



## Homework 2: Exploring a C++ GitHub Repository\*

### Summary and Motivation

This homework assignment asks you to explore a *GitHub* repository and answer a few questions about it. *GitHub* is a code hosting platform that supports version control and collaboration on projects by people from anywhere in the world. A **repository** is a storage location that is used to organize a single project and provides a structured way for programmers to store the development files for that project. Repositories can contain folders and files, images, videos, spreadsheets, and data sets. In this assignment, you will not need to know anything about version control, nor will you learn about version control. GitHub's role is limited to its code hosting features. The purpose of the assignment is to give you some experience in searching through a code hosting platform and in code-reading.

### Instructions

Answer all questions using the attached template.

1. The *Insight Segmentation and Registration Toolkit (ITK)* is an open-source, cross-platform system that provides developers with an extensive suite of software tools for image analysis. You can learn more about it from its website, <https://itk.org>. Visit this website and find a page that has a link to the ITK Software Guide. When you find it, download the guide, which is a PDF document. Answer the following questions:
  - (a) Who is the principal author of the ITK Software Guide?
  - (b) What are the two principal types of data represented in ITK?
  - (c) What is the definition of generic programming given in this document?
2. The source code for ITK is available on GitHub <https://github.com/>. Go to the GitHub website and find the ITK repository.
  - (a) What are the steps that you followed to find the download page for the repository? Write these steps as a sequence of instructions that someone could follow to find this page.
3. The developers of ITK decided that it was advantageous to create classes that implement *infinite precision numbers*. They distinguish between *infinite precision decimal numbers* and *infinite precision integers*. Infinite precision decimal numbers are infinite precision numbers that support decimal arithmetic, whereas infinite precision integers support integer arithmetic. Find the interface file, i.e., the header file, for the class that implements infinite precision decimal numbers and open that file. Answer the following questions:
  - (a) What is the name of the header file?
  - (b) What is the name of the class that defines these numbers?
  - (c) Who authored this code?
  - (d) When was it last modified?
4. Two functions in this header file have the name `operator>>`.
  - (a) Are they public or private?
  - (b) How do they differ?

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- (c) What is it called when a language allows two different functions to have the same name?
  - (d) What does the first of these functions do? Read the file's comments and your textbook to determine the answer to this question and explain in your own words what this function does (not how it does it.)
  - (e) What is the purpose of the word `inline`, which you should have noticed in the file, and why is it used there?
5. Notice that there are many functions defined in this file whose names contain the word `operator`, such as `operator+=` and `operator-`.
- (a) How many different functions whose name starts with `operator` are in this file?
  - (b) What do you think is the reason that these functions have been provided in this interface? You might have to read about this in your C++ textbook.
6. Find the implementation file for this interface and open it.
- (a) What is its name?
7. Find the implementation of the function whose name is `operator<`. Read it carefully.
- (a) Does it depend on any other user-defined functions? If so, which ones?
8. Find the implementation of the function whose name is `operator+`.
- (a) List all of the functions whose name starts with `operator` on which it depends (i.e., that it calls.)
  - (b) What is the return type of this function?
  - (c) Is this function recursive?

## Grading Rubric

There are twenty questions in this assignment, each worth 5% of the total grade. Questions are assessed on their completeness and correctness. Expository answers (ones that explain or describe) will be graded on their clarity, conciseness, and content.

## Submitting the Homework

This assignment is due by the end of the day (i.e. 11:59PM, EST) on October 24, 2016. I have created a plain text answer sheet for you to use as a template. It is called `hwk2_answer_sheet.txt` and is downloadable from the course website. Type all of your answers into the space provided, expanding it if necessary. Submit this document either as plain text or, if you wish, converted to a PDF. You can use the `submitpdf` script that was used for the first homework (it does not matter whether it is a PDF or not). If your file's name is `hwk2_answer_sheet.txt` then enter the command

```
/data/biocs/b/student.accounts/cs235_sw/bin/submitpdf 2 hwk2_answer_sheet.txt
```

The program will create `/data/biocs/b/student.accounts/cs235_sw/hwks/hwk2/hwk2_your_username`. You will not be able to read this file, nor will anyone else except for me. If you decide to make any changes and resubmit, just run the command again and it will replace the old file with the new one. Do not try to put your file into this directory in any other way - you will be unable to do this.