CSM6120 Fundamentals of Intelligent Systems

Essay: AI Methods for Finding Degree-Constraint Minimum Spanning Trees

Academic Year 2019–2020

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1 Introduction

This is the second assignment for CSM6120 'Fundamentals of Intelligent Systems' and comprises 60% of the total marks for the module. It gives information about the different sections, how and when to hand in, specifies the tasks you have to perform, and highlights the criteria from which the assignment will be marked. Please follow these instructions carefully. If anything is unclear or you have any questions, please, send an email to `t.jansen@aber.ac.uk` and ask!

This assignment asks you to research a difficult combinatorial optimisation problem: the degree-constraint minimum spanning tree problem. Using what you have learned in the module as a starting point, you are asked to perform a literature search and discuss possible attempts of solving this problem by different AI methods.

2 Hand-In

You have to write an essay that introduces the problem, details results of a literature search, discusses how the problem might be solved using different AI techniques, and also describes your conclusion and what you would suggest if you had to solve the problem yourself. There are no strict page limits but it is safe to assume that you will need at least 6 pages to cover the required material and that more than 15 pages will not be needed. A good essay explains its topic in sufficient detail without being unnecessarily wordy.

You are asked to submit via Blackboard. The deadline for submission is 9th December, 1pm.

By submitting your work you are acknowledging that it is your own work and that you are aware of both the University's and the Department's views on plagiarism. Please follow the guidelines from the Student Handbook (see `https://impacs-inter.dcs.aber.ac.uk/images/editorcontent/Documentation/Handbooks/handbook-cs-2019-2020.pdf`) to help you avoid straying from legitimate and desirable cooperation into the area of plagiarism.

3 Task

You are asked to write an essay that considers the problem of computing degree-constraint minimum spanning trees, discusses solving the problem by different approaches AI approaches, and contains a comparison and discussion of the different approaches. It is based on a significant literature search that you need to perform before you write your essay. You should write the essay for a general computer science audience. You can assume that your readers know general computer science concepts and are able to program, however they do not have specialist knowledge in artificial intelligence.

The structure for your essay is pre-defined as follows. The first section is an introduction that gives a very brief overview of the contents of your essay and describes how you performed the literature search. The second section introduces and discusses the problem of computing degree-constraint minimum spanning trees. The third section discusses how the problem might be solved using different AI approaches. The fourth section discusses the different approaches and their properties. In the fifth section you will summarise what you conclude and how you would tackle the problem yourself (based on everything you have learned).

Do not deviate from this structure!

Since literature search is a significant part of your essay there will be a list of references (also known as bibliography). Make sure that you include all sources that you cite in the text but do not include titles in the list of references that you do not refer to in your text.

There are specific requirements for your essay that are specified in the next section. Please, follow them closely. Also consider the marking scheme to understand what is expected.

4 Requirements

You essay will contain five clearly marked and numbered sections and additionally a list of references (also known as bibliography). The headings and section numbers for the five sections are as follows.

1. Introduction
2. The Degree-Constrained Minimum Spanning Tree Problem
3. AI Approaches for Computing Degree-Constrained Minimum Spanning Trees
4. Comparing the Different Approaches
5. Conclusion and Way Forward

The essay has to be submitted as a single PDF document via Blackboard before the deadline. It needs to have the sections described above and page numbers on every page. Do **not** produce a table of contents or a title page. **The submission deadline for the report is 9th December 2019 (1pm).**

5 Marks

The essay will be assessed under departmental assessment criteria in appendix AC of the Student Handbook:
`http://impacs-inter.dcs.aber.ac.uk/images/editor-content/Documentation/Handbooks/Appendices/AppendixAC.pdf`
The marks breakdown is as follows (adding up to 100).

- 5 marks for the introduction
- 10 marks for the section describing the problem
- 25 marks for the section describing different approaches
- 25 marks for the section comparing the different approaches
- 25 marks for the section containing your conclusions and preferred approach
- 5 marks for references
- 5 marks for following the format requirements