

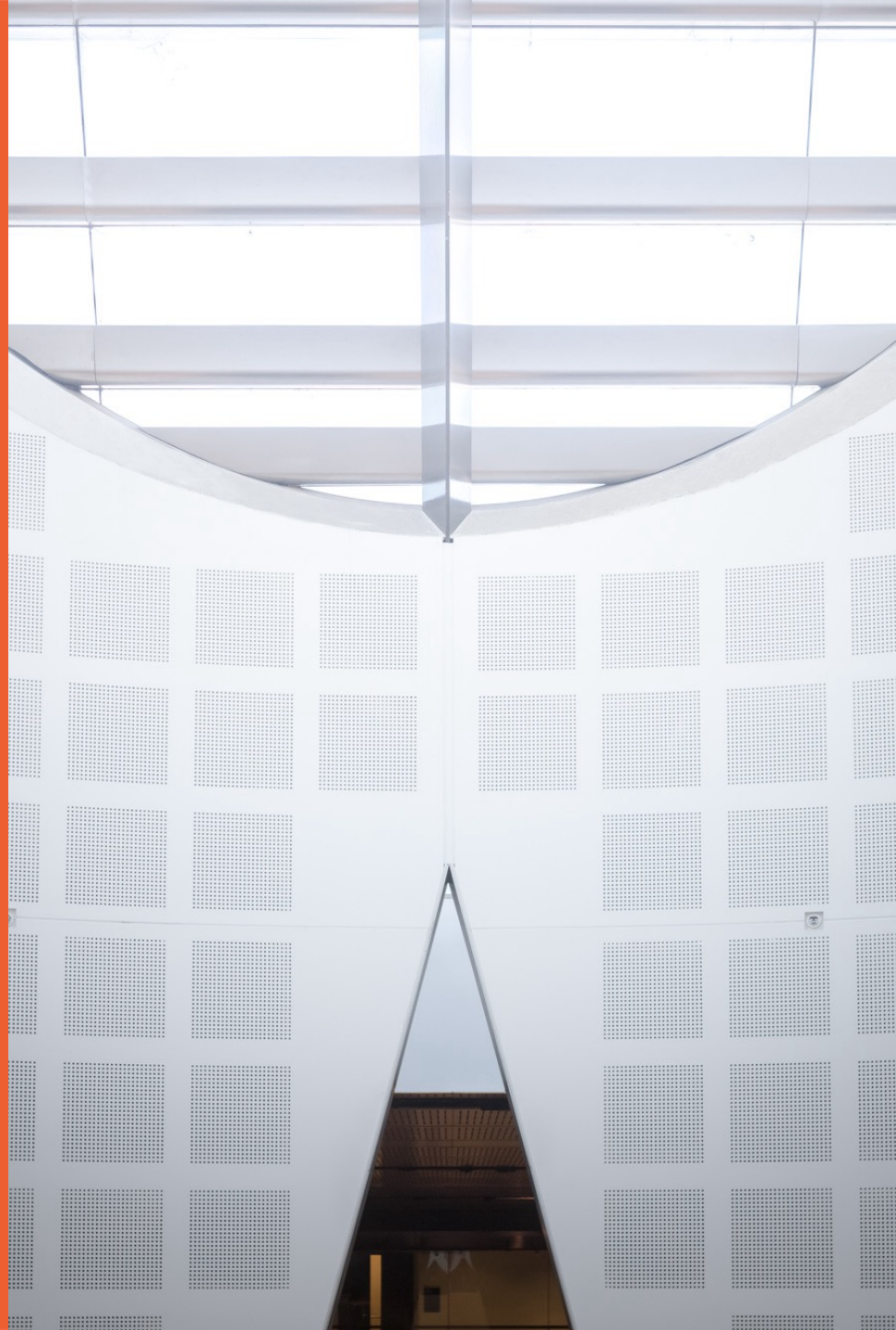
COMP2123

Week 13: Recap and Exam Review

André van Renssen
School of Computer Science



THE UNIVERSITY OF
SYDNEY



Quick announcements

Fill out online Unit of Study Survey

- <https://student-surveys.sydney.edu.au/students/>
- Use the free text to help us make this better for next years students. “Pay it forward”

Examples of changes based on past years’ feedback:

- wrote the guide on how to approach algorithmic problems
- designed programming exercises

Week 13 Quiz

Quiz 10 will be about the final.

It's available until the start of the exam period

Week 13 Tutorials

There is no tutorial sheet. This is on purpose, so that you have the time to bring any lingering questions to your tutor.

Use this opportunity, as after this week we'll have reduced presence on Ed.

Looking back

We covered a lot of ground!

Lectures

Lecture 0 - Administrivia	PDF
Lecture 1a - Introduction	PDF
Lecture 1b - Analysis	PDF
Lecture 2 - Lists	PDF
Lecture 3 - Trees	PDF
Lecture 4 - Binary Search Trees	PDF
Lecture 5 - Priority Queues	PDF
Lecture 6 - Hashing	PDF
Lecture 7 - Graphs	PDF
Lecture 8 - Graph Algorithms	PDF
Lecture 9 - Greedy Algorithms	PDF
Lecture 10 - Divide and Conquer I	PDF
Lecture 11 - Divide and Conquer II	PDF
Lecture 12 - Randomization	PDF

Core concept 1: Abstraction layers

Abstract Data Type



Data Structure



Computer code

Problem definition



Algorithm



Computer code

Core concept 2: Algorithm analysis

A principled framework for evaluating algorithms:

- measuring performance of resource use
- proving correctness

These should inform your design and implementation choices

Learning outcomes

1. Proficiency in organising, presenting and discussing professional ideas [...]
2. Using mathematical methods to evaluate the performance of an algorithm.
3. Using notation of big- O to represent asymptotic growth of cost functions.
4. Understanding of commonly used data structures, including lists, stacks, queues, priority queues, search trees, hash tables, and graphs. This covers the way information is represented in each structure, algorithms for manipulating the structure, and analysis of asymptotic complexity of the operations.
5. Understanding of basic algorithms related to data structures, such as algorithms for sorting, tree traversals, and graph traversals.
6. Ability to write code that recursively performs an operation on a data structure.
7. Experience designing an algorithmic solution to a problem, coding it, and analysing its complexity.
8. Ability to apply basic algorithmic techniques (e.g. divide-and-conquer, greedy) to given design tasks.

Beyond this unit of study

SCS offers many algorithmic units:

- COMP2022 Models of Computation (S2)
- COMP3027 Algorithm Design (S1)
- COMP4445 Computational Geometry (S1)
- COMP4530 Discrete Optimisation (S2)
- COMP4270 Randomised Algorithms (S2)

Sydney Algorithms and Computation Theory group:

- weekly reading group on Algorithm research
- do a research project with us
- we are always looking for bright honours students

What is examinable?

Everything from the lectures, the referenced sections of the textbooks, the tutorials, the quizzes, the assignments. Exceptions to this rule:

- when explicitly labeled as non-examinable.
- probabilistic analysis of randomized algorithms

In general, if it happened during this unit, you are expected to know about it!

Focus on the things we put most emphasis on, as seen in tutorials and assignments

Final Exam Structure

2 hours writing plus 10 minutes reading

5 questions worth in total 60 points

Worth 60% of overall COMP2123/9123 grade

Final exam has a 40% barrier

Restricted Open Book:

- You can bring 1 A4 double-sided cheatsheet (handwritten or printed)
- No electronic devices or any kind are allowed

Do's and Don'ts

Exam is in person.

Check your exam timetable for details on the venue!

Restricted open book exam:

- Making the **cheatsheet yourself is highly recommended**
- **Never** copy text verbatim from anywhere, including the slides (this is grounds for academic dishonesty case). If you refer to anything from the permitted material, write in your own words

Start your submission with your student ID

- Don't include your name

Problem 1

10 points

Analysis of given algorithms

Easy problem. Make sure you nail it!

Problem 2

10 points

Analysis of given algorithms

Easy problem. Make sure you nail it!

Problem 3

10 points

Design or modify an ADT/algorithm that solves a problem

Medium difficulty problem.

Remember to:

- Describe your approach
- Prove correctness
- Analyze complexity (if there's a space requirement, don't forget to analyze this as well)

Problem 4

10 points

Design or modify an ADT/algorithm that solves a problem

Medium difficulty problem.

Remember to:

- Describe your approach
- Prove correctness
- Analyze complexity (if there's a space requirement, don't forget to analyze this as well)

Problem 5

20 points

Design or modify an ADT/algorithm that solves a problem

Hard problem.

Remember to:

- Describe your algorithm
- Prove correctness
- Analyze complexity

Problem 3, 4, and 5

Check if you're supposed to use a specific technique:

- “design a greedy algorithm”
- “design a divide and conquer algorithm”

(Using a different technique will cost you a significant number of marks, but may still be better than a poorly explained incorrect attempt)

Let the running time requirement guide you:

- If we ask $O(1)$ time, this limits your options considerably
- If we ask $O(n)$ time, you can't sort the input

Exam technique

Read all questions to see which ones you can answer quickly

Plan how you will allocate time (wisely)

Start with easy problems and move to harder ones

Write clearly and efficiently

- Start with outline/bullet points, then expand if you have time
- No need for fancy style or overly formal

Pragmatic Advice

- It's a good idea to check the exam venue ahead of time
- Plan to arrive ahead of time (don't rely on public transport running smoothly on the day of the exam)
- Bring water, spare pens, and ID
- Have clothing in layers
- Start by writing your student ID. Do not write your name on the exam (marking is anonymous)
- Breathe and relax
- Follow the instruction of the invigilator

More info:

<https://www.sydney.edu.au/students/exams/in-person.html>

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