COP 5536 Advanced Data Structures

Fall 2020

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TA (Office Hours):
Ruiliang Gao (rgao15@ufl.edu) : Tuesday 10 am to 12 noon, Friday 10 am - 11 am at:
Zoom link: https://ufl.zoom.us/j/6414387431

Tentative Class Schedule:

Week 1 (Aug 31 – Sep 04) : Lecture 1 - Lecture 3
Week 2 (Sep 07 – Sep 11) : Lecture 4 - Lecture 5 Holiday : Sep 07
Week 3 (Sep 14 – Sep 18) : Lecture 6 - Lecture 8
Week 4 (Sep 21– Sep 25) : Lecture 9 - Lecture 11
Week 5 (Sep 28 – Oct 02) : Lecture 12 - Lecture 14
Week 6 (Oct 05 - Oct 09) : Lecture 15 - Lecture 17 **Exam 1: Oct 09 (Lecture 1-13)**
Week 7 (Oct 12 – Oct 16) : Lecture 19 - Lecture 20
Week 8 (Oct 19 - Oct 23) : Lecture 21 - Lecture 23
Week 9 (Oct 26 – Oct 30) : Lecture 24 - Lecture 26
Week 10 (Nov 02 – Nov 06) : Lecture 27 - Lecture 29
Week 11 (Nov 9 – Nov 13) : Lecture 30 - Lecture 31 Holiday: Nov 11
Week 12 (Nov 16– Nov 20) : Lecture 32 - Lecture 34 **Exam 2: Nov 13 (Lecture 14-28)**
Week 13 (Nov 23 – Nov 27) : Lecture 35 Holidays : Nov 25-27
Week 14 (Nov 30 – Dec 04) : Lecture 36 - Lecture 38
Week 15 (Dec 07 – Dec 11) : Lecture 39 – Lecture 40 **Exam 3: Dec 16 (Lecture 29-40)**

Note:- The exam dates are tentative subject to room availability. These exams will most probably be held in the evening.

Pre-requisites:
You should know the following:
1. C, C++, or Java. Since the text is in C++, you should at least be able to read C++.
2. Algorithm analysis methods (in particular asymptotic complexity).
3. Basic data structures such as stacks, queues, linked lists, trees, and graphs. Basic sorting methods such as insertion sort, heap sort, merge sort, and quick sort.

Course Requirements:

There will be two assignments and three exams. The exams will be closed book exams. The programming assignment(s) may be done in any high level language. Some possibilities are C, C++, and Java. Please have the use of any other language approved by the instructor or the TA. C++ is the preferred language.

Grading:

Exam 1: 25%
Exam 2: 25%
Exam 3: 25%
Assignment 1: 20%
Assignment 2: 5%

Course Outline

The specific topics are:

- Amortized complexity
- External sorting & tournament trees
- Buffering
- Run generation & optimal merge patterns
- Priority queues and merging
- Leftist trees, Binomial heaps and Fibonacci heaps
- Pairing heaps
- Double ended priority queues
- Static and dynamic weighted binary search trees
- AVL-trees
- Red-black trees
- Splay trees
- B-, B+- and B*-trees
- Tries and digital search trees
- Tries and packet forwarding
- Suffix trees
- Bloom filters
- Segment trees
- Interval trees

- Priority search trees
- k-d trees
- Quad and oct trees
- BSP trees
- R-trees

Lecture	Content
1	Amortized complexity.
2	Amortized Complexity.
3	Introduction to external sorting.
4	Introduction to external sorting.
5	Selection trees & k-way merging.
6	Run generation.
7	Optimal merging of runs.
8	Buffering.
9	Double-ended priority queues. General methods.
10	Double-ended priority queues. Interval heaps.
11	Leftist trees.
12	Binomial heaps.
13	Binomial heaps.
14	Fibonacci heaps.
15	Pairing heaps.

16	Dictionaries.
17	Optimal binary search trees.
18	AVL trees.
19	AVL trees
20	Red-black trees.
21	Red-black trees.
22	B-Trees.
23	B-trees.
24	B+ and B*-trees.
25	Splay Trees.
26	Splay Trees.
27	Binary Tries.
28	Compressed Binary Tries.
29	High-order Tries.
30	Tries and Packet Forwarding.
31	Suffix Trees.
32	Bloom Filters.
33	Segment Trees.
34	Interval Trees.
35	Priority Search Trees.
36	Priority Search Trees.
37	Multidimensional Search Trees.
38	Quad Trees.
39	BSP Trees.
40	R-trees.

Course Policies:

1. Every student is expected to follow the University of Florida Honor Code. (See http://www.dso.ufl.edu/STG/default.html)
2. Handouts, assignments, solutions, and others will be posted on Canvas. Students should check Canvas regularly, at least once per week.
3. When submitting homework for grading, your answers should be written neatly and contain an explanation that is clear and reasonably concise.
4. All requests for re-grading must be made to a teaching assistant within 2 weeks of the date that scores are posted.
5. Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.