

UNIVERSITY OF EXETER  
COLLEGE OF ENGINEERING, MATHEMATICS  
AND PHYSICAL SCIENCES  
**ECM3428**

*Algorithms that changed the world*

**Continuous Assessment I**

Date Set: 11 November 2020

Date Due: 9 December 2020

Return Date: 13 January 2021

This CA comprises 40% of the overall module assessment.

This is an **individual** exercise and your attention is drawn to the College and University guidelines on collaboration and plagiarism, which are available from the College website.

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This summative assessment requires you to write a technical report of an algorithm, implement it using a programming language and create a video to demonstrate your work. Please ensure you read the entire document before you begin the assessment.

**Please Turn Over**

# Problem Statement

In this assessment you are asked to write a technical report of an algorithm of your choice, implement it using a programming language, and create a video to demonstrate your code and its results.

Your report should include the following contents about the chosen algorithm:

- The main principals of the algorithm.
- Pseudo code to describe the algorithm.
- The complexity (time and space) analysis of the algorithm.
- The limitations or constraints of the algorithm and the advances that could overcome them.
- The applications of this algorithm in diverse areas for problem solving (e.g. how the algorithm changed or is changing the world).

The report should be no more than 1500 words. The title page, references and appendices are not counted. Please respect the following formatting constraints: Times New Roman or Arial, at least font size 11, margins (2.0cm sides, 2.0cm top and bottom), and single line spacing.

A separate title page containing the title, student number, abstract, word count and a signed declaration stating: *“I certify that all material in this report which is not my own work has been identified”*. should be provided.

Implement the algorithm using a programming language of your choice (Python is recommended), and submit the source code along with the report. Your code should perform correctly and have sufficient comments.

Create a short video (no more than 5 minutes in length and 100MB in size) to introduce the algorithm including its background, principles, importance and your implementation. It should also demonstrate how the code works.

## Algorithms

You can choose an algorithm from the list below. Alternatively you can suggest an algorithm that is not covered by this module (in the latter case, you should discuss your choice with the module leader within one week of handout).

- Multicast routing algorithm for sensor networks.
- Frequent pattern growth (FP-Growth) algorithm.
- The Edmonds-Karp algorithm for finding the maximum flow.
- Orthogonal range searching and k-d trees algorithms.
- Boruvkas algorithm.
- Reed-Solomon algorithm.
- Quickhull algorithm.
- Iterative solvers, e.g. Jacobi, Gauss Seidel.
- Derivative-free optimization algorithms.

## Writing

Your technical report must be well structured and written in good English. Pay attention to the following:

- Spelling, punctuation and grammar.
- Writing in short, snappy sentences.
- Making sure to define acronyms.
- Referencing properly.

## References

If you refer to other published documents in your report, you must cite the source using a standard citation style (e.g. IEEE, Harvard, etc. ).

- All references must be presented in a consistent and uniform style.
- All references must be presented in a font no smaller than 11 point.

## Deliverables

The deliverables for this coursework comprise one **electronic** submission. You should name the submission as *StudentID\_CandidateNumber*.

- The source code, video file and report should be compressed into one single file and submitted to the E-BART system by 11:59am on the date indicated on the front page of this document. The link to the submission page can be found using the method introduced in the handbook above. See the *On-line Submission Student Handbook* for other requirements.

**You are suggested to complete the submission at least a few hours before the deadline, leaving enough time for potential last-minute amendments.**

# Marking Scheme

Criteria	Marks
<b>Report</b> <ul style="list-style-type: none"> <li>• The degree to which the report describes the main principles and aims of the algorithm clearly (10).</li> <li>• The degree to which the pseudo code of the algorithm is well presented, e.g. using a flowchart (10).</li> <li>• The degree to which the complexity of the algorithm is correctly analysed, including the reasons as to why the algorithm has such complexities (5).</li> <li>• The degree to which the report describes the limitations of the algorithm and possible advances that could overcome these limitations (5).</li> <li>• The degree to which one or more applications of the algorithm is specified and clearly described (5).</li> <li>• The degree to which the report is logically structured and written clearly, with appropriate section and subsection titles, proper referencing, clear diagrams/images, and a neat/polished appearance (5).</li> <li>• <b>If the report has more than 1500 words (excluding the title page, references and appendices), (-5 per 200 words).</b></li> </ul>	40
<b>Source code</b> <ul style="list-style-type: none"> <li>• The degree to which the source code produces the intended results (10).</li> <li>• The degree to which effective expression of the algorithm using proper data structures and good design (e.g. sufficient instructions and a proper user interface) is provided (10).</li> <li>• The degree to which the layout of the code is clear (5).</li> <li>• The degree to which sufficient comments are provided (5).</li> </ul>	30
<b>Video</b> <ul style="list-style-type: none"> <li>• The degree to which the introduction is effective and informative (5).</li> <li>• The degree to which the key points of the algorithm are clearly covered (10).</li> <li>• The degree to which the presentation is well organised (5).</li> <li>• The degree to which the visual aids, e.g., slides, source code, etc., are clear, effective and well prepared (5).</li> <li>• The degree to which speaker uses a clear, audible voice, and has good language skills (5).</li> </ul>	30
<i>Total</i>	100

## Feedback section

***What contributes to an outstanding report:*** An excellent description of the main principles and aims of the algorithm and the pseudo code. The complexity is analysed correctly and concisely. The limitations of the algorithm are clearly described and the suggestions to overcome these limitations are reasoned with sufficient supports. The applications are clear and appropriate. The report is logically structured, professionally formatted and well written in academic English.

***What contributes to an outstanding source code submission:*** The code produces intended results correctly, without clear bugs and any unexpected outputs. The algorithm adopts proper data structures and is efficiently implemented. There is a good software design that prints adequate instructions and displays the results clearly and informatively. The layout of the source code is clear and nicely formatted. There are correct and sufficient comments.

***What contributes to an outstanding video submission:*** There is an excellent introduction of the algorithm and all the key points are presented with sufficient details. The presentation is well organised with relevant, effective and sufficient visual aids. Outstanding language skills are demonstrated.