MANCHESTER
1824
The University of Manchester

Introduction to COMP26120: Video 1 Welcome

Louise A. Dennis

COMP26120

Why?

MANCHESTER
1824
The University of Manchester

The Team

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Lucas Cordeiro

Tom Carroll

Bernardo Magri

Topics

Sorting and searching Algorithms

Graph Algorithms

Computational Complexity

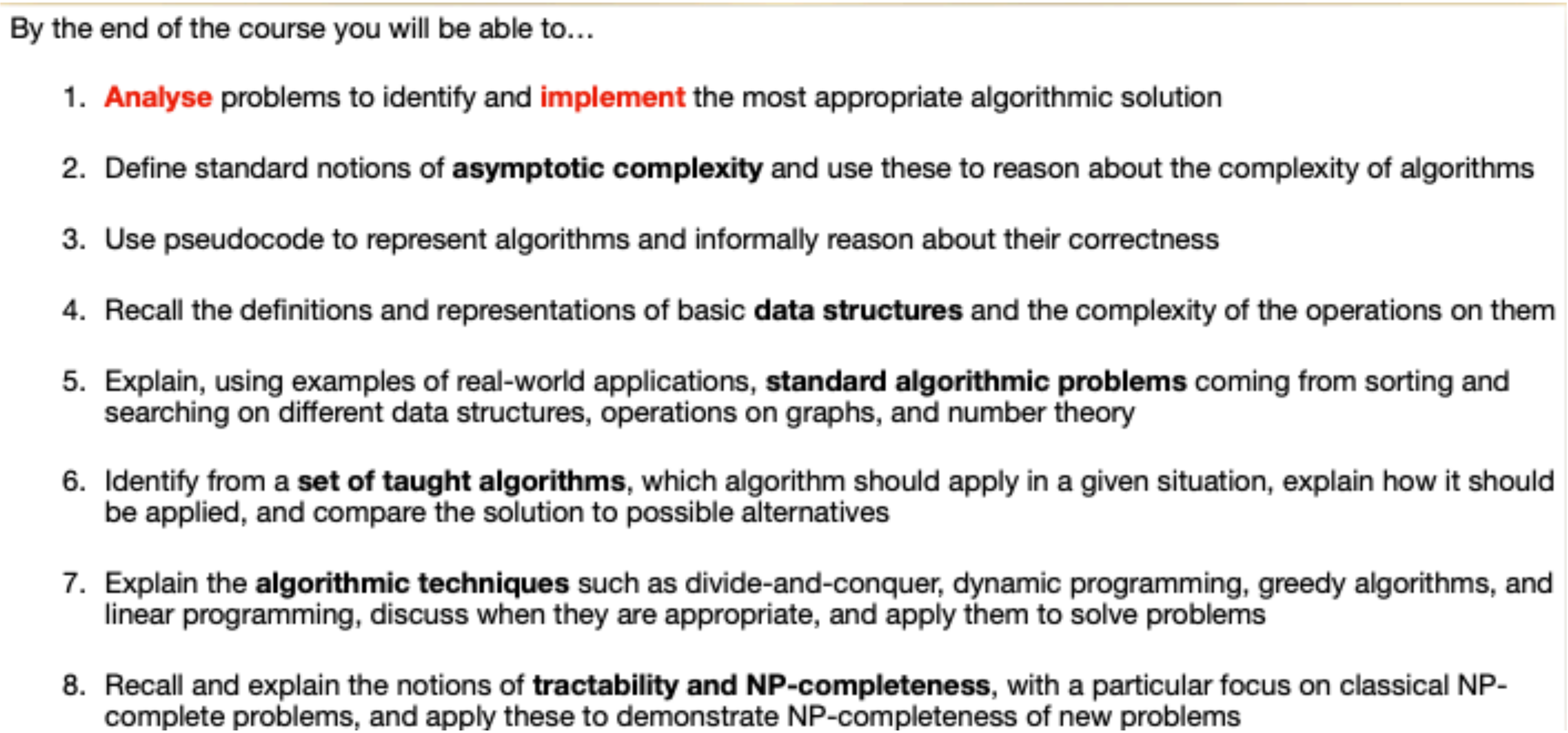
Data Structures

General Algorithmic Techniques

Tractability and NP-completeness

Linear Programming

Number Theoretic Algorithms

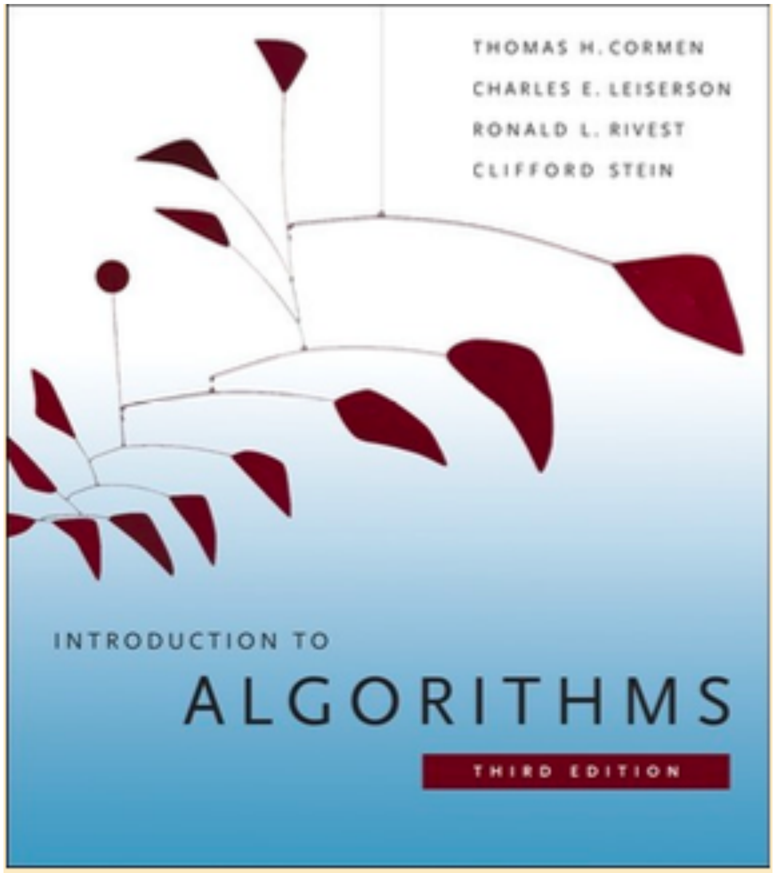


By the end of the course you will be able to…

1. **Analyse** problems to identify and **implement** the most appropriate algorithmic solution
2. Define standard notions of **asymptotic complexity** and use these to reason about the complexity of algorithms
3. Use pseudocode to represent algorithms and informally reason about their correctness
4. Recall the definitions and representations of basic **data structures** and the complexity of the operations on them
5. Explain, using examples of real-world applications, **standard algorithmic problems** coming from sorting and searching on different data structures, operations on graphs, and number theory
6. Identify from a **set of taught algorithms**, which algorithm should apply in a given situation, explain how it should be applied, and compare the solution to possible alternatives
7. Explain the **algorithmic techniques** such as divide-and-conquer, dynamic programming, greedy algorithms, and linear programming, discuss when they are appropriate, and apply them to solve problems
8. Recall and explain the notions of **tractability and NP-completeness**, with a particular focus on classical NP-complete problems, and apply these to demonstrate NP-completeness of new problems

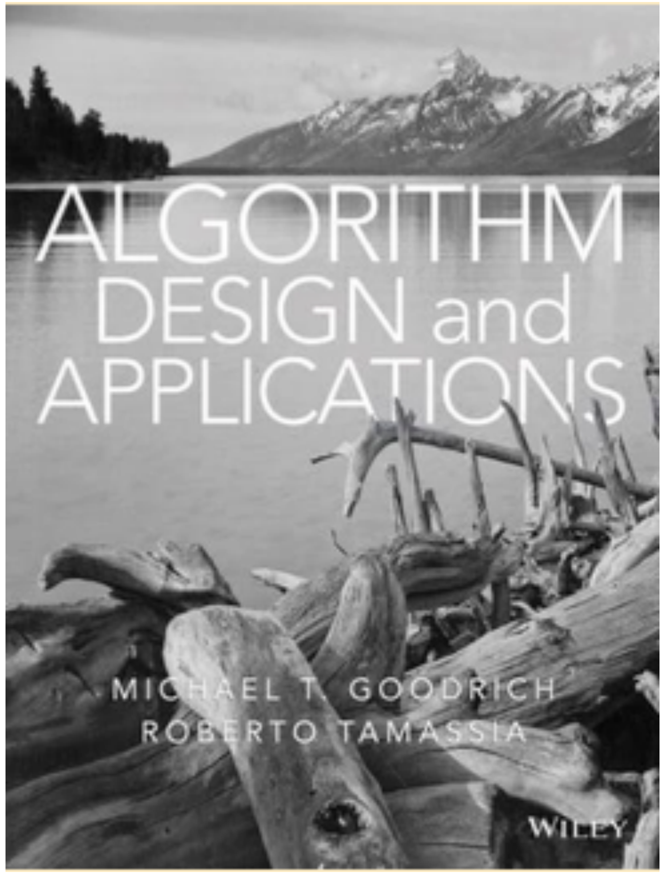
Typical *Teaching* Activities in a COMP26120 Week

What	How	Why
Motivating and explaining material	Short (10-15 minute) videos, sometimes directed reading	Good to place concepts in context and highlight key ideas
Additional material to consolidate ideas	Pointers to linked material e.g., the textbook or videos	Reinforcement of key ideas, provision of wider context, adding depth
Demonstrating how to do things	Short videos, explanatory handouts	Showing the process, not just the outcome
Weekly Synchronous session	In person in lecture theatre and uploaded later as podcasts	A chance to ask questions, and reflect on the material



THOMAS H. CORMEN
CHARLES E. LEISERSON
RONALD L. RIVEST
CLIFFORD STEIN

INTRODUCTION TO
ALGORITHMS
THIRD EDITION



ALGORITHM
DESIGN and
APPLICATIONS

MICHAEL T. GOODRICH
ROBERTO TAMASSIA

WILEY

Typical *Feedback* Activities in a COMP26120 Week

What	How	Why
Formative quizzes	Blackboard quizzes with immediate feedback and no marks	Helping you check your understanding and practice for the exams
Worksheets or lab work	Worksheets are pen and paper, labs are programming exercises	Doing is a powerful technique to check and develop understanding
Summative lab coursework	Programming exercises, backed up with a Blackboard quiz and a report	Explaining your solution is also a powerful technique for understanding
Discussion Forms	Piazza (available via Blackboard)	**An asynchronous way to ask questions**
Drop-in Sessions	GTAs & Staff available to answer questions and give feedback	An opportunity to access individual help and feedback on exercises

This Week

What	What is it?
Introduction to the Course	This video! Introduces the team and some organisational stuff.
What is an Algorithm? What is a Data Structure?	Two videos taking a high-level look at what we mean by an algorithm and a data structure and what we'll be covering in the course
An Example Problem	A series of four videos presenting an example problem and showing worked examples of three different approaches to solving it
Directed Reading and Viewing	Not much reading this week, though there are also some optional videos to watch that place the course in more context
Analysing Algorithms Worksheet	Your task is to repeat the process from the example problem videos for two new problems
Synchronous Session	In our first face-to-face session you will meet the staff in person, we'll remind you about organisational matters.

Worksheets and Labs

What	Title	Subject Matter	Due
Worksheet 1	Analysing Algorithms	Designing and analysing algorithms	3rd Oct
Worksheet 2	Introducing Complexity Analysis	Applying methods for determining the complexity of simple programs	10th Oct
Lab 1	Spellchecking 1	Implementing linear and binary search and some sorting algorithms	17th Oct
Worksheet 3	Complexity of Recursive Programs	Applying methods for determining the complexity of recursive programs	28th Oct
Lab 2	Spellchecking 2	Exploring the complexity of sorting algorithms and some amortisation arguments	14th Nov
Lab 3	Spellchecking 3	Using data structures (trees and hash maps) to speed up searching	9th Dec
Lab 4	Priority Queues	Comparing different implementations of priority queues	19th Dec

Have Fun!