Assignment

Report on Comparison of three programming languages (Java, Python, Shell Script)

Submitted To: Dr. Kamruddin Nur

Course Name: Concepts of Programming Language

Course Code: CSE425

Section:02

Group Members:

1. Name: Sany Mohammad Khaled
   ID:1711853042 (Shell Script)
2. Name: Tamalika Bakshi
   ID:1812469042 (Python)
3. Name: Nujhat Tabassum
   ID:1731175042 (Java)

Comparison of three programming languages (C++, Python, Shell Script)

Problem Description:

The aim of this assignment to read and search and sort data from the given (heart.csv) csv file. This file contains around 304 rows and 14 columns of data. The implementation should be done using 3 programming languages. To made this assignment productive we've used JAVA, Python and shell script. Firstly we implement the code to read the csv file and then searched data ,and sort some data through the column (Age, sex, Chest Pain type (cp), resting blood pressure(trtbps), cholesterol, fasting blood sugar(fbs), restecg, thalachh, exng, oldpeak etc.) of data.

Characteristics of comparison:

- **Readability,**
- **Writability,**
- **Reliability,**
- **Performance**

Readability

Readability in software system programming are often outlined by the benefit with that the software system is read and understood.

JAVA: Code readability is difficult in Java. Programmer needs to give a lot of efforts to maintain and develop a Java code. Java code is difficult to read than Python but it is easier to read than Shell Scripts. Java contains some logical tools like variables and operations which is very easy to remember. Java is a simple, efficient, general purpose language. Java is a dynamic language where programmer can safely modify a program while it is running. Java is portable, object oriented and interpreted language. Java is flexible, highly structured and it has strong security features.

Python:

Python is successful on its readability. Code is clear and easy to understand. One of the reasons is that Python uses words for a few things that other languages use symbols for. Python is considered to be cleaner and more direct, with an emphasis on code readability. Python replaces

with if / continue, places value for a large number to make it more readable. Moreover, we can use inline statements to reduce confusion by having a syntax that is understandable in plain English (Fewer syntax rule) . Multiple variables can be assigned to define the function clearly. It is an object-oriented language. It is platform-independent, scripted is easy to language, with complete access to operating system API's

Shell-script:

Shell scripting language does not fit the classic definition of a useful language. If we want to shell scripts to be readable, we have to be treated shell as a real programming language. As, It does not have many of the features such as portability, facilities for resource intensive tasks such as recursion or hashing or sorting like most other real programming language. It does not have data structures like arrays and hash tables..

Readability Comparison: Java is likely to be more readable than Shell Script but not more than Python.

Writability

Writability is the measure of how easily a language can be used to create programs for a chosen problem domain.

JAVA: Java is a static-typed programming language. So programmer needs to declare the variables before using the variables. So it is difficult to write in Java programming language than Python in terms of writability. But Java requires long code to perform where Shell Script doesn't. So in terms of writability, It is difficult to write a code in Java than Shell Script.

Python

Syntax of python is very clutter-free and it has multi-paradigm programming style to use to write program. Python is an easy writing language with the ability for the function to return more than one parameter and we all how useful that is . Its automatic memory management allows us to write code without overflow or out or stack errors. In terms of writability python again is easy to write it does not require too many attributes to code ex- variable need not to be declared first to use as it is dynamically typed programming language. Python strikes a good balance between

fast compilation, readability, and writability. Compared to Java it takes less code to write

Shell-script: Shell script is ahead of the other two programming. In terms of writability shell script easy to write than Java because as it does not require long code like Java to perform tasks. One can check if file is writeable or not using the "**-r"** option.

Writability Comparison: Python is needed less code to write than Java and Shell need less code than Python and Java. So Shell script is more writeable.

Reliability

Java: Java is Simple, efficient and reliable language. Java program is highly structured and all functions, methods and executable statements in Java, resides within a class. Java has advanced authentication and access control functionalities which keeps the web application secure. Java is used to develop softwares, used in game console and in super computers. So, in terms of reliability, Java is more reliable than Python and Shell Script.

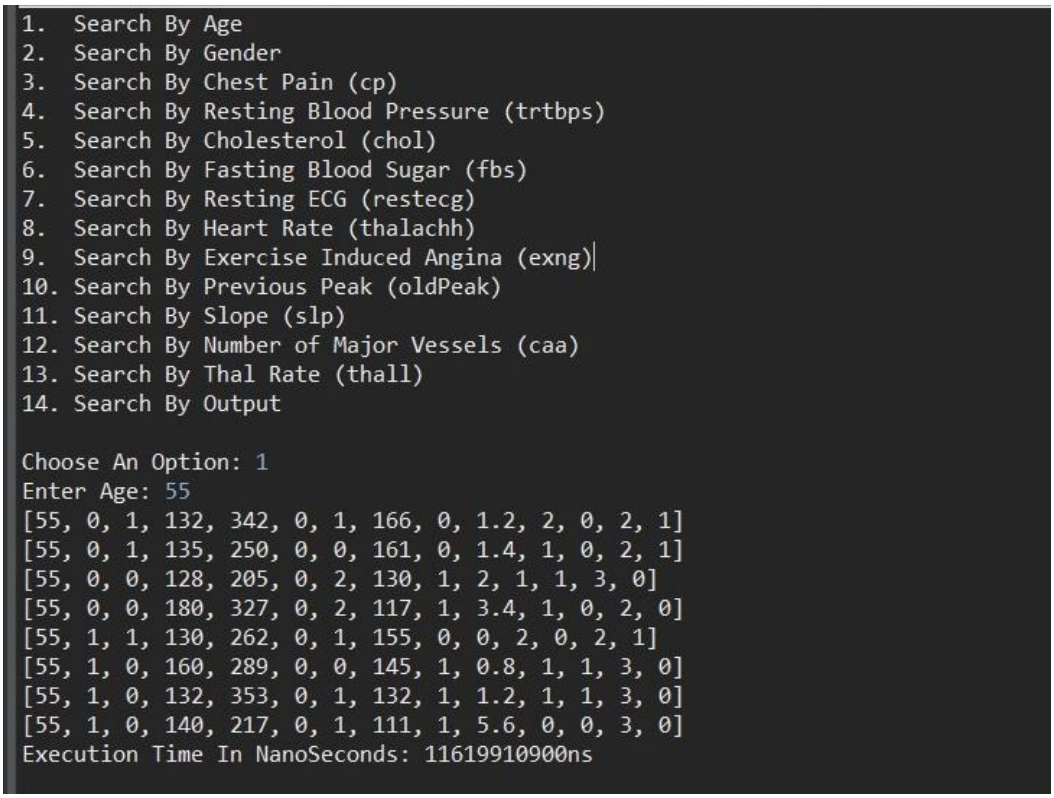
Python: Python is reliable, speedy and efficient. One can work with and deploy Python applications on nearly any platform. There's little to no performance loss. We are not bound to a single platform or domain. It offers the same experience everywhere. In terms of reliability, python is less reliable than java.

Shell script: There is no doubt that shell is very less reliable than Java as it can-not use in software development and to perform other task as Java and Python do.

Comparison: If the algorithm is same for the three different programming language , Java will be more reliable than python .But the performance and the reliability of the code can be improved by good algorithm. Generally, Java have most number of code lines compared to python and shell script. But all above performance matters

Performance

Java: Java is a compiled language. Java compiles the code in advance. A simple program of binary search tree runs ten times faster in Java than Python. Java is faster than Python and Shell script. In our assignment, Total line of code to search from a CSV file in Java was 315 line. To search age from the column'Age', we took input 55 and the execution time in nanoseconds was 11619910900 Ns in Java.



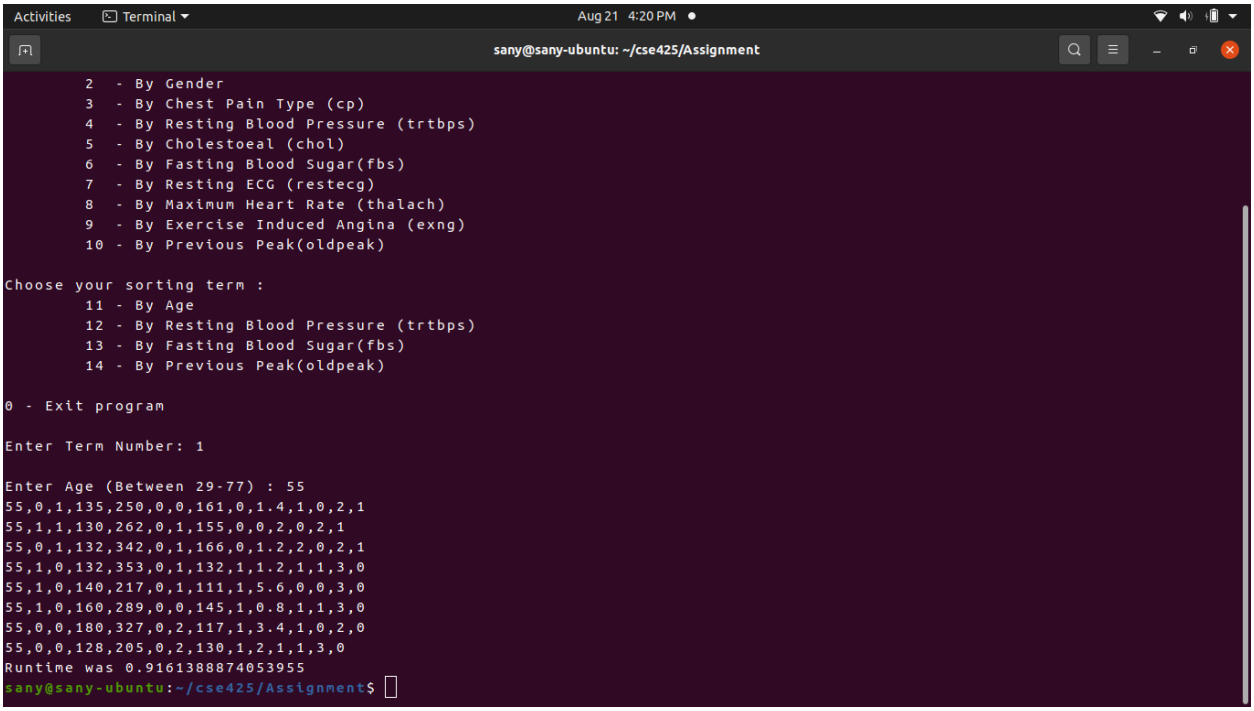
Python: In terms of performance Python is slower speed compared to Shell. In our assignment To search data from csv (heart.csv)file w.r to column “Age” and we take the input “55”. And the 7.22 execution time became seconds . Total line number of the code in Python is 175.

```
enter 1 to search by Age :
enter 2 to search by Gender of the person :
enter 3 to search by Chest Pain type :
enter 4 to search by resting blood pressure :
enter 5 to search by cholesterol:
enter 6 to search by fasting blood sugar :
enter 7 to search by resting electrocardiographic :
enter 8 to search by maximum heart rate :
enter 9 to search by exercise induced angina :
enter 10 to search by old peak :
enter 11 to search by slp :
enter 12 to search by Cerebral amyloid angiopathy /caa :
enter 13 to search by thall :
enter 14 to search by output :
enter 15 to sort csv file by age
enter 16 to sort csv by oldpeak
enter your choice:1
enter any range of age :
55
['55', '0', '1', '135', '250', '0', '0', '161', '0', '1.4', '1', '0', '2', '1']
['55', '1', '1', '130', '262', '0', '1', '155', '0', '0', '2', '0', '2', '1']
['55', '0', '1', '132', '342', '0', '1', '166', '0', '1.2', '2', '0', '2', '1']
['55', '1', '0', '132', '353', '0', '1', '132', '1', '1.2', '1', '1', '3', '0']
['55', '1', '0', '140', '217', '0', '1', '111', '1', '5.6', '0', '0', '3', '0']
['55', '1', '0', '160', '289', '0', '0', '145', '1', '0.8', '1', '1', '3', '0']
['55', '0', '0', '180', '327', '0', '2', '117', '1', '3.4', '1', '0', '2', '0']
['55', '0', '0', '128', '205', '0', '2', '130', '1', '2', '1', '1', '3', '0']

Time Taken to run this program 7.2291646003723145
```

Shell script: In terms of Performance, Shell Script is faster compared to Python but slower than Java. In our assignment To search data from csv (heart.csv)file w.r to column “Age” and we take the input “55”. And the

execution time became 0.91 seconds . Total line number of the code in Shell is 106.



Comparison: Java code runs faster than both Python and Shell Script. Shell Script runs faster than Python. So, Python runs slowest amongst all.

Table of comparison

Term	Characteristic	Shell Script	Python	Java
Readability	**Simplicity:** Simple Syntax Design	Average simplicity. Less easy to Understand	Most Simplicity. Very easy to understand	Less simplicity. Hard to understand
	Orthogonality: Small sets of primitive constructs	Independent. Hard to read datatypes	Independent. Hard to read datatypes	Java is related to primitive relationships. Easy to read
	Control Statement: Adequate Control Statement	Own limited control statement	Various scope of control statement	Various scope of control statement, less than Python
	Data Type: Adequate Data structure	Dynamically typed but works differently due to its own architecture	Dynamically typed. Run time checked	Statically typed. Compile time checked
	Syntax Design: Identifier and special words design	Easy and small but tricky	Easy and rich syntax to learn	Rich but Complex syntax design

According to this Readability comparison, **Python** is the most readable language, **Shell script** is 2nd and **Java** is the less readable language.

Term	Characteristic	Shell Script	Python	Java
Writability	**Simplicity:** Simple Syntax Design	Not easy to implement	Very easy to implement code	Hard to implement code
	Orthogonality: Small sets of primitive constructs	Independent. No need to declare data type	Independent. No need to declare data type	Java is related to primitive relationships
	Expressivity: Less line of code	Less line of code, for same problem (106)	More number of code than Shell (175)	More Number of code than Python 315
	Abstraction: Support process and data abstraction	No data abstraction.	It supports Abstraction by using abstract class and interfaces	Java supports Abstraction

According to this writability comparison, **Python** is the most writable language for its easy syntax, Independent datatypes and abstractions , **Shell script** is 2nd and **Java** is the less writable language.

Term	Characteristic	Shell Script	Python	Java
Reliability	**Type checking:** Testing for types error	No type checking	No type checking	Hard type checking
	Exception Handing: Handle runtime error	No exception handling	Less exception, Less exception handling	There can be a lot of exception and it can be handled.
	Aliasing: Same memory location having more than one name	No aliasing	No aliasing	No aliasing
	Readability: Influence reliability	Readable	Most Readable	Less Readable
	Writability: Influence Reliability	Writable	Most Writable	Less Writable
	Strong typing :it is the concept of requiring that all type errors should be detected	Shell script has substantial typing value. it is better than python and java.	by how its primitives and library functions respond to different types less strongly typed than shell script.	Java compiling is the most critical part so that its less reliable .

According to this writability comparison, **Python** is the most Reliable language for its less exception, readability and writability. **Java** is 2nd and **Shell Script** is the less language.

Term	Characteristic	Shell Script	Python	Java
Performance	**Execution Time:** Time to perform a task	the searching age of 55 was 0.91s	execution time for searching age 55 was 7.24s	To search the age 55, execution time in nano second is 8887352700 ns
		the sorting age of 0.053s	execution time for sorting csv file was 8.25s	To sort age, execution time in nano second is 10399134000 ns
	Generality: Not limited to specific application	Limited only to command line interpreter	Cross platform compatible	Cross platform compatible

Shell script is superfast compare to others.

But python and Java's cross platform compatibility makes life easier for developer.