

Cmpe 150 Lab 1: Introduction

General Info About Lab Sessions

- First, we'll review a short slide covering the fundamental concepts from the theoretical part.
- Then, the main goal is to practice the related topic by solving some examples.

General Info About Lab Sessions

- If you have questions, you can ask at any time. Please do NOT hesitate.

Motivation

- This class is about learning the essentials of programming/coding/computing.
- But why should we care about it?

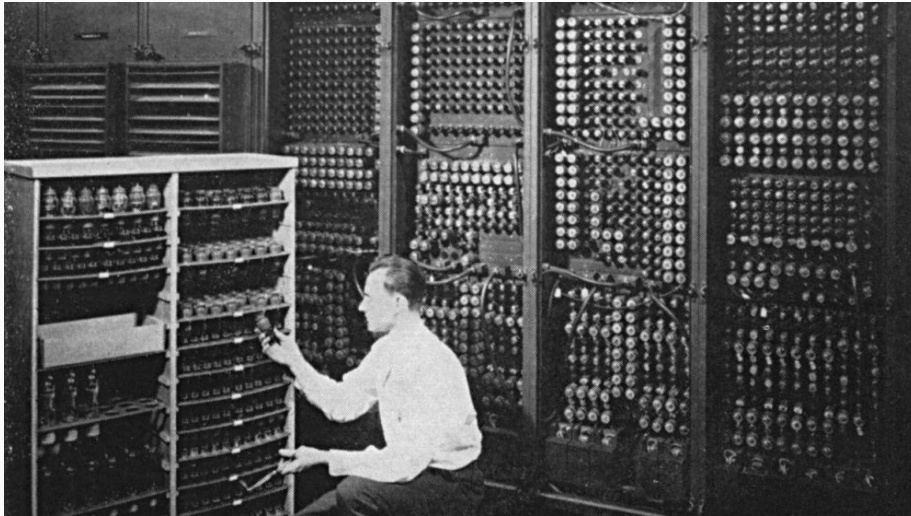


Some Reasons to Be Excited About the Course

- Even if your department is not Computer Engineering, you might use programming in certain parts of your profession.
- Beyond that, we use a lot of software tools; therefore, even having an idea about what is under the hood would be beneficial.
- Lastly, it is funny as well.

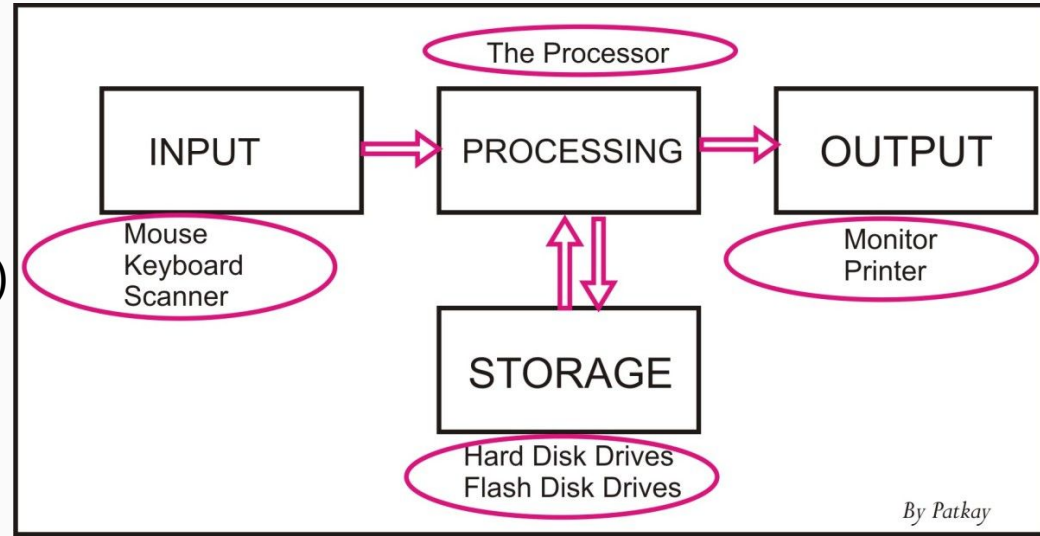
What Computers Really Are

- They are information processing systems.



Main Components of a Computer

- Input Device
- Memory
 - RAM
 - Disk
- Central Processing Unit (CPU)
- Output Device



Main Components of a Computer: Input Device

- The typical option is keyboard and mouse.

My dad's keyboard:



Main Components of a Computer: Input Device

- Technically, a lot of things can be the input device for a computer
 - Camera
 - Radar
 - Scanner
 - Microphone
 - Fire sensors and so on

Main Components of a Computer: Memory

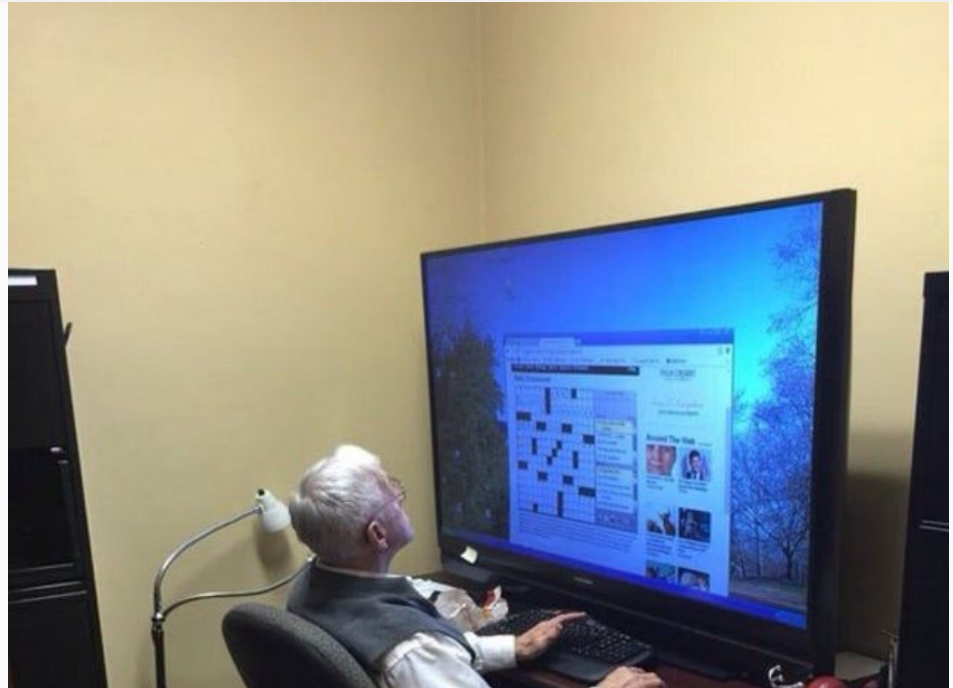
- Stores the information that we get as binary numbers
 - RAM is faster but limited in size, and it is gone when we turn off the computer
 - The disk is slower, yet it is bigger and permanent.

Main Components of a Computer: CPU

- Just storing information is not very interesting. We need to process it.
- CPU allows us to do basic logical and mathematical operations on the information we store in the memory.
 - Some example operations: +, -, *, /, is_equal, is_greater_than

Main Components of a Computer: Output Device

- The missing part is being able to give output to human beings. The typical option is the monitor.



Main Components of a Computer: Output Device

- Nevertheless, it can be in a lot of different forms, just like the input device
 - Printer
 - Speaker
 - Projector
 - Autonomous vehicle control (Gas, brake, steering angle) and others

Please Notice That

- Almost all of these operations could be done by a human as well, yet some advantages of using a computer are being
 - Faster
 - More robust in calculations
 - As long as you provide energy to it, it never gets tired or bored

Hardware vs Software

- All these physical components are called hardware. What is software/code/program then?
- Let's say that we have a problem/task and want to use a computer for our help. The only thing needed is to develop a solution that can be described to the computer in its own language.

What is the Language of Computers

- The language computers understand is just the basic operations we described in the hardware slides. For instance,
 - Get this information from the use
 - Add these three values
 - Check if these two values are equal
- We use programming languages to be able to tell computers to do these basic operations in the order we define
 - **Python**, C, C++, Java ...

The Concept of **Algorithm** and **Code**

- Our solution methodology/recipe is called the algorithm. Like a recipe for how to prepare a specific meal.
- The actual text/list of instructions in Python (or any other programming language) corresponding to the algorithm is called software/program/code.

Let's See Some Basic Operations in Action

- Start PyCharm IDE, please: It's a tool that makes writing code easier.
- Define a new file called `main.py` if it still needs to be defined.

Giving an Arbitrary Output

- `print('This is my first code')`
- `print('Merhaba Dünya')`
- `print('Hello World')`

Giving an Arbitrary Output

- `print(3 * 5)`
- `print(8 + 3 * 7)`
- `print('I am', 75, 'years old')`

Getting an Input from the User and Processing

- `name1 = input()`
- `name2 = input()`
- `print('My first name is', name1, 'and my second name is', name2)`
- `number1 = input()`
- `number2 = input()`
- `number3 = int(number1) - int(number2)`
- `print('The difference is', number3)`

The Concept of **Variable**

- Remember that we store different pieces of information in memory, so we want to be able to refer them back. Therefore, we give a name to each piece of information (**variable**).
- For instance,
 - `name1 = input()`
 - `print('My name is', name1)`

Classical Variable Types

- Our variables can be of different types
 - **Integer** e.g. `my_int = 32` or `my_int = -25` or `my_int = 9223372036854775807`
 - **Float** e.g. `number_pi = 3.14` or `my_float = -7.4823` or `my_float = 567.634623`
 - **String** (A list of characters) e.g. `surname = "Tuğcu"` or `my_name = 'Tuna Tuğcu'`
 - **Boolean** (True or False) e.g. `is_ready = False` or `is_greater = 5 > 2`
 - and others we'll see later

Classical Variable Types

- We can see the type of a variable by using `type()`
 - `x = 3`
 - `print(type(x))`
 - `number_e_in_math = 2.71`
 - `print(type(number_e_in_math))`
 - `x = 'Car'`
 - `print(type(x))`
 - `x = input()` Enter 3 and see the type

Type Conversion

- `my_int_variable = 369`
- `my_float_variable = float(my_int_variable)`
- `my_string_variable = str(my_float_variable)`

What about

- `my_str_variable = 'Merhaba'`
- `my_int_variable = int(my_str_variable)`

Very Commonly Used Math Operators

- +
- -
- *
- /
- // (Integer division)
- % (Modulus operator)
- ** (Power)

Very Commonly Used Logical Operators

- == (Is equal)
- != (Is not equal)
- > (Is greater than)
- >= (Is greater than or equal)
- < (Is less than)
- <= (Is less than or equal)
- Also we can connect them using “and”, “or”, “not”
- For instance, number plate (plaka)
 - (number_plate < 82) and (number_plate > 0) and (not number_plate == 34)

Syntax of input

- `my_high_school_number = input()`
- Or we can add a prompt as well.
- `my_university_number = input('Enter your university number please:')`

Syntax of print

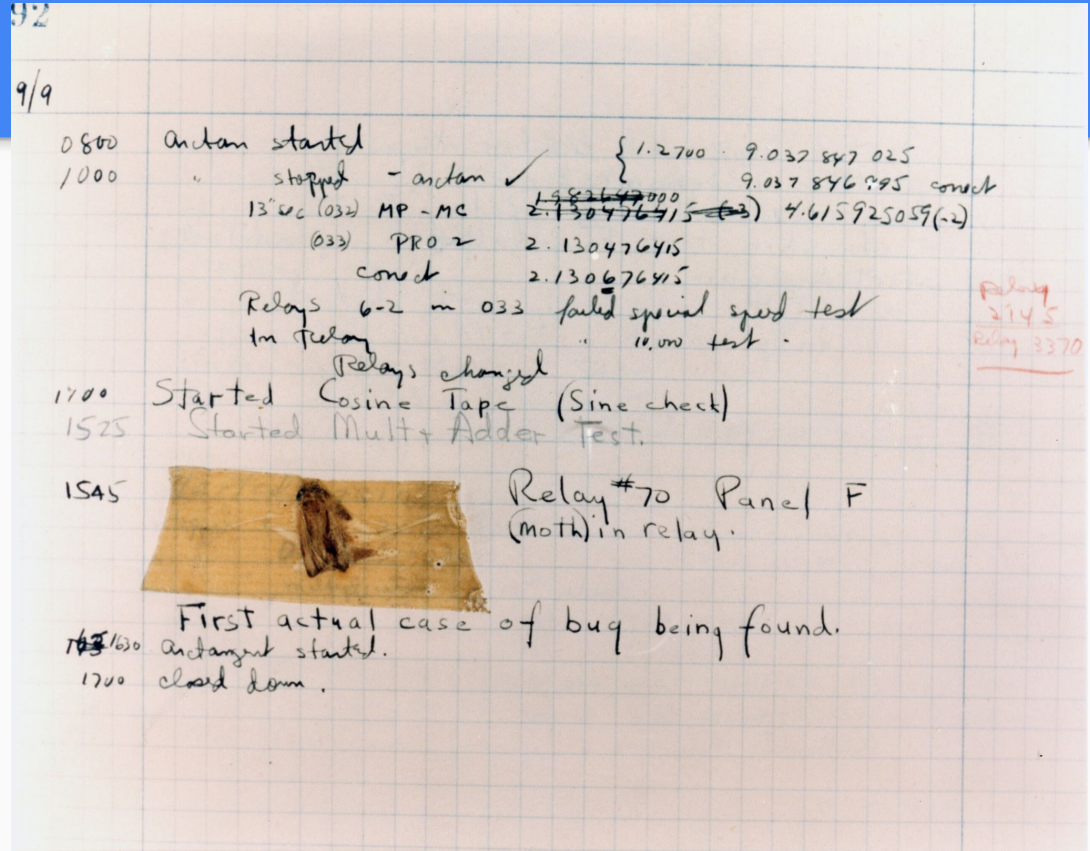
- `print("Çift tırnak ile output verme")` or `print('Tek tırnak ile output verme')`
- We can put multiple variables/strings inside print as well. We need to separate it with comma
- `variable_keeping_my_name = 'Ali'`
- `print('Merhaba benim ismim:', variable_keeping_my_name)`
- Comma put a space between elements.
- `print('1', '2', '3', '4', '5')`

Common Error Types in Coding

- **Syntax Error:** Not obeying the rules of the programming language that you use. For instance,
 - `print('A syntax error: Did not close the parenthesis')`
- **Runtime Error:** You want something that is not possible from the computer. For instance,
 - `divide_by_zero = 4/0`
- **Logical Error:** Your code works but is not doing the things that you aimed for. Something is wrong in either your algorithm or coding. For instance,
 - `square_of_eight = 8 ** 8`
 - `print('Eight squared is equal to:', square_of_eight) # It will give 16777216 instead of 64`

Errors are Common in Programming

- Sometimes they are also called **bugs** and trying to fix the problems is called **debugging**.



Comments in Programming

- We might want to add some explanation about our code. It is just for human beings to read. Not for the computer to run: Use # then write whatever you want. For instance,
 - `print('Eight squared is equal to:', square_of_eight) # It will give 16777216 instead of 64`
- `# This code reads a number from the user and prints it square`
- `number = input('Enter a number please')`
- `print('The square of the number you entered is:', number * number)`

Comments in Programming: Caution



Very useful !

**CODE COMMENTS
BE LIKE**



Doing Practice is Essential

- Programming is similar to Math in the sense that just listening to a topic or watching someone solve some problems is not sufficient. You HAVE TO practice it yourself.
- Beyond the questions solved in the lab, you can use Code Step by Step (<https://www.codestepbystep.com/>) for that. Just sign up for free and then you can search for a specific topic (e.g. if-else) in the menu. (<https://www.codestepbystep.com/problem/list/python>)
- Also, do NOT hesitate to try an idea coming to your mind in the code as a practice. For instance, can I do this with Python?

Let's Do an Exercise: Build up a Cmpe 150 Chatbot

- Also see the problem definition

Hi, I'm Cmpe 150 Chatbot, what is your name?

Oğulcan

Hi Oğulcan , how old are you?

22

Hmm, you are 22 years old. Older than me. How can I help you? What do you want to do?

Cooking some meal

Well, what you want is Cooking some meal , but I don't know much about it to be honest.
Can't you request something easier?

Then tell a little bit about yourself

My code was written by Oğulcan a few minutes ago, and I'm always ready to chat. See you.

Thanks

Any questions?

References

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