

Washington State University
School of Electrical Engineering and Computer Science
Fall 2021

CptS 440/540 Artificial Intelligence

Homework 1 - Solution

Due: September 2, 2021 (11:59pm pacific time)

General Instructions: Put your answers to the following problems into a PDF document and upload the document as your submission for Homework 1 for the course CptS 440 Pullman (all sections of CptS 440 and 540 are merged under the CptS 440 Pullman section) on the Canvas system by the above deadline. Note that you may submit multiple times, but we will only grade the most recent entry submitted before the deadline.

1. Go <https://www.cleverbot.com> and engage the chatbot in a conversation. Enter at least 10 comments/questions and copy the entire conversation into your homework. Based on this conversation explain why you think CleverBot does or does not pass the Turing Test.

Solution: Below is a transcript of my session with Cleverbot. Obviously, yours will vary. To evaluate if Cleverbot passes the Turing test, we need to assess whether Cleverbot's answers are typical for a human. While Cleverbot's answers are mostly relevant, they are clearly not typical, e.g., jumping from introductions to "He let him drown." And the responses about brothers and sisters were clearly inconsistent. So, unless Cleverbot is a human with severe mental problems, the bot is clearly not a human, and therefore, does not pass the Turing test.

User: Hello.

Cleverbot: Who are you?

User: Larry.

Cleverbot: He let him drown.

User: Who let who drown?

Cleverbot: Ben.

User: Who's Ben?

Cleverbot: A dead boy.

User: Rather morbid, don't you think?

Cleverbot: Can you explain why it's morbid?

User: Because he's dead.

Cleverbot: No, because he didn't have the guts!

User: Let's talk about your mother.

Cleverbot: What do you want to know about me?

User: Are you an only child?

Cleverbot: No.

User: Do you have brothers or sisters?

Cleverbot: Brothers.

User: Is Ben your brother?

Cleverbot: How do want me to answer that?

User: Yes or no.

Cleverbot: What exists.

User: How many brothers do you have?

Cleverbot: None I have 3 sisters.

User: How many sisters do you have?

Cleverbot: Two.

User: What is $1 + 2$?

Cleverbot: 1 2 is a number.

User: What is my name?

Cleverbot: I don't know, I no have idea.

User: Goodbye.

Cleverbot: Yes.

User: Bye.

2. Suppose you want to design an intelligent pizza-delivery robot, similar to Domino's (<https://media.dominos.com/stories/nuro-story>).
 - a. Describe two different sensors, two different actuators, and two different performance measures relevant to this task?
 - b. For each of the following task environment properties, choose which option is most appropriate for this task. Include a brief explanation for each.
 - i. Fully observable or partially observable?
 - ii. Single agent or multi-agent?
 - iii. Deterministic or stochastic?
 - iv. Episodic or sequential?
 - v. Static or dynamic?
 - vi. Discrete or continuous?
 - c. Of these four agent types (simple reflex, model-based reflex, goal-based, utility-based), which is most appropriate for this task? Include a brief justification for your choice.

Solution:

- a. Sensors: Cameras, radar, LADAR, sonar, speed, battery level. Actuators: Motors for movement, steering, open/close doors, tire pressure. Performance measures: delivery time, accuracy, profit, safety, maintain non-zero battery level.

- b. Properties:
- i. Partially observable. Much of the environment is available to the agent, but there are still some aspects that are not observable, but would improve performance if they were, e.g., traffic and pedestrians coming from around the corner.
 - ii. Multi agent. There will be other agents vying for the same resources need by this agent, e.g., other vehicles on the road.
 - iii. Stochastic. The outcome of some actions is uncertain. E.g., given uncertainty in road conditions, a movement action may not have the expected outcome.
 - iv. Sequential. Current action choice depends on previous actions. E.g., a decision to take a different route to a destination, say due to an accident, causes the agent to speed up, turn on a warmer to keep pizzas hot, or call the customer to report a delay.
 - v. Dynamic. Roadways are highly dynamic; other vehicles (or people, or pets) do not stop while the agent is thinking.
 - vi. Continuous. Multiple features of the environment are described using real-valued features, and therefore the state space is infinite.
- c. Goal-based. The objectives of the pizza-delivery agent are very specific: We can give deliver pizzas to specific locations and return home. A simple reflex agent is insufficient to handle all the nuances of pizza delivery. A model-based agent would be infeasible due to the unpredictability of the environment. A utility-based agent would be impractical due to the need to determine the utility function over an infinite number of states; and almost delivering a pizza is much worse than a successful delivery.

3. *CPTS 540 Students Only*: List the complete citation for two different research papers about chatbots (conference or journal) published after 2010. Be sure to include a URL to the paper. Note: arXiv papers are not “published” papers.

Solution: Here are a few I found searching for “chatbot” on Google Scholar.

- a. Zhou, L., Gao, J., Li, D., & Shum, H. Y. (2020). The design and implementation of xiaoice, an empathetic social chatbot. *Computational Linguistics*, 46(1), 53-93. https://doi.org/10.1162/coli_a_00368
- b. B. R. Ranoliya, N. Raghuwanshi and S. Singh, "Chatbot for university related FAQs," *2017 International Conference on Advances in Computing, Communications and Informatics (ICACCI)*, 2017, pp. 1525-1530, <https://doi.org/10.1109/ICACCI.2017.8126057>.
- c. Minjee Chung, Eunju Ko, Heerim Joung, Sang Jin Kim. Chatbot e-service and customer satisfaction regarding luxury brands. *Journal of Business Research*, Volume 117, 2020, pages 587-595, ISSN 0148-2963, <https://doi.org/10.1016/j.jbusres.2018.10.004>.
- d. Adamopoulou E., Moussiades L. (2020) An Overview of Chatbot Technology. In: Maglogiannis I., Iliadis L., Pimenidis E. (eds) *Artificial Intelligence Applications and*

- Innovations. AIAI 2020. IFIP Advances in Information and Communication Technology, vol 584. Springer, Cham. https://doi.org/10.1007/978-3-030-49186-4_31.
- e. G. Daniel, J. Cabot, L. Deruelle and M. Derras, "Xatkit: A Multimodal Low-Code Chatbot Development Framework," in *IEEE Access*, vol. 8, pp. 15332-15346, 2020, <https://doi.org/10.1109/ACCESS.2020.2966919>.