CS 7637/4635 KBAI
Ashok Goel
Fall 2015

Final Examination
Assigned Monday, November 23, 2015
Due midnight Tuesday, December 1 anywhere on earth
Submission via T square

This is a take-home examination. You may consult any book, video, website, etc. However, your answers must be your own work: you may not consult any person.

Please answer all questions. We expect answers at about the same level of detail as the exemplary assignments in the class. A good heuristic for these open-ended questions is about 1500 words each. This is neither a minimum requirement nor a maximum constraint. We are more interested in the quality of answers rather than in length.

Please be specific and precise. Show architectures and processes when appropriate. Show the data structures for the knowledge representations and the pseudo algorithms for the reasoning methods.

Make sure that you use the concepts and methods you have learned in the class: please highlight such concepts and methods in your answers.

A challenging but fun aspect of designing (and redesigning) this KBAI course has been using AI to teach AI. For example, when we initially designed this course in 2014, we built about 150 microexercises and 100 nanotutors that are embedded in the video lessons; each nanotutor is really an AI agent. Later, when we came to recognize the challenge of grading a few hundred programming projects, we developed an autograder that does most of the grading automatically: for the most part, human intervention is needed only when a program does not work properly.

It is easy to imagine additional opportunities to use AI to help teach this AI course. Here are two. Your task in this final examination is to design AI agents that can exploit these two opportunities (both of which can lead to startups).

Q1. As you know the Piazza forum for this class is fairly busy. (As of now, the residential section with less than 100 students has more than 900 postings; the online section with less than 190 students has more than 6000 postings). Many of the postings are open-ended, novel and creative, but many fall under the category of "frequently asked questions": routine questions that, perhaps with small variations, are repeated semester after semester.

Design an AI agent that can automatically answer routine, repetitive, frequently asked questions on the Piazza forum of the KBAI class. Assume that the AI agent has access to all postings on the Piazza forums for previous sections of this class - some 40,000 in all. You may want to visit the Piazza forum to remind yourself of some of the routine questions and the answers to them. If such an AI agent was available for future sections of the class, it would be able to promptly answer many of the FAQ on Piazza.

Q2. Again as you know, each term the students in the KBAI class produce a few hundred AI agents for addressing problems similar to those on the Raven's test of intelligence. Let us call them Student-Agents. By now we have several hundred Student-Agents. Some of these agents are quite good: they likely would give fairly decent performance on the Raven's test. However, none of the Student-Agents is perfect.

Further, just like we can think of different kinds of problems on the Raven's test, we can think of different types of Student-Agents: some types of Student-Agents may be better suited to some kinds of problems, but not necessarily others. You may want to look at your own agents, the agents you have reviewed, as well as the exemplary agents in this class to remind yourself of some of the different kinds of Student-Agents.

Design a meta-AI agent that can combine the capabilities of the hundreds of different types of Student-Agents such that the performance of the meta-AI agent on the Raven's test is superior to that of any of the individual Student-Agents. This meta-agent may invoke the right Student-Agent (or Student-Agents) for each different kind of problem. If such a meta-AI agent was available, students in future sections of the class will be able to observe its decisions and behaviors, and learn from it.