
Coursework commentary

2018–2019

CO3310 Artificial intelligence

Coursework assignment 1

General remarks

- In what follows, 'AIMA' refers to *Artificial Intelligence: A Modern Approach*. (3rd edition, 2010) by Stuart Russell and Peter Norvig.
- Students were told that all references should be listed at the end of their work, and should be properly cited whenever referred to. Note that any answers that consisted entirely or mostly of quoted material were unlikely to gain high marks, even if properly referenced.
- Where students were asked to explain or justify an answer, unless otherwise stated, no more than one or two sentences were expected.

Students were reminded:

It is important that your submitted assignment is your own individual work and, for the most part, written in your own words. You must provide appropriate in-text citation for both paraphrase and quotation, with a detailed reference section at the end of your assignment (this should not be included in any word count). Copying, plagiarism and unaccredited and wholesale reproduction of material from books or from any online source is unacceptable, and will be penalised (see our guide on [how to avoid plagiarism](#) on the VLE).

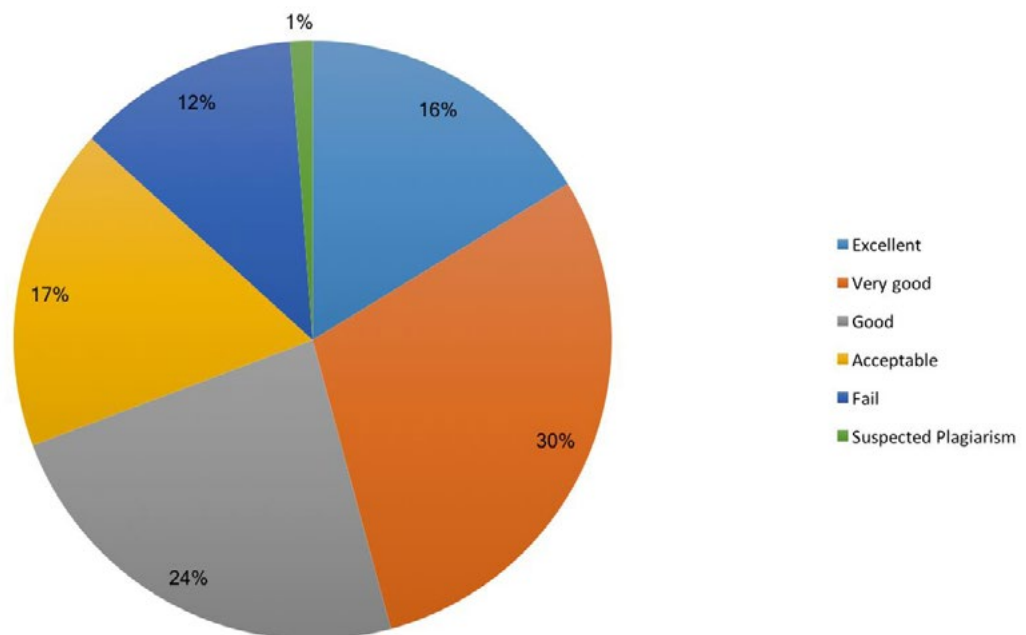
Preparatory reading

Before tackling the questions, students were advised to study the following resources:

1. "Will robots steal our jobs?" – chapter from PWC report, UK Economic Outlook, March 2017 <https://www.pwc.co.uk/economic-services/ukeo/pwcukeo-section-4-automation-march-2017-v2.pdf>
2. "Granny and the robots: ethical issues in robot care for the elderly", Sharkey, A. & Sharkey, N. *Ethics Inf Technol* (2012) 14: 27. doi: <https://doi.org/10.1007/s10676-010-9234-6>, PDF: <https://link.springer.com/content/pdf/10.1007%2Fs10676-010-9234-6.pdf>
3. Introduction to Logic, a series of tutorials from Oxford University's Philosophy Department <http://logic.philosophy.ox.ac.uk/>

See the 2018–2019 CW1 cohort mark distribution below:

CO3310 CW1 Cohort mark distribution 2018-19



Comments on specific questions

Question 1: Intelligent Agents, social and ethical Issues [50 marks]

This question considered speculations that robots, humanoid or otherwise, will be deployed to fulfil a growing need for elderly care. Students were referred to a list of typical tasks carried out by carers, available from the UK's National Career Service.

- a. Students were required to describe selected tasks in terms of the dimensions listed in the subject guide (p.7) and in Chapter 2 of AIMA, justifying their answers. It is important to keep in mind that the question says 'describe' not 'list'. Answers lacking adequate explanation or justification were marked down. The tasks are rather vaguely specified: excellent answers might discuss how more precise requirement specifications could help classify the tasks with more confidence, and would give details of their assumptions about sensors, actuators and what actions are available to the agent. Some answers showed imperfect understanding of the task definitions: it's not enough to answer with something like *'Agent knows what is going to happen next in the environment'*, or with apparently circular statements such as *'It is deterministic because the next state of the environment can be determined'*. Many students displayed worryingly stereotypical ideas in this and the following sub-questions about the lifestyles and capabilities of older people, or 'elderlies' as some of them charmingly put it. Most answers were marked as good, very good or excellent.
- b. Students were required to describe actually implemented or proposed systems which carry out the three tasks selected for part (a). Good answers would include an element of evaluation, and focus on systems specifically designed for care-giving rather than, for example, fast-food outlets. Too many answers appeared to be simply reproducing marketing claims such as *'Through AI, it is able to learn user's likes and needs which in turn provides the user with suggestions on what to do'* or *'able to learn to complete task which is integral in providing individual care'*. The submissions that gained the highest marks were those that gave clear and accurate descriptions

of relevant systems, and showed good scholarly practice as well as critical appraisal evidence of appropriate self-directed reading. Around half the submitted answers were assessed as good, very good or excellent.

- c. Marks for this essay question were awarded for showing appropriate and relevant technical knowledge, for quality of argumentation and critical thought, and for good scholarly practice. There were many thoughtful and well-researched answers, but not all of them directly addressed the actual question. Some raised important issues of elder abuse, others argued that robots would be more rational than human carers and as a consequence, would not act out of pity for their clients or give into their requests for alcohol, etc. It is questionable whether this would be a desirable characteristic, and any students pursuing this line of argument would need to give a convincing justification. More than half of the answers were assessed as very good or excellent.

Question 2: Logic and reasoning [50 marks]

- a. This sub-question was essentially bookwork, which students should have been able to answer through diligent reading of the subject guide and other recommended sources. However, many answers were unsatisfactory for various reasons. The question says '*in your own words*', so answers taken verbatim from other sources were marked down. 'Explain' means more than just giving a formula, and it is not enough to explain technical terms using other technical terms such as inference, validity, models, or logical consequence – it is important for students to show that they actually understand the terminology. Judicious use of examples was needed for full marks, but many students gave no examples suggesting that they may not have understood their own definitions. Worryingly, some students could not even explain terms which are defined in the subject guide. No credit was given for circular answers such as '*Entailment is the idea that a conclusion is logically entailed from a set of premises if that premise always entails the conclusion*' or '*Knowledge base is the central based component of a knowledge-based agent*'. The majority of answers were assessed as good, very good or excellent.
- b. This question required students to demonstrate their understanding of Predicate Calculus. Most students showed a basic grasp, but struggled with the more challenging examples. For instance, $\exists x(\text{Cucumber}(x) \rightarrow \text{Yellow}(x))$ means '*Something exists such that, if it is a cucumber it is yellow*' – this is trivially verified by the existence of anything which is not a cucumber. Very few got this, most reading it as '*all/some cucumbers are yellow*'. Most answers were marked as good, very good or excellent, with some gaining full marks, but a number of students evidently found this topic confusing and it calls for careful revision when it comes to the examination.
- c. This sub-question involved the application of Bayes' Rule, something that regularly comes up in examinations. Students generally showed reasonable understanding, though some went wrong by misreading the question. Some read '*the percentage of apples that are green*' as '*the percentage of items which are green apples*', which is not the same thing. Students were instructed to give their answers and interim calculations to two significant figures. Some either ignored this or did not know what it meant, e.g. giving answers to two decimal places. Some answers were marked down for not explaining the calculations as required. However, most answers were marked as very good or excellent.
- d. For this question, students were required to show which literals can be inferred from given knowledge bases, using both reasoning patterns and truth tables, while showing all steps in their reasoning and explaining the answers. Many students only used one technique, either reasoning patterns or truth tables, and lost marks thereby. It was not enough to simply present a truth table: answers should explain what can be concluded from the values. The intention was for students to apply

reasoning patterns and truth tables independently to show that both supported the same conclusions; however, some students interleaved them within a single solution and lost marks thereby. More than half the answers were marked as good, very good or excellent, but a sizeable minority got very low marks or did not even attempt the question.