

ICS 46: Data Structures

Implementation and Analysis (SU25)

Instructor	Shion Fukuzawa
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Class Information	Week 1: Remote asynchronous! Sorry all.. RH 101 , MWF 10:00-10:50
Office Hours	Pending
Website	https://www.shionfukuzawa.com/courses/46wi25.html

About Me

Hi all! My name is Shion (pronounced she-own) and I use he/him pronouns. I am a fifth year PhD student doing research in quantum algorithms and information theory. I'm also very passionate about CS education, and I hope that I get to continue being involved in education throughout my career. Outside of class I love baking, taking care of my hamster and plants, and playing video games. I am excited to meet you all and learn together, and if there is anything I can be doing better throughout the quarter to help you please let me know! I'll be providing opportunities to share feedback throughout the course (more on that later).

About This Course

Have you ever bought too many books for your bookshelf, had clothes in your closet that you forgot you have as they hide in the back or a pantry hiding expired food some old version of you purchased? Having more things is nice, but we don't often consider an extra cost that it incurs on us. If these things aren't organized well, perhaps with their particular use cases and volume in mind, we can't fully make use of what we had prepared. This can happen even with 20-30 items at a time, but in computing we often have data amounting to millions of units. How do we organize things at this volume, and what metrics can we use to ensure that we are doing things as best we can? Computer scientists call these organization schemes "data structures", and you will quickly see that this is not a one-size-fits-all scenario.

In this course we will learn about many standard data structures in computer science, discuss their use cases, and how we evaluate their strengths and weaknesses. This will be the first course in your CS sequence where you will really begin your study on the analytical techniques we use to evaluate the quality of our code. This will also be a secondary course on C++, where you will be using what you know about the language to build these data structures.

Prerequisites

You will **need** to know how to code in C++, as all the programming exercises will require you to code in the language. At UCI, this is the equivalent of having completed ICS45C.

Student Learning Outcomes

There are broadly two categories of learning outcomes I have for you in this course. After successful completion of this course, you should be able to do the following for the listed data structures:

- List of Data Structures
 - Arrays
 - Linked lists
 - Stacks and Queues
 - Trees (Binary search trees)
- 1. Implementation
 - Use C++ templates to implement type independent data structures.
 - Design unit tests to ensure code is bug free.
- 2. Analysis
 - Given some data, describe how a data structure would store it.
 - Describe the runtime of standard operations for each data structure.
 - Choose a data structure that is best for a stated application, and use Big-Oh notation to explain why that is the case.

Reading

Please register for the Zybook: [[TODO]]

Lecture, Discussion, and Class Participation

Students in this class are encouraged to speak up and participate during class meetings and on Ed Discussion. Because the students in the class will have a diversity of backgrounds and experiences, every member of this class must show respect for every other member of this class. Diverse teams have been shown to exhibit more creativity, social cohesion, and success which I hope we can agree are things that all of us want.

Grading

Here is the big picture breakdown for your grades. See below for details.

- [2%] Weekly Surveys
- [4% = 2 x 2%] Office Hour Presentations
- [8%] Zybook Readings
- [28%] Programming Assignments
- [20% = 10% + 10%] Midterms
- [34%] Final

Weekly Surveys: I will be sending out a survey after Friday's class each week where you can provide feedback for the course, especially communicating parts that you feel you need more support on. I take your feedback very seriously and have made changes to courses mid quarter based on these, so if there are things that could be better please don't hesitate to express that! Logistically, this acts like a free 2% grade bump.

Office hour presentations: You are required to attend 2 of my office hours, where I will ask you to give a brief presentation about your programming assignment. We are doing this for two reasons: First, I believe it will help you greatly to build a habit of meeting your professors early on, both for academic and professional reasons. Second, I am not implementing any AI related policies for this course, meaning you are free to use any tool you wish. However, I want to know how to implement such policies in the future and would like to understand if and how you are using these tools. These are graded for **completion**, so you will get full credit just for showing up and chatting with me! Please use the sign-up sheet in the course homepage to find your slots.

Zybook Readings: You are required to complete your zybook readings **before** class each day. These will be equally weighted.

Programming Assignments: Project 0 is worth 2%. Projects 1, 3 and 4 are worth 6%. Projects 2, 5, 6 are worth 4%. You will be graded on whether you pass all the hidden test cases.

Midterms: Each midterm is worth 10% of your grade. Each of these will also have a preemptable problem that will reappear in the final (not the exact same though!). Between the problem appearing in the midterm and the final, I will take the higher of the two and count it as your grade for that problem in the final.

Final: The final will comprise of 16% from the material covered after midterm 2, and 10% for each preemptable problem from the midterms.

Academic Dishonesty

The Bren School of ICS and the University have already established an academic honesty policy. [Which you can read here.](#)

Violators of academic honesty policies are subject to the penalties described in the Bren School of ICS policy. They are also subject to an immediate course grade of F, and you will not be allowed to drop the course to avoid the grade. Also be aware that a single documented case of academic dishonesty

may preclude you from switching into computing majors, registering for computing minors, joining the ICS Honors Program, and graduating from a computing major with honors.

Guidelines to avoid plagiarism:

- **Do not look at another person's homework.** Instead you should prefer to discuss the problem in plain English. This helps you to communicate clearly, practice technical jargon as it applies to your problem, and to identify how your solution exhibits behavior different from what you expect.
- **Do not write down the solution in your notes.** It is perfectly fine (and encouraged) to collaborate on work. Working in a group is a rewarding experience, and definitely a necessary skill in any professional career. The collaboration can include drawing diagrams and perhaps solving the problem on a whiteboard. However, you should avoid writing the solution in your notes and instead practice reconstructing it using your own words afterwards. It is very useful to rethink the problem and go through the details and logic when you solve it again on your own, and it will help avoid plagiarism.

We expect that:

- **You can monitor each other and enforce these rules among yourselves (even over Zoom).** Making sure that others follow these guidelines will help to ensure that they don't pass off your work as their own.
- **Your work honestly represents your efforts.** The entire purpose of obtaining an education is so that you can accumulate a body of skills and experience that will help you later on. If you do not perform the work yourself, then you have cheated yourself out of the education. Employers in our field can (and do) screen applicants for skills and knowledge. You will perform poorly (and discredit UCI) if you do not practice now by doing your own work.

Disability Services

If you need any accommodations, please contact the Disability Services Center (DSC) and make the appropriate arrangements through them. If you are starting the class aware of necessary accommodations, I highly suggest you have prepared them by the middle of week 2, which will be a bit over one week before the first in class test.