SDV602

Language Comparison:

Python & JavaScript

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Heritage and Philosophy

Python

Heritage:

In the 1980s Python was created and being worked on by Guido van Rossum, a Dutch programmer. For this, Guido was called the "benevolent dictator for life" (BDFL) until he stepped down from this position in July 2018. The BDFL title is given to open-source software development leaders/founders who retain the final say in disputes amongst the community. *(Guido van rossum, 2021)*.

The first release of the programming language was in 1991 as Python 0.9.0. Python2 and 3 were released in 2000 and 2008 respectively. The two versions were not compatible with one another. Python 2 was eventually discontinued in 2020 but remains one of the most popular programming languages today. *(Wikipedia Contributors, 2019b)*.

Python is also a multi-paradigm programming language, this includes object-oriented programming structured programming, functional programming, and aspect-orientated programming. There are other paradigms that can be enabled and supported by a range of extensions available to Python.

Philosophy:

The core philosophy is described in the document named “The Zen of Python” this describes such expressions relating to Python such as:

- Simple is better than complex.
- Complex is better than complicated.
- Explicit is better than implicit.
- Beautiful is better than ugly.
- Readability counts.

A key factor in Python is that instead of having all the functionality built in, it was instead designed to be expandable with the help of modules. The modularity approach made Python a popular language due to its ease of adding modules to existing applications. This was Van Rossum’s vision of a small core language with a vast extensive library. *(Wikipedia Contributors, 2019b)*.

Python’s development is largely developed through the Python Enhancement Proposal (PEP) process. This is the primary mechanism for proposing the latest and new major features to be implemented. Through this collective community input on issues relating to python design decisions is collected, analysed, and reviewed by the Python community and council. *(Wikipedia Contributors, 2019b)*.

JavaScript

Heritage:

In December 1995 JavaScript was officially released. It is a programming language that follows the ECMAScript standard. This standard is meant to ensure the synergy and compatibility of web pages across many different web browsers.

Like Python, JavaScript is a multi-paradigm language. It supports event-driven, functional, and imperative programming styles. Application programming interfaces (APIs) can used with JavaScript when using text, dates, expressions, data structures and Document Object Model (DOM). Currently, alongside HTML and CSS, JavaScript is one of the most used technologies of the world wide web. As it stands over 97% of websites used JavaScript for their client-side web pages. *(Wikipedia Contributors, 2019a)*.

Its original design made by Brendan Eich was to be intended to be used with dynamic behaviours along with an interpreter when it came to the Netscape Navigator browser (released in 1994) which was hugely popular at the time.

Soon after Microsoft debuted a new browser called Internet Explorer in 1995. A selling point was support for CSS and HTML extensions. A competition war ensued between Netscape Navigator and Internet Explorer. Internet explorer won out the battle with 95% market share in early 2000s. Over time however, the climate started to change and gain traction as multiple newer browsers were released, Firefox and Chrome in 2005 and 2008 respectively. Chromes V8 JavaScript engine boasted it was faster than the competition leading to other browsers overhauling their engines to use a key innovation compiler named Just In Time (JIT). *(Wikipedia Contributors, 2019a)*.

Today, the current JavaScript ecosystem provides many libraries and frameworks for developers to use.

Philosophy:

JavaScript's philosophy originally is a fusion of using lightweight self-implementation which is a lightweight Smalltalk, built from an older object-orientated programming language named Smalltalk. Thus, the philosophy would have been the same as Smalltalk, being Simplicity, composability, uniformity. JavaScript achieved composability, along with somewhat simplicity but it was far from being uniform.

The original philosophy could arguably have been replaced by ECMA's all things to all people approach. It is notable how much JavaScript has changed over the last decades and the key position it currently holds in development. *(Wasserman, 2019)*.

Open-source developers and communities have been working for years to develop and revolutionise JavaScript. There have been many libraries released over the years which has become confusing and hard to follow. In 2008 a large convention of many community development parties was held that help decide the fate of JavaScript and bring the many libraries and tools together under a new agenda known as Harmony (ECMAScript 6).

In 2009 a project called CommonJS was founded with the goal of a common standard library mainly for JavaScript development outside the browser. Single-page applications and JavaScript heavy sites on the rise it is increasingly being used as a compile target for source-to-source compilers for dynamic and static languages. *(Checkmarx Team, 2018)*.

Platforms for development

What is a IDE and Code/Text editor?

Integrated development environment (IDE) can perform several functions like running and executing code, debugging, interpreting, compiling and the use of a built-in terminal. It is considered a development environment where programmers can write the script, compile, and debug all in one go.

A code/text editor helps for writing scripts, modifying code or just simple text modifications. An advantage of text editors is that it allows the modification of all types of files rather than a specific language. However, code/text editors can have added functionalities that allow similar functionality to that of an IDE. *(Simpao, n.d.)*

What are code libraries?

Code libraries are a collection of programming parts that are sections of prewritten code that developers can use to optimise tasks. Usually, these libraries consist of specialised code that can allow certain tasks to be completed easier. Commonly, it allows for specific functions and objects that can be called or instantiated. By using libraries, the developer can spend more time concentrating on the unique requirements of the application. *(TechTarget Contributor, n.d.)*.

What are package managers?

Package managers are collections of software tools that automate the process of installing, updating, configuring, and removing programmes for/on computer systems. General steps include the user requesting a package using the software tools package manager. The package manager then finds the requested package from an available location and downloads it. The package manager then installs the packages and advises on any extra steps needed. *(Package manager, 2021)*.

Python

Python's development scope is most commonly used for many versatile applications, including server-side web development, software development, math, scripting, machine learning and artificial intelligence. Python can also be used on a range of operating systems such as Linux, MacOS, and Microsoft Windows. *(12 best python ides and code editors in 2021, n.d.)*.

Integrated Development Environments (IDEs) / Code Editors

PyCharm – A widely used IDE in Python. PyCharm was created by Jet Brains and is one of the best IDEs for Python. It provides a smart platform for developers helping save time with auto code correction, error detection, and quick fixes etc. There is in build multiple framework support.

Sublime Text – Hugely popular cross-platform editor that was developed on c++ and Python along with Python API. It has good compatibility with language grammar and allows users to choose specific preferences in relation to the current project.

Spyder – An open-source IDE it is extremely popular among scientists and engineers for scientific development environments for Python. It has a powerful debugger to trace each step of script execution. Supports extended plugins to improve functionality. *(12 best python ides and code editors in 2021, n.d.)*.

Code libraries

TensorFlow – Great for working on machine learning algorithms. TensorFlow works likes a computational library for when writing new algorithms that can involve a large number of tensor operations. A very flexible library that has modular parts allowing for even standalone options. TensorFlow has a large community due to the fact that it has been developed by Google.

NumPy – One of the most popular libraries in Python. NumPy is simple, interactive, intuitive, and easy to use. A large community base that allows for constant improvements. Its main uses are for expressing images, sound waves, and other raw streams of data.

Keras – Provides some of the best utilities for compiling models, visual graphs, processing data and so much more. Many big companies already use features built with Keras, such as: Netflix, Uber, and Yelp just to name a few. Keras is useful for deep learning projects. The library has been adopted by scientific organisations like CERN and NASA. *(Anirudh Rao, 2018)*.

Package managers

PIP – Pip Installs Packages(pip) is a package manager for Python. It allows the installation of additional libraries and dependencies. Package management is essential for Python, so pip has been included with the python installer since versions 3.4 for Python 3.

Python has a very active community that contributes many sets of packages that can help with a wide variety of projects. These packages are published and available at the Python Package Index or PyPi website. *(Python, n.d.)*.

JavaScript

JavaScript platforms and libraries help make website and application development easier with a wide range of features and functionalities. This is due to JavaScripts dynamic and

flexible nature. JavaScript is one of the most used programming languages, in today's market. It is useful for front-end and back-end development.

Integrated Development Environments (IDEs) / Code Editors

Visual Studio Code – Also known as VS Code. VS Code is one of the best IDEs for JavaScript, powerful and rich in features. Most importantly it's free to use. VS Code comes with multilanguage support, great git integration, many plugins/extensions, and it is lightweight.

Atom – An open-source IDE that was popular before the introduction of VS Code. GitHub backed Atom which is one of the reasons it became so popular. Atom is like VS Code and has many similar features and functionalities, has support for multiple operating systems such as: Windows, Mac, and Linux.

Webstrom – Webstrom is a product of the company JetBrains which make tools for software developers. Webstrom has in built support for many technologies and languages and has support as well for multiple operating systems. Git integration is also available along with intelligent code completion. *(Which is the best IDE for javascript development in 2021?, n.d.).*

Code libraries

jQuery – Is a fast lightweight and rich library. Built in 2006 by John Resig. jQuery is a free open-source software. jQuery simplifies things for HTML document manipulation, traversal, animation, and event handling. The syntax is like that of CSS and as such is easy for beginners to learn.

React.js – Also known as React. It is an open-source, front-end JavaScript library. Created in 2013 by Jordan Walke. React currently has a MIT license and is designed to make interactive UI elements simple. React supports JavaScript XML (JSX) this method combines both JS and HTML. Many large companies use React, such as: Facebook, Instagram, and WhatsApp.

Lodash – Is a JS library that is utility based and helps when working with numbers, arrays, strings, and objects etc. Released in 2013. Lodash has many great features including writing concise code, simplifying common tasks like math operations, creating, modifying, and sorting arrays. *(Acharya, 2021).*

Package managers

npm – Node package manager(npm) is a package manager for JavaScript. It is the default package manager for the JavaScript runtime environment Node.js. The world's largest software registry with over 1.3 million packages available in the main npm registry. The registry does not have a vetting service which can mean certain packages may be of inferior quality. This issue was fixed in npm version 6 where an audit feature was introduced. (*Npm (software)*, 2021).

Programming Language Comparison

Advantages and Disadvantages

	Python	JavaScript
Advantages	• Easy to learn and use – Python has an English-like syntax which makes it easier to read and understand, especially for beginners. *(TechVidvan Team, 2019)*. • Free open-source – OSI approved under an open-source license, this makes Python free to use and distribute. *(DataFlair Team, 2018)*. • Large library support – Python library is massive and has availability for almost all the functions needed for any project. There's no need to depend on external libraries. *(TechVidvan Team, 2019)*.	• Speed – JavaScript on the client side is very fast since it is run on the client browser. This reduces load on the back end. *(Gupta, 2019)*. • Popular – Many applications use JavaScript. Therefore, it is feature rich and in high demand. • Highly adaptable with other languages and applications.
Disadvantages	• Slow – Line by line execution of code often leads to slow execution. *(DataFlair Team, 2018)*. • Memory – Python uses a large amount of memory. For applications that require memory optimisation this can be a disadvantage. • Runtime errors – Being a dynamically typed language. Data type variables can change at any time. Such as a variable containing an integer number may hold a string, which can lead to runtime errors. Thorough testing is required. *(TechVidvan Team, 2019)*.	• Security – because the code executes of the users' computer and devices, in some cases this could be exploited for malicious activities. *(Gupta, 2019)*. • Browser support – JavaScript can be interpreted differently by different browsers. This can be difficult when it comes to writing cross platform code. *(Team, 2019)*.

Code Comparison

Code Blocks	Python	JavaScript

Define	`def stuff(x):`
	`  print(x)`
	Python uses indentation to define code blocks. This means that when a series of continuous lines of code are indented at the same level then they are part of the dame code block. *(Navone, 2021).*
		`function stuff(x) {`
		`  console.log(x);`
		`}`
		JavaScript uses curly braces {} to group statements to the same code block to define their scope and use. *(Navone, 2021).*

Variables	`#<Variablename> = <value>`
	`x = 5`
	Python's simplistic approach to define and declare a variable cuts down on code and is easy to read.
		`// var <Variablename> = <value>;`
		`var x = 5;`
		`let x = 5;`
		The syntax just like Python is similar with JavaScript. The only difference is a key word is used before the name of the variable and a semicolon at the end of the value. *(Navone, 2021).*

Naming Conventions	`#first_name` Python uses snake_case naming style. Variable names follow the same conventions as function names.	`//firstName` JavaScript's naming style is lowerCamelCase. This means that the name starts with a lower case letter then every new word starts with an uppercase letter.
Comments	`#This is a comment` Python uses a # for comments. All characters in a single line after this are considered part of the comment.	`//This is a comment` JavaScript uses two forward slashes // to start a single line comment.
List vs Arrays	`numbers = [1, 2, 3]` In Python, lists store a sequence of values in same data structure. They can be modified.	`let numbers = [1, 2, 3]` JavaScript, has an equivalent version called an array.
Logical Operators	`# and or not` Python logic operators are written and easily to understand.	`//&& || !` JavaScript uses symbolism to cut down on code.

Conditional Statements	`# if condition:`
	`#  code`
	`# else:`
		`// if (condition) {`
		`  //code`
		`//} else {`

Code Blocks	Python	JavaScript

	`#  code`
	Like the define code block above Python has a simplistic approach that's clean and simple to read.
		`  // code`
		`//}`
		JavaScript's If, else statement is also simplistic in its design and shows the structure or outline of the code with {} curly braces.

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