Announcements

- Fill in the entry questionnaire (see schedule for link)
- Assignment 1 is available and due at 11:59pm Thursday February 7th
  - See schedule for link to assignment description
- Reading for next class
  - *Java Foundations*, by Lewis, DePasquale and Chase, 2nd edition. (Denoted as LDC on the schedule)
  - See Chapters 1 and 2 for more information about today's topics
  - Read Chapters 3 and 4 (3.6 and 3.7 are optional)
  - Submit your **reading response** on time
- Thursday: 12:30 in the HCI Lab info session about summer research in CS

Course Website

- [http://cs.wellesley.edu/~cs230](http://cs.wellesley.edu/~cs230)

Collaboration Policy
Why take CS230?

- You will learn the “big picture” of programming
  - Data abstraction
  - Modularity
  - Performance Analysis
  - Basic abstract data types (ADTs)
- You will become a more competent programmer
  - You will also become a designer, tester, analyzer, debugger, team member
- You will develop a project worth showing off
- You will have fun in the process!

Why use ADTs?

- Allows you to write complex programs more easily
  - To keep mental track of complex data interaction
  - To reuse code
  - To improve code performance
- Allows modularity of large projects
  - Easier to understand large chunks of code
  - Easier to collaborate with large teams

Basic ADTs

- Collections
  - Linked List
  - Stack
  - Queue
  - Hash Table
  - Priority Queue
- Less basic:
  - Tree
  - Set
  - Graph

Why Java?

GitHub pulls 2018

Stack Overflow 2018

TIQUE’ Index for January 2019

A First Program

```java
/**
 * Our first CS230 program.
 * It prints out Wellesley's motto.
 * @author Orit Shaer
 */
public class Motto {
  // Program execution begins with the "main" method
  public static void main(String[] args) {
    System.out.println("Non ministrari");
    System.out.println("sed ministrare");
  }
}
```

A Java “method” is similar to a Python “function”

Multi-line JavaDoc comment

Single line comment

A public class must be in a Java file with the same name

Curly braces, rather than indentation, indicate the body of classes, methods, loops, and conditionals

String denoted by double quotes

Statements end with semicolons
Using Java and BlueJ

- You can study **data structures** using *any language*, but in this course we will use **Java**.
- You can **write and execute Java programs** in many ways, on the command line or with an IDE, but in this course we will use a simple IDE called **BlueJ**.

![BlueJ IDE](image)

Data Types in Java

- Java is a **statically typed** language.
  - You must explicitly define the type of each variable when it is declared.
- Unlike Python, not all variables in Java are objects.
  - Some are **primitive data types**.

<table>
<thead>
<tr>
<th>Primitive</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>int</td>
<td>Integer</td>
</tr>
<tr>
<td>float</td>
<td>Float</td>
</tr>
<tr>
<td>double</td>
<td>Double</td>
</tr>
<tr>
<td>char</td>
<td>Char</td>
</tr>
<tr>
<td>boolean</td>
<td>Boolean</td>
</tr>
</tbody>
</table>

Variable Declaration in Java

- A variable must be declared once before it can be used.
- The type of a variable cannot be changed after declaration.
- The value of a variable can be changed any number of times.

```java
int x;
int y;
int z;
x = 7;
y = 5;
z = x + y;
System.out.println(z);
```

Variables declared and initialized in separate statements.

```java
int x = 7;
int y = 5;
int z = x + y;
System.out.println(z);
```

Variables declared and initialized in single statement.

Decimal Numbers

```java
double num = 5.2;
num = 1.4;
um = num * 2.0;
System.out.println(num);
```

```java
double fahrenheit = 98.6;
double celsius = (fahrenheit - 32) * 5 / 9;
System.out.println(celsius);
```
### String Concatenation

```java
String course = "Data Structures";
System.out.println(course);

String s1 = "CS230 is ";
String s2 = "fun";
String fact = s1 + s2;
System.out.println(fact);

double temp = 39.2;
System.out.println("It is "+ temp + " degrees");
```

### Strings in Java

- Strings in Java and Python are quite similar.
  - Like Python, Java strings are immutable.
  - The difference is that Java uses method calls where Python uses Operators.

<table>
<thead>
<tr>
<th>Python</th>
<th>Java</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>str[3]</td>
<td>str.charAt(3)</td>
<td>Return character in 3rd position</td>
</tr>
<tr>
<td>str[2:5]</td>
<td>str.substring(2,4)</td>
<td>Return substring from 2nd to 4th</td>
</tr>
<tr>
<td>len(str)</td>
<td>str.length()</td>
<td>Return the length of the string</td>
</tr>
<tr>
<td>str.find('x')</td>
<td>str.indexOf('x')</td>
<td>Find the first occurrence of x</td>
</tr>
<tr>
<td>str.split()</td>
<td>str.split('\s')</td>
<td>Split the string on whitespace into a list/array of strings</td>
</tr>
<tr>
<td>str.split(',')</td>
<td>str.split(',')</td>
<td>Split the string at ',' into a list/array of strings</td>
</tr>
<tr>
<td>str + str</td>
<td>str.concat(str)</td>
<td>Concatenate two strings together</td>
</tr>
<tr>
<td>str.strip()</td>
<td>str.trim()</td>
<td>Remove any whitespace at the beginning or end</td>
</tr>
</tbody>
</table>

### Find the Errors!

```java
// This program has at least 5 errors. Can you find them all?
public class Errors {
    public static void main(String[] args) {
        String temperature = 80.3;
        int n = 100
        n = "Wait, what?";
        print("This is fine.");
    }
}
```
Choose your own adventure...

- Find a group and a board

- Write your own Java program to calculate some value and print it out

- Some ideas (or make your own!):
  - Area of a circle (or other shapes) given its radius (or other necessary dimensions)
  - Volume of a box/sphere/cylinder of some given dimensions
  - Simple interest given amount, rate, time