Position
[4] Delete at Start
[5] Delete at End
[6] Delete at Position
[7] Delete Number
[8] Search Number
[9] Display Number At Position
[10] Display Linked List
[0] Exit

Enter choice: 1
Enter integer to insert: 5
Data is inserted at beginning
```

Step 3

-Select [2] to insert at end by typing 2

-input the integer to be inserted

Image 3

```
LinkedList Main Menu:
[1] Insert at Start
[2] Insert at End
[3] Insert at Position
[4] Delete at Start
[5] Delete at End
[6] Delete at Position
[7] Delete Number
[8] Search Number
[9] Display Number At Position
[10] Display Linked List
[0] Exit

Enter choice: 2
Enter integer to insert: 1
Data Inserted at end
```

Step 4

-Select [3] to insert at position by typing 3

-input the integer to be inserted

-input the position where to insert the integer

***note**

-to check all the integer in the list, select [10]

Image 4

```
LinkedList Main Menu:
[1] Insert at Start
[2] Insert at End
[3] Insert at Position
[4] Delete at Start
[5] Delete at End
[6] Delete at Position
[7] Delete Number
[8] Search Number
[9] Display Number At Position
[10] Display Linked List
[0] Exit

Enter choice: 3
Enter integer to insert: 3
Insert at position: 2
Data Inserted at position 2
```

***note: to check the integers' positions [10]**

```
Enter choice: 10
head->5->4->3->2->1->None
```



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Step 5

-Select [4] to delete at start by typing 4

Image 5

```
LinkedList Main Menu:
[1] Insert at Start
[2] Insert at End
[3] Insert at Position
[4] Delete at Start
[5] Delete at End
[6] Delete at Position
[7] Delete Number
[8] Search Number
[9] Display Number At Position
[10] Display Linked List
[0] Exit

Enter choice: 4
Removed value from beginning: 5
```

Step 6

-Select [5] to delete at end by typing 5

Image 6

```
LinkedList Main Menu:
[1] Insert at Start
[2] Insert at End
[3] Insert at Position
[4] Delete at Start
[5] Delete at End
[6] Delete at Position
[7] Delete Number
[8] Search Number
[9] Display Number At Position
[10] Display Linked List
[0] Exit

Enter choice: 5
Removed value at end: 1
```

Step 7

-Select [6] to delete at position by typing 6
-enter the position of the value to be deleted

Image 7

```
LinkedList Main Menu:
[1] Insert at Start
[2] Insert at End
[3] Insert at Position
[4] Delete at Start
[5] Delete at End
[6] Delete at Position
[7] Delete Number
[8] Search Number
[9] Display Number At Position
[10] Display Linked List
[0] Exit

Enter choice: 6
Remove value at position: 1
Data removed at 1
```



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Step 8

- Select [7] to delete at position by typing 7
- enter the value of the number to be deleted

Image 8

```
LinkedList Main Menu:
[1] Insert at Start
[2] Insert at End
[3] Insert at Position
[4] Delete at Start
[5] Delete at End
[6] Delete at Position
[7] Delete Number
[8] Search Number
[9] Display Number At Position
[10] Display Linked List
[0] Exit

Enter choice: 7
Enter the value of the number to be deleted: 2
Value 2 has been successfully deleted.
```

Step 9

- Select [8] to delete at position by typing 8
- enter the value to search

Image 9

```
LinkedList Main Menu:
[1] Insert at Start
[2] Insert at End
[3] Insert at Position
[4] Delete at Start
[5] Delete at End
[6] Delete at Position
[7] Delete Number
[8] Search Number
[9] Display Number At Position
[10] Display Linked List
[0] Exit

Enter choice: 8
Enter value to search: 4
Value 4 is at position 0
```

Step 10

- Select [9] to display number at position by typing 9
- enter the position of the value

Image 10



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```
LinkedList Main Menu:
[1] Insert at Start
[2] Insert at End
[3] Insert at Position
[4] Delete at Start
[5] Delete at End
[6] Delete at Position
[7] Delete Number
[8] Search Number
[9] Display Number At Position
[10] Display Linked List
[0] Exit

Enter choice: 9
Get value at position: 0
Value at position 0 is 4
```

Step 11

Select [10] to display linked list by typing 10

Image 11

*After inserting 5 integers in the list using [1] Insert at start (2, 4, 5), [2] Insert at end (1), and [3] Insert at position (3 at index 2).

```
LinkedList Main Menu:
[1] Insert at Start
[2] Insert at End
[3] Insert at Position
[4] Delete at Start
[5] Delete at End
[6] Delete at Position
[7] Delete Number
[8] Search Number
[9] Display Number At Position
[10] Display Linked List
[0] Exit

Enter choice: 10
head->5->4->3->2->1->None
```

*After deleting 4 Integers using choices [4] Delete at Start, [5] Delete at End, [6] Delete at position, [7] Delete Number.

```
LinkedList Main Menu:
[1] Insert at Start
[2] Insert at End
[3] Insert at Position
[4] Delete at Start
[5] Delete at End
[6] Delete at Position
[7] Delete Number
[8] Search Number
[9] Display Number At Position
[10] Display Linked List
[0] Exit

Enter choice: 10
head->4->None
```

Step 12

Select [0] to exit by typing 0

Image 12

```
LinkedList Main Menu:
[1] Insert at Start
[2] Insert at End
[3] Insert at Position
[4] Delete at Start
[5] Delete at End
[6] Delete at Position
[7] Delete Number
[8] Search Number
[9] Display Number At Position
[10] Display Linked List
[0] Exit

Enter choice: 0
Thank you!
```



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PROGRAM CODE

Insert your Python code here, be sure to add comments to describe each line/set of codes...

```
#Python program that will implement a List Data Structure using Linked List and menu

#define class node
class Node:

    def __init__(self,data=None,next=None):
        self.data=data
        self.next=next

    def print(self):
        pass

#define class
class LinkedList:
    def __init__(self):
        self.head=None

    # Insert At Start
    def push_front(self,data):
        self.head=Node(data,self.head)

    # Insert At End
    def push_back(self,data):
        i=self.head
        if i:
            while i.next:
                i=i.next
            i.next=Node(data,i.next)
        else:
            self.head=Node(data,self.head)

    #Insert At Position
    def push_at(self,index,data):
        i=self.head
        if i and index>0:
            j=0
            while i.next and j<index-1:
                j+=1
                i=i.next
            i.next=Node(data,i.next)
        else:
            self.head=Node(data,self.head)
```



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```
#Delete At End
def pop_back(self):
    i=self.head
    if i:
        while i.next:
            j=i
            i=i.next
            j.next=i.next
        return i

#Delete At Position
def pop_at(self,index):
    i=self.head
    if i:
        if index>0:
            k=0
            while i.next and k<index:
                k+=1
                j=i
                i=i.next
            j.next=i.next
        elif index==0:
            self.head=self.head.next
        return i

#Delete At Start
def pop_front(self):
    node=self.head
    self.head=self.head.next
    return node

#Display Number At Position
def peek_at(self,index):
    i=self.head
    if i and index>0:
        j=0
        while i.next and j<index:
            j+=1
            i=i.next
        return i

#Search Number
def search(self,data):
    i=self.head
    j=-1
    k=0
    while i:
        if i.data==data:
            j=k
            break
        k+=1
```




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```
        i=i.next
    return j

# Display items of the List
def print(self):
    i=self.head
    print('head',end='->')
    while i:
        print(i.data,end='->')
        i=i.next
    print('None')

#define class
class LinkedListSystem:
    def __init__(self):
        self.linked_list=LinkedList()

#define menu
def main_menu(self):
    quit=False
    while not quit:

        # display all the choices in the menu
        print(
            '\nLinkedList Main Menu:\n'+
            '[1] Insert at Start\n'+
            '[2] Insert at End\n'+
            '[3] Insert at Position\n'+
            '[4] Delete at Start\n'+
            '[5] Delete at End\n'+
            '[6] Delete at Position\n'+
            '[7] Delete Number\n'+
            '[8] Search Number\n'+
            '[9] Display Number At Position\n'+
            '[10] Display Linked List\n'+
            '[0] Exit\n\n'
        )

        # ask for the user input
        choice=int(input('Enter choice: '))

        #if else statement that assigns function to the menu choices
        if choice==0:
            quit=True
            continue
        elif choice==1:
            self.insert_at_start()
        elif choice==2:
            self.insert_at_end()
        elif choice==3:
            self.insert_at_position()
```



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```
elif choice==4:
    self.delete_at_start()
elif choice==5:
    self.delete_at_end()
elif choice==6:
    self.delete_at_position()
elif choice==7:
    self.delete_number()
elif choice==8:
    self.search_number()
elif choice==9:
    self.display_number_at_position()
elif choice==10:
    self.print_linked_list()

print('Thank you!')

#function of choice 1
def insert_at_start(self):
    data=int(input('Enter integer to insert: '))
    self.linked_list.push_front(data)
    print('Data is inserted at beginning')

#function of choice 2
def insert_at_end(self):
    data=int(input('Enter integer to insert: '))
    self.linked_list.push_back(data)
    print('Data Inserted at end')

#function of choice 3
def insert_at_position(self):
    data=int(input('Enter integer to insert: '))
    index=int(input('Insert at position: '))

    self.linked_list.push_at(index,data)

    print('Data Inserted at position',index)

#function of choice 4
def delete_at_start(self):
    print('Removed value from beginning: ',self.linked_list.pop_front().data)

#function of choice 5
def delete_at_end(self):
    print('Removed value at end: ',self.linked_list.pop_back().data)

#function of choice 6
def delete_at_position(self):
    index=int(input('Remove value at position: '))
    self.linked_list.pop_at(index)
    print('Data removed at',index)
```



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```
#function of choice 7
def delete_number(self):
    data=int(input(' Enters the value of the number to be deleted: '))
    index=self.linked_list.pop_at(data)
    if index== -1:
        print('Value',data,"is not on the list and cannot be deleted.")
    else:
        print('Value',data,'has been successfully deleted.')

#function of choice 8
def search_number(self):
    data=int(input('Enter value to search: '))
    index=self.linked_list.search(data)
    if index== -1:
        print('Value',data,'not found.')
    else:
        print('Value',data,'is at position',index)

#function of choice 9
def display_number_at_position(self):
    index=int(input('Get value at position: '))
    print('Value at position',index,'is',self.linked_list.peek_at(index).data)

#function of choice 10
def print_linked_list(self):
    self.linked_list.print()

sys=LinkedListSystem()

sys.main_menu()
```



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TUTORIAL VIDEO

YouTube Link: <https://youtu.be/YN2oC-HJEFk>

TAKEAWAYS

Name of Member: Venn P. Delos Santos
Contribution to the Group: coding the program & video documentation
Learnings: Learned the idea how to perform Data Structures Operations such as Insertion, Deletion, and Search in a simple Linked List program.

Name of Member: Marc Christian D. Tumaneng
Contribution to the Group: coding the program & video documentation
Learnings: I learned the concept of List Data Structure, linked list and somehow understand its applications.

Name of Member: John Mark A. Pajenago
Contribution to the Group: coding the program & video documentation
Learnings: I learned that how to create node and distinguish what is linked list and how it work and to code in python



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