UNIVERSITY OF RICHMOND

Welcome to CMSC 240!

CMSC 240 Software Systems Development

Spring 2024

Today

- Introductions
- Course logistics
- Motivation
- Hello C++

- Environment setup
- In-class coding exercise

Introductions

Dr. David Balash

Faculty page: https://cs.richmond.edu/faculty/dbalash

Homepage: https://davidbalash.github.io

Professor Balash

“Ba-lish”

He/Him

- BS in computer engineering Iowa State
- Two-decade career as a software engineer
- MS and PhD in computer science from GW
- Research: Computer S&P

Dr. David Balash

Things I like

- Education/Learning
- Hiking
- Cycling
- Guitars
- Board games
- Programming
- Cats

Ask me anything

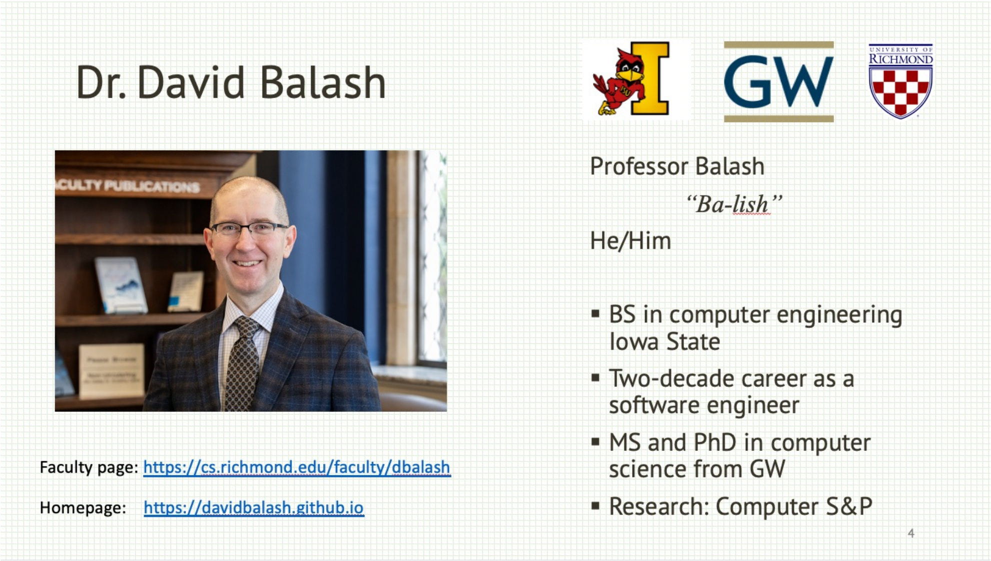
Assignment 1

Task: Create a personal introduction slide and post it to the introductions channel on the course Slack workspace

Due: Friday January 19th

Points: 5

Be Creative



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Name

Photo

Pronunciation

Pronouns

Personal Introduction

Classroom Meet and Greet

1. Introduce yourself to a person near you

2. Introduce yourself to a different person near you

- Potential conversation topics:
  - What are some of the things that you like?
  - Who are your favorite pets?
  - Why do you want to take this class?

Student Introductions

- Name
- Pronouns
- Major
- Class year
- Favorite snack food

Course Logistics

Classroom Norms

- Questions are always welcome!!
  - Ask them at any time
- “I don’t know” is okay
- Be curious
- Treat peers and instructors with kindness and respect
- Communication is key!
- Seek support when needed

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Where All Class Information Can Be Found

https://cmsc240-s24.github.io

How to Communicate With Me

- Slack workspace
  - https://cmsc240-s24.slack.com

- After class or in office hours - 223 Jepson Hall
  - Tue 4:30PM - 5:30PM
  - Fri 3:00PM - 5:00PM
  - and by appointment https://calendly.com/davidbalash

- Email
  - david.balash@richmond.edu

Course Outline

- **Weeks 1-5** Introduction to C++ programming
  - Syntax, memory management, libraries, file IO
- **Weeks 6-10** Object-oriented programming
  - Abstraction, polymorphism, inheritance, encapsulation
- **Weeks 11-15** Software systems development
  - UML, design patterns, testing, debugging

Learning Outcomes

- Experience modern C++ programming
- Gain familiarity with Unix/Linux environments
- Understand the software development life cycle
- Practice object-oriented programming and design
- Understand design patterns, reuse, and usability
- Exposure to version control systems
- Demonstrate skill in software testing and debugging

Lecture

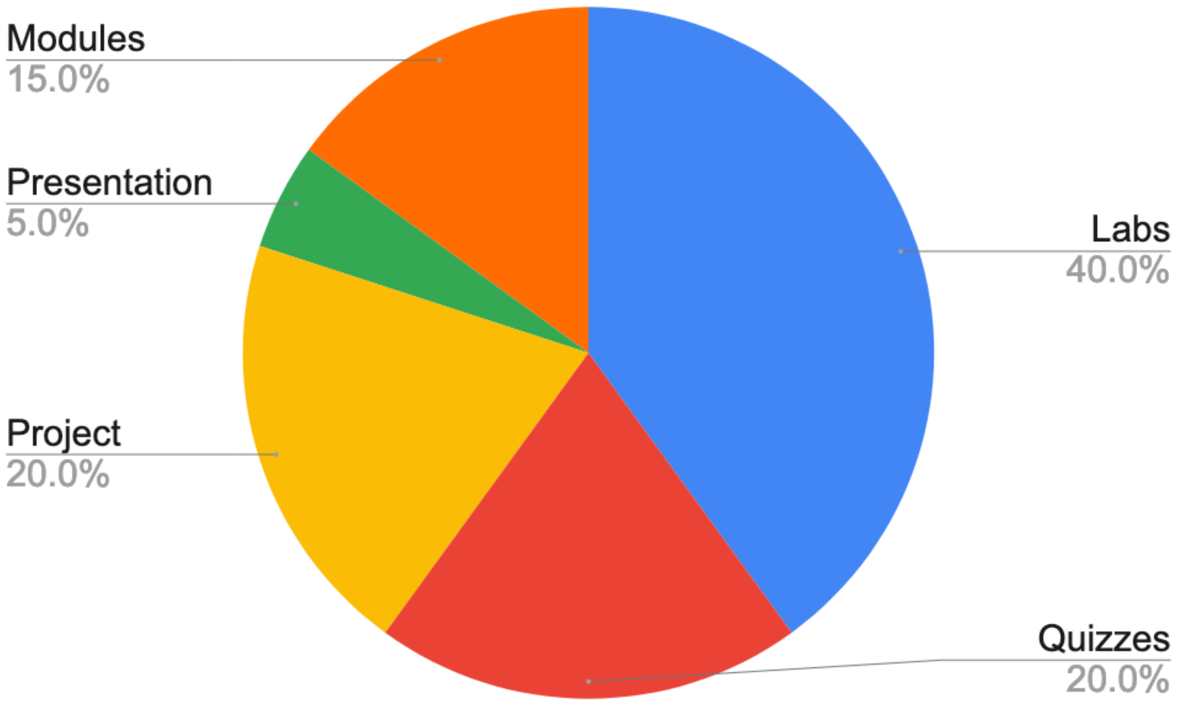
- Tuesdays and Thursdays Jepson G04
- Will usually include in-class exercises
- In-class exercises will be due one week from when they are assigned (except during break)
- Regular attendance is expected
- Students who are sick should not attend class
- Notify me in advance of the absence, if possible

Labs

- Fridays in Jepson G03
- Lab assignments done individually and in groups
    - but will always be turned in individually
- Lab assignments are typically due at 5:00 pm on the night prior to the next lab (except during break)
- Please ask for help from me or the lab assistant

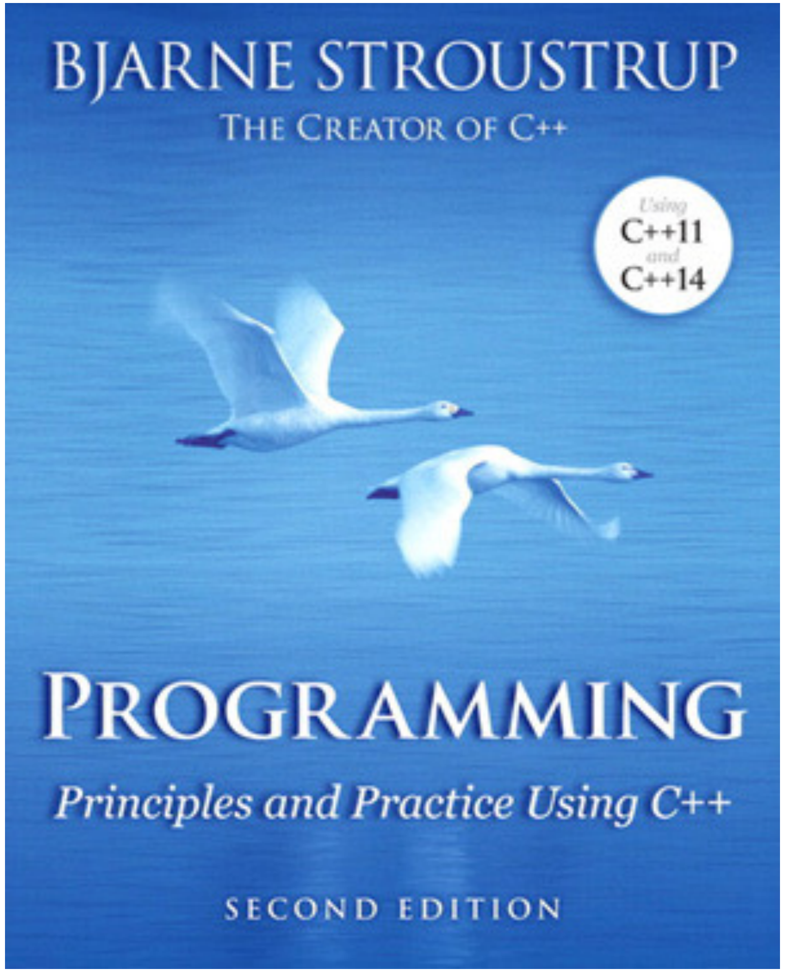
Coursework and Grading

- Modules (In-class coding exercises)
- Lab assignments
- Programming project
- Project Presentation
- 4 Quizzes (5% each)



Textbook

- Free electronically from the UR library
- Reading assignments



Ask me a question

Motivation

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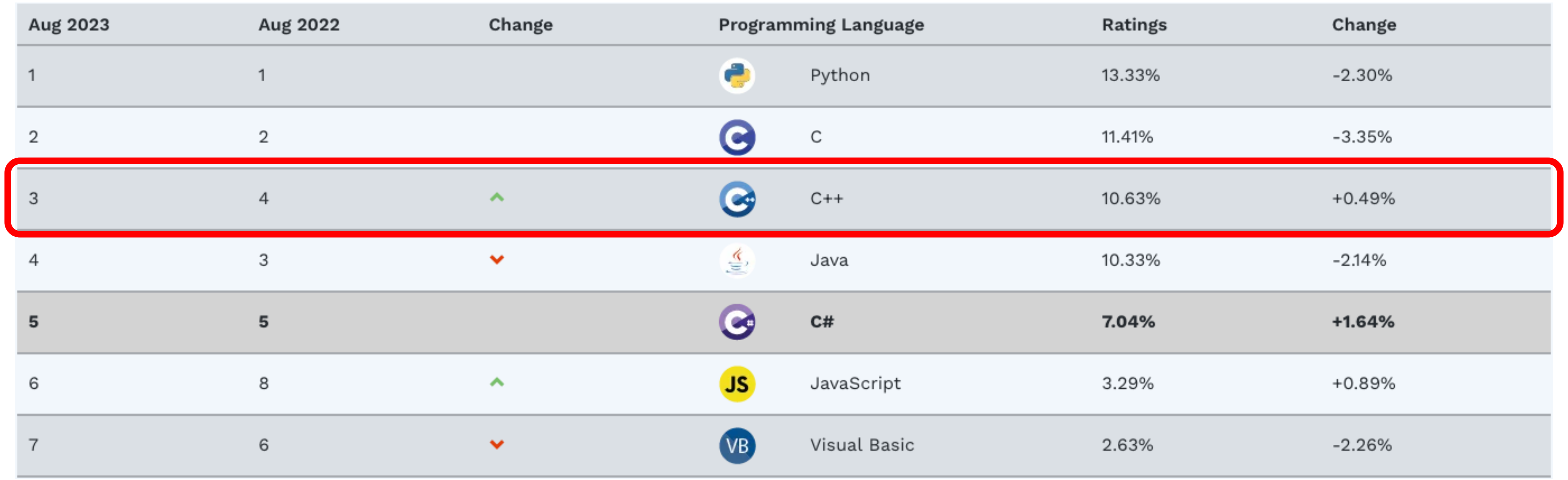
C++ is a Very Popular Language

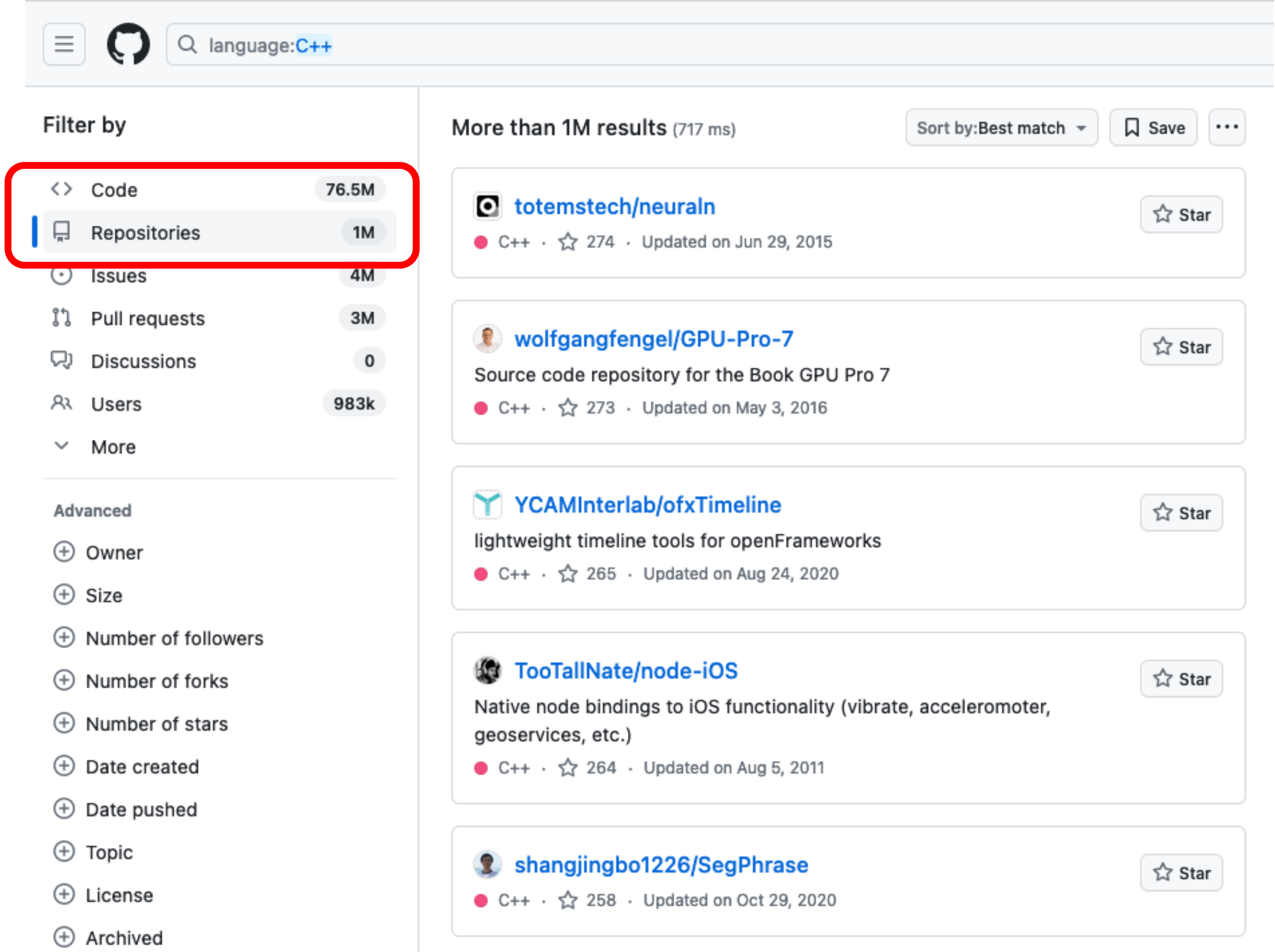


Aug 2023	Aug 2022	Change	Programming Language	Ratings	Change
1	1		Python	13.33%	-2.30%
2	2		C	11.41%	-3.35%
3	4	▲	C++	10.63%	+0.49%
4	3	▼	Java	10.33%	-2.14%
5	**5**		**C#**	**7.04%**	**+1.64%**
6	8	▲	JavaScript	3.29%	+0.89%
7	6	▼	Visual Basic	2.63%	-2.26%

TIOBE Index for August 2023

Source: https://www.tiobe.com

Many Open-Source Projects



language:C++

Filter by

- Code 76.5M
- Repositories 1M
- Issues 4M
- Pull requests 3M
- Discussions 0
- Users 983k
- More

Advanced

- Owner
- Size
- Number of followers
- Number of forks
- Number of stars
- Date created
- Date pushed
- Topic
- License
- Archived

More than 1M results (717 ms)

Sort by:Best match · Save

totemstech/neuraln
C++ · 274 · Updated on Jun 29, 2015

wolfgangfengel/GPU-Pro-7
Source code repository for the Book GPU Pro 7
C++ · 273 · Updated on May 3, 2016

YCAMInterlab/ofxTimeline
lightweight timeline tools for openFrameworks
C++ · 265 · Updated on Aug 24, 2020

TooTallNate/node-iOS
Native node bindings to iOS functionality (vibrate, accelerometer, geoservices, etc.)
C++ · 264 · Updated on Aug 5, 2011

shangjingbo1226/SegPhrase
C++ · 258 · Updated on Oct 29, 2020

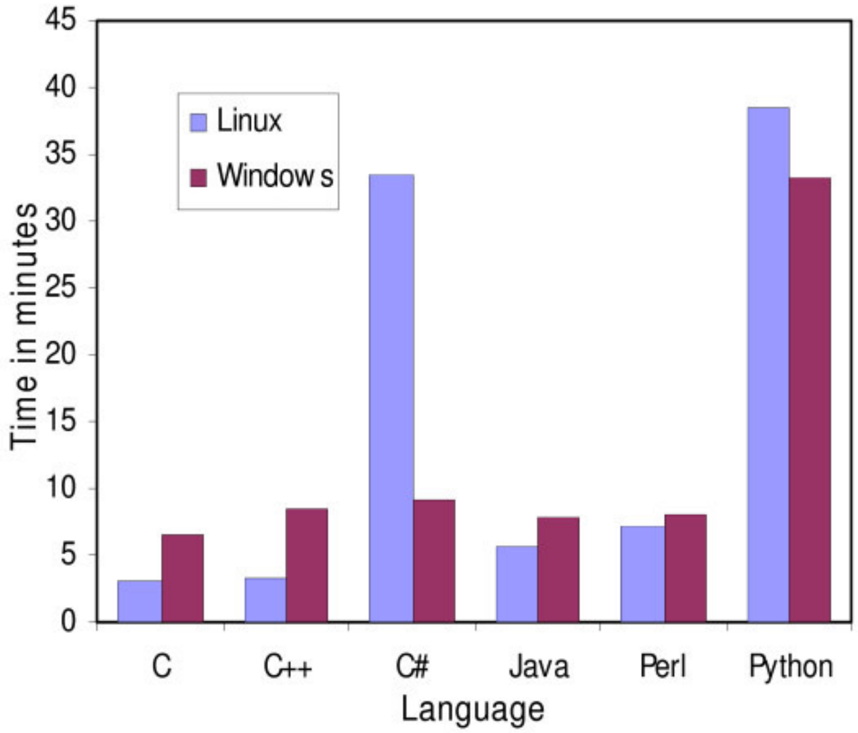
https://github.com

Cool Things Were Built With C++

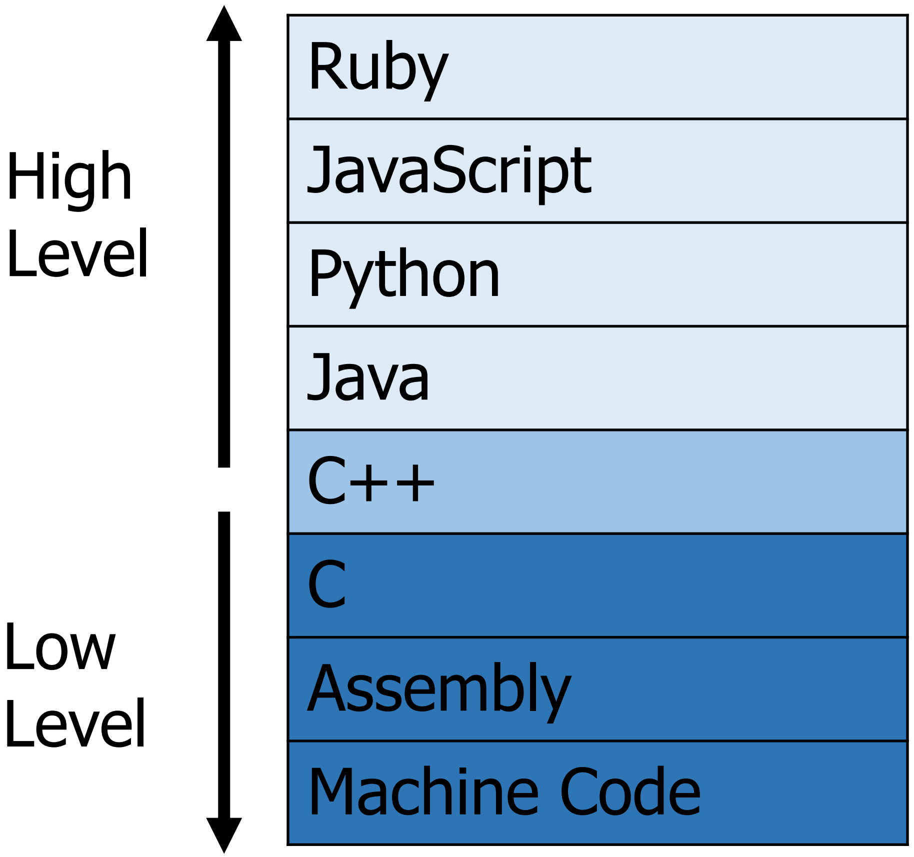
Images source: https://commons.wikimedia.org

What Makes C++ Great?

Speed: It’s Fast!



Low-level control


High Level

Low Level

- Ruby
- JavaScript
- Python
- Java
- C++
- C
- Assembly
- Machine Code

Source: https://www.researchgate.net

Foundational Software Development Skills

- Object-oriented design
- Software development life cycle
- Design patterns and code reuse
- Version control systems
- Testing and debugging

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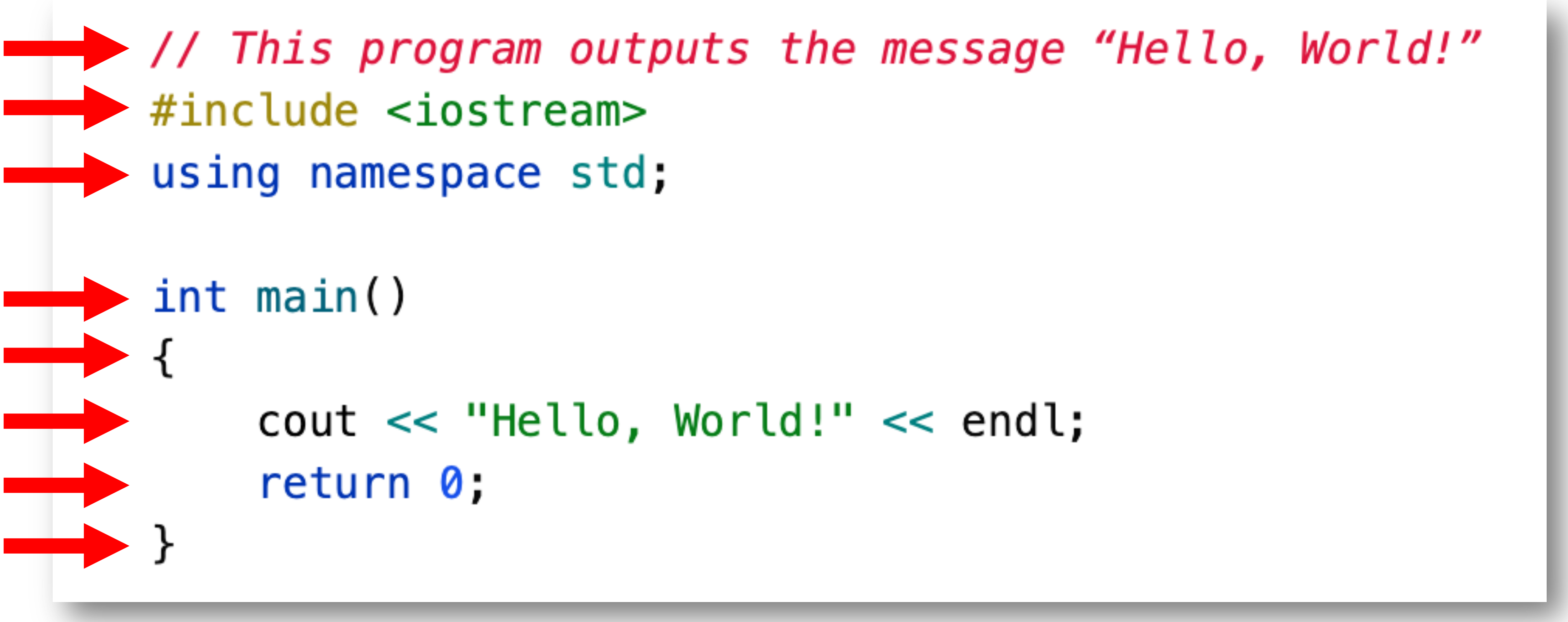
What motivates you?

Hello C++

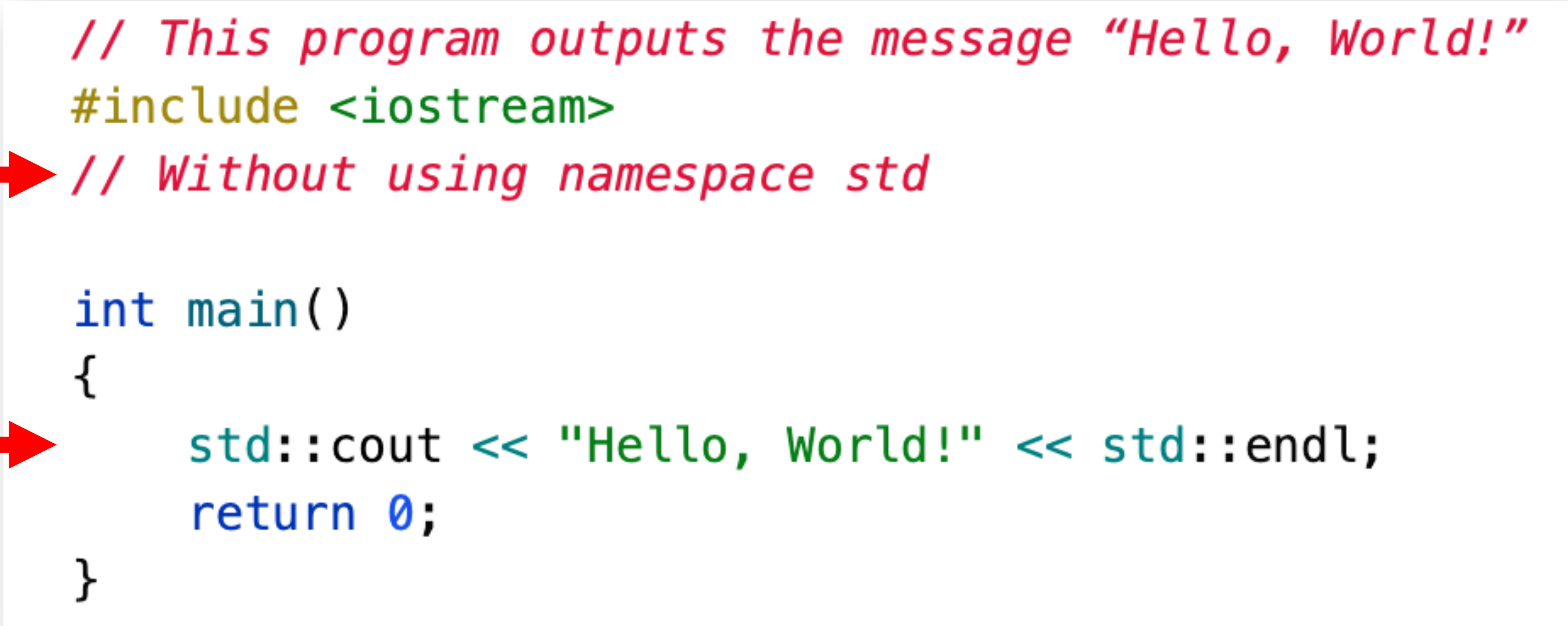
Writing Your First C++ Program



```cpp
// This program outputs the message “Hello, World!”
#include <iostream>
using namespace std;

int main()
{
    cout << "Hello, World!" << endl;
    return 0;
}
```

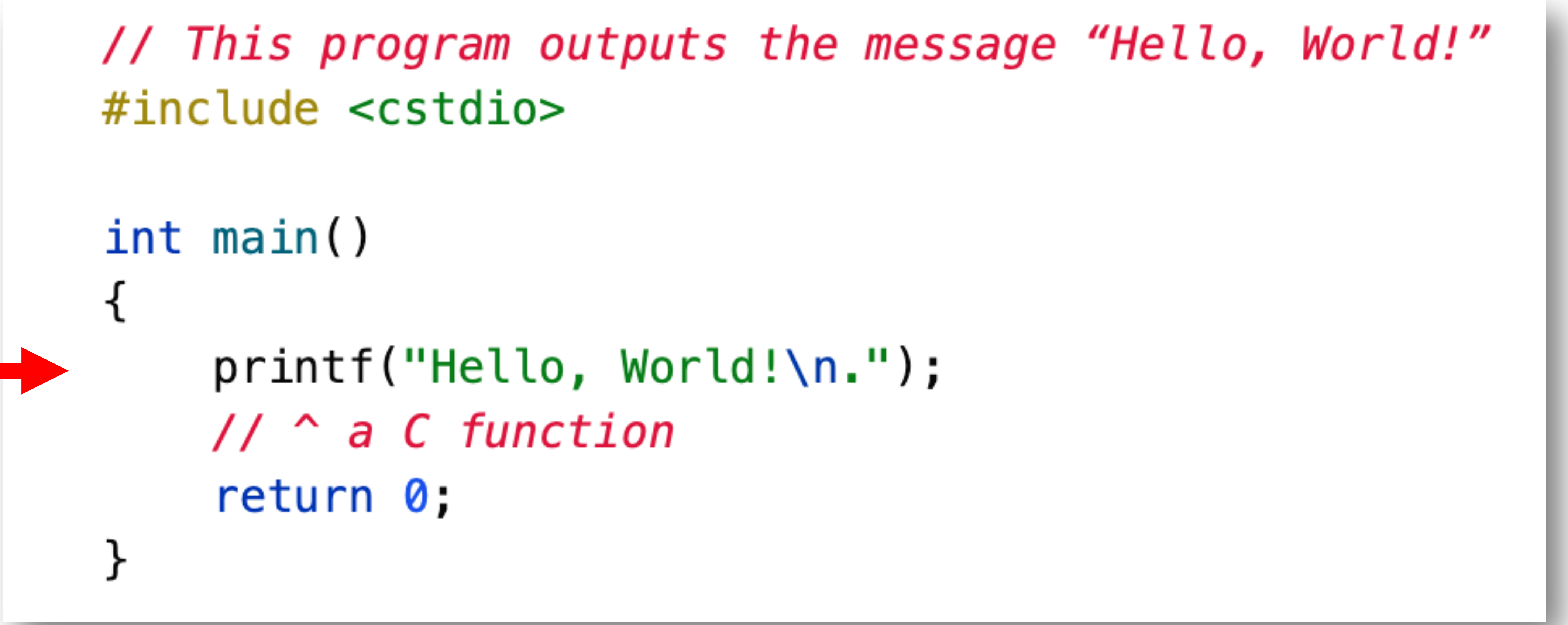
Writing Your First C++ Program



```cpp
// This program outputs the message “Hello, World!”
#include <iostream>
// Without using namespace std

int main()
{
    std::cout << "Hello, World!" << std::endl;
    return 0;
}
```

Writing Your First C++ Program



```
// This program outputs the message “Hello, World!”
#include <cstdio>

int main()
{
    printf("Hello, World!\n.");
    // ^ a C function
    return 0;
}
```

Compile & Execute Your Program

```
g++ hello.cpp -o hello
```

The C++ compiler

The source code file name

Using the `-o` option allows you to name the executable file

```
./hello
```

indicates that the executable resides in the current directory

Environment Setup

Development Environment

- All work will be compiled, run, tested and graded on the computer science Linux machines:
  - cs01 – cs06.richmond.edu

- GitHub classroom for all assignments
  1. Accept the assignment
  2. Clone repository using VSCode with remote-ssh
  3. Make updates to the code and README.md file
  4. Add (Stage), Commit, and Sync changes

Development Environment

1. Open a terminal
2. ssh your_UR_netid@cs01.richmond.edu
   For example: my netid is **dbalash**@cs01.richmond.edu

3. Follow instructions:
   - https://cmsc240-s24.github.io/guides/vscode-ssh

In-Class Coding Exercise