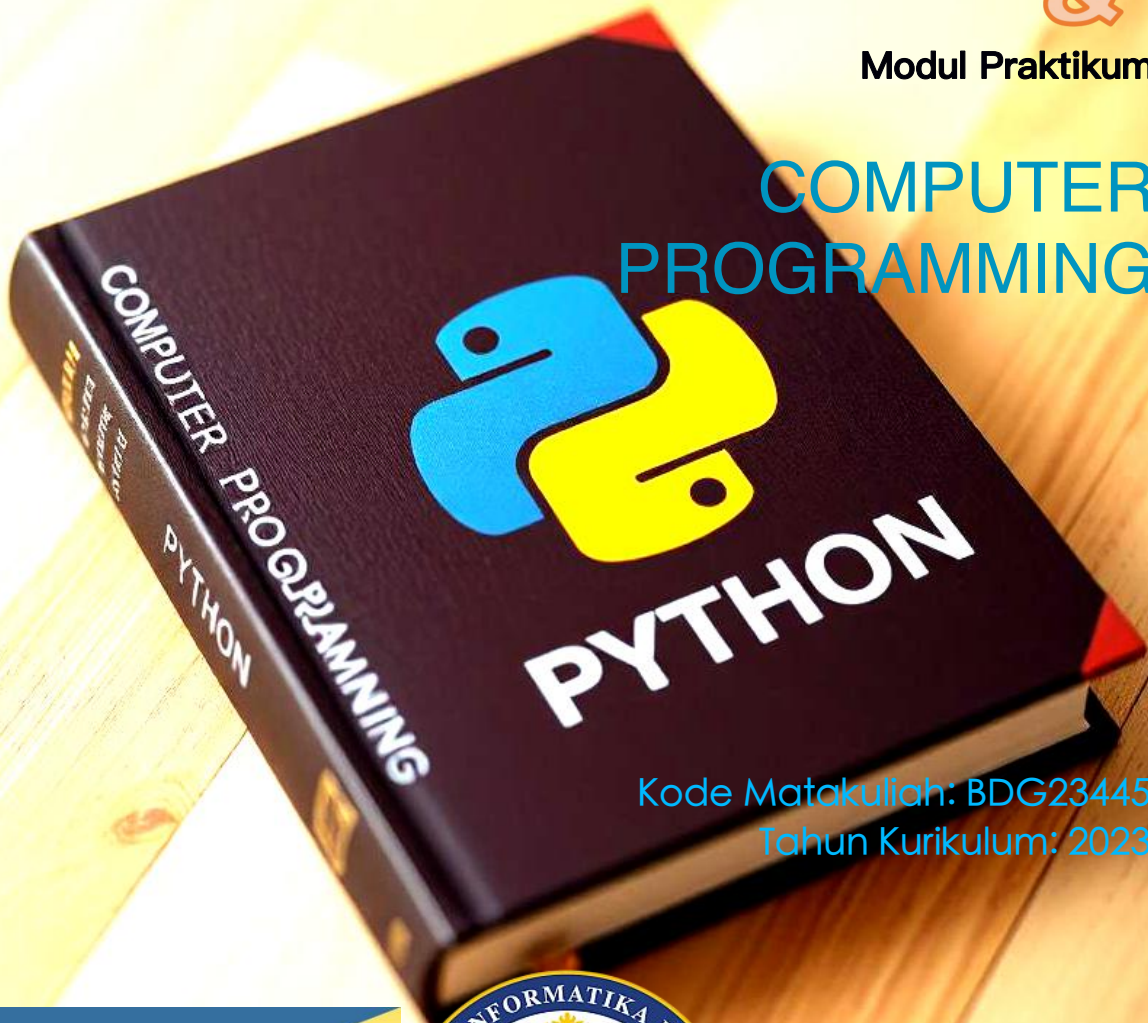




COMPUTER PROGRAMMING



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Modul 13

Konsep dasar pencarian dan pengurutan dalam Python

1. What is Linear Search?

Linear Search, also known as Sequential Search, is a straightforward method for finding a particular element within a list. It sequentially checks each element in the list until a match is found or the whole list has been searched.

The time complexity of linear search algorithms is $O(n)$, where n is the number of elements in the list.

It is used for smaller datasets and the data set is unsorted.

How Linear Search Works?

Use linear search algorithm in the given list: [2, 4, 6, 8, 10]. To find the number 6:

Start from the first element (2).

Compare the current element with the target element (6).

If they match, the search ends.

If they do not match, move to the next element.

Repeat steps 2-4 until the target element is found or the list ends.

Now, its time to check how this is implemented in Python.

Problem Statement: You are given a list of integers and a target integer value. Write a Python function to search for the target value in the given list using the Linear Search algorithm. If the target value is found in the list, return the index of the value in the list; otherwise, return -1 to indicate that the value is not present in the list.

2. What is Binary Search?

Binary Search is a more efficient searching algorithm that finds the position of a target value within a sorted array. It compares the target value to the middle element of the array and eliminates half of the search space successively.

The time complexity of Binary Search is $O(\log n)$, making it more efficient for large datasets.

It is efficient for large datasets and requires sorted data.

Now, let's understand how linear search is implemented with the help of an example.

How Binary Search Works?

Consider a sorted list of numbers: [2, 4, 6, 8, 10]. To find the number 6:

Determine the middle element (4).

Compare the middle element with the target element (6).

Since 6 is greater than 4, eliminate the left half of the list.

Repeat the process with the remaining half until the target element is found.

Now, its time to check how this is implemented in Python.

Problem Statement: You have a sorted list of integers and a target integer value. Your task is to write a Python function to search for the target value in the given sorted list using the Binary Search algorithm. If the target value is found in the list, the function should return the index of the value in the list; otherwise, it should return -1 to indicate that the value is not present in the list.

Advantages and Disadvantages of Binary Search

Aspect	Binary Search
Advantage	Efficiency: Binary Search is highly efficient for large datasets. It significantly reduces the search space by half with each comparison, leading to a time complexity of $O(\log n)$.
Disadvantage	Sorted Data Requirement: Binary Search requires the dataset to be sorted beforehand. This prerequisite can be a limitation if dealing with unsorted or dynamically changing datasets.