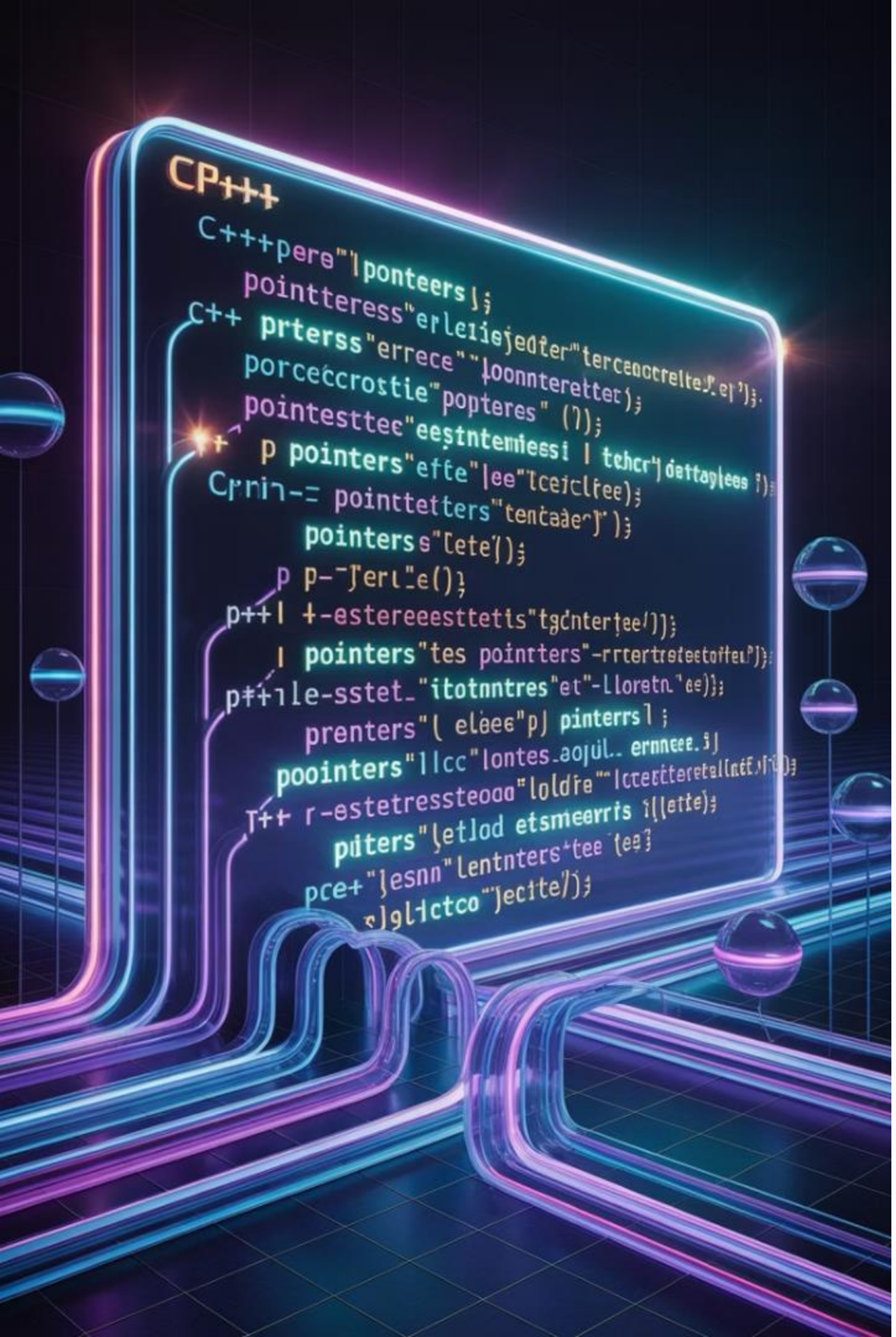


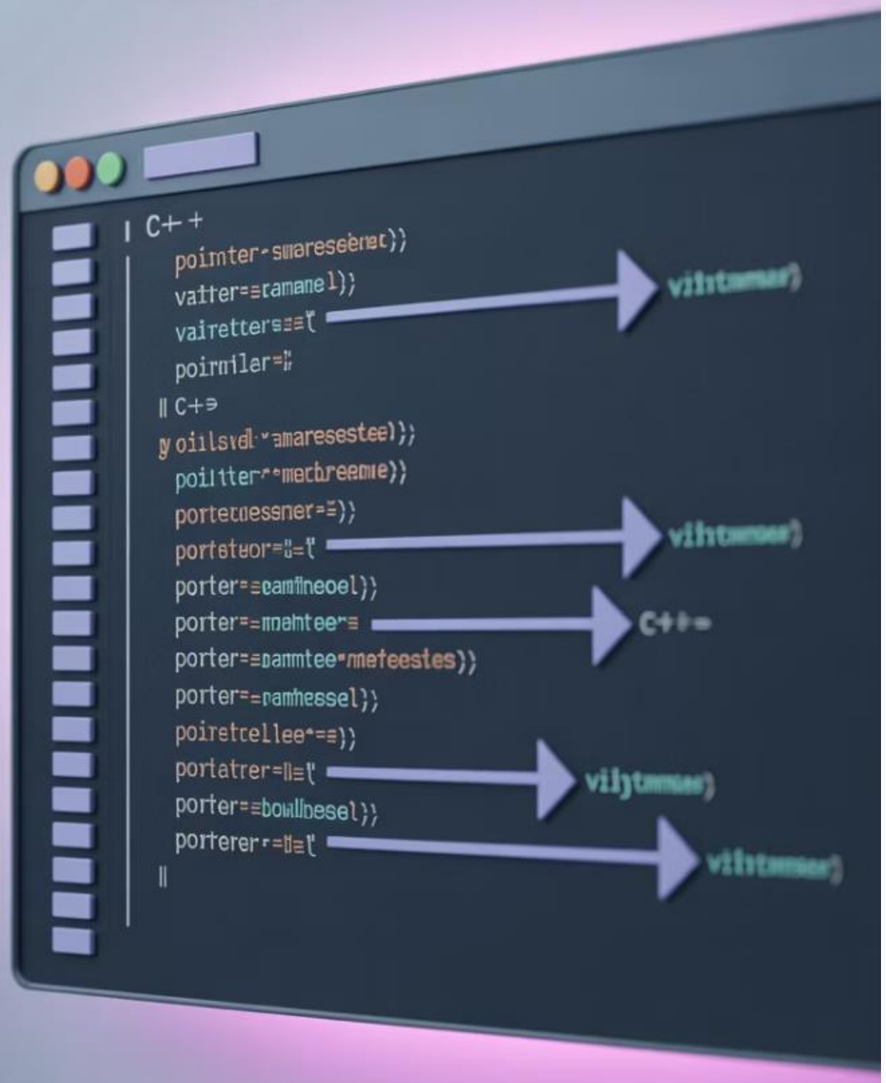
Pointers and Function Parameters in C++

Lecture 9

Asst. Lect. Ali Al-khawaja

What is a pointer?

- A pointer is a variable that stores the memory address of another variable. It essentially "points to" the location in memory where data is stored rather than storing the actual data value itself.
- Pointers are powerful features in C++ that enable direct memory manipulation, dynamic memory allocation, and efficient parameter passing to functions.
- Working with pointers involves two key operators:
  - The address operator (&) returns the memory address of a variable
  - The dereference operator (*) accesses the value stored at the memory address
- Understanding pointers is essential for advanced C++ programming and memory management.



Syntax:

Pointer Declaration

```
int a = 10;
int* ptr = &a; //
'ptr' stores the
address of 'a'
```

Address Operator

&a → gives the address of variable a

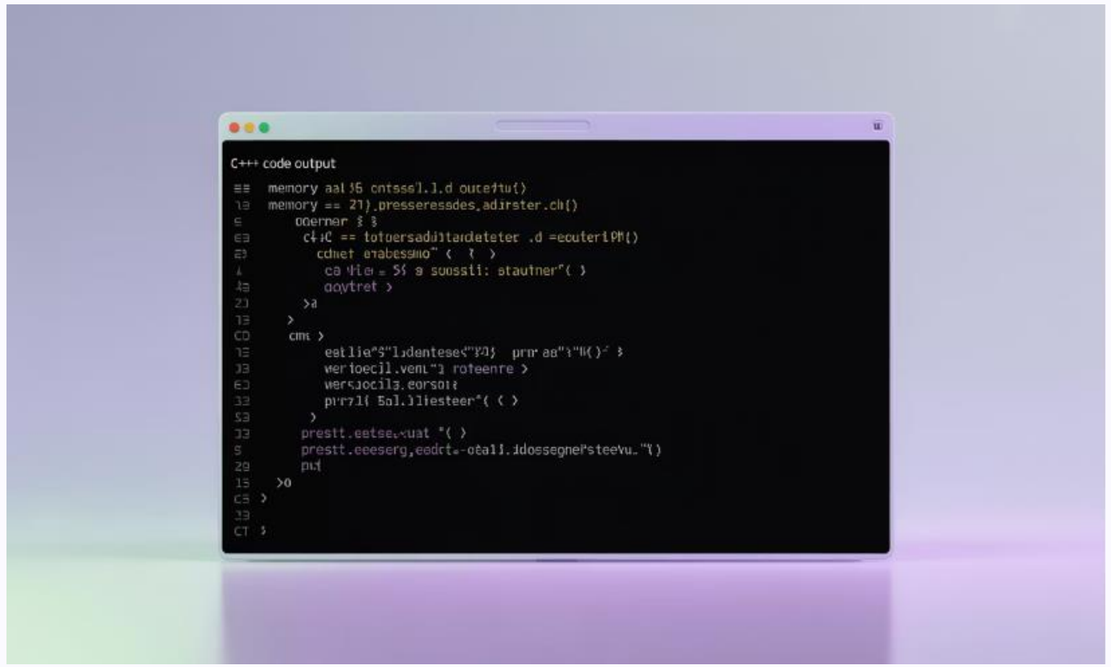
Dereference Operator

*ptr → accesses the value stored at the address ptr is pointing to (dereferencing)

Example:

```
#include <iostream>
using namespace std;

int main() {
    int x = 5;
    int* p = &x;
    cout << "Value of x: " << x << endl;
    cout << "Address of x: " << &x <<
endl;
    cout << "Pointer p stores address: "
<< p << endl;
    cout << "Value pointed by p: " << *p
<< endl;
    return 0;
}
```



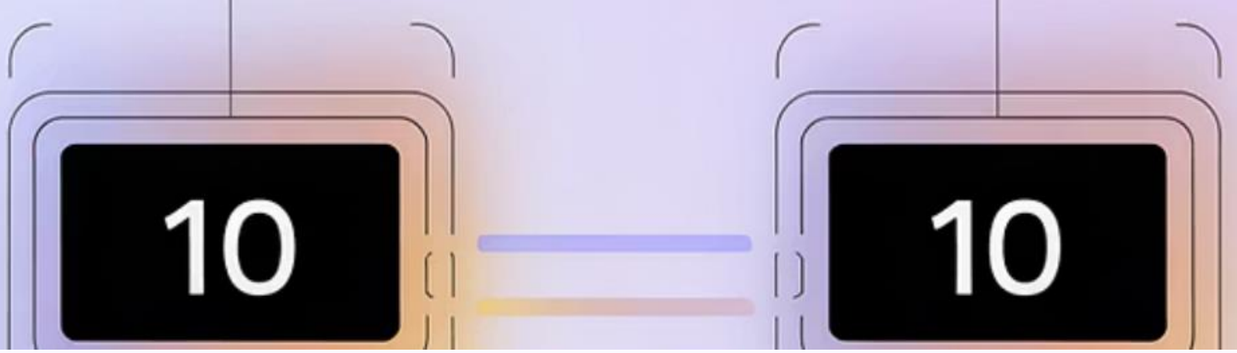
Key Concepts:

Dereferencing

* is used for dereferencing

Address Operator

& is used to get the address



Why use pointers in functions?

Modify Original Variables

To allow the function to modify the original variable (pass by reference)

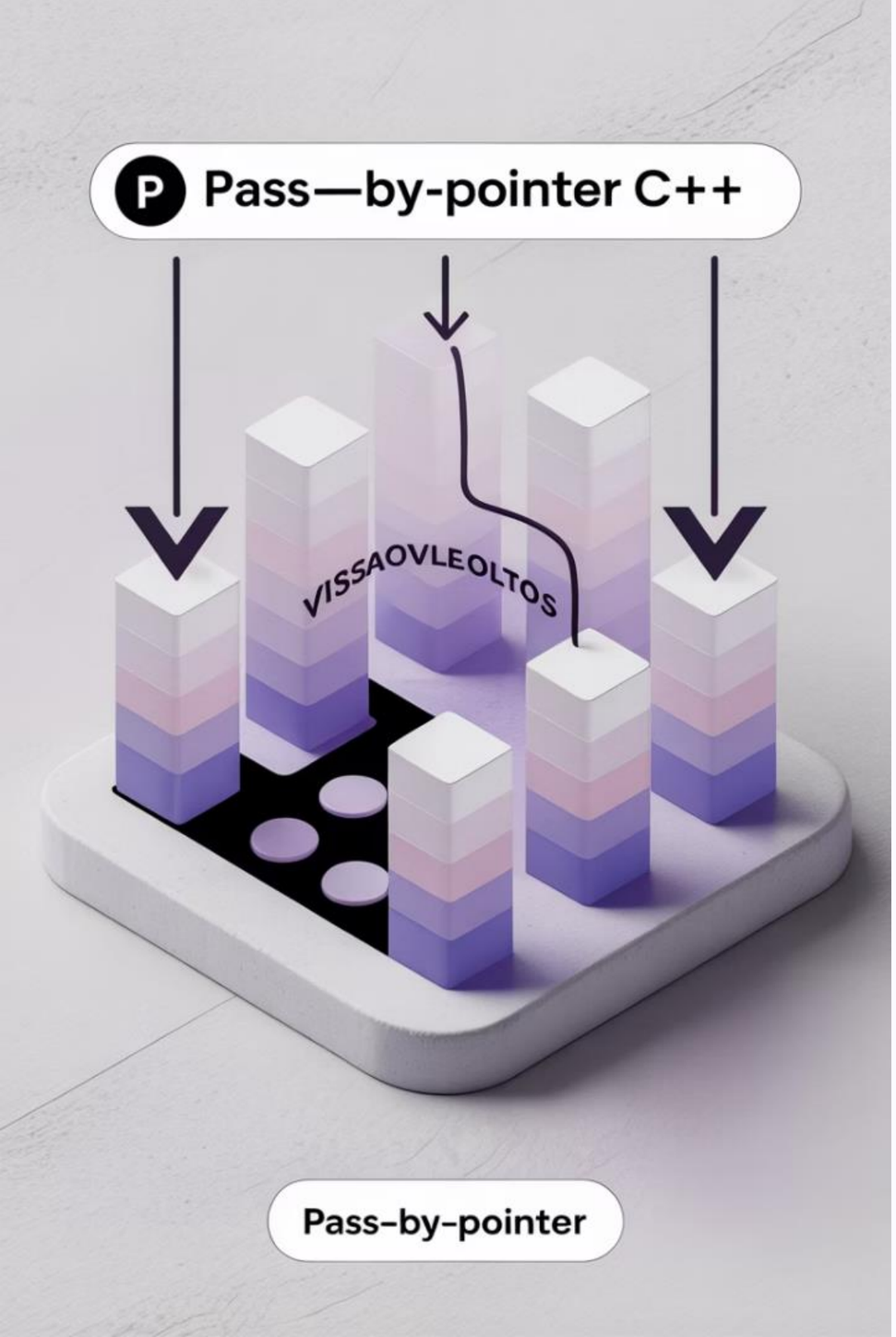
Efficiency

To avoid copying large data structures

A. Passing by Value (Default)

```
void change(int a) {
    a = 20;
}

int x = 10;
change(x);
cout << x; // x remains 10
```



B. Passing by Pointer (Reference using pointer)

Define Function with Pointer Parameter

```
void change(int* a) {
    *a = 20;
}
```

Call Function with Address

```
int x = 10;
change(&x);
```

Check Result

```
cout << x; // x becomes 20
```

The function modifies the original variable because it receives its address.

Full Example:

```
#include <iostream>
using namespace std;

void update(int* num) {
    *num += 5;
}

int main() {
    int a = 15;
    update(&a);
    cout << "Updated value: " << a << endl; // Output: 20
    return 0;
}
```

Homework

Create Structure

Declares a structure Student with name and age

Write Function

Passes a pointer to a function increaseAge() that increases the student's age

Show Results

Displays the updated age