Data Structures

Compare and contrast between linear and non-linear data structure, and Stack and Queue.

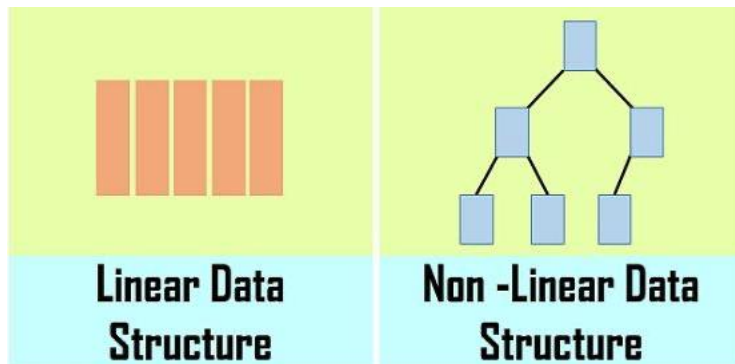**Difference between linear and non-linear data structure**

Figure 1: Difference Between Linear and Non-linear Data Structure (TechDifferences, 2022)

A data structure is a relationship between the individual elements of the data. Linear and non-linear structures are subclassifications of the data structure. When it comes to linear structure, the data are sorted and stored one after the other in the memory. The required amount of data is fixed before realising this kind of data structure. However, the result of this function can lead to a waste of memory space.

Furthermore, only one element can be attained. A linear data structure is an array, stack, queue, list as well as linked list. An array can be defined as a group of comparable data elements. By comparison, a stack and queue are similar to an array, though there are conditions like the last in first out order, the stack feature. Queue follows, by contrary, the

first in, first out condition. A list is similar to an array; however, it can store different types of elements. Lastly, the linked list is a set of data connected via links.

Contrary to the non-linear data structure, the data are not sorted sequentially. Because of that, every element has a hierarchical relationship with its grandparents, parents, and children. Thus, the data insertion and deleting do not follow one another. Furthermore, the non-linear data structure uses the storage efficiently and does not need to fix the amount of data at the beginning like the linear data structure. Examples are the tree and graph data structure. A tree data structure sort and store the data in a hierarchical relationship (TechDiferrences, 2022).
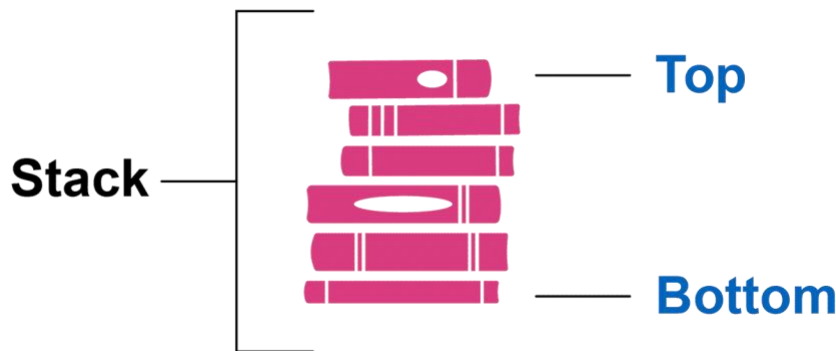
Stack

Figure 2: Stack Data Structure (Muzumdar, 2022)

The linear data structure has many functions, such as traversal, insertion, deletion, searching, etc. Stack data structure inserts and deletes elements in last in first out order; that means that only the elements on top of the stack are considered. With the operation

"Push", an element can be inserted from the top side and with "Pop" deleted. For example, in figure 2, books are stacked. The book at the bottom was inserted first, but the book on the top will be deleted or taken out first. Therefore, the book at the bottom can only be taken out when the upper books are deleted (Muzumdar, 2022).
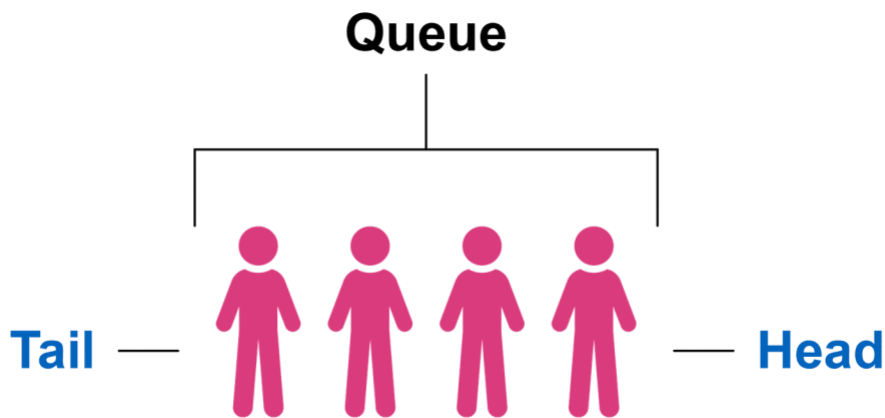
Queue

Figure 3: Queue Data Structure (Muzumdar, 2022)

In contrast to stack, a queue data structure inserts and delete elements in first out order; that means that the inserted elements will be sorted at the tail of the queue, and the deleted elements will be taken out at the head of the queue. For example, figure 3 shows people who are sorted in a queue. The people who came in will not be removed until every people who were there before is removed (Muzumdar, 2022).

References:

Muzumdar, A. (2022) *Operating Systems & Data Structures* [Lecturecast]. LSC_PCOM7E MARCH 2022 Launching into Computer Science March 2022. University of Essex Online.

TechDifferences (2022) Difference Between Linear and Non-linear Data Structure. Available from: https://techdifferences.com/difference-between-linear-and-non-linear-data-structure.html [Accessed 18 April 2022].