Take-home Essay i IT3708, 2018

March 15, 2018

1 Introduction

Science and engineering are related endeavours. They differ significantly in both their methodologies and particularly in their goals. Whereas science seeks to understand the workings of the natural world, engineering aims to produce useful techniques and technologies. In their own aims and procedures, many academic fields exhibit more science than engineering (or vice versa) while still drawing benefits from engineering (or science). Bio-inspired AI draws heavily from both paradigms and operates as both a scientific and an engineering enterprise. The scientific side of bio-inspired AI has a strong focus on unlocking the mysteries of natural intelligence with the help of computational models. Engineering bio-inspired AI, on the other hand, devotes considerable effort to designing artifacts that exhibit a high degree of intelligence in solving particular tasks, even if the underlying mechanisms have little grounding in biological or psychological principles. Biology plays a fundamental inspiration for bio-inspired AI. It is, further, the dominant influence of the newer school of AI that has names such as The New AI, Situated and Embodied AI, or simply Bio-Inspired AI.

In this essay, you will reflect upon the engineering and scientific aspects of EITHER **Evolvable Hardware** or **DNA Computing**. NB select ONLY ONE of these topics.

2 Guidelines

You may use the course literature as a source of information, together with references highlighted in the book and other material that we have supplied. However, further searching in the literature is expected and with a focus on a **structured literature search**.

It is your essay and your opinion that we are interested in. Even if an opinion you raise could be interpreted as wrong, as long as you can support it with suitable argumentation it is then a valid opinion. You are not expected to be an expert in either of these techniques/technologies in such a short time, but should be able to provide an opinion with argumentation based on the broader bio-inspired knowledge you have gained in the course.

The essay has two goals: The first, is for you to learn more about one of these techniques/technologies. You yourself can choose what you want to learn. Do you want a broader understanding of this sub-field then you should formulate a research question(s) to this effect. If you are interested in a particular aspect of the field then your research question(s) should address this aspect. The second, is to learn a systematic way to plan, search, read, evaluate and document your literature search and findings.

The essay should be **max 5 pages in length (single column, 12 point font)** plus a front page (name, essay title, course name, date) and a reference list page. The 5 main pages should include:

1. Literature Search Protocol (ca. 1 page)
2. Short introduction to your chosen technique/technology (Evolvable Hardware or DNA computing) and reflection of the Engineering and Scientific aspects (ca. 2.5 pages)
3. Existing or potential application areas and your reflection as to the realism of such application areas (ca. 1 page)
4. Conclusion (ca. 0.5 page)

NB that you may structure your essay as you wish after the first page with the Literature Search Protocol (review protocol). Also your reference list may use 10 point font.

The essay is worth 20% of your grade in the course. Your total effort should not exceed 20 hours where we suggest that ca. 6 hours are allocated to search (requiring an effective search methodology), ca. 10 hours allocated to reading and ca. 4 hours allocated to the writeup.

The deadline is **Thurs 19.4 kl 08:00**. No extensions will be given. Please submit through blackboard.

3 Structured Literature Search

There are three key aspects to finding good papers:

- Planning
- Conducting
- Reporting

3.1 Planning

- research questions
- search words, sources, search strings
- selection criteria
- inclusion criteria
- quality criteria

To create a good plan you need to start with identifying your **research question(s)**. What do you want to learn from your literature search? Once you have a research question(s), you are ready to create a **review protocol**, search strategy. DO NOT jump in and just search. Create the plan and then search!

In your protocol you will need to state which **search words** you are going to use, which **search engines** and possibly some **domain literature**, if relevant, relating to your question(particular journals addressing the topic etc).

Watch for potential search words that are similar and may be concatenated with an **or** rather than an **and** to make search strings for your search.

Some useful **search engines** include: ACM, IEEE explore, ISI web of knowldege, Science Direct, Citeseer, Springer-link, Google scholar...

Further you need to identify your **selection criteria**. This is a way to reduce the number of papers. You may wish to remove papers that are: on the same sub-topic or similar in another way; prior to a certain date; too general for your intended goal, too specific for your intended goal etc. That is your selection criteria throws papers out, not in.

Your **inclusion criteria** is what you want to keep. What is of particular interest to your essay? Some possible inclusion criteria include:

- IC1: The study's main concern is the problem being studied
- IC2: The study provides a unique angle to the study
- IC3: The study focuses on a relevant method/approach
- IC4: The study describes a relevant system

Your **quality criteria** may include criteria such as:

- QC1: There is a clear statement of the aim of the research
- QC2: The study is put into the context of other studies
- QC: There are no unsubstantiated claims in the paper

It is your choice to create the ICs and QCs of your choice to support your selection of strong relevant papers.

3.2 Conducting

Apply your review protocol active ie follow your plan, revise the plan if needed, based on an initial search.

To save time, it is important to read the title, abstract and conclusion of a paper so as to pick out potentially good articles (relevant for your essay) before reading such articles in detail.

When evaluating a paper, consider the problem/question the paper is addressing. What does the conclusion highlight? Is there evidence in the paper that supports the conclusion? How important do you deem this work?

You may wish to take some short notes on the papers that you have selected, providing you some reminder of why this paper is chosen and what the key contributions the paper will make to your report

3.3 Reporting

Plan your essay. Ensure that you create a good flow whilst presenting the knowledge you have acquired and the opinions that you want to make. Be concise with your arguments and make it clear whether you are stating your

opinion or the opinion of authors in the literature. Use your literature review to support the story you are telling by adding citations to relevant statements in your text. NB that it is only papers that are cited that should appear in your reference list.