Report specification, A1 Assignment, January 2025

Introduction

For this assignment, you will need perform an experiment in simulation where you demonstrate or investigate an Artificial Life system.

You will present and discuss your work in a scientific style report, which will be 3500 words long, not including the methods section, figure captions, bibliography and appendices. You must also submit your complete project code.

While there are different ways to achieve a very good mark, as submissions which really stand out in some areas may be forgiven for deficiencies in others, **your aim should be to submit a report which has interesting results, analyses, and discussion**. The measure of success in this assessment is not only whether you have successfully implemented something interesting and/or difficult - whether or not you have done that, if you want a very good mark, you need to *demonstrate* understanding of why your experiment either was or was not successful, as well an understanding of how your work relates to the general subject area of this module.

Subjects

Your project should build on some pre-existing theory or research in Artificial Life, Computational Biology or Complexity Science, preferably introducing a novel element. For instance, a highly-marked project might be:

- A replication (with extension) of an existing paper
- An application of a known technique to a novel problem
- An application of a novel technique to known problems
- An exploration of some previously unexamined aspect of a known system
- An examination, using existing tools, of a novel variant of a known system

Some suggested subjects can be found here:

> **Project topics (https://canvas.sussex.ac.uk/courses/30910/pages/project-topics)**

Proposals

You should all get your projects approved. Please see this page for details on the project approval process:

> **Project proposals (https://canvas.sussex.ac.uk/courses/30910/pages/project-proposals)**

Report style and structure

You will present and discuss your work in a scientific style report, as described below.

Abstract

I would like you *all* to include an abstract in your reports. It should be a single short paragraph which briefly tells me what you did, why you did it (i.e. why it matters), and what your main results and conclusions are. A good abstract will make a selective reader actually *want* to read your article.

Introduction

In your introduction, you should begin by introducing and discussing background material. As well as discussing related research, you should use this section to introduce and clearly define the concepts which you will refer to throughout your report. You will need to refer to these in later discussion. If you will test hypotheses in your experiment, then you should state your hypotheses here. Whether or not you will test hypotheses, you should clearly state your *research questions* here, and briefly explain how you will address them.

Methods

This section is not included in the word count.

You should include enough detail in your methods for someone with similar knowledge and skills to your own to reproduce your results, using the programming language and tools of their choice. This should be on the level of algorithms and equations etc. and should not include implementation detail or program code. For algorithms, you should use pseudocode or flowcharts. **You should use diagrams to illustrate your methods and designs *wherever possible*.**

If you rely on any third party libraries in your experiment, then you must demonstrate understanding of the algorithms they implement by describing them **as you would describe your own**. This level of detail is not necessary for any libraries which you might use in your *analyses*, in which case you only need to briefly explain any tools you have used as well as identifying their origins.

Third party libraries or existing code

If you want to use third-party libraries or existing program code in your project you *must* get my approval first - failure to do so could have a severe effect on your results!

The list of software which is already approved can be found here:

> **Assignment approved software list**
> **(https://canvas.sussex.ac.uk/courses/30910/pages/assignment-approved-software-list)**

Results and analyses

It is of **central importance** to *analyse* your results - you can't answer many interesting research questions without doing so. Some examples of analysis will be covered in seminars, Canvas discussions and labs, but you should also have seen others when reading recommended papers or when researching your project.

Some brief suggestions:

- If the notion of performance applies to your system, then assess the performance of your system under different conditions, e.g. with varying levels of noise or interference. Under what conditions does it fail, and does it fail gracefully or catastrophically?
- For experimental tests, form and state a hypothesis before you run the experiment.
- When comparing two different experimental conditions, keep the change as simple as possible and keep other variables as equivalent as possible.
- If you are assessing the fit of a theory to a model, try to characterise under which conditions the theory fits the model and under which conditions it does not.
- If you are exploring a system's behaviour, try to develop a systematic classification of the behaviours you observe.
- Present your data in a useful format. A graph or figure is usually more informative than a table.

Discussion

In your discussion, you should all cover the following points:

- How have your results and analyses addressed your research questions?
- How does your experiment connect to the larger research area of Artificial Life?
- What further work might follow from your experiment?

As well as at least one of the following, but any which are applicable:

- If you set out to test any hypotheses in your experiment, then to what extent do your results support or oppose them?
- Have your results led you to form any new hypotheses?
- If you have implemented a new kind of system, then how successful was your implementation?
  - How well did your system perform?
  - How might your system be improved?
  - How robust is it to noise and other disturbances?
  - What other applications might your system be useful for?

(Please don't just list my points/questions and then your answers - this is not a good style for a discussion. I expect that most of you already know this, but some few students make this mistake each year.)

This is **not a comprehensive list,** and you may have other interesting points to discuss. In general, you should focus on one or two main discussion points (whichever are the most interesting), and you should craft your report in such a way as to build up to them, from

introduction to results and analyses all the way up to discussion. Other discussion points can be covered more briefly.

A separate Conclusion section can also be included, but is very rarely needed.

Figure and table captions

Captions are not included in word count, because like the methods section, they should be exactly as long as required. It should be made clear in the captions exactly what figures and tables represent, and what exactly your reader should be paying attention to. All figures and tables should be numbered and referred to by their numbers in your main text. It is perfectly acceptable to repeat the text which describes a figure or table in its caption and in the main text, if that will lead to the most clarity in both places.

Bibliography

Not included in word count.

A list of references. You must make sure that your references are complete, that you cite **all** of your sources, and **do not** cite sources which you do not actually refer to in your report. You can use whichever referencing style you prefer, as long as you are consistent.

For an assignment of this size, I would expect to see something in the region of 10 items in your bibliography. This is only a ballpark figure, and I know some of you will go well over it. To go under it will not look good - you should have researched your chosen topic, and you should also be connecting your project to some material already given in the module, so it should not be difficult to populate your bibliography with sources which you actually cite *at all appropriate points* in your report, to support your descriptions and points (I *will not look kindly* on bibliographies which are artificially inflated with items which are either not cited, or which are cited for no apparent reason).

Appendices

Appendices are also not included in the word count, but should not include any material which is part of your main narrative - i.e. appendices may not be used to circumvent the word limit - it should be entirely up to your reader whether or not they review material in appendices. No reader wants to have flick back and forth between different sections of a report as they read the main text.

Presentation of report

I recommend the use of LaTeX for typesetting your reports. It is not very difficult to learn, and will help you to produce professional-looking reports, which is exactly what you should be aiming for at this point in your studies.

Please pay attention to the following details when writing and structuring your reports:

- General quality of writing. Minor errors in English language will not have a large effect on your mark, **as long as what you have written can be understood.** We can only mark what is on

the page - if we can't understand it, then we can't give full credit for it.

- General structure of report. Is it clear how one paragraph follows from another, and how one subsection or section follows from another? Is there a clear narrative to your report, which starts with a good introduction and description of methods, and ends with an interesting discussion which connects material and concepts introduced at the beginning to your results and analyses?
- Layout and style. A report which is laid out and styled well *and* consistently is much easier for a reader to follow than one which is not, so this is something you should pay attention to if you want to get your points across well.
- Figure and table labels and captions. All figures and tables should be numbered, and when they are referred to in the main text, they should be referred to by those numbers. Every figure and table should be described in its caption, and the caption should also make it clear what your reader should pay most attention to in the figure or the table.
- Equations should also be numbered, and referred to by number in the main text.
- Referencing. **All sources of information, code, quotes, figures, etc. should be clearly referenced.** A failure to clearly indicate and reference all sources could be interpreted as plagiarism, so this is very important.

Marking of code

The purpose of your code is to produce the results and analyses that your report will be built upon. The quality and quantity of the code you write for this assignment will normally only directly affect you mark under one of the following circumstances:

- You submit none. In this case, either your report will include no results, or it will include results which you cannot prove are real. A failing mark is very likely either way. If you think you will have no code to submit, you must discuss this with me as early before submission as you can - at that point, I may be able to help you in some way, but once you have submitted, I can do nothing but mark what is there.
- Your code is very bad, won't run, is completely undocumented, or is fundamentally unsound in some way, e.g. it includes a lot of code duplication or convoluted logic. In this case, your code will have a negative effect on your mark, as bad code means bad methods, and bad methods means results cannot be trusted.
- Your code is outstanding in some way. In this case, your code will have a small positive effect on your mark.

I will not judge your code at all on choices such as whether or not you use object-oriented style. I am also unconcerned by how efficient, or not, your code is, unless that somehow affects your results - reliability of code matters on this module; efficiency and "elegance" of code do not.