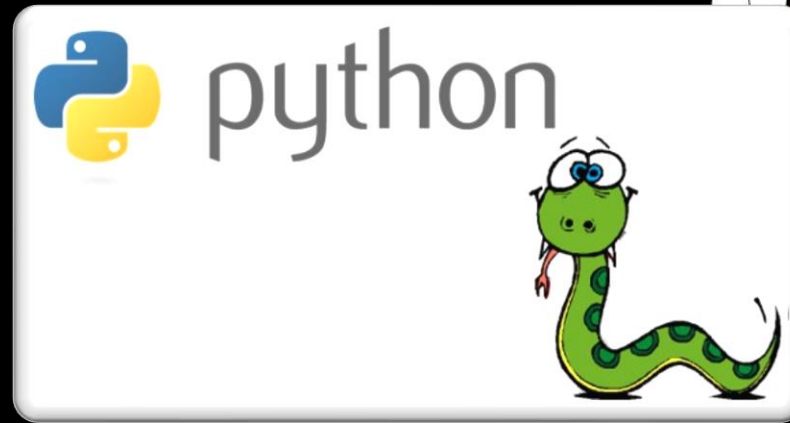


UNIVERSITY OF TWENTE.

Introduction to



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INTRODUCTION

A **computer** is a **tool** that can perform tasks

A computer needs **instructions** to be able to do so

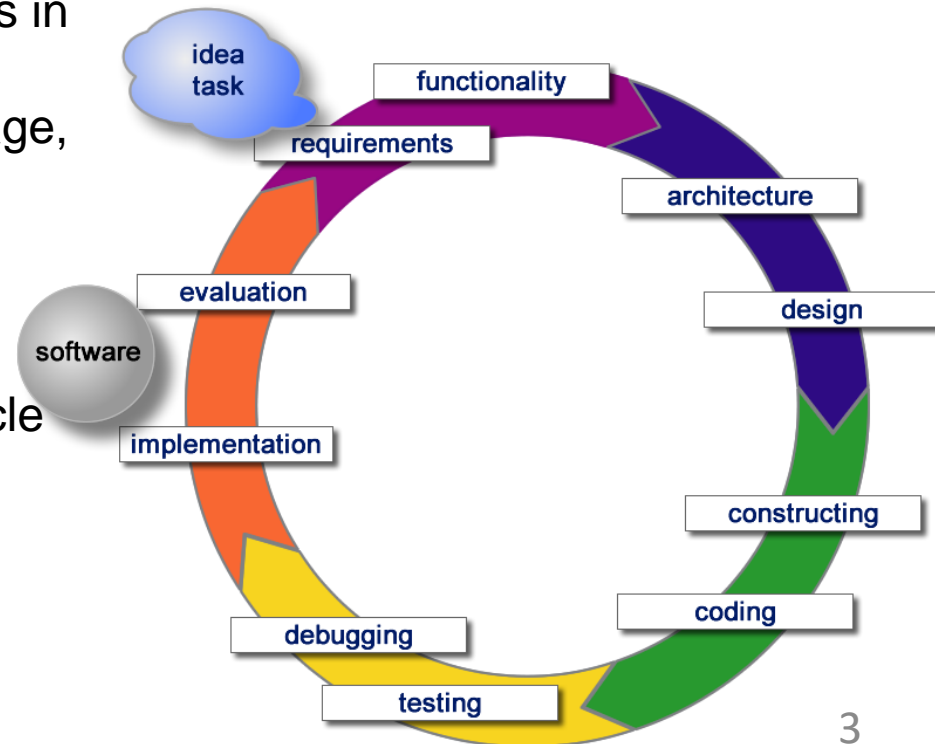
Programming is the process of **developing** and **implementing** a sequence of **instructions** to perform a task

A **programming language** is a vocabulary with a number of grammar rules for **instructing** a computer to perform specific tasks.



Program development cycle

1. **Analyze**: understand & define problem, collect requirements, ideate a solution, describe functionality
2. **Design**: how to solve the problem, design the program, define algorithms
3. **Code**: express solution in the programming language
4. **Test**: locate and remove errors in the program
5. **Deliver**: create the final package, document and evaluate
6. **Update**: create new version on basis of user response and new ideas. Go through the cycle again





Programming versus scripting

A **programming language** is a formal language designed to communicate instructions to a computer.

Programming



Scripting

A **scripting language** is a programming language that is **interpreted** by another program at runtime, one step at the time.

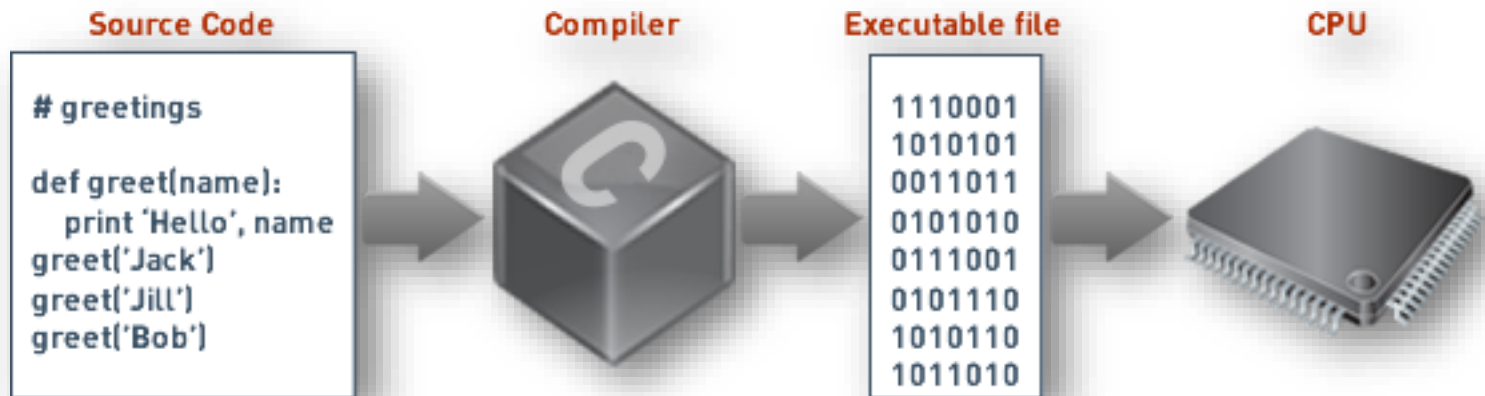
Python is a scripting language ...



Program compiler

A compiler translates source code into an executable (eg, .exe) file

Programing languages like C and C++ are handled in this way



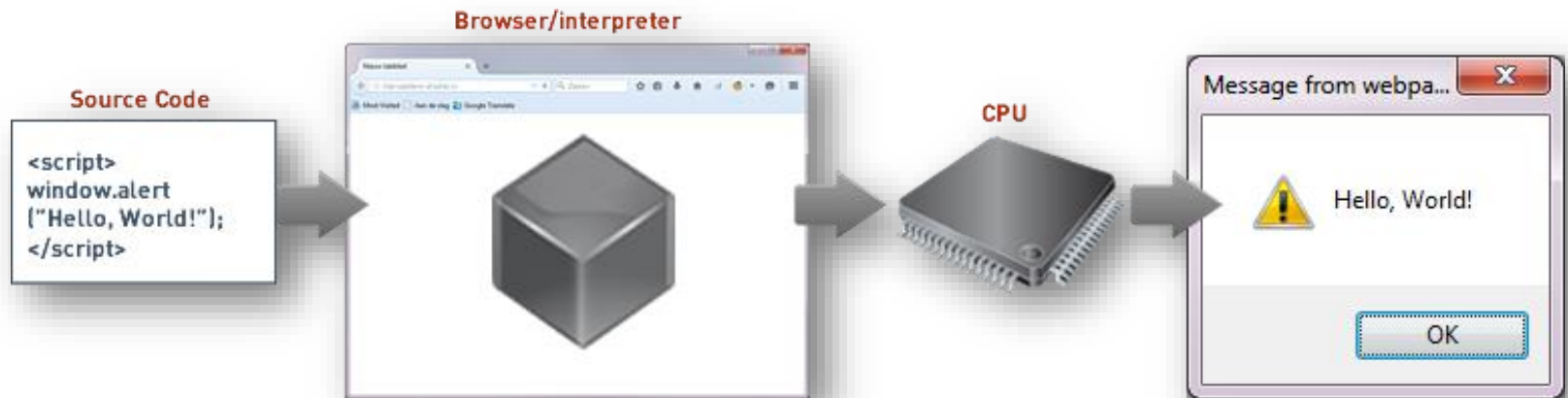


Program interpreter

An interpreter is a “line-by-line compiler”

It compiles and executes the program instruction-by-instruction

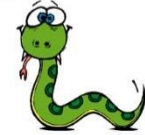
Scripts in languages like Python and Javascript are run in this way





Scripting

Python



a widely used general-purpose, high-level programming language

an *interpreted, interactive, object-oriented* scripting language

a portable language: it runs on Linux, Windows, OS/2, MacOS, and many other platforms

a language created by *Guido van Rossum*

a free language



python

Python allows writing very compact and readable programs

Pythonic programs are typically much shorter than equivalent C or C++ programs

Python isn't better or worse than C or C++, but it is different

Official Python website: www.python.org

Official Python documentation: <http://docs.python.org>



Hello World

C#:

```
// Hello World in C#  
class HelloWorld {  
    static void main(string[] args) {  
        Console.WriteLine("Hello World!");  
    }  
}
```

C++:

```
// Hello World in C++  
#include <iostream.h>  
Main() {  
    cout << "Hello World!" << endl;  
    return 0;  
}
```

Python:

```
# Hello World in Python  
print("Hello World!")
```



Python basics

files use ***.py** extension

grouping of code is done by **textual indentation**

logical block of statements has same indentation

indentation can be using

tab character, or

equal width in white spaces



Integrated development environment (IDE)

We don't need an IDE for coding! But it can help us coding, for instance, by:

- Highlighting code (colorize);
- Identifying potential errors *on the fly*;
- Selecting part of code and run it;
- In this course, we will use the **PyCharm** IDE
- IDE \neq Interpreter



Python and GIS



IP[y]:

pandas
 $y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$



FIONA

RASTERIO



SHAPELY



Vispy

Interactive Scientific Visualization



pysal

Python Spatial Analysis Library



interoperability with
C, C++, Fortran



Enough Talk Let's Code





Exercise 1 — My first program

To make sure we installed all correctly, run the following code.

```
2+2
```

4

```
1000/2
```

500.0

```
print("Hello world")
```

Hello world

If needed, ask for HELP!

Thanks for your attention



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