University of Aberdeen

School of Natural and Computing Sciences

Department of Computing Science

MSc in Artificial Intelligence

2020 – 2021

Please read all the information below carefully

Assessment Item 1 of 2 Research Project/ Essay – Individually Assessed (no teamwork)

Course: CS551J – Knowledge Representation and Reasoning

Note: This assessment accounts for 50% of your total mark of the course.

Research Project/ Essay

Learning Outcomes

On successful completion of this component a student will have demonstrated competence in the following areas:

- In depth analysis of fuzzy systems.
- Design and execution of suitable experiments.
- Analysis and discussion of experimental results.
- Understand how to write a critical essay/ report.
- Effective communication of complex concepts.

Information for Plagiarism and Conduct: Your submitted report may be submitted for plagiarism check (e.g., Turnitin). Please refer to the slides available at MyAberdeen for more information about avoiding plagiarism before you start working on the assessment. Please also read the following information provided by the university: https://www.abdn.ac.uk/sls/online-resources/avoiding-plagiarism/

In addition, please familiarise yourselves with the following document "code of practice on student discipline (Academic)": https://tinyurl.com/y92xgkq6

Assessment Tasks & Report Guidance

While there is no particular format specified for the layout of the report/essay, you should make sure the document conforms to accepted formats for reports.

Overview

"Fuzzy Logic/ Set Theory" and "Model-based Systems and Qualitative Resaoning" are active areas in Knowledge Representation and Reasoning; and have been so for for over forty years. For this assessment there are two tasks, exploring each of these domains in different ways.

Please read all the information below carefully

Task 1: Experimental exploration of Fuzzy Systems (70%)

This part of the assignment is a research exercise in which you will carry out a set of experiments making use of the fuzzy systems tools in scikit-fuzzy (https://pypi.org/project/scikit-fuzzy/). The main aim of this is for you to be able to assess the strengths and limitations of Fuzzy Systems for problem solving.

For a task such as this there are a number of things that can be adjusted or changed (added to or removed):

- The values of the input(s)
- The fuzzy sets utilised.
- The fuzzy rules themselves.
- The defuzzification method used.

You can utilise the example from the lectures as a starting point (or a system of your own choosing).

You must:

1. Identify and describe a set of experiments that you plan to carry out **[10%]**, along with the rationale for the choices made **[10%]**. (Obviously given the options listed above it is not possible in an assignment such as this to be exhaustive; therefore you should give careful consideration to which experiments you will choose.) **(Total:20%)**
2. Carry out the experiments that you identified and present the results **[15%]**, along with a description of the results **[5%].** **(Total: 20%)**
3. Analyse and discuss the results **[10%]** with particular reference to what they say about the construction and use of Fuzzy Rule bases **[15%]**, and draw relevant conclusions **[5%]**. **(Total: 30%)**

Some points to take note of in doing this part of the assignment.

- While there are a number of ways in which a fuzzy set can be represented, **you must use the 4-tuple representation presented in the lectures (a, b, α, β)**.
- To keep your experiments manageable you should restrict your attention to systems with only one consequent.

NB: This is an experimental/ research project, therefore you do not need to include implementation details in the report. (There should, of course be a general description of the kind of system you are using as part of the introduction/ scene setting.)

Task 2: A Review of Qualitative Reasoning (30%)

For this part of the assessment you must provide an overview of around 1000 words describing and assessing Qualitative Reasoning as an approach to KRR.

Things to consider for this part:

- The background and motivation for its introduction.
- The main approaches and ongoing developments.
- What and how it has been applied.

Please read all the information below carefully

Marking Criteria

- Quality of the report, including structure, clarity, and brevity (Academic writing skills)
- Communication skills (clear technical content)
- Critical approach (sound reasoning and evaluation).
- Depth and breadth of the analysis and evaluation (is it robust)

Submission Instructions

You should submit a PDF version of your report/essay via MyAberdeen by **23:59** on **Friday 5th March**. The name of the PDF file should have the form "CS551J_Assessment1_<Your Student ID>". For instance, "CS551J_Assessment1 _4568985.pdf", where 4568985 is your student ID.

Please try to make your submission file less than 20MB as you may have issues when uploading large files to MyAberdeen.

Any questions pertaining to any aspects of this assessment, please address them to the course coordinator Prof. George M. Coghill, g.coghill@abdn.ac.uk.