OMSCS 7637/ CS 7637/ CS 4635
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Fall 2016

Mid-Term Examination
Assigned Monday, October 3, 2016
Due Sunday October 9, 2016

Instructions

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

A good length for an answer is about 2000 words. However, this is neither a minimum requirement nor an upper limit. We are more interested in the quality of the answer than in its length.

The Alexa Prize

This take-home examination is based on Amazon's recently announced Alexa Prize: https://developer.amazon.com/alexaprize. Here is a brief description from Amazon's public announcement:

Artificial intelligence (AI) is becoming ubiquitous. With advances in technology, algorithms, and sheer compute power, it is now becoming practical to utilize AI techniques in many everyday applications including transportation, healthcare, gaming, productivity, and media. Yet one seemingly intuitive task for humans still eludes computers: natural conversation. Simple and natural for humans, voice communication in everyday language continues to be one of the ultimate challenges for AI. Human conversation requires the ability to understand the meaning of spoken language, relate that meaning to the context of the conversation, create a shared understanding and world view between the parties, model discourse and plan conversational moves, maintain semantic and logical coherence across turns, and to generate natural speech.

Today, we are pleased to announce the Alexa Prize, a $2.5 million university competition to advance conversational AI through voice. Teams of university students around the world are invited to participate in the Alexa Prize (see contest rules for details). The challenge is to create a socialbot, an Alexa skill that converses coherently and engagingly with humans on popular topics for 20 minutes. We challenge teams to invent an Alexa socialbot smart enough to engage in a fun, high quality conversation on popular topics for 20 minutes.

Participating teams will advance several areas of conversational AI including knowledge acquisition, natural language understanding, natural language generation, context modeling, commonsense reasoning and dialog planning. Alexa users will experience truly novel, engaging conversational interactions.

Up to ten teams of students will be selected to receive a $100,000 research grant as a stipend, Alexa-enabled devices, free AWS services to support their development efforts, and support from the Alexa Skills Kit (ASK) team. Additional teams not eligible for funding may be invited to participate. University teams can submit their applications between September 29 and October 28, 2016. The competition will officially start on November 14, 2016 and run until November 2017, concluding with an award ceremony to be held at AWS re: Invent in Las Vegas, NV.

Incidentally, Dr. Ashwin Ram, the Head of AI at Amazon was a Georgia Tech faculty member from 1989-2012; indeed, he still is an adjunct faculty member in the School of Interactive Computing.

Relationship to KBAI

We have deliberately used the Alexa Prize to make this mid-term examination because this may encourage you to participate in it. It would be good to have a few Georgia Tech teams competing in it.

However, this is also a KBAI examination. Therefore, it is critical that your answer be based on concepts and methods you have learned in the KBAI class. If needed, you may also use concepts and methods from outside the KBAI class. However, the KBAI concepts and methods must be central to your answer, and your answer must focus on explaining them.

It is also important that your answer be specific and precise. General and vague essays in English are unlikely to earn high points. Specific and precise answers that show computational processes, knowledge representation, pseudo algorithms, and illustrate them with examples, are more likely to score highly.

For the purpose of this examination, let us avoid the issue of voice. There are plenty of voice-to-text and text-to-voice systems now available. Instead, assume that your agent will converse via email or posts on a discussion forum.

Your Task

Design an AI agent that can converse about the topic you selected above with a human. Here are some questions you may want to think about. This list is illustrative, not exhaustive:

1. What types of knowledge will your agent contain?
2. How will it represent all this knowledge?
3. How will it organize this knowledge in memory?
4. How will it acquire this knowledge?
5. How will it access this knowledge when needed?

6. How will your agent understand the human's posts in English?
7. How will it extract a topic or theme or question or issue to answer?
8. How will take into account the context of the conversation in accomplishing 7?
9. How will it plan an answer in its mind?
10. How will it generate an answer in English?

Yes, we know this is not an easy examination. To simplify a little, for the purpose of this examination, let us assume that the topic of conversation is Georgia Tech, or the Georgia Tech College of Computing, or the Georgia Tech OMSCS program, or the Georgia Tech residential MS in CS program, or the Georgia Tech BS in CS program. Pick any one topic you prefer, only one topic; make sure you specify the topic in your answer.

To simplify a little more, in this mid-term examination you want to answer the following five questions. Once again, please think of all ten questions above, and then answer only the following five. We will grade your answer on these five questions:

1. What types of knowledge will your agent contain?
2. How will it represent all this knowledge?
5. How will it access this knowledge when needed?
6. How will your agent understand the human's posts in English?
9. How will it produce an answer in its mind?

One way to answer these questions is to consider an example. Consider the following snippet:

Human: *I am thinking of graduate school.*
Your agent: *Georgia Tech is highly ranked.*
Human: *I wonder if Georgia Tech is the right school for me.*
Your agent: *Most Georgia Tech alumni are satisfied with their experience.*

Now you can use the above running example through the answer, illustrating each step in the processing until the output is produced. Obviously you can select a different topic, and a different input and output examples.

In the spirit of the Amazon competition, we are not looking for any answers that rely on "tricking" the users, that make them feel duped afterwards, for example making them think they are talking to a famous movie star or with a child. We want your agent to be "authentic".

You may display your ingenuity by finding creative ways to enhance the entertainment value of the system, but the soundness of the system itself and its connection to KBAI concepts and methods are the primary components of the grade.

May the Force be with you!