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Comparative study of Java and Python: A Review

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ABSTRACT:

Because computing is everything about us, it will inevitably pervade society. One way to get started in the IT industry is to learn to program. Choosing a language that is simple to learn is crucial for novice programmers. It could be difficult for a novice to know where to start with the wide variety of coding packages available on the market. If someone is new to programming and chooses a challenging language, they may quickly lose interest in the field. Python and Java, two of the most well-liked, in-demand, and often used programming languages, are compared and contrasted in this essay. This article compares and contrasts Python and Java's features, applications, advantages, and disadvantages in brief.



KEYWORDS: Casting, Framework, Java Object Oriented, Python, Variable.

INTRODUCTION

Out of all the technologies that could be useful to a developer, the team decided to focus on these two because they were the most appropriate. We selected Python and Java because reliable sources regard them as being very well-known and highly recognized. They are highly sought after in the job market and are well-liked. For a novice programmer, a language's ease of understanding, simplicity, approachability, and believability some of its most crucial qualities. To learn the two languages, the group perused books, journals, and scholarly paper

Overview of Java:

The Java programming languages were first proposed in 1991 by Jim Gibson and his son's Microsystems group, and they became publicly available in 1995. Java's WORA (write once, read anywhere) features allow it to run on any platform, which is its most notable feature. OAK was the original name under which Java was developed. The original goal of OAK was to serve as a computer language for interfaces between TVs, VCRs, and other devices. Java was solely owned by Oracle Corporation after it acquired Sun Systems in 2009–2010. Because Java is a dynamically typed language, properties must be defined before values can be assigned. Even though Java programs perform better than C++ programs, they are faster than Python programs. Large organizations like as Infosys, Intel, HP Technology, Snapdeal, Naukri and several other still utilize Swing. Assume that your day job involves developing computer products. For coding, C or C++ can be utilized. Even after some time spent on it, it doesn't seem to be getting any easier. A plethora of disparate hardware has surfaced in recent years, all of which are capable of running one or more competing graphical user interfaces and multiple incompatible operating systems. It is now your responsibility to ensure that your applications are functioning as distributed clients/servers. The use of computers, the Internet, and "virtual shopping" has increased the complexity of the manufacturing cycle. The tools you are using to make apps don't seem to be very helpful. It seems that the new



entity techniques have ignored some problems and introduced new ones, so you're back to square one with the same old problems. You convince yourself and your friends that there has to be a more sensible way to handle this situation.

A. Features of Java:

i) Object-oriented programming languages, also known as object-oriented computing languages, use coding techniques that divide a program into multiple subclasses. There are four fundamental concepts in object-oriented computing. ii) Platform Independent: The JVM executes the generated bytecode once the compiler has transformed the source code into bytecode. We can build a program on Windows and run it on Ubuntu, and vice versa, because this bytecode is compatible with Windows, macOS, and Microsoft platforms. When bytecode is executed, all operating systems yield identical output, even though each has its own JVM. This is due to Java's reputation as a platform-neutral language iii) Abstraction iv) Encapsulation v) Inheritance vi) Polymorphism vii) The execution environments and the JVM are both safe. Among Java's many built-in security features are real-time type verification and compile-time version verification. Java provides very good security. Because Java doesn't use references, it is extremely safe. viii) Multitasking is possible with Java. It facilitates the development of dynamic, responsive apps that can manage several projects at once. Sharing a storage region among multiple threads improves speed and functionality.

B. Applications of Java:

The official programming language for Android mobile application development is Java. JVM is the more widely used option, even though Dart can be used to create mobile apps. One particular Android digital engine that executes Java byte codes is called Dalvik (DVM). Kotlin and Android are two examples of application development technologies that support the JVM. The security, adaptability, and productivity of developing Android applications are enhanced by the Android OOP concept.

Java is used to write web applications that utilize struts, servlets, and HTML (Java Server Page). Java is a good choice for developing systems in the domains of healthcare, financial



security, education, and coverage because of its straightforward code and high level of safety. Many open-source markets are available to Java programmers.

Java is used for Big Data analysis because of its strength, speed, and dependability. Java is a fantastic option for Big Information applications because of its features, which include automatic garbage collection and effective resource management. Java uses tools like Apache Hadoop, Apache Diamond, and

Java Free chart to participate in big data. All of that technology works better with Java because of its experience in open-source communities. Apache, Linux Sparks, Apache Mahout, and numerous other state-of-the-art IT projects are examples of Java sub-projects.

C. Overview of Python:

At Centrum Wickende & Informatics (CWI) in Amsterdam, Guido van Rossum developed Django in the late 1980s. The program was made available to the general public in November 1989. The errortolerant ABC programming languages, which could interface with Amoeboid operating systems, were intended to be superseded by Django. The name Django came from the television show Monty Python's Circus, which was Guido's favourite. Since Python is a constructed and dynamically-typed programming language, developers don't need to use a compendium or explain the intricacies of the factors in detail; instead, they can use the engaging control to get feedback right away rather than waiting for the completion of the entire curriculum. The Python Systems Foundations (PSF) has owned the language's copyrights since Python version 2. At the moment, Python is the most popular computer language. Python is widely used in data science, which is one of the main reasons for the increase. On numerous websites, including Reddit,

YouTube, Google, Instagram, and others, there are a few Python-written programs. Other similar services like Quora, Dropbox, Spotify, and others are also available to you. We have worked with major corporations such as NASA, Disney, IBM, Amazon, Instagram, Spotify, and others. Facebook and other websites use Python. E. Features of Python:

Compared to other languages like Java, C++, and others, Twitter is simpler to write and read. Everybody gets the opportunity to learn Python in a lesson. For a brief period, the



program is comparable to the English language. This enables the pupil to concentrate on the outcome.

Open-source code for the Python programming language can be downloaded for free. Anyone can participate in and make contributions to language development. Panda's source code is available for download, modification, and distribution.

The extensive Python standard libraries contain a wide range of packages and methods. As such, the developer does not need to write any new ones—they just need to export the software.

Given that variables in Python do not require the definition of their data types at the time of declaration, the language is referred to as adaptively coded. During execution, the type of object is selected.

D. Application of Python:

- Python is a popular programming language used in web development. The Python platforms Bottles, Django, Elixir, and Pyramids are among them. Python web technologies are well known for their security and adaptability. The Python Program Index contains libraries such as Curved Python, Request, Lovely Soup, Para Miko, and Feed parser.
- GUI desktop applications: Python can also be used to create desktop applications. GUI tools and packages like PyQt, PyGtk, Kivy, Tkinter, Django, PyGUI, and PySide make it easy to create desktop applications.
- The process of gathering enormous amounts of data from websites for use in price comparisons, job postings, and other applications is known as web scraping. For this kind of work, Python is an excellent tool. These include various internet scraping technologies such as Lovely Broth, Robotic Porridge, LXML, and others.
- For data analysis and visualization, including data mining and data representation, Python is a popular choice. Information researchers analyse and visualize complex data using analytical techniques based on Python. NumPy, Penguins, Sci-Kit, and additional Python libraries are utilized.



- Game Development: Python comes with a number of pre-installed components that can be used to make games. PySoy is a Python3 3D online gaming platform, whereas PyGame and PyKyra are tools for creating video games.

E. Syntax comparison between Java and Python:

- Variables: In Android, on the other hand, properties and their class need to be declared beforehand. Even though a variable can be defined before a value is assigned, the variable's identifier must be verified at the time of creation. It is possible to alter a variable's value, but the new value must correspond to the same datatype. The "final" keyword in Java stops values from being overwritten. A commaseparated list can be used to declare multiple variables of the same type. The three types of factors in Java are: example factors, static factors (class variables), and local parameters.
- A specific datatype need not be provided for Python in order for a variable to have a value. Typing in Python is now dynamic. Once values are established, they can be changed. It could be changed to $x = 1j$ and $1j$ be a significant integer if $x = 5$ and 5 is a number in the future. a challenging number Use the character "=" to define and store multiple parameters with the same values. Use the ',' character to divide parameters with different values. Python makes use of two different kinds of variables: subclass attributes (static elements) and example parameters (dynamic variables).

For one-line comments, Java uses the "///" character (two backward dashes); anything that appears after the "///" is regarded as a remark. The characters /* and "*/" are used to start and finish multi-line remarks, respectively. Text or code that appears in the middle is ignored.

- Text or code added to software to enhance accessibility is called a comment. They will not be executed. Python uses the symbol "#" to denote that anything is a comment
- Operators: Java has a wide variety of operators, some of which are comparable to those in Python. Unlike Python, Java offers arithmetic operations for increment and decrement, such as ++ and —. Java does not have an identity or membership operator. In Java, one uses the logical operators &&, ||, and ! for and, or, and not, respectively.
- The arithmetic operators (+, *), assignment operators (=, +=), comparison operators (= =), logical operators (and, not), identity operators (is, is not), membership operators (in, not in), and bitwise operators (, |) are just a few of the many operators available in Python.



- **Strings:** In Java, a string can be declared using double quote marks. The characters datatype, denoted by a single quote mark `'`, is the second datatype in Java. In Java, characters are managed as entities. Text Storage and Text Constructor can help make strings in Java more pliable even though they cannot be changed. The escape character is present in Python and Java. Java comes with built-in text functions. In Groovy, multiline integer messages are not permitted.
- Python allows the use of both single and double quote marks when writing strings. There is no character datatype in Python. Multiline strings can also be declared using triple quotes. In Python, strings are arrays, and negative indexing is used. In Python, strings are also immutable. Many string methods are already included. You can combine a string and a number using the format method in string without having to typecast. The escape character `\` is used if an illegal character needs to be inserted into a string.
- Java offers four different kinds of loops: do while loops, nested loops, while loops, and for loops. Java uses a for loop when there is a set number of iterations. Additionally, there is a "for-each" loop that can only iterate through arrays. If there are differences in the number of iterations, use "while." Before a variable can be increased or decreased inside a loop, it must first be initialized. The do while loop is used when the condition must be true and the code must run at least once. The "break" keyword is used in both languages to end the current loop. Java switch also uses a break statement to exit the loop.

II. LITERATURE REVIEW

A) PYTHON:

In the latter part of the 1980s and the early 1990's, Guido van Russom developed the programming language Python in the

Netherlands. Python was heavily influenced by and preceded by the languages Java, C, C++, and Smalltalk. Because Python is a dynamically typed programming language, variables may change as the program runs. Additionally, the language will choose the datatype for the programmer, saving them from having to do it themselves. The language doesn't require a lot of prior computer science knowledge to get started, which is one of the reasons it's often considered beginner friendly. As the figure shows, Python has



grown to be one of the most popular programming languages over time, with a large user base and a variety of applications. The programming language provides strong support for most of the features required for a general-purpose language. It supports the use of desktop and web applications framework and the size library.

Jan 2019	Jan 2018	Change	Programming Language
1	1		Java
2	2		C
3	4	▲	Python
4	3	▼	C++
5	7	▲	Visual Basic .NET
6	6		JavaScript
7	5	▼	C#

Figure Statistics of the most popular programming languages in January 2019.

B) JAVA:

Microsystems in 1991, and it was first made available in 1995 [2]. Java's "write once, run everywhere" feature, which renders the programming language platform independent, is one of its primary selling points. When a Java application runs, the compiler produces byte code rather than machine code specific to a given platform. When the application is run, Java's virtual machine will then start to run the byte code [2]. This means that the application can only be used on systems that have a Java virtual machine (JVM) installed. This facilitates the process of running the same application across various platforms.

II. DISCUSSION

Java is both a programming language and a framework. Java is a high level, trustworthy, and secure object-oriented programming language. A platform is any physical or digital environment on which software can run. Java is called a platform because of its distinct API and execution contexts. The original plain text files with the extension "java" were used to generate the source codes for Java technology. The source files are subsequently converted into class files by the Java compiler. A



class file contains bytecodes, which are the machine language of the Java Virtual Machine (Java VM), as opposed to processor-specific bytecode. The Java launching program then launches a Java Virtual Processor to execute your application.

Python is popular among developers because it increases the productivity of their work. With no compilation step, the modify cycle is incredibly fast. Since a Python script will never experience a fragmentation fault due to a bug or incorrect input, they are easy to debug. If the translator discovers an error, though, it creates an exception. If the program cannot identify the error, the interpreters generate a stack trace. Among the things you can do with source level debugging are examine local and global parameters, examine random phrases, place breakpoints, and work through a program line by line. The introspective features of Python were utilized in the development of the analyser. Nevertheless, adding a few print lines to the original code is usually the fastest way to debug a program. This straightforward approach generates a brief edit-test-debug cycle, which is why it works so well. To prevent squandering time and losing faith in the procedure, the group investigated which code should be used initially. The group only chose Java and Python as their technologies, and they might or might not be used. In some circumstances, this is the safest course of action. The company is aware that there are other programming languages that are superior to these two technologies. The selection of Python and Java was based on their community support and robustness. It is significant that there are many people who speak these two languages. When an expert and a novice meet, the expert is crucial. In the event that they encounter an issue or struggle to comprehend a particular idea, they may ask for assistance. support from the specific community. The research team came to the conclusion that each of the two nations examined in this study had benefits and drawbacks in the relevant fields. It is not possible to predict with certainty. Python has a simpler structure than Java, but both are still superior because Java provides a better understanding of memory management and is more secure. Python is a concise, uncomplicated, and easy-to-use programming language. Programs can be easily understood by beginners because they are written in Python. Python code needs to be indented in order to improve readability. This is precisely the case with Java, where the program can appear shorter if it is written on a single line and indentation has no effect.



III. CONCLUSION

The habit of forgetting to include the comma at the end of a paragraph is one of the main problems with Java translation. Python is a flexible programming language, so while the code is being executed, the variable's type is checked. However, because Java is an inscription-based language, calling the relevant data structure for the variable during compilation allows for faster execution. Anybody can easily learn another language, regardless of the language they choose, as many computer languages have similar foundations. The beginner should hold off on switching languages until they have mastered the current one because doing so will reduce confidence. Therefore, a novice should choose a programming language based on the outcomes they hope to achieve. If one wants to work on apps, options include Java, Fast, or Flutter. Should the individual want to create games, they should select a language such as JavaScript, Java, C, or C++. Python and JavaScript are two programming languages that might be appropriate for someone who is interested in web programming or intelligent learning, for example. Ruby can be of assistance. Consequently, a novice needs to select an area of interest or determine what they wish to work on going forward. Next, the languages have to be selected according to the individuals' preferences.

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