Python Basics II

Saif Ali

Department of Electrical Engineering

Jamia Millia Islamia

ERRORS and EXCEPTIONS

Recap: What is a program?

A program is a sequence of instructions that specifies how to perform a computation.

- Mathematical
- Symbolic

A few basic instructions appear in just about every language:
input
> Get data from the keyboard, a file, or some other device.

output
> Display data on the screen or send data to a file or other device.

math
> Perform basic mathematical operations like addition and multiplication.

conditional execution
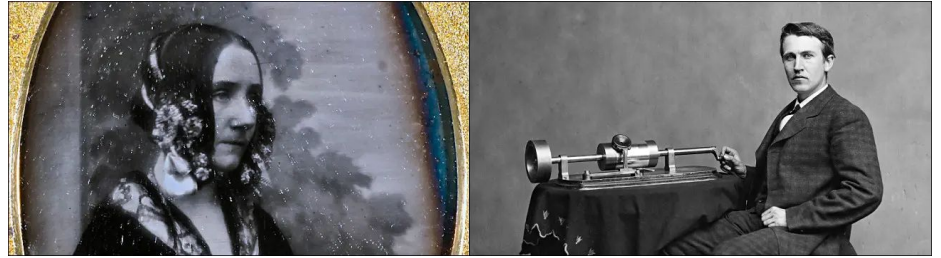> Check for certain conditions and execute the appropriate sequence of statements.

repetition
> Perform some action repeatedly, usually with some variation.

Recap: What is debugging?

"The key to success is *failure*."

Programming **errors** are called **bugs** and the process of tracking them down and correcting them is called debugging.

Types of Programming Errors

Syntax Errors

You have *written* the code incorrectly

Runtime Errors

Your code does not *run* correctly

Semantic Errors

You have written the *wrong code*

Debugging

D**ebugging** is one of the most *intellectually rich, challenging, and interesting* parts of programming.

Debugging is like *detective work*.

- The output that you see is the "crime scene" - you have to *work backwards* to see what led to this scene.

Debugging is also like an *experimental science.*

- Hypothesis about what went wrong > make changes to your code.
- Hypothesis correct > then predictions will be correct. You take a step closer to a working program.
- Hypothesis wrong, you have to come up with a new one.

Programming and debugging are the same thing.

- Process of gradually debugging a program until it does what you want.

You are the Sherlock Holmes of Programming

"When you have eliminated the impossible, whatever remains, however improbable, must be the truth."

-   Sherlock Holmes, (A. Conan Doyle, The Sign of Four)

Exception Handling in Python

Exceptions are errors that occur at run-time. Basically the same as runtime errors.

Exceptional - meaning, something outside of "normal".

Exceptions are raised by the Python interpreter when conditions arise that cause an interruption in the normal flow of a program.

They do not stop the execution of a program but change the flow.

Source: https://www.geeksforgeeks.org/python-exception-handling/

Types of Exceptions (not an exhaustive list)

1. **TypeError**: This exception is raised when an operation or function is applied to an object of the wrong type, such as adding a string to an integer.
2. **ZeroDivisionError**: This exception is raised when an attempt is made to divide a number by zero.
3. **IndexError**: This exception is raised when an index is out of range for a list, tuple, or other sequence types.

Source: https://www.geeksforgeeks.org/python-exception-handling/

Exception Handling Framework

```
try:
    # Some Code....

except:
    # optional block
    # Handling of exception (if required)

else:
    # execute if no exception

finally:
    # Some code .....(always executed)
```

Source: https://www.geeksforgeeks.org/python-exception-handling/

Example

```python
x = 5
y = "hello"
try:
    z = x + y
except TypeError:
    print("Error: cannot add an int and a str")
```

Source: https://www.geeksforgeeks.org/python-exception-handling/

Summary

1. Debugging is an exciting art of programming in which we proceed by eliminating what is wrong with our code until what remains is right!
2. Debugging is like detective work or experimental science.
3. We must formulate hypothesis and test them by experimentation
4. There are broadly three types of errors, syntax, runtime and semantic errors.
5. Exception is a broader word for runtime errors.
6. Python provides sophisticated facilities for exception handling in the form of **try-except-else-finally** blocks and **assert** and **raise** keywords

Try it yourself
Open the "SA2-PR.ipnub" Python notebook in Google Colab.

Link to Notebook

https://colab.research.google.com/drive/1TNmIwiwBZm2ik3eu-jOsDmaouLyd6l-R?usp=sharing

https://shorturl.at/KJzur