



UNIVERSITY OF CALOOCAN CITY
COMPUTER ENGINEERING DEPARTMENT



Data Structure and Algorithm

Laboratory Activity No. 5

Python Data Structures

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I. Objectives

Introduction

Data Structures are fundamentals of any programming language around which a program is built.

This laboratory activity aims to implement the principles and techniques in:

- Writing algorithms using Array data structure
- Writing a python program that can implement Array data structure

II. Activity

1. What is a singly linked list, and how does it differ from an array?
2. When would you prefer a linked list over an array, and vice versa?
3. How are linked lists used in real-world applications (e.g., browser history, undo functionality)?
4. Cite your reference/s

III. Answer

1. A singly linked list is a data structure composed of nodes, where each node contains data and a pointer to the next node, allowing traversal in one direction only. Unlike an array, which stores elements in contiguous memory locations with fixed size and allows constant-time access by index, a singly linked list stores elements non-contiguously with dynamic size, requiring sequential access that takes linear time. Arrays support efficient random access but have costly insertions and deletions due to element shifting, while singly linked lists provide efficient insertions and deletions through pointer manipulation but use extra memory for storing pointers. These differences make singly linked lists suitable for dynamic data management and arrays ideal for fast, indexed access and memory efficiency.
2. Linked lists are preferred over arrays when the data size changes frequently or when there are many insertions and deletions, as linked lists allow dynamic resizing and efficient modifications without shifting elements. Arrays are better when fast random access to elements is needed and the number of elements is fixed or changes rarely, due to their contiguous memory allocation and constant-time access by index. Thus, linked lists suit dynamic and frequently changing data, while arrays suit static data with fast access requirements.
3. Linked lists are widely used in real-world applications that require dynamic data management and sequential access. For example, browser history uses a doubly linked list to

allow users to easily navigate back and forth between visited pages. Undo and redo functionality in text editors also leverages doubly linked lists to move backward and forward through changes. Music and video playlists use linked lists to play media in order and allow navigation to the next or previous item. Operating systems use linked lists to manage task scheduling and memory allocation. Other applications include image viewers for accessing next/previous images, GPS navigation for managing routes, and file systems for directory structures. These applications benefit from linked lists' ability to efficiently insert, delete, and traverse elements without fixed size constraints or contiguous memory requirements. The versatility of singly, doubly, and circular linked lists enables their use across many domains such as browsers, media players, OS process handling, and more.

Follow this link: [CPE-201L-DSA-2-A/Activity\(Online Class\)/Python Data Structures.ipynb at main · Ruperto-April-Anne/CPE-201L-DSA-2-A](https://github.com/Ruperto-April-Anne/CPE-201L-DSA-2-A/blob/main/Activity(Online%20Class)/Python_Data_Structures.ipynb)

References

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