

COMP5711: Advanced Algorithms

Course Description

This is an introductory graduate course on advanced algorithms. It covers most of the classical advanced topics in algorithms design (approximation algorithms, amortized analysis, randomized algorithms, etc.), as well as some recent algorithmic developments, in particular algorithms for "big data".

Students must have taken COMP3711 or its equivalent before taking this course. A good grasp of discrete mathematics and probability is also required.

Staff

Instructor: [Ke Yi](#)

Office hours (in Room 3552): 4-5pm on Tuesdays or by email appointment.

TA: Bin Wu (bwuac@cse.ust.hk)

Office hours (in Room 4209): 3-4pm on Wednesday.

Time and Place

12:00pm ~ 1:20pm on Mondays and Wednesdays, in Room 4621.

Books

[KT] (Required) *Algorithm Design*, by Jon Kleinberg and Eva Tardos.

[CLRS] *Introduction to Algorithms (3rd edition)*, by T. Cormen, C. Leiserson, R. Rivest, and C. Stein. [\[link to e-version\]](#)

[V] *Approximation Algorithms*, by Vijay V. Vazirani.

[MR] *Randomized Algorithms*, by Rajeev Motwani and Prabhakar Raghavan. [\[link to e-version\]](#)

Syllabus and Notes

1. Introduction. [\[notes\]](#)
2. Fixed-parameter algorithms. [KT 10.1~10.3] [\[notes\]](#)
3. Approximation algorithms. [KT 11.1~11.6, 11.8] [V 10.2, 14.1, 14.2] [\[notes\]](#)
4. Local search. [KT 12.1, 12.2, 12.4, 12.7] [\[notes\]](#)
5. Amortized analysis. [CLRS 17, 19] [\[notes\]](#)
6. Randomized algorithms. [KT 13.1~13.10, MR 9.1~9.2] [\[notes\]](#)
7. Streaming algorithms, external-memory algorithms, parallel and distributed algorithms. [\[notes\]](#)

Assignments and Exams

- [Assignment 1](#) (Due on Sep 29) [Solutions](#) (password: birds)
- [Assignment 2](#) (Due on Oct 13) [Solutions](#)
- [Midterm exam](#) and [Solutions](#)
- [Assignment 3](#) (Due on Nov 10) [Solutions](#)

- [Assignment 4](#) (Due on Nov 26) [Solutions](#)
- The midterm exam is scheduled at 19:00 - 21:00 on Oct 16 (Thu) in room LSKG012. It will be an open-book exam.

Course Policies

Grading Scheme:

4 Assignments: 20%

Midterm exam: 30%

Final exam: 50%

Assignments:

Assignments involve only written work (no programming). Your solutions will be judged not only for correctness but also for the clarity and simplicity of your presentation. In questions that involve designing an algorithm, you should typically (i) give an overview of the main ideas, (ii) present pseudocode or plain language description of the algorithm, and (iii) present an analysis (usually, of the running time) of your algorithm. When correctness is not obvious, you should also provide a proof or justification of correctness.

Assignments are due **in class** on the stated dates. Typesetting your solutions in LaTeX is recommended. You can submit your assignments by either emailing the pdf to the TA or handing in the paper version. Late assignments will not be accepted and will be given a mark of zero. In case of genuinely extenuating circumstances such as illness, please inform the instructor as soon as possible. It is highly recommended that you start early instead of waiting till the last moment.

Cheating:

You are reminded of the university's [Academic Honor Code](#) and [Regulations on Academic Integrity](#). The penalty for cheating may be severe, including possibly a failing grade in the course and notification for appropriate disciplinary action.

Do *not* copy (or modify) from any parts of someone else's write-up.

Do *not* copy (or modify) from any parts of writings from other sources (books/the web/etc.).

You must acknowledge any discussions you have had with others or any consultation with other sources. You are allowed to discuss assignment questions with classmates but only about general ideas. You must work out the details of your solutions on your own; in particular, you must write up your solutions entirely on your own. Never show your write-up to other students.

Mark Appeals:

Mark appeals for assignments must be made within one week of the date of the return (if you pick up your assignments late, your appeal period does not lengthen). You should first consult the TA who marked the question. Only if the problem is still unresolved should you then bring the case to the instructor's attention.

For the midterm and final exam, appeals must be made during the exam paper checking session. If you cannot attend the checking session, please inform the instructor for special arrangement.