

# CS 31 Discussion Week 1

TA: Tianxiang (Peter) Li  
Learning Assistant: Kyle Wong

April 5, 2019

# A little about myself

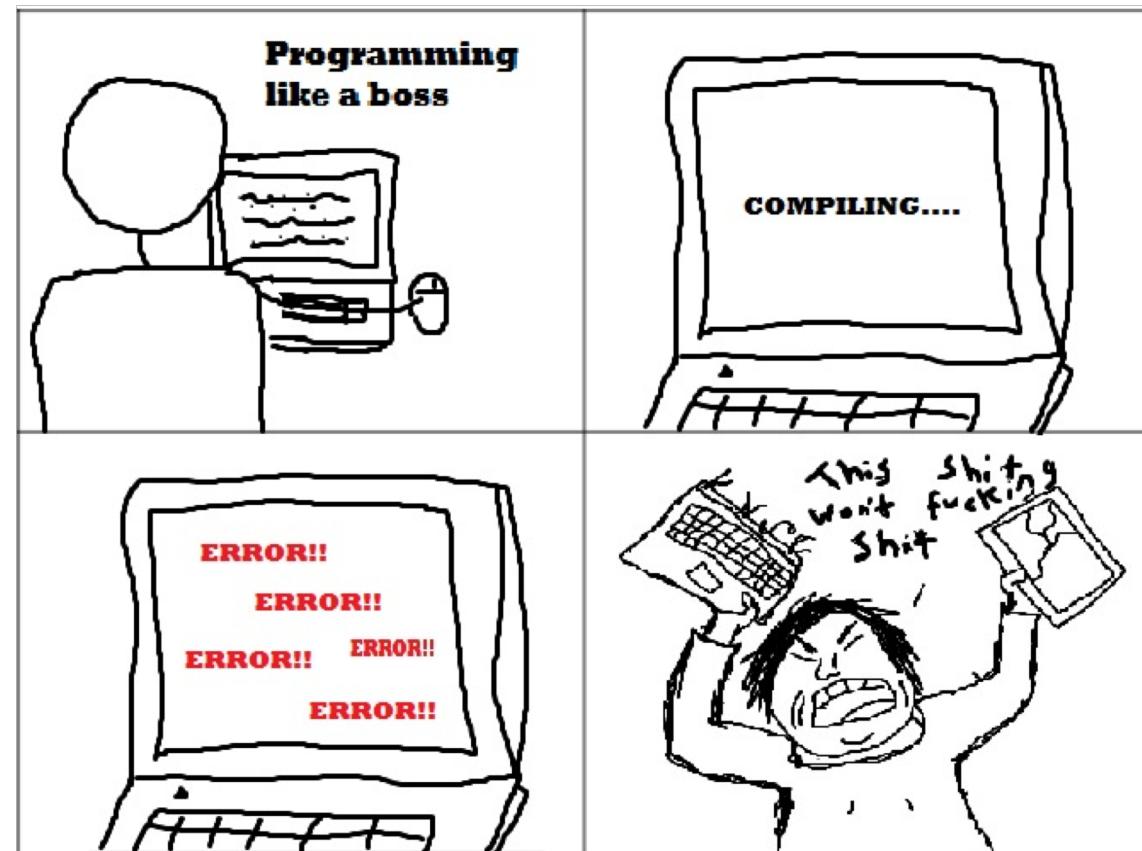
- 2<sup>nd</sup> year PhD student in Internet Research Lab
  - A new Internet infrastructure: Named Data Networking
  - <https://named-data.net/>

# Outline

- Basic code structure
- Errors
- Environment setup
- Accessing SEASnet Linux Server
- Project 1

# Course Tips

- Project
  - Always start early
  - Coding and debugging time is always a mystery
- Read instructions carefully
  - Double check program requirements
- Incremental development
  - Add bits of code at time, then compile and run



# C++

- Popularity
  - Windows, Linux, Mac OSX, Photoshop, game engines, Illustrator, MySQL, MongoDB, ...
  - VR, Unreal Engine, Machine Learning, Networking, Telecom, ...
- a general-purpose programming language
  - Procedural
    - Solve problems from top to bottom
  - Object oriented
    - Uses classes and objects

# Code structure

```
#include <iostream>
using namespace std;

int main()
{
    cout << "How many hours did you work? ";
}
```

# Code structure

```
#include <iostream>
using namespace std;
```

```
int main()
{
    cout << "How many hours did you work? ";
}
```

includes the predefined header file,  
a file which already present in C++,  
header file contains some functions which will be useful for code development

# Code structure

```
#include <iostream>
using namespace std;
```

```
int main()
{
    cout << "How many hours did you work? ";
}
```

Uses namespace standard: uses standard library to do some work, for example the cout belongs to the standard library

Namespace allows you to have the same name for multiple things, cout belongs to the standard namespace which has definition in the iostream for performing one function.

# Code structure

```
#include <iostream>
using namespace std;

int main()
{
    cout << "How many hours did you work? ";
}
```

# Code structure

```
#include <iostream>
using namespace std;

int main()
{
    cout << "How many hours did you work? ";
    double hoursWorked;
    cin >> hoursWorked;

    cout << "What is your hourly pay rate? ";
    double payRate;
    cin >> payRate;
}
```

# Different types of programming errors

- From the point of view of when errors are detected

## 1. Compile time errors

- Errors in the program indicated by compiler

*Syntax error: not following syntax of the programming language*

*Semantic error: improper use of statements*

- E.g. Error in expression, variable definition, ...

Hide and seek  
Champion

;

Since 1958

## 2. Runtime errors

- The program is compiled and executed without errors, but does not generate the requested result
- incorrect, unusual, or nonsensical output

# Syntax Error

- Errors that occur when you violate the rules of writing C++syntax
- These errors are detected by the compiler → compile-time error
- Examples
  - Missing parenthesis ()
  - Printing the value of a variable without declaring it
  - Missing semicolon

# Syntax Error

```
#include <iostream>

using namespace std;

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

# Syntax Error

```
#include <iostream>

using namespace std;

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

```
syntaxerror.cpp:7:32: error: expected ';' after expression
        cout << "Hello World!" << endl
                           ^
;
1 error generated.
```

# Syntax Error

```
#include <iostream>

using namespace std;

int main()
{
    a = 1, b =2;
    cout << a+b << endl
    return 0;
}
```

# Syntax Error

```
#include <iostream>

using namespace std;

int main()
{
    a = 1, b =2;
    cout << a+b << endl
    return 0;
}
```

```
syntaxerror.cpp:7:2: error: use of undeclared identifier 'a'
      a = 1, b =2;
      ^
syntaxerror.cpp:7:9: error: use of undeclared identifier 'b'
      a = 1, b =2;
      ^
syntaxerror.cpp:8:13: error: use of undeclared identifier 'a'
    cout << a+b << endl;
    ^
syntaxerror.cpp:8:15: error: use of undeclared identifier 'b'
    cout << a+b << endl;
```

# Semantic Error

- This error occurs when the statements written in the program are not meaningful to the compiler

```
#include <iostream>

using namespace std;

void main()
{
    int a, b, c;
    a + b = c;
}
```

# Semantic Error

```
#include <iostream>

using namespace std;

void main()
{
    int a, b, c;
    a + b = c;
}
```

```
syntaxerror.cpp:8:9: error: expression is not assignable
    a + b = c;
~~~~~ ^
1 error generated.
```

# Logic Error

- After compilation, on the execution of a program
- A mistake in program source code that results in unexpected/incorrect behavior
- Correct input → incorrect output
  - Using = instead of == when comparing integers
  - Using < when <= was needed
  - Failing to increment a loop counter creating an infinite loop etc.

# Environment set up on Mac OSX

- Install Xcode
  - App store or online (<https://developer.apple.com/downloads/>)
  - Xcode is an integrated development environment (IDE) that uses the clang++ compiler to compile your programs
- Test if compiler is installed
  - `g++ --version`

# Environment set up on Windows

- Microsoft Visual C++ 2017
  - <https://imagine.microsoft.com/en-us/Catalog/Product/530>

# Using command line tool

- A text editor
  - A terminal window
  - An installed C++ compiler
- 
- Simple workflow, no need for IDE
  - More useful as you gain experience
  - No hardware resource requirements

# Using command line tool

- Open text editor
- Write some code

```
#include <iostream>
```

```
Int main() {
    std::cout << "hello" << std::endl;
    return 0;
}
```

- Save as hello.cpp
- Open terminal
- Switch to the directory containing hello.cpp

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

```
./hello
```

# Accessing SEASnet Linux Server

- Every program you submit, must run successfully on the SEASnet Linux server cs31.seas.ucla.edu using the g31 command
- Example
  - transfer a C++ program to the SEASnet Linux server to build and run

# Accessing SEASnet Linux Server

- Goal
  - transfer a C++ program to the SEASnet Linux server to build and run
- Prerequisite
  - Write a C++ program hello.cpp
- Connection
  - Connected to the wired UCLA campus network (not behind the dorm firewall)
  - Connected to WiFi, need to connect to UCLA VPN
  - Windows-based remote SEASnet Terminal Server

# Accessing SEASnet Linux Server (Mac)

- Put your C++ source file onto your desktop
- Copy your file from your Mac to the SEASnet cs31 Linux server  
`scp Desktop/hello.cpp yourSEASaccount@cs31.seas.ucla.edu:Desktop`  
(might need to add SHA key to known\_hosts file)
- Log into remote Linux server  
`ssh yourSEASaccount@cs31.seas.ucla.edu`
- set up for running g31 command (first time only)  
`curl -s -L http://cs.ucla.edu/classes/spring19/cs31/Utilities/setupg31 | bash`
- Copy program file to current directory  
`cp Desktop/hello.cpp .`
- Build an executable file from the source file and run  
`g31 -o hello hello.cpp`  
`./hello`

# Using g31 command

- Test your program periodically using g31 during your development
- g31 command sometimes gives more accurate pointer to where error is than IDE
- Sometimes report errors not shown by IDE

# Project 1 code clarification

```
cout.setf(ios::fixed)
```

makes cout print floats with a fixed number of decimals and

```
cout.precision(3)
```

sets this number to be three.

For example, if you got a

```
double f = 2.5;
```

then

```
cout << f;
```

will print

```
2.500
```

# Resources

- Different types of errors  
<https://www.geeksforgeeks.org/errors-in-cc/>
- Short video for installing Xcode, and building first c++ program (Mac OS)  
[https://www.youtube.com/watch?v=1E\\_kBSka\\_ec](https://www.youtube.com/watch?v=1E_kBSka_ec)
- Short video for installing Visio Studio Code(Windows)