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Comparative Review of JAVA and Python

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Abstract: In this era of technology, programming has become more significant than ever before. Python and JAVA are both widely used programming languages. Python, the most popular programming language in today's world, is a high-level object-oriented language, whereas JAVA is the object-oriented language. In this paper, we present a comparative study of Python and JAVA. This paper discusses the introduction to these languages, their memory management techniques, and the reasons behind their program execution speed. Furthermore, we analyzed the execution time and memory used by multiple algorithms in both the languages with best, average, and worst cases. They are also compared with respect to the benefits and issues related to them. This paper includes a comparison of the two most popular, top-ranked, and in demand programming languages Python and Java. A brief overview of Python and Java including its features, applications, advantages, and disadvantages is presented in this work. The comparison of the two languages is based on syntax and features comparison.

Key Words: Comparison, Python, Java, Programming Language, Beginner.

1. Introduction:

The possibility that writing computer programs is a characteristic attribute is a legend. While showing how to peruse, we as a rule take more limited books including basic, rudimentary words and not an exemplary book. Likewise, we simply need to apply something similar in programming too. Taking care of simple and basic issues helps in building the certainty to take care of confounded issues [4]. Computational Thinking is fundamental particularly for an individual related with Computer Science. The contention to figure out which programming language to be picked by an amateur has been an on-going debate [10]. Programming Language is the phrasing used to convey among machines and people. PCs don't get human language so we want a language that machine typically comprehends. It carefully guides the PC what to do straightaway to play out an assignment or take care of an issue. The principal programming language formally proposed was Plankalkül, created by Konrad Zuse for his Z1 PC somewhere in the range of 1943 and 1945 albeit not carried out until further notice. The principal working significant level programming language is known as the Short Code proposed by John Mauchly's in 1949 and was written in the mid 1950s. Fortran (Formula Translation) was the primary industrially accessible language created by a group at IBM in the extended time of 1954. Programming and Coding are regularly utilized as tradable words, however we really want to comprehend that knowing how to code doesn't mean you can program. Coding is the capacity to compose code with the information on the grammar and design of a language while Programming is the ability to interpret a plan to take care of an issue and it contains coding, breaking down and executing calculations, understanding information constructions, and taking care of issues.

There is a huge extension for a Computer Science certificate holder and they can endeavor in any field. These days, there are many programming dialects accessible and every single one of them is superior to the next in their own viewpoints. To pick just a single programming language is intense. There are various variables to be viewed as while picking a language. Incorrectness and deception of qualities of a programming language like outsider help, simplicity of getting, speed or capacity, and so forth, can have a tremendous effect while choosing a programming language [5].

Fledgling thinks uniquely in contrast to a specialist or experts. What is simple and can be tackled in almost no time by an expert can consume a large chunk of the day and be challenging for a beginner. Amateur has to know the grammar, variable, circles, how to emphasize, and so on, while experts have previously obtained the information. Fledgling normally battles on the best way to investigate as they don't generally have any idea what ought to occur. A few antagonistic conditions that were even seen at colleges like Lappeenranta University of Technology (LUT) where students of programming neglected to pass the essential course and regardless of whether they pass, they were abominable. Amateur as a rule sees that practically all programming instruments expensive and respectable Integrated Development Environments (IDEs) bewildering. Along these lines, modest yet high perspective instruments ought to be picked [4]. Amateur requirements to utilize little errands and devices appropriate for their standard not for the level of an expert.

To a beginner, it is difficult and confounded to realize every one of the themes like article situated, unique memory taking care of, and so forth, as they are not exceptional [4]. It is fundamental to execute an express and significant plan while learning a programming language since the primary programming language has an enduring effect in regards to the insight and aspiration for picking up programming [3]. Student's consideration is separated on the off chance that they are constantly confronted with the new programming climate.

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In this way, it is fundamental that they keep on dominating the climate they know about [4].

Comparative central structure blocks are utilized by the vast majority of the programming language, so it will be simple and easy

to pick another new dialect on the off chance that one has become capable in a specific language [1]. Despite the fact that developers utilize various dialects, they typically grade to utilize the style and design of their first language [6]. Assuming fitting advances are started PC writing computer programs is fun and simple. Hence, choosing a specific programming language is a urgent advance looked by a fledgling so as not to be puzzled and devalue their trust in programming. Among the different dialects accessible, just Java and Python are picked for this paper. Fame of Programming Language (PYPL) Git-center point file and the fourth Annual Developer Ecosystem Survey by JetBrains was utilized to get a few thoughts in regards to the current programming patterns [14, 13]. Java is one of the most indemand and famous dialects and has been flourishing for around 25 years. Python is more seasoned than Java i.e., it has been around for a very long time. Python has been taking off in ubiquity for the beyond couple of years and ready to challenge the well known dialects. This paper thinks about different attributes and highlights of the two dialects.

The yearning of this paper is to dissect and suggest which programming language will be better for a novice to such an extent that they don't lose interest in the field of programming. This paper doesn't intend to confirm that the programming dialects referenced in this paper outperforms the wide range of various programming language accessible and is the best one for a novice. Choosing a language that is novice cordial is vital for a fledgling. Amateurs for the most part have no information on which language to pick, so in this paper, we made an honest effort to recommend a language for the fledgling. Choosing a specific language and adhering to it is a vital responsibility any other way the students will be baffled and it will belittle their certainty. This report centers around Python and Java as it were. Python utilizes extremely straightforward English and it is exceptionally simple to learn. It was worked with the idea of a fledgling. While Java is likewise simple to learn, it has solid local area support. The open position for the two dialects is additionally exceptionally high. The interest for designers with the information on these dialects continues to increment. Be that as it may, the requests can't be satisfied as they required talented designers so the interest and store network isn't direct.

2. Related Work:

Monica, N., O. Ogbuokiri, Benedette, O. Okwume (2015), introduced a report on "Examination of python and java for use in guidance in the principal course in PC programming" [1]. This proposal makes sense of the examination of programming dialects (Python and Java) in light of code size, execution time, memory utilization, rightness/heartiness, and remarking/dependability. The work requests and compensation for Java and Python designers are accentuated in this paper. The calculation for calculation of expanding grade point normal (CGPA) was authorized and executed in both the language. The consequence of this trial shows that Python consumes less memory than Java, Python has a more modest code size than Java, Python executes quicker than Java, and Java is more strong than Python. Along these lines, Python is embraced for guidance in the main course in PC programming class for the beginner.

E Insanudin (2019) directed research on the examination of source code execution in Python and Java [2]. The air pocket sort calculation is utilized in this paper to break down the correlation. The examination is directed in view of lines of code, record limit, and access speed. A similar air pocket sort calculation is carried out in both the language i.e., Java and Python. The creator reasoned that python has a lesser number of codes and less record limit than Java and access speed of Python is additionally great.

A Bogdanchikov, M Zhaparou, and R Suliyev (2013) introduced a report on "Python to pick up Programming" [3]. Python is utilized for this report as it has perfectly coordinated v language structure and useful assets to address any assignment. Python is simple

furthermore, straightforward math. A few comparative codes are carried out in Python, Java, and C++ and are dissected. Python is not difficult to

peruse and see along these lines, it is positive for novices. Fledgling generally comprehends programming great when Python is utilized. The report additionally presents an aftereffect of the midterm characteristics of similar courses instructed in Java and Python. A climb of 16% is seen in the course instructed in Python.

Jussi Pekka Kasurinen (2007) introduced a report on "Python as a programming language for the starting programming course" [4]. This report investigated the initial level schooling and seek after a few normal issues among the course. Python is contrasted with C, C++, and Java to demonstrate the induction that Python is better for the beginner. The report additionally examined what to remember for the course construction and what to educate on the principal programming course. Louisiana State University and the State University of West Georgia applied Python to their fundamental programming course. The conditions at fall Lappeenranta University of Technology (LUT) 2005 is likewise examined in the report. Collecting great course books and reference material was demanding.

Akesson Tobias and Rasmus Horntvedt (2019) introduced a report on "Java, Python, and JavaScript, an examination" [5]. The report presents a concise correlation of three unique dialects Python, Java, and JavaScript-in light of three

various stages i.e., its punctuation, why the particular language is liked than one more in conditions, and speed. Python is supposed to be the most straightforward among the three dialects referenced which expect for lesser chance to compose. Java's severe sentence structure is likewise profitable and ideal. Python is depicted as the slowest from the other two dialects.

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K. R. Srinath(2017) led an examination paper on "Python - The Fastest Growing Programming Language" [9]. This paper makes sense of why Python is an appropriate language for both learning and certifiable programming. Why Python is considered as the quickest developing language is additionally thought in this paper. The main elements of python language, the sorts of programming upheld by python and its clients, and its applications are likewise inspected here. Python additionally has a few cons like the bigger and confounded a program is, it is arduous to keep up with and right blunders that emerge; and as Python is powerfully composed, the machine needs to perform additional work making Python slow.

Stephen J. Humer and Elvis C. (2014) introduced a report on "a similar investigation of the C++, java and python language" [11]. The report is an investigation of the correlation of Python, Java, and C++. The basic and progressed highlights of the three dialects are thought about and dissected. Every language is assessed in light of standard
assessment models of comprehensibility, effortlessness, symmetrically, movability, programming climate, and utilization cost. Java is supposed to be more helpful and leaned toward than C and C++ in its own viewpoints. Python is simpler and requires as it were
a couple of lines of code contrasted with the others. Python is additionally liked because of its immense accessible decisions for execution.

Kirby McMaster and his group in the year 2017 introduced a report on the correlation of Java and Python for the inclusion of Introductory Programming Concepts [12]. In this paper, they broke down the two dialects i.e., Java and Python by examining the words on course books that portray fundamental programming insight. TextSTAT program is taken on in this report to appraise the count of the idea of fundamental programming themes recorded in the example of Java and Python reading material. There is a great similarity to ideas in the two dialects. Python exhibit is compatible with a rundown. The position of connection of Java and Python is 0.726 and it continues to rise. Module and capacity are more liked in Python than Java. Essentially, string, constructor, the assertion is more liked in Java than Python.

3. Outline

There are different dialects that might be better for a developer however in this report, the group chosen just two dialects according to their comfort. The chose programming dialects i.e., Java and Python are wellestablished and highest level in eminent sites. They are well known and the interest in the gig market is very acceptable. The absolute most significant elements of a programming language for a fledgling should be that it is basic, open, dependable, and straightforward. The group led some examination concerning the two dialects from various sources, for example, research papers, books, articles, and so forth A short investigation of the two dialects is given underneath.

3.1 Overview of Java

The programming language, Java was proposed by James Gosling and his group from Sun Microsystems in the year
1991 and was delivered in 1995 [5]. Java's most noticeable component is that it is stage free i.e., it has the properties of WORA (Write Once, Run Anywhere). Whenever Java was first proposed, it was called OAK. OAK was presented with the impression of a programming language that goes about as a stage for association for apparatuses like VCR, TV, and so on, [8]. Prophet Corporation acquired Sun Microsystems in 2009-10 and turned into the owner of Java. Java is an arranged language that is statically composed i.e., their factors are to be proclaimed prior to allotting values. The projects written in Java runs quicker than Python however is more slow when contrasted and C++.

Airbnb, Uber, LinkedIn, Pinterest, Groupon, Spotify, Eclipse, Hadoop, and so forth, are generally founded on Java. Huge Companies like Infosys, TCS, Wipro, HCL Tech, Naukri, Jabong, Myntra, Flipkart, Trivago, ibibo, and so on, are as yet utilizing Java.

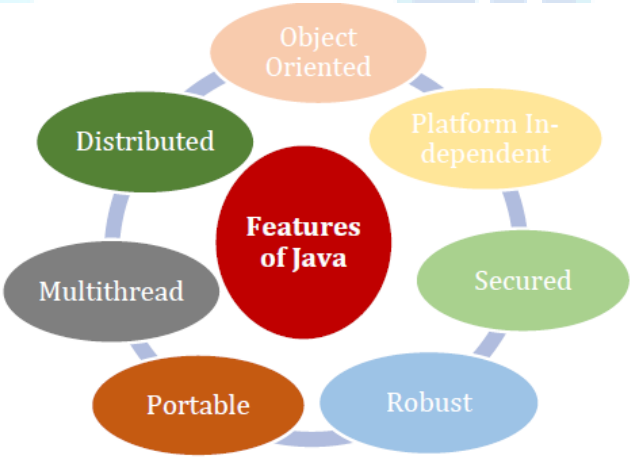

Fig. 1: Features of Java

Figure 1 displayed above is an outline containing a few elements of Java.

Object-oriented

Java is completely object-situated. The OOP (Object-Oriented Programming) helps in managing certifiable applications. The consideration of legacy, polymorphism, deliberation, and embodiment makes a program an OOP.

Stage Independent

While ordering a program, it is arranged into a stage free byte code which is then executed utilizing a Java Virtual Machine (JVM). The utilization of JVM makes Java programming stage free since assuming that JVM is introduced a similar program can be executed in numerous stages [5].

Secured

Java utilizes its own runtime climate i.e., JVM, Java applications are secure. Security viewpoints like

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Typechecking at gather time and runtime checking are tracked down inbuilt in Java. Java is likewise known for the security that it gives. Java additionally needs pointers, which empowers security.

Powerful
Java has solid memory the executives and it consequently disposes of articles that are not utilized. Java comprises of special case taking care of and kinds of actually looking at methods. This large number of elements of Java make it vigorous.

Compact
Java byte code can be moved to any stage with next to no execution making it convenient.

Multi-string
The highlights of multi-stringing are inbuilt in Java. It supports fabricating profoundly intelligent and responsive applications that arrangement with many errands on the double. Multi Threads share a typical memory region, increment the abilities and execution.

Conveyed
This part of Java permits getting to records by calling the techniques from any machine on the web. It upholds the sharing of information and projects among various PCs for systems administration that is inherently incorporated into it. Java upholds RMI (Remote Method Invocation), Socket Programming, and the COBRA that guide in sharing articles in an appropriated climate.

3.2 Applications of Java
There are many fields that utilization Java in reality. The group led some exploration in regards to the uses of Java. A concise depiction of a portion of the normal purposes of Java is introduced beneath.

Android Applications
Java is viewed as the authority programming language for android portable application advancement. Albeit versatile applications can be made utilizing Dart, Java is generally liked. The Java byte code aggregated runs on a specific virtual machine for android called Dalvik Virtual Machine (DVM). Application making programming like Android Studio and Kotlin is viable with Java. Java OOP rule gives better security, straightforward and more powerful with creating android applications

Work area GUI Applications
Java can be utilized for the created work area application. The bundles like Abstract Windowing Toolkit (AWT), JavaFX, and Swing are utilized to construct GUI applications.

Electronic Applications
Java is utilized to make web applications with the assistance of servlets, swaggers, JSP (Java Server Pages), and so on Java caters simple coding and high security which works with the improvement of utilizations for wellbeing, government managed retirement, schooling, and protection. Open-source web based business stages like Broadleaf give help to Java in creating web based business web applications.

Cloud-based Applications
Distributed computing gives a minimal expense result for IT foundation. It gives on-request conveyance of IT assets through the web containing capacity, servers, data set, systems administration, and programming with the pay-more only as costs arise valuing model. Java has characters that guide being developed like SaaS (Software-as-a-Service), IaaS (Infrastructure-as-a-Service), and PaaS (Platform-as-a-Service).

Enormous Data Technologies
For the investigation of Big Data, Java is utilized as it is quick, solid, and hearty. The highlights of Java, for example, Automatic Garbage Collection and solid memory the board make it positive for use in Big Data. Structures like Apache Mahout, Apache Spark, Java JFreechart are utilized by Java for participating in Big Data. Java is well established with Open source networks making it better for this large number of advancements. Huge Data Technologies like Apache Hadoop, Apache Spark, Apache Mahout, and so on, are sub-undertakings of Java.

3.3 Overview of Python
Python was formed in the last part of the 1980s and upheld in December 1989 by Guido van Rossum at Central Wiskunde and Informatica (CWI) in the Netherlands [5, 7, 16]. Python was proposed to be the beneficiary for the ABC language that is capable for special case taking care of and communicating with the working framework Amoeba [7, 17]. Python was named relating to Guido's energy for the network show Monty Python's Flying Circus [2, 17]. Python is deciphered and progressively composed programming language which implies that software engineer doesn't have to characterize the information kind of the factors and no requirement for accumulation and with the utilization of the intelligent order line, they get
brief appraisal without trusting that the entire program will be done. Python Software Foundation (PSF) is a non-beneficial association dug in as the scholarly proprietor of Python since adaptation 2.1 [2]. Python has turned into the quickest developing language. The prevalence of Python in information science is one of the fundamental purposes behind the climb of Python [9]. Some product programs that are written in Python are YouTube, Google, Instagram, Reddit, Spotify, Dropbox, Quora, and so forth Organizations like IBM, Disney, NASA, Instagram, Spotify, Amazon, SurveyMonkey,
Facebook, and so on, use Python.

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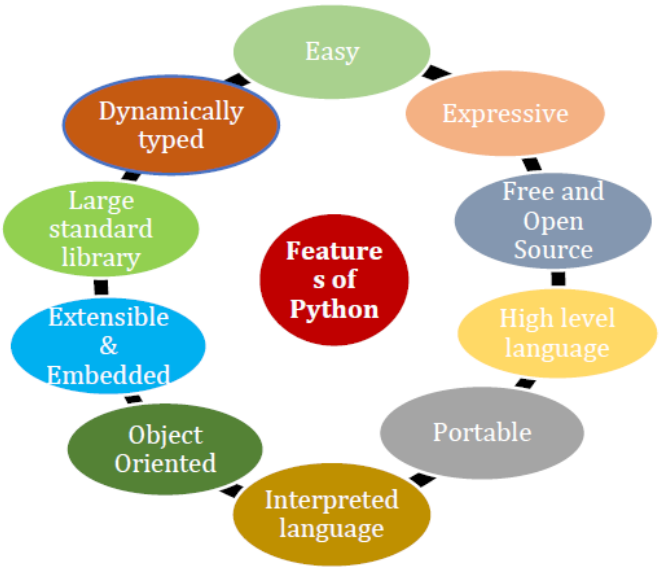

Fig 2: Features of Python

Figure 2 shown above are some common features of Python.

Simple
Python is not difficult to code and simple to peruse when contrasted with different dialects like Java, C, C++, and so on Python sentence structure can be examined by anybody during a brief timeframe. Python code resembles English that permits the student to zero in on the outcome.

Expressive
Python can execute a convoluted capacity with a couple of lines of code contrasted with different dialects.

Free and Open Source
Python is open source and uninhibitedly accessible. The general population can help and add to the improvement of the language. The Python source code can be downloaded, changed, utilized, and be dispersed.

Significant level language
Python is an undeniable level language. There is no requirement for recollecting the engineering and memory the board which makes python entirely great.

Convenient
Python is supposed to be versatile as a similar program written in Python can be executed in various stages like Windows, Linux, Unix, and so forth, if framework subordinate elements are stayed away from.

Deciphered Language
Python is a deciphered language. The code doesn't require aggregation, they are executed line by line and not all at a time which makes troubleshooting the code more straightforward than the wide range of various dialects. Along these lines, Python is more slow than Java because of this component.

Object-Oriented
Python upholds an article arranged approach which assists the software engineer with composing reusable code and help in fostering the application with lesser code.

Extensible and installed
The extensible property of Python permits code to be composed and ordered in different dialects like C or C++. This code then, at that point, can be utilized further in Python when required. The inserted property of Python permits is permitting the utilization of Python in another programming language.

Enormous Standard Library
Python alongside the enormous standard library accommodates a huge scope of modules and capacities. So the software engineer doesn't have to compose the code, they can simply import it

Powerfully Typed
Python is supposed to be a powerfully composed language since it doesn't have to indicate the information sort of the variable while proclaiming it. The sort of significant worth is chosen during the run time.

3.4 Applications of Python
There are many purposes of Python yet the group just chosen a few normal applications. The utilizations of Python are displayed to sum things up beneath.

Web improvement
Python is a go-to language for web improvement. Django, Pyramid, Flask, Bottle are a portion of the structures presented by Python. Python web structures are well known for their security, adaptability, and adaptability. Demands, Beautiful Soup, Paramiko, Feedparser, Twisted Python, and so on, are libraries that additionally remembered for the Python's Package Index.

Game turn of events
Python has many in-constructed libraries that are good for fostering a game. PyGame, PyKyra are structures for game turn of events and PySoy is a 3D cloud game motor for Python3.

Man-made brainpower and Machine Learning
Man-made brainpower and Machine Learning is one of the rising themes and will be gone on from now on. Python is famous and positive to be utilized in Artificial insight and AI because of its personality of being steady, secure, adaptable, and of its different devices. Some of Python libraries and structures utilized in Artificial Intelligence are SciPy, Pandas, Seaborn, Keras, TensorFlow, Scikit-learn, NLTK, Pytorch, Accord.NET, and so forth

Work area GUI applications

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Python is additionally utilized for work area applications. GUI toolboxs and systems like PyQt, PyGtk, Kivy, Tkinter, WxPython, PyGUI, and PySide help in making the improvement of famously practical work area application a simple undertaking.

Web scratching applications

A Python is a grand instrument that can be utilized to passage enormous information from a site which is then utilized for work postings, cost examination, and so forth Excellent Soup, Mechanical Soup, LXML, and so on, are a few instruments utilized for web scratching.

Information Science and Data Visualization

Python is liked by a larger number of people for the investigation and representation of enormous information. Python is related with measurable means to examine and portray confounded information by information researchers. Bundles like NumPy, Pandas, Sci-Kit, and so forth, are utilized.

4. Conclusion:

A large portion of the programming language has comparative basics, in this manner paying little heed to which language is picked the individual can get familiar with another programming language without any problem. The fledgling should not continue changing the language prior to dominating it as it will prompt a deficiency of certainty. Thus, the beginner ought to pick the programming language as per the objectives they like. On the off chance that the individual might want to go for application improvement, pick Java or Swift or Flutter. If the individual has any desire to make a game than a language like JavaScript, Java, C or C++ might be liked. In the event that the individual is keen on web improvement or Artificial Intelligence, and so forth, language like Python, JavaScript, Ruby will be great. In this manner, a novice should initially know what he/she might want to deal with from now on or pick an area of interest. From that point onward, as indicated by their inclinations, the language should be picked.

References

[1] Monica, N., O. Ogbuokiri Blessing, and O. Okwume Benedette. "Comparison of python and java for use in instruction in first course in computer programming."

[2] Insanudin, E. "Implementation of python source code comparison results with Java using bubble sort method." Journal of Physics: Conference Series. Vol. 1280. No. 3. IOP Publishing, 2019. doi:10.1088/1742-6596/1280/3/032027

[3] Bogdanchikov, A., M. Zhaparov, and R. Suliyev. "Python to learn programming." Journal of Physics: Conference Series. Vol. 423. No. 1. IOP Publishing, 2013. doi:10.1088/1742-6596/423/1/012027

[4] Kasurinen, Jussi. "Python as a programming language for the introductory programming courses." (2007).

[5] Åkesson, Tobias, and Rasmus Horntvedt. "Java, Python and Javascript, a comparison." (2019).

[6] Pellet, Jean-Philippe, Amaury Dame, and Gabriel Parriaux. "How beginner-friendly is a programming language? A short analysis based on Java and Python examples." (2019).

[7] Adawadkar, Kalyani. "Python Programming Applications and Future." International Journal of Advanced Engineering and Research Development. http://ijaerd. com/papers/special_papers/IT032. pdf (2017).

[8] Fatima, N., and S. Arabia. "Performance comparison of most common high level programming languages." International Journal of Computing Academic Research (IJCAR) 5.5 (2016): 246-258.

[9] Srinath, K. R. "Python–The Fastest Growing Programming Language." International Research Journal of Engineering and Technology (IRJET) 4.12 (2017): 354-357.

[10] Pears, Arnold, Stephen Seidman, Lauri Malmi, Linda Mannila, Elizabeth Adams, Jens Bennedsen, Marie Devlin, and James Paterson. "A survey of literature on the teaching of introductory programming." In Working group reports on ITiCSE on Innovation and technology in computer science education, pp. 204-223. 2007.

[11] Foster, Elvis. "A comparative analysis of the C++, Java, and Python Languages." (2014)

[12] McMaster, Kirby, et al. "Java vs. Python coverage of introductory programming concepts: a textbook analysis." Information Systems Education Journal 15.3 (2017): 4.

[13] https://www.jetbrains.com/lp/devecosystem-2020/

[14] http://pypl.github.io/PYPL.html

[15] https://octoverse.github.com/

[16] https://en.wikipedia.org/wiki/Python_(programming_language)

[17] Donaldson, Toby. "Python as a first programming language for everyone." Western Canadian Conference on Computing Education. Vol. 232. 2003.

[18] Dr. R. Nageswara Rao. "Core Python Programming". New Delhi: Dreamtech Press; 2018

[19] R. v. Hattem, "Decorators – Enabling Code Reuse by Decorating" in Mastering Python , April 2016, ch. 5, pp. 130

[20] R. v. Hattem, "Async IO – Multithreading without Threads" in Mastering Python , April 2016, ch. 7, pp. 176

[21] K. R. Srinath, "Python – The Fastest Growing Programming Language", 2017.

[22] R. v. Hattem, "Performance – Tracking and Reducing Your Memory and CPU Usage" in Mastering Python , April 2016, ch. 5, pp. 346

[23] M. Joseph and P. Keshwani, "Comparison Between Linear Search and Binary Search Algorithms", 2018.

[24] A. R. Chadha, R. Misal, and T. Mokashi, "Modified Binary Search Algorithm.", International Journal of Applied Information Systems, 2014.

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