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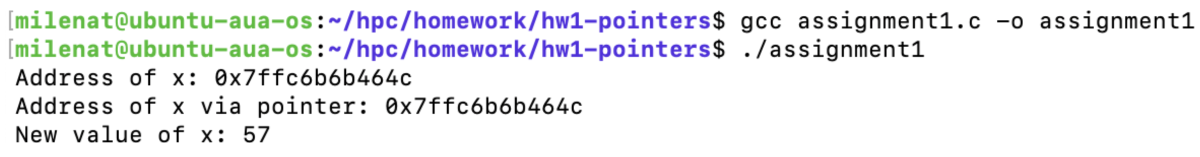
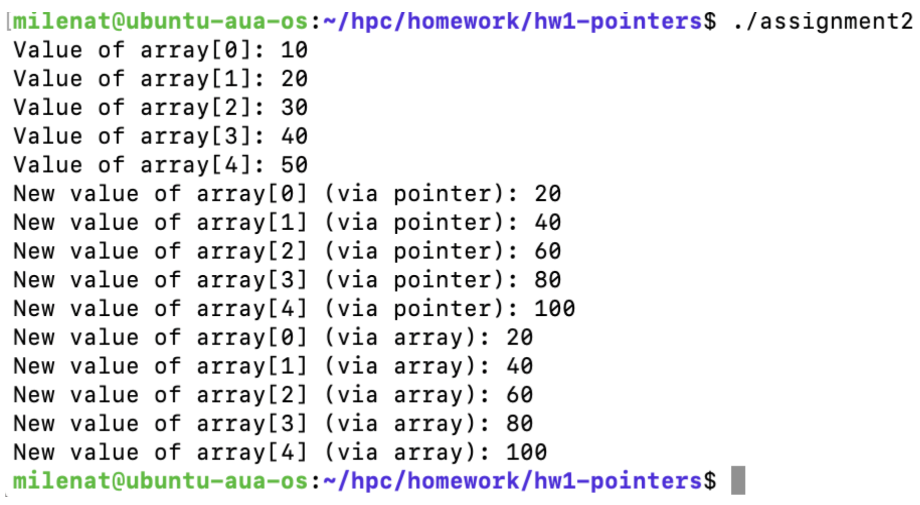
Parallel HPC - HW1 - Pointers
Link to Repo

Assignment1: The program creates an integer x, stores its address in a pointer ptr, and prints the memory address of x both directly and through the pointer. Then it modifies x indirectly by dereferencing the pointer (*ptr = 57) and prints the updated value of x.



```
[milenat@ubuntu-aua-os:~/hpc/homework/hw1-pointers$ gcc assignment1.c -o assignment1
[milenat@ubuntu-aua-os:~/hpc/homework/hw1-pointers$ ./assignment1
 Address of x: 0x7ffc6b6b464c
 Address of x via pointer: 0x7ffc6b6b464c
 New value of x: 57
```

Assignment2: This program initializes an array of 5 numbers, sets ptr to point to the first element, and prints each value using pointer arithmetic (*(ptr + i)). Then it multiplies every element by k = 2 through the pointer, and prints the updated values both via the pointer and directly via the array to show they refer to the same underlying data.



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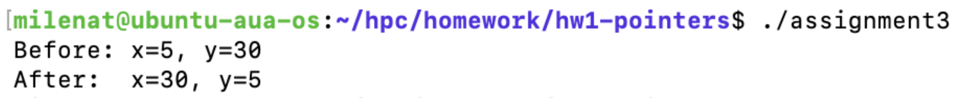
[milenat@ubuntu-aua-os:~/hpc/homework/hw1-pointers$ ./assignment2
 Value of array[0]: 10
 Value of array[1]: 20
 Value of array[2]: 30
 Value of array[3]: 40
 Value of array[4]: 50
 New value of array[0] (via pointer): 20
 New value of array[1] (via pointer): 40
 New value of array[2] (via pointer): 60
 New value of array[3] (via pointer): 80
 New value of array[4] (via pointer): 100
 New value of array[0] (via array): 20
 New value of array[1] (via array): 40
 New value of array[2] (via array): 60
 New value of array[3] (via array): 80
 New value of array[4] (via array): 100
 milenat@ubuntu-aua-os:~/hpc/homework/hw1-pointers$
```

Assignment3: This program shows how to swap two integers using pointers. The swap function receives the addresses of a and b, uses dereferencing (*ptr_a, *ptr_b) to access their values, and exchanges them using a temporary variable. In main, the values are printed before and after calling swap to show that the swap worked.



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[milenat@ubuntu-aua-os:~/hpc/homework/hw1-pointers$ ./assignment3
 Before: x=5, y=30
 After:  x=30, y=5
```
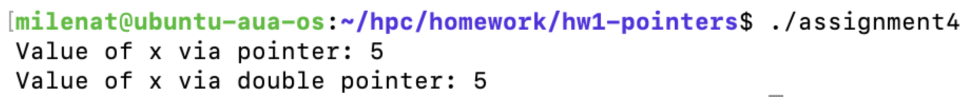
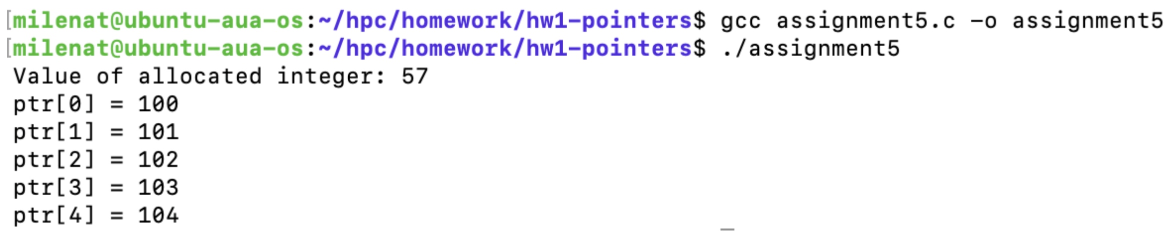

Assignment4: This program demonstrates a pointer and a double pointer. ptr stores the address of x, and ptd stores the address of ptr. It prints the value of x by dereferencing the pointer once (*ptr) and by dereferencing the double pointer twice (**ptd), showing both access the same integer value.



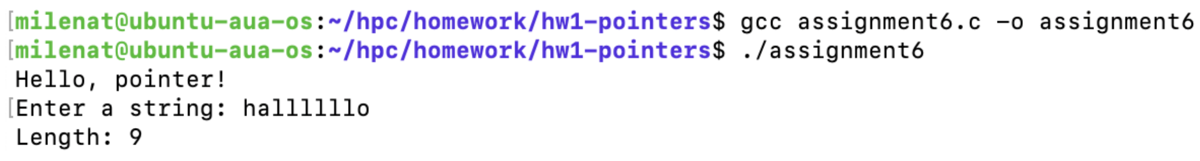
```
[milenat@ubuntu-aua-os:~/hpc/homework/hw1-pointers$ ./assignment4
 Value of x via pointer: 5
 Value of x via double pointer: 5
```

Assignment5: This program first allocates memory for a single integer, assigns it the value 57, and prints it. Then it allocates memory for an array of 5 integers, fills the array using pointer arithmetic (*(ptr + i)), and prints each element. Finally, it frees both allocated memory blocks to avoid memory leaks.



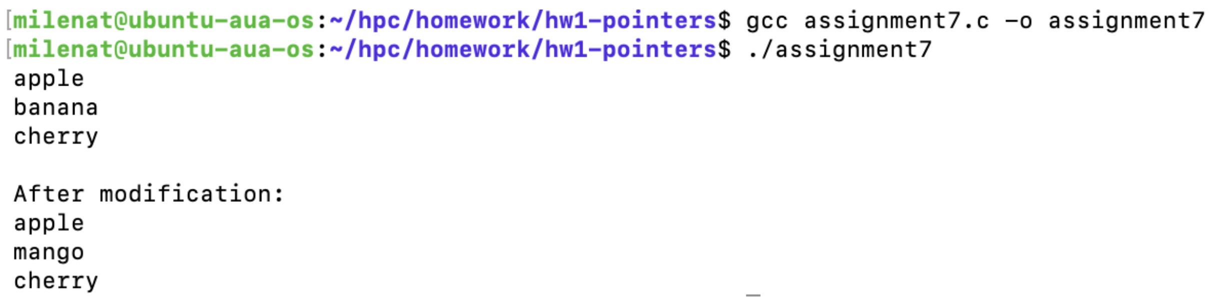
```
[milenat@ubuntu-aua-os:~/hpc/homework/hw1-pointers$ gcc assignment5.c -o assignment5
[milenat@ubuntu-aua-os:~/hpc/homework/hw1-pointers$ ./assignment5
 Value of allocated integer: 57
 ptr[0] = 100
 ptr[1] = 101
 ptr[2] = 102
 ptr[3] = 103
 ptr[4] = 104
```

Assignment6: This program first stores a string literal in a character pointer and prints it character by character by moving a pointer through the string. Then it asks the user for a string, and the function str_length calculates its length using pointer arithmetic by iterating through the characters until the null terminator ‘\0’ is reached, then returns the difference between the pointers, that is the length.



```
[milenat@ubuntu-aua-os:~/hpc/homework/hw1-pointers$ gcc assignment6.c -o assignment6
[milenat@ubuntu-aua-os:~/hpc/homework/hw1-pointers$ ./assignment6
 Hello, pointer!
[Enter a string: hallllllo
 Length: 9
```

Assignment7: This program stores three strings ("apple", "banana", "cherry") and prints each one character by character using pointer notation (*(words + i) and then moving through the string). Then it modifies the second string by changing the pointer words[1] to point to a new string literal "mango", and prints the updated list.



```
[milenat@ubuntu-aua-os:~/hpc/homework/hw1-pointers$ gcc assignment7.c -o assignment7
[milenat@ubuntu-aua-os:~/hpc/homework/hw1-pointers$ ./assignment7
 apple
 banana
 cherry

 After modification:
 apple
 mango
 cherry
```