

# Python versus other programming languages

Python is one of the most popular programming languages for data professionals, which makes it a great addition to your data analytics toolbox! As we've previously investigated, Python's use of syntax to communicate commands and perform tasks mirrors spoken language. This makes Python a much easier programming language to learn. Python's structure is similar to many other programming languages, but there are some key differences to consider as well.

In this reading, you'll learn how Python compares to other programming languages data professionals use, including R, Java, and C++.

## Five considerations of programming languages

Python isn't the only programming language used for data analysis, but it is one of the most widely used and most powerful. Many data professionals even use more than one programming language. Every language has benefits and drawbacks. For the purposes of this course, examine the following considerations: speed, approachability, variables, data science focus, and programming paradigm.

### Speed

There are many factors that contribute to the speed of a program's execution, including compile time, runtime, hardware, installed dependencies, and the efficiency of the code itself. In general, low-level programming languages are faster, but they're more difficult to learn and work with.

### Approachability

Approachability refers to how easy it is for new learners to start using a language. Learning new programming languages can be challenging depending on their syntax and overall structure. The **syntax** is the structure of code words, symbols, placement, and punctuation. Semantics builds meaning into those structures by using variables and objects. Additionally, those variables help add flexibility to the programs and objects where data is housed.

### Variables

Information in code is stored in variables. A **variable** is a named container which stores values in a reserved location in the computer's memory. The way a programming language uses variables will have an effect on a system's core operations or kernel speed. Some languages use static variables to maintain a value throughout the entire run of a program. Others approach variables as dynamic, allowing values to be determined when a program is run. Some languages even allow declarative variables, which enable a program to determine where a variable should be placed.

### Data science focus

Programming languages have individual characteristics and can better serve different tasks in data analysis; this means programmers often use them for specific data science tasks.

## Programming paradigm

Programming languages can be object-oriented, functional, or imperative. Object-oriented programming languages are modeled around data objects. Functional programming languages are modeled around functions. Imperative languages are modeled around code statements that can alter the state of the program itself.

## Programming language comparisons

Python, R, Java and C++ are four of the most commonly used programming languages for data analysis. The following chart compares them using five considerations: speed, accessibility, variable, data science focus, and programming paradigm.

Features by Software	Python	R	Java	C++
Speed	Slower	Depends on configuration and add-ons	Faster	Very fast
Approachability	Easy to learn	Complex	Easy to learn	Complex
Variable	Dynamic	Dynamic	Static	Declarative
Data science focus	Machine learning and automated analysis	Exploratory data analysis and building extensive statistical libraries	Used across projects with open-source assets	Not as widely used but powerful implementation
Programming Paradigm	Object-oriented	Functional language	Object-oriented	Multi-paradigm (imperative, functional, & object-oriented)

## Key takeaways

There are a number of different programming languages that can be used for data analysis. Each language has its own benefits and drawbacks. Learning to work with different languages will give you the opportunity to broaden your data skills and access new tools for your analysis. However, in this certificate program, Python will be your sole focus. As mentioned previously, Python is an easy to learn, object-oriented programming language that engages dynamic variables; though it sometimes requires a longer time to execute, it is a great tool for machine learning and automated analysis.