Algorithm Design for Data Science
DATS 6001 - 10, Summer 2020

1 Meeting Time and Location

- Meeting time: Monday / Wednesday, 2:00 PM - 4:30 PM
- Location: `https://gwu.webex.com/join/yuxiaohuang`

2 Instructor

- Name: Yuxiao Huang
- Email: yuxiaohuang@gwu.edu
- Office address: `https://gwu.webex.com/join/yuxiaohuang`
- Office hours: By appointment

3 Teaching Assistant

- Name: Gaofeng Huang
- Email: ghuang920@gwmail.gwu.edu
- Office address: `https://gwu.webex.com/meet/ghuang920`
- Office hours:
  Monday, 04:30 PM - 06:30 PM;
  Wednesday, 04:30 PM - 06:30 PM;

4 Course Description

- This course covers Algorithm Design. Unlike the ones offered in most CS departments, this course is particularly tailored for non-CS major students. Specifically, we will only focus on (the theory and implementation of) the most important problems in algorithm design.
- The main goal of this course is to teach students to write code that is bug-free and has the lowest time complexity (i.e., uses the minimum time) and space complexity (uses the minimum space). This is the key skill that will be tested in the "Whiteboard Coding" interviews for Data Scientist / Software Engineer positions.
- In this course we will cover Data Structures (Array, Stack, Queue, and Tree) and Algorithms (Search, Sort, and Dynamic Programming). See details in the Tentative Schedule in sec. 16.
- This course will use `Python` exclusively. We assume students have used `Python` previously hence we will not discuss the syntax of the language in class.

5 Learning Outcomes

As a result of completing this course, students will be able to:

- understand the theory and implementation of the data structures and algorithms covered in the course
- use appropriate data structures and algorithms to design solutions that have the lowest time and space complexity
- write bug-free code to implement the solutions

6 Textbook

- There is no textbook for this course
- Instead, the course will be largely based on lectures notes, which are available in the course github repository
- Students are highly recommended to read the lecture notes and work on the coding exercises before the class

7 Average Minimum Amount of Out-Of-Class or Independent Learning Expected Per Week

- Going over the theories and coding covered in class is integral for success in this course
- You should spend at least 5 hours of out-of-class or independent learning per week

8 Homework

- There will be 5 homework, which will only include coding questions
- Homework must be completed individually

9 Exam

- There will be 2 exams (a Take-Home Midterm and Take-Home Final), which will only include coding questions

10 Submission

- Homework will be due for submission through `blackboard` by 11:59 PM (Eastern time). See more details in sec 16.
- Submission will no longer be accepted after the deadline, and will receive a grade of 0.

11 Grading Scheme

- 60% Homework (5)
- 40% Exams (2)
  - 20% Midterm Examination
  - 20% Final Examination

12 Grade Appeals

- A grade becomes permanent one week after you receive the grade
- Grade appeals and questions must be raised in writing (email) within one week after the day on which the grade was received

13 Letter Grade Distribution

$[93, 100]$	A
$[90, 93)$	A-
$(87, 90)$	B+
$[83, 87]$	B
$[80, 83)$	B-
$(77, 80)$	C+
$[73, 77]$	C
$[70, 73)$	C-
<70	F

14 University Policies

14.1 University Policy on Observance of Religious Holidays

In accordance with University policy, students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance. For details and policy, see: `https://students.gwu.edu/accommodations-religious-holidays`.

14.2 Academic Integrity Code

Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information. For details and complete code, see: `https://studentconduct.gwu.edu/code-academic-integrity`.

14.3 Safety and Security

In the case of an emergency, if at all possible, the class should shelter in place. If the building that the class is in is affected, follow the evacuation procedures for the building. After evacuation, seek shelter at a predetermined rendezvous location.

15 Support for Students Outside the Classroom

15.1 Disability Support Services (DSS)

Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in the Rome Hall, Suite 102, to establish eligibility and to coordinate reasonable accommodations. For additional information see: `https://disabilitysupport.gwu.edu/`.

15.2 Mental Health Services 202-994-5300

The University's Mental Health Services offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include: crisis and emergency mental health consultations confidential assessment, counseling services (individual and small group), and referrals. For additional information see: `https://counselingcenter.gwu.edu/`.

16 Tentative Schedule

Class Date	Topic	Release Date	Due Date
05/18	Time and Space Complexity	Homework 1	
05/20	Time and Space Complexity (continued)		
05/25	Memorial Day (no classes)		
05/27	Basic Data Structures and Algorithms: Array, Stack, and Queue	Homework 2	Homework 1
06/01	Basic Data Structures and Algorithms: Array, Stack, and Queue (continued)		
06/03	Basic Data Structures and Algorithms: Search	Homework 3 Midterm exam	Homework 2
06/08	Basic Data Structures and Algorithms: Search (continued)		
06/10	Basic Data Structures and Algorithms: Sort	Homework 4	Homework 3 Midterm exam
06/15	Advance Data Structures and Algorithms: Tree (graph) and search	Homework 5	Homework 4
06/17	Advance Data Structures and Algorithms: Tree (graph) and search (continued)	Final exam	
06/22	Dynamic Programming		Homework 5
06/24	Dynamic Programming (continued)		Final exam