Université de Paris

Programmation avancée
1 - Introduction

Sylvain Lobry

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Before we start…

- https://www.wooclap.com/PROGAC1

Today’s menu

1. Objective of this class
2. Paradigms
3. Class’ outline

Objectives of this class

Learn new languages

- In this class, we will learn 2 new languages:
  - C++ → basic introduction
  - Python → towards proeficiency

Objectives of this class

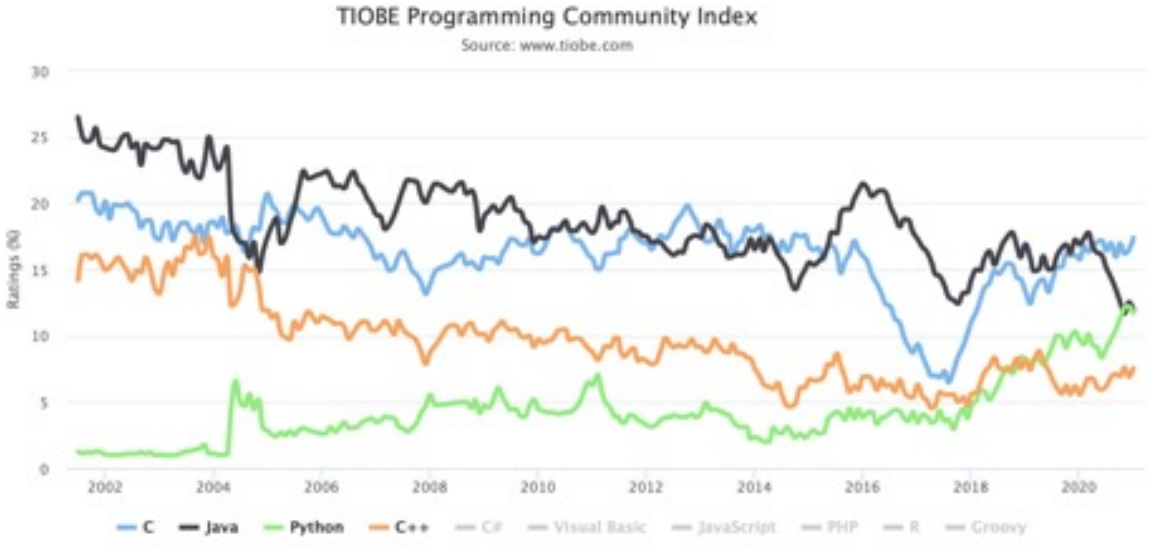
Using python for AI/Vision

- Exploring data
- Scientific computing

Objectives of this class

Why learn new languages?

- Boring (but important!) answer: for your CV
- Popularity contest (source TIOBE index = indicator of popularity of languages)



Objectives of this class

Why learn new languages?

- Boring (but important!) answer: for your CV
- More interesting answer: different languages for different tasks:
  - Because of libraries/resources/community adoption
  - Different levels of abstractions:

"[…] a programming language performs two related tasks: it provides a vehicle for the programmer to specify actions to be executed by the machine, and it provides a set of concepts for the programmer to use when thinking about what can be done. "

Bjarne Stroustrup, The C++ programming language

Objectives of this class

Why learn new languages?

- Boring (but important!) answer: for your CV
- More interesting answer: different languages for different tasks:
  - Because of libraries/resources/community adoption
  - Different levels of abstractions
  - Because it makes it easier to follow a specific programming paradigm

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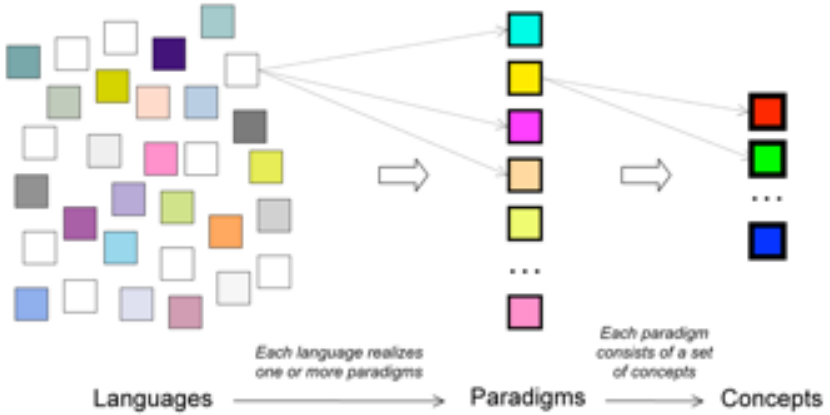
Programming paradigms

Programming paradigms

- Definition:

A programming paradigm *is a style of programming a computer that is defined by a specific set of programming concepts and techniques, as embodied by its* kernel language*, the small core language in which all the paradigm's abstractions can be defined.*

Peter Van Roy

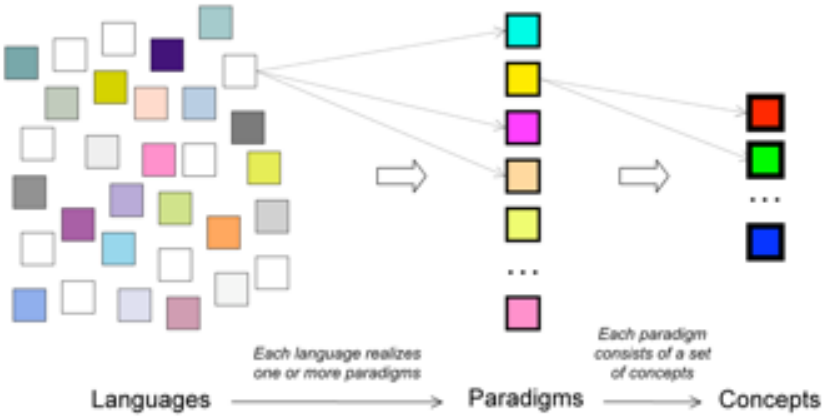


Peter Van Roy, Concepts, Techniques, and Models of Computer Programming, MIT Press

Programming paradigms

Programming paradigms

- A language can realize one paradigm: "*pure*" languages
- Most languages allow several paradigms
- Some languages are designed to realize several paradigms: *multi-paradigm* languages
- A language can evolve and realize new paradigms



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Programming paradigms

The ones to know

- Imperative: specify **instructions** to the program (to get to a **result**)

- Declarative: specify **result** to the program (not the **instructions**)

Programming paradigms

The ones to know

- Imperative: specify **instructions** to the program (to get to a **result**)
  - Structured programming: uses structured control flow (conditions, loops)
    - Procedural programming: uses procedures to structure the program
  - Object-oriented programming: concept of objects (data + code)
- Declarative: specify **result** to the program (not the **instructions**)
  - Functional programming: a program is a composition of functions
  - Logic: expression in terms of logical formulas

Where is C? OCaml? Java?

Programming paradigms

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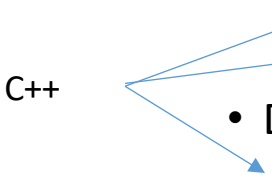

Programming paradigms

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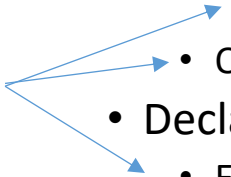
Python



Programming paradigms

The ones to watch

- Generic: programms are written for generic types (to be specified when used)
- Metaprogramming: program programms
- …. Want to know more? Book chapter from Peter Van Roy

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Outline

- Introduction to the class (today)
- Introduction to C++ (starting today)
- Introduction to Python
- Functions, exceptions, modules
- OOP
- Python for data science

Practical information

- Every week:
  - Lecture (1h30)
  - TD (1h30) -> List of exercises to work on, we correct them together
- Some weeks:
  - Homeworks -> given on Monday evening to be handed on the following Sunday 23h59
  - Some will be graded automatically: stick to the instructions (otherwise… 0)
  - Some will be graded manually
- Towards the end of the class: project
- Defence during the last labs/class

- Final grade (target) = 17% Homeworks + 33% Project + 50% Final exam
- Questions?

Questions?

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