MEMORANDUM

DATE: March 27, 2023
TO: Professor Glauser
FROM: Team Project Group 2: Abby East, Ayush Kasaju, Kevin Le, Tobi Orekoya
SUBJECT: Module 8 Status Report Memo

PROJECT FOR: Graduating high school seniors and incoming college freshman
START DATE: March 1, 2023
COMPLETION DATE: April 3, 2023

Team Project Topic Summary

Group 2 is currently working on a project to introduce several programming languages to young adults. The target audience consists of graduating high school seniors and incoming college freshmen. The presentation will provide a high-level overview of the following programming languages: C++, Python, R, and Java. Each language will be presented with the same template: which includes the history/background, uses, and libraries/communities.

Audience and Purpose

The purpose of this presentation is to provide exposure to prospective students who are interested in pursuing a career in the technology industry. By providing an overview of each programming language, we aim to give them a better idea of what to expect and help them decide which language(s) to use in their future studies or career. Our goal is to provide a starting point for these students to explore and understand the basics of different programming languages, and encourage them to continue their learning journey beyond this presentation.

Background Information

We believe that this educational content is warranted for our intended audience, as it can provide them with the foundational knowledge they need to succeed in the technology industry. By presenting this content in a clear and accessible manner, we hope to spark their interest in programming and encourage them to continue their learning journey beyond this presentation.

Materials Needed

The materials needed for this presentation are a computer or device that can display a PowerPoint presentation, and an internet connection to access online resources. There are no additional materials required for this presentation, as it is designed to be an introductory overview of programming languages.

Video Production and Editing

For video production, we hope to work asynchronously, with each team member recording themselves presenting their sections of the PowerPoint whilst following guidelines specified by module documents. After each member records their respective parts, we will stitch and edit all four recordings into one combined video.

Document/Video Text

The next following sections will be topics outlined and discussed on our presentation. Structurally, we will provide an introduction then segway into our main topics, that is, four programming languages (each presented by a different team members).

A Gentle Introduction to Programming Languages
(Presenter to be decided later)

- The world of computer science is vast, and programming languages are an essential tool for anyone interested in pursuing a career in this field
- Programming languages are used to create software, develop websites, analyze data, and build artificial intelligence systems, among many other applications
- Each language will be presented with a brief history/background, an overview of its uses, and a discussion of its libraries and communities
- Our goal is to provide you with a gentle introduction to programming languages, giving you a basic understanding of the different types of languages and their uses
- In this presentation, we will introduce you to four popular programming languages: C++, Python, R, and Java.
- By exposing the audience to multiple programming languages, we hope to spark curiosity beyond this presentation

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R (Abby East)

History/Background

- Created by statisticians for statistical analysis computation (to make doing statistics easier for people). [1]
- R is a desirable skill for big tech firms, financial institutions, and biostatistics as well as in academic settings
- Anyone who uses data (software engineers, data scientists, quantitative analysts) benefit from familiarity with R. [2]

Practical Applications and Real-World Uses [1]

- Statistics
  - Libraries created and largely contributed to by statisticians to aid their computational work in academia
  - Programming tool for data scientists
  - Library example: `stats`
- Data Analysis
  - Quickly reads in very large datasets (one of the main pros is that it deals with big data more efficiently than python)
  - Easy-to-use libraries for intricate data visualization (highly customizable as well)
  - Library examples: `ggplot2`, `dplyr`
- Machine Learning
  - Good for predictive models/supervised learning
  - Most academics use R, so a lot of brand new techniques seen in research are published as an R package
  - Also particularly good for regression modelling (estimating the relationship between variables)
  - Library example: `caret`

Libraries and Communities [2]

- `stats`
  - Already a part of R (package not library)
  - Functions for basic statistical functions such as mean, median, and standard deviation
- `ggplot2`
  - Used to make better data visualizations than the default r functions
  - Very customizable and pretty to look at
- `dplyr`
  - Used for data wrangling and analysis
  - Helps organize datasets and make handling large amounts of data easier on the user
- `caret`
  - Machine learning library used to split, train, and evaluate data
  - Makes using a variety of different machine learning models accessible and simple

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C++ (Ayush Kasaju)

History/Background

- Created as an extension to C in 1983 by Bjarne Stroustrop to allow object-oriented programming and other additional features. [3]
- First commercially implemented in 1985 by AT&T

Practical Applications and Real-World Uses [4]

- Operating systems
- Software applications
- Embedded systems
- Gaming
- Artificial Intelligence/Machine Learning

Libraries and Communities [4]

- `stl`: Standard Template Library
  - Contains template classes for data types such as stacks, lists, arrays, and more Also contains algorithms and iterators for accessing and traversing containers
- `iostream`: Input/Output (I/O) Library
  - Allows functionality for inputs and outputs through streams, like reading from or writing to a file, console, or network connection.
- `cmath`: Standard Math Library
  - Contains mathematical functions
  - Trig, exp, log, round, min/max, etc
- `Boost`
  - Might not be discussed on PowerPoint presentation
- `OpenCV`
  - Used for machine learning
- `OpenGL`
  - Used for graphics

Python (Kevin Le)

History/Background

- Created in late 1980s and implemented in 1989, by Guido van Rossum at Centrum Wiskunde & Informatica (CWI) in the Netherlands. [5]
- Designed to be easy to read and write, with a syntax that emphasizes readability and simplicity

- Popularity has grown steadily over the years, and it is now one of the most widely used programming languages in the world
- Incredibly versatile language with a rich and collaborative community for all of its practical and niche uses

Practical Applications and Real-World Uses [6], [7]

- Scientific Research
- Scientific Computing and Data Analysis
- Machine Learning and Artificial Intelligence
- Web development – includes backend development and web scraping
- Desktop Application Development – building graphical user interfaces
- Finance – analyzing financial data and building financial models
- Healthcare – working with medical terminologies and data
- Automation – automating web browser actions

Libraries and Communities [8]

- `NumPy, SciPy, and Pandas`
  - Provides tools for working with large datasets, performing scientific computing and data analysis, and building data visualizations
- `TensorFlow, Keras, and PyTorch`
  - Provide tools for building and training neural networks for machine learning and artificial intelligence applications
- `Jupyter Notebooks`
  - A web-based interactive computational environment for creating and sharing documents that contain live code, equations, visualizations, and narrative text
- `Selenium`
  - Provides tools for automating web browser actions, such as filling out forms, clicking buttons, and navigating between pages
- `Pygame`
  - Provides tools for building 2D games, including graphics, sound, and user input

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Java (Tobi Orekoya)

History/Background

- Why Java?
  - Helps with learning coding fundamentals, when considering learning other languages such as Javascript or Python
  - Highly sought after skill by businesses
- Created in the early 90s by James Gosling (Sun Microsystems) as a convenient high level language for developing digital systems. [9], [10]
- Initially named “Oak”
- Acquired by Oracle in 2009. [11]

Practical Applications and Real-World Uses [12]

- Wide range of applications, including developing consumer electronics such as TVs
- Web/Mobile Development
- Cross-platform desktop applications
- Game development
- IoT on security/sensor devices
- Large-scale enterprise applications

Libraries and Communities [11], [12]

- Unit Testing Libraries `(JUnit, Mockito)`
  - Highly recommended and great libraries for conducting unit testing on your code (good etiquette for professional programmers)
- JSON parsing libraries `(Jackson, Gson)`
  - 3rd party method for sending info from client to server
  - Parse/create JSON messages
- Logging libraries `(Log42j, SLF4j)`
  - Important for documentation in server-side application use
  - Better alternatives to that provided by JDK
- General Purpose Libraries `(Guava, Apache Commons)`
  - Helps create more efficient workspace and simplify tasks
- HTTP Libraries `(HTTP Client)`
  - Many other libraries for variety of uses

Final Thoughts

- By exploring the history, uses, and communities of C++, Python, R, and Java, we have aimed to give the audience a better understanding of what each language is capable of and how it can be used.
- We believe that programming languages are an essential tool for anyone interested in pursuing a career in the technology industry. Whether there's an interest in web development, artificial intelligence, or scientific computing, having a basic understanding of different programming languages can help one to achieve their goals.

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