Engineering Tripos Part IIB, 4M26: Algorithms and Data Structures, 2024-25

Module Leader

Prof Per Ola Kristensson [1]

Lecturers

Prof Per Ola Kristensson [1]

Timing and Structure

Lent term. 16 lectures (including two integrated examples classes). Assessment: 100% exam.

Aims

The aims of the course are to:

- Introduce the principles behind algorithm and data structure design and evaluation.
- Cover key topics including elementary and advanced data structures, including sorting algorithms, graph algorithms, and so on.
- Provide an understanding of how to translate algorithms into code for selected engineering problems through coding-focused computerised examples papers.

Objectives

As specific objectives, by the end of the course students should be able to:

- Analyse the computational efficiency of algorithms.
- Re-implement and debug algorithms.
- Correctly choose a suitable algorithmic solution and set of data structures for a computational problem.
- Understand the theoretical and practical advantages and disadvantages of various algorithmic approaches and established solutions.
- Devise and implement new algorithms and data structures, or modify existing algorithms and data structures, to solve previously unencountered tasks.

Content

- Part 1: Fundamentals of Algorithms and Data Structures (7L + 1 Example Class)
 - Interpreting and writing pseudocode, demonstrating correctness, arriving at tight/lower/upper bounds of running time/storage, and solving computational problems using a repertoire of data structures and algorithmic approaches.
- Part 2: Algorithms and Data Structures in Engineering (7L + 1 Example Class)
 - Translating pseudocode into code, debug implementations of algorithms and data structures, apply algorithms and data structures to solve a range of frequent engineering problems, such as finding shortest paths, resource allocation, and scheduling.

Booklists

Introduction to Algorithms (3rd ed) by Cormen, T., Leiserson, C., Rivest, R., Stein, C. The MIT Press. ISBN:978-0-262-03384-8.

Also, please refer to the Booklist for Part IIB Courses for references to this module, this can be found on the associated Moodle course.

Examination Guidelines

Please refer to Form & conduct of the examinations [2].

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Links

[1] mailto:pok21@cam.ac.uk

[2] https://teaching.eng.cam.ac.uk/content/form-conduct-examinations