National University of Computer & Emerging Sciences (NUCES), Islamabad
School of Computing

DATA STRUCTURES – FALL 2021

LAB 08

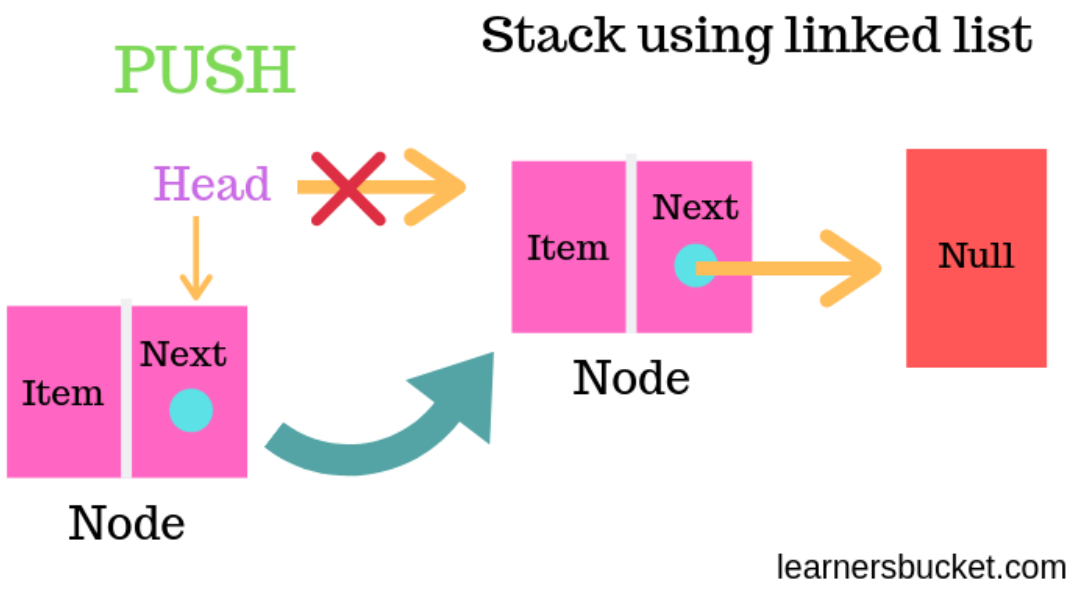
Learning Outcomes

In this lab you are expected to learn the following:

- **Implement the Stack using linked list**
- Google testing

Structure

Stack is a linear data structure which follows a particular order in which the operations are performed. The order may be LIFO (Last in First Out) or FILO (First in Last Out).
Implement a stack using single linked list in which all the single linked list operations perform based on Stack operations LIFO (last in first out) and with the help of that knowledge we are going to implement a stack using single linked list. We are storing the information in the form of nodes and we need to follow the stack rules and we need to implement using single linked list nodes so what are the rules we need to follow in the implementation of a stack a simple rule that is last in first out. All the operations we should perform with the help of a **top** variable.



Practice Tasks

This section will provide more practice exercises which you need to finish during the lab. You need to finish the tasks in the required time.

Note: Implementation of all the variables should be template-based.

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Lab Task 1 (Time 1 hr. 10 Minutes)

Implement Following Operations

1) Stack (int ignored = 0)

Requirements: None
Results: Constructor. Creates an empty stack.

2) void push (Dataitem)

Requirements: None
Results: Push the element at top of the stack.

3) void pop ()

Requirements: Stack is not empty
Results: Remove the element from the top of the stack.

4) DataItem peak ()

Requirements: Stack is not empty
Results: Return the element of the top of the stack.

5) void clear ()

Requirements: None
Results: Removes all the elements from a stack.

6) Bool isEmpty ()

Requirements: None
Results: Returns **true** if a stack is empty. Otherwise, returns **false**.

7) int sizeofstack ()

Requirements: None
Results: Returns the length of the stack.

Test Plan

Test case	Commands	Expected Result
Push	1	1
	2	1, 2
	3	1, 2,3
	4	1,2,3,4
	5	1,2,3,4,5
pop		5
pop		4
isEmpty		FALSE
clear		isEmpty ==TRUE

Lab Task 2 (Time 50 minutes)

Write a code that takes a string into array then pass that array to a function. Function will perform the following operation on the string **using stack**.

- Remove spaces and special characters (use only., %#! *[{()}]) from the string

  Hint: You can create a separate function to clean the string
- After the cleaning, function will check the given cleaned string is palindrome or not and return true or false accordingly.

Test Plan		
Test case	Commands	Expected Result
Validate	M A%! DAm#	True
InValidate	Universi ty	False

Hint: Use the above Stack class object in the above function