The Context of Python

SURP 2022 Python Bootcamp

Ohio State Astronomy

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Objectives

Python in Comparison to Other Languages

The Python Interpreter

The Python Model

Static vs. Dynamic Typing

Weak vs. Strong Typing

Python in the Context of Coding Languages

Python: an *interpreted* language

- Programs are "translated" to machine language *as they run*
- Easily written
- Slow

C/C++: a *compiled* language

- Programs are "translated" to machine language, and *then* ran
- Difficult to write
- Fast

Note: Python's use of whitespace as syntax is not common, and it is often criticized for this.

The Python Interpreter

The program which reads and runs code written in python

Written in C*: a compiled language

- A program which is already in machine language is reading what you write and is deciding what to do based on that
- If you take on data intensive project(s) and need faster code: this makes getting python and C code to talk to each other *easy*

*There are other implementations of Python, though CPython is the standard

The Python Model: Everything is an Object

No – ***really*** – everything

- This is part of what makes python a slower language

Objects in programming – anything with attributes and functionality

- Python interpreter implements the PyObject under the hood

This applies to everything in python

- Type attribute: string, integer, float, list, array, etc.
- Values: numerical types have the number itself attached to them
- Lists/Arrays: length, the objects they store

Static Typing vs. Dynamic Typing

Python: **Dynamic** Typing

- Example: x = 3

- Python knows that x is an integer, and you ***are*** able to change that
  - x = 3.1 changes x's type to float
  - x = "example" changes it to str

C/C++: **Static** Typing

- Example: int x = 3;

- You have to tell your program that x is an integer, and you ***are not*** able to change that
  - x = 3.1; produces an error

Strong Typing vs. Weak Typing

Strong/Weak Typing is a spectrum while Static/Dynamic is binary, and its definition is much less standard.

Python: **Stronger** Typing

- Example: x = 3
  y = “4”

- Python stores x as type *int*, and that allows certain interactions w/different data types
  - x + y produces an error
  - x * y produces “444”

JavaScript: **Weaker** Typing

- Example: var x = 3;
  var y = “4”;

- JS makes more “best guesses” on how to interpret data than Python
  - x + y produces “34” in JS
  - x * y produces 12 in JS

Summary

Python is an interpreted language – this makes it easy to write but slow

The Python Interpreter – the program which runs the python code you've written

The Python Model – ***Everything*** is an object

Dynamic Typing – Python keeps track of data types for you

Typing Strength – Python prohibits some operations between data types