CS4/5720 Design and Analysis of Algorithms

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Office Hours: Tu/Th: 4-4:30pm; 7:30-8pm; Wed 2pm-4pm.

Introduction

This course is an introduction to analysis of algorithms. We would be interested in designing and analyzing efficient algorithms for various problems. We will also address the issue of why some problems are inherently intractable using the theory of NP-completeness.

Back-up classes are scheduled for Saturday February Feb 10th, 17th, March 17th and April 7th 2018, at 1pm-3:30pm in case of weather related emergencies or my absence due to trip or illness. Please reserve these times in your calendar as possible back up classes for this course. And if you have any questions, please talk to me at your earliest convenience regarding the above.

Please note that due to expected travel in 1st week of March, a back-up class is already scheduled on Saturday Feb 10th, at 1-3:30pm.

There is no class during Spring Break (March 26-April 1st, 2018).

Week-by-Week Schedule

Please keep yourself up-to-date with the lectures, as sometimes only selected portions of the Chapters from the text-book would be covered. It is the responsibility of the student to know what has been covered in the class and when assignments are due. So please keep up with lectures and Homework assignments deadline.

An outline of the course is as follows – please note that there are three exam (tests) dates which are closed book and in class:

• Week 1-2: Summary and review of Chapters 1-2.

• Week 2: Homework 1 (Given: Jan 25th, Due: Feb 6th)

• Week 3-6: Start Chapter 3 (Divide and Conquer), 4 (The Greedy Method), and Chapter 5th (Dynamic Programming).

• Week 4: Homework 2 (Given: Feb 6. Part A due: Feb 13th and Feb 20th – may have two parts).

→ **Exam 1: Feb 22nd, 2018** (4:45pm-6pm, in class, closed book, Chapters 1-5).

• Week 7-11: Chapters 5 (Dynamic Programming), 6 (Basic search and traversal techniques), 7 (Backtracking) and 8 (Branch-And-Bound).

• Week 9: Homework 3: Given: March 8th. Due: March 15th.

→ **Exam 2: March 22nd, 2018** (4:45pm-6pm, in class, closed book, Chapters 5 to 8).

• Week 12-15: Chapters 2 (The Theory of NP-Completeness) and 3 (Proving NP-Completeness Results) and selected sections from Garey/Johnson's text book.

• **Graduate reading and term paper report**: I will provide reading assignment or please consult me at your earliest convenience for determining your topic of interest. Due: February 26th (one page text proposal by eMail due). Undergraduate students can complete this assignment for extra credit (maximum 2% of the total grade).

• Week 13: Homework 4 (Given: April 10th Due: April 26th, 2018).

• Summary of term reports by graduate students: All graduate-student term papers due May 6th. In class informal presentation, time permitting.

• **Final Exam: 5:20-7:20pm, May 8th, 2018** (in class, closed book).

Assignments – home-work

Late submissions of homework and assignments would be accepted, but with a penalty of 50 percent of the grade for that assignment if assignment is submitted to Dr. Semwal within a week, after that with a penalty of 75%. No homework or projects demonstrations will be accepted after two weeks of the due date. Under extreme circumstances (such as job related or illness), an extension would be provided on an individual basis.

Also, students are expected to do their own assignments. At this stage of senior/graduate level, cheating is not expected. However, if cheating is proven then the policy of academic ethics of college of EAS (see the University Catalog) will be followed.

Distribution of Grades

Departmental policy of cross-listed courses requires that more work be done by graduate student than an undergraduate student. Graduate reading and report satisfies the departmental policy in this course for graduate students.

The distribution of grades (100 percent) is as follows:
CS4720 Homework: (Total: 40 percent). Homework 1 (5%), Homework 2 (15%), Homework 3 (15%), Homework 4 (5%).

CS5720 Homework: (Total: 40 percent). Homework 1 (4%), Homework 2 part A and B (12%), Homework 3 (12%), Homework 4 (4%). Graduate reading and term-report (8%).

A homework can be combination of theory and programming assignments.

For graduate reading and report, up to three selected papers or reports are to be read in the area of dynamical algorithms, generative algorithms, or in complex systems theory (please contact Dr. Semwal), or suggested by student and in consultation with the instructor. A report (maximum five pages) is to be prepared and could be informally **presented** by the student as time permits. The suggested size of this term-paper report is around 5-10 (maximum) pages which must be written following IEEE, ACM, or Springer-Verlag conference formats[1] available on line.

Algorithm writing is encouraged for all homework. For assignments, students may implement some algorithms as programs as sometimes that will be convenient for the student. Programs must be properly commented and well documented to receive full credit. You can implement your projects on a computer or language of your choice with the knowledge that you would be responsible to complete the project. Note that a **working** demonstration is required for all programming portions of assignments in this class. Any platform of choice is acceptable in any of the laboratories or notebooks could also be used for student demonstrations.

Textbooks and Further reading

- Computer Algorithms by Horowitz, Sahni, and Rajasekaran ISBN-13: 978-0929306414
- Computers and Intractability: Garey and Johnson.
- Further reading: The Design and Analysis of Computer Algorithms: Aho, Ullman and Hopcroft (a supplementary book).
- Further reading: Dynamical – time and space varying algorithms; or Quantum Computing and Analysis.

Graduate students -- Term Paper Presentation

The last week of the course would schedule an informal presentation by each student depending on number of students in the class, and time permitting. The presentation would be based on the term project material. The presentation would give a summary of the techniques and results obtained by the student. Student can present demo, analysis, of their term project along with the power-point presentation of their term project. The presentations will be scheduled in class. All term reports (email and printed) are due on May 4th, 2018 or earlier. No late homework and term report work will be accepted after May 4th, 2018.

[1] LaTex or Word Template can be found on the web. In case of questions, contact Semwal.

Three Examinations (Closed Book) – Each 20%

Three **in class** exams (**two midterms and one final exam)**, are scheduled each worth 20%. Will include everything covered in the class till that point.

Department Policy on Late Drop

A late drop will be approved only if there is **documented** evidence that the student was prevented from attending a significant number of classes by circumstances beyond his or her control. Please be aware of the deadlines of dropping the class as late drop requires signatures by the Chair and EAS Dean.

Office Hours

Tuesday and Thursday: 4-4:30pm; 7:30-8pm. Wed: 2-4pm.

You are welcome to discuss/talk about the course any time you find me free. If I am busy outside the office hours then please do return at some later time so that I could answer your questions. You could also send me an e-mail at ssemwal@uccs.edu.