AI Large Practical: Assignment 3

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The third assignment (Assignment 3) involves extending the system you developed in assignment 2 to allow for a computational version of so-called "critical questions" which occur in the middle of a legal debate. This is a method to invoke the notion of *burden of proof*.

The main credit will go to a report you are asked to write on the work you have done in both assignments, placed in context.

▸ look at some presentations of the use of critical questions in dialogue, and in particular the burden of proof; a starting point is in a paper mentioned below.

▸ extend your system to support schematic statements (statements allowing variables as well as constants) and design a mechanism to invoke such a critical question under appropriate conditions.

▸ write a report on the work done, placed in context.

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You should write your own code and report. You are not permitted to

▶ copy programs which someone else wrote.

▶ show your own programs or report to other students.

but you are encouraged to have discussions with your colleagues.

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Your are required to submit

- ▶ program source code, ensuring
    - ▶ that the comments allow a reader to understand the intention behind the code, together with
    - ▶ some example scenarios treated by your program.
- ▶ Your report.

Put all these in a single directory, and submit using the command in DICE:

```
submit ailp cw3 <your-directory>
```

The deadline for Assignment 3 submission is

16:00 on Wed 20th December 2017

The first goal is to extend the system to allow propositions to allow variables to appear in those places where constants (names) currently appear. This will require that you have some way of distinguishing between constants and variables.

The syntax of input files can also be extended to allow declaration of critical questions. (This is not absolutely required, but is likely to be helpful for you.)
Look at examples of critical questions in "The Carneades model of argument and burden of proof" by Gordon, T. F., Prakken, H. & Walton, Artificial Intelligence, vol 171.[1] It describes informally how this can be represented in the Carneades framework.

The critical question patterns are not to appear themselves in a CAES agrument graph; but you will need to have them available somehow in your imeplementation.

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[1] http://www.sciencedirect.com/science/article/pii/S0004370207000677

From the paper above:

> *Major Premise. Source E is an expert in the subject domain S containing proposition A.*
> *Minor Premise. E asserts that proposition A in domain S is true.*
> *Conclusion. A may plausibly be taken as true.*
> *The six basic critical questions matching the appeal to expert opinion [49, p. 223] are the following.*
>
> 1. *How credible is E as an expert source?*
> 2. *Is E an expert in the field that A is in?*
> 3. *Does Es testimony imply A?*
> 4. *Is E reliable?*
> 5. *Is A consistent with the testimony of other experts?*
> 6. *Is A supported by evidence?*

Some aspects are already implicit in Carneades; the task here is to make this reasoning explicit.

> *Besides being defeasible, argumentation schemes have a dialogical aspect in that they come with a set of critical questions [20], which enumerate ways of challenging arguments created using the scheme. Critical questions differ with regard to their impact on the burden of proof [3,43]. For some critical questions, merely asking the question is enough to shift the burden of proof back to the party who put forward the argument to answer the question. For other critical questions, the party who raised the question also has the burden of answering it. Carneades models critical questions as additional premises of an argument, with a different type of premise, called assumptions and exceptions, for each kind of question.*

▸ The "variables" E, S, A in the example earlier are used to allow that the questions can be asked whenever we have matching instances present among the CAES propositions.

▸ The point of asking these questions is that it places a *burden of proof* on the other side, who can either:

  ▸ already have enough evidence do answer the question positively;
  ▸ come up with evidence not yet available to answer the question positively;
  ▸ or admit that there is no good answer.

In the first case, it would be a **bad** use of the critical question!

▶ Allow explicit critical questions to be represented, and matched against some statements entered in CAES.

▶ Choose an applicable critical question.

▶ For a good submission, you should implement a **selection criterion** that chooses among the possible critical questions, one that is likely to help the side that asks the question. This should be based on the current state of the argumentation graph, as well as the critical questions available.

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Your report should be not longer than 8 pages;
there is a template for writing the report on the course web page.
You do not have to use any particular word processing system, but
an outline document will be provided in LaTeX.

Your report should be similar to some of the papers you have seen.
For example, it should contain proper **references** to papers
consulted, and sources of ideas. Don't forget to make clear any
ideas that you yourself have introduced.

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Your report should

- explain the background to argumentation systems in general, and Carneades in particular —
  what are they for?
- Describe the functionality you have added to the system, and how you did this.
- Present test cases, explaining why you chose these particular test cases.
- Evaluate your final system as a tool — what are the strengths and weaknesses, how could it be improved.
- Say something about the potential role of systems like this in the longer term.

Those reports that just describe what you did and what you got will not get good marks.
Some thought is required in how best to present the test cases you will have run.

The second assignment is worth 50% of the course mark.
Remember, there is no exam.
The marks are distributed as follows.

▸ **Programming** (10 marks)
Will the program run by invoking runCaes <filename> ?

a sanity check that the code does what is claimed

▶ **Short report** (40 marks)
This should be not longer than 8 pages, and should cover:

   ▶ Quick review of argumentation systems, what they are for etc.
   ▶ Description of Carneades in abstract, and initial implementation
   ▶ Description of enhanced system, what additional functionality is intended and how achieved
   ▶ Choice of experiments (experimental methodology)
   ▶ Presentation of results, analysis and conclusion

to pass, a presentation that sets the scene correctly, describes work done and gives some results

for A grade, a clear presentation that makes explicit the links between the intended functionality, the choice of experiments and justifies the results.

Do aim to fit within the given space —
this is not an exercise in formatting, so slightly longer is OK.

It is easy to fill up the space —
think hard about how to structure this report.
There are different ways to structure the report; a couple of
examples follow.

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1. Introduction, the goal of the exercise.
2. The chosen methods were A, B, briefly explained.
3. The experiments used data sets X,Y,Z; they used the implemented methods as as follows.
    3.1 Results for A,
    3.2 Results for B,
4. The results show that method B gives best results, followed by A.

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1. Introduction: The goal.
   Method A was chosen because . . .
   It is expected that method A will give the following benefits,
   across all data sets. (hypothesis)

2. Outline of method algorithms.

3. Experiments: data sets, results summarised.

4. Conclusions: the hypothesis was right, in that A usually gave
   the expected benefits;
   it did not work so well on experiment 4;
   this may be because the arguments in that experiment had
   the following property . . .

▸ You are expected to provide references in your report, to relevant articles and other publications.

▸ The template gives examples of how to do this directly.

▸ There is a separate `bibtex` system that can help with this, integrated with LATEX; it may be easier for just a small number of references to do this as in the template, however.

There will be a session on the second part of the assignment in the lecture slot next week:

9:00, Wednesday 16th November

This will cover more on report writing, and some ideas of scenarios that you could think of modelling in this way. Remember, most of the credit will be assigned based on the report.
The drop-in sessions continue as before.