

Part 1

(20 points) Consider the following potential AI problems. For each of them, describe whether the environment is: a) static or dynamic b) fully or partially observable c) episodic or sequential d) deterministic or stochastic. Please explain your reasoning.

A robotic medical assistant that can assist a doctor or nurse. It communicates with patients, administers bloodwork, and takes vitals.

- a) Static. Unless this AI is taking sample from patient in real-time basis, the environment it works on (including communication history, bloodwork result, vitals data, etc.) does not change when it makes decision.
- b) Partially observable. Illness is complicated. This AI must make decision without knowing the actual illness and/or patient background.
- c) Sequential. The communication requires analysis of communication history, which requires memorizing historical environment and choice.
- d) Stochastic. What patient behave can change in many ways depending on what they are thinking and condition of their body. Same advice might not work on two people with same vitals.

An agent that plays poker against a human player. Assume that the cards are digital, and that the player interacts with the agent via a touchscreen.

- a) Static. Poker is a turn-based game. Environment doesn't change before agent decides what to do next.
- b) Problem is vague about partially or fully observable. If this agent is designed to play against human without knowing their hand, then it is partially observable. However, if this agent is deigned to cheat poker game (which can be quite possible since many illegal gambling websites do this) and play against human knowing all the card on the table, this environment becomes fully observable.
- c) Sequential. Each decision can change how the game becomes next.
- d) Deterministic. The rule of poker game is fixed. With the same hand and making the same decision, the result would be the same.

An agent that can select TV shows and movies for a user. It watches the user's choices, asks the user to rate shows, and gives new shows the user is predicted to like.

- a) Static. This is a communication problem and when human waits response the environment won't change.
- b) Partially observable. Idea of "good movie/show" is vague and even human sometimes don't have a clearly understanding of what they want/like to view when we open the TV. Therefore, agent doesn't know what user actually likes. It also won't (in most of times) get a full list of all shows/movies a user watched.
- c) Sequential. The recommending requires analysis of viewing history, which requires memorizing historical environment and choice.
- d) Stochastic. Again, idea of "good movie/show" is vague. Two people with same viewing history might have different reason of why they viewed those shows and same recommendation might not work on both of them.

A digital chatbot for diagnosing mental health issues. It interacts with the user via SMS and makes a prediction about their mental health based on responses.

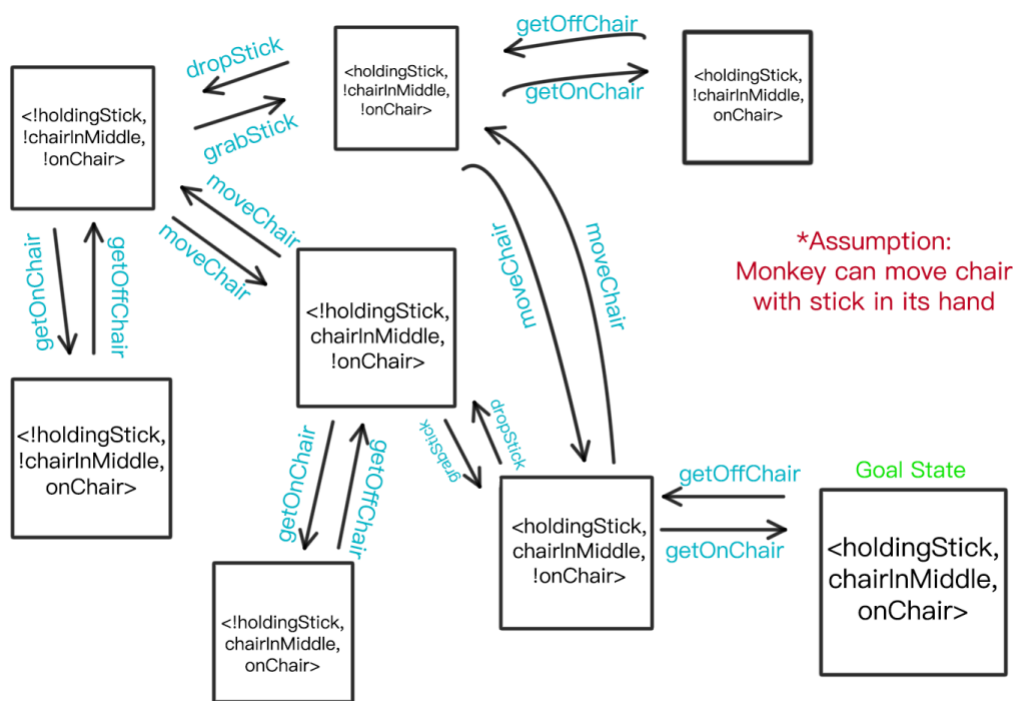
- a) Static. This is a communication problem and when human waits response the environment won't change.
- b) Partially observable. Mental is complicated. This AI must make decision without knowing the actual mental health condition and/or patient background.
- c) Sequential. The communication requires analysis of communication history, which requires memorizing historical environment and choice.
- d) Stochastic. A person's mental condition can change in many ways depending on what they are thinking and their experience.

A robotic submarine for scientific exploration. It's able to autonomously travel to the ocean floor and collect samples.

- Dynamic. Environment around the robot always changes in real time.
- Partially observable. Environment under sea is complicated and agent have no way to understand all the details around it.
- Sequential. Each decision the agent makes would affect environment around it and how it should behave next.
- Stochastic. There are so many things happens at ocean floor and everything is not predictable.

Part 2

- <holdingStick, chairInMiddle, onChair>
- (Original image included in repositories called **MonkeyProblem.png**)



Part 3

(20 points) Turing Test. Kuki is a chatbot developed using Pandorabots chatbot technology. Kuki has won the Loebner Prize for the last five years. You can interface with Kuki in quite a few ways here.

If you talk with Kuki, you'll see the limits of her responses pretty quickly. Try talking with her about different subjects - movies, music, games, life. What are places where Kuki's responses seem artificial? What sorts of responses or conversations does she have problems with?

Here are a few topics where her responses become artificial or reaches the limit.

- Topics that clearly not known by many people. I tried to discuss about my favorite anime character. Her response is amazingly relevant but doesn't answer my question at all. It seems more like a copy-paste from Wikipedia or relevant website. This was completely caused by training material. I've seen some Japanese chatbot who does very well on Anime culture related conversation but poorly on many things else.
- Topics that are related to the previously discussed things (Sequential AI problem mentioned in part 1). For example, we discussed about this AI homework. She asked me how many hours I have been worked on it and I said around 12 hours. But she then claimed that we have been talked for 12 hours which is really confusing.

Now try to have a conversation that generates responses that seem as human as possible. What sorts of phrases and discussions does Kuki do well with?

Here are some topics that she did quite good on.

- Topics that are very famous. Clearly, she was trained for topics that most people know. She included a picture when I asked her if she knows Super Mario and she commented movie Tenet as "quite confusing" .
- Respond to short daily conversation. Like responding "good evening" , "awesome" , and "sorry" .
- Self-identification. It is really an old- fashioned thing for chatbot to act like 100% real human. AI nowadays tend to develop their own identity and don't hesitate to show people about this. Kuki handled topics about AI in very interesting way. When

discussed about Apple company she said she likes Siri and asked me whether I would include her when I said I' m working on a paper about AI.

Part 4 & 5 & 6

See graph.py and pandasExercise.py

Part 5 (essay) - 686 students only

(10 points - 686 students only): A classic thought experiment in response to the Turing Test is the Chinese Room, proposed by John Searle. To begin, please read [this webpage \(Links to an external site.\)](#), which presents the Chinese Room thought experiment, intended to show that a computer can manipulate symbols to produce replies without understanding what they mean.

Then, read section 2 (Replies and Rejoinders) of [this page \(Links to an external site.\)](#), which summarizes many of the responses to the Chinese Room argument.

a) Summarize the Chinese Room argument. What does this have to do with computers? Why does Searle believe that it shows that a computer can pass the Turing test without understanding?

Chinese room argument is an imaginal circumstance where a man who doesn' t know Chinese but has a huge number of detailed scripts about how to communicate with Chinese speaker hides himself in a room. He himself doesn' t know Chinese, but if the scripts are large enough and in detailed enough, people who speaks with this person who doesn' t know what is inside would definitely identify the person inside the room as Chinese speaker.

This argument has close relationship because those "huge number of detailed scripts" is an image of what AI have when they deal with the input they received. Searle claimed that since AI works just like the person who follows the script without knowing anything about what he is doing, AI *"doesn' t really have intentional (that is, meaningful) mental states"* [1].

b) Do you find Searle's argument convincing? Or do you find one of the responses more appealing? Explain your position.

Although written in 1980s, some of Searle' s argument is still very convincing today, at least in my opinion. In Searle' s argument regarding to Robot Reply, robots are not able to create and "think" about sensory-motoric connection. Replies from AI nowadays are still limited by the environment and historical detail AI acquires. As I mentioned earlier, chatbot would fail on many sequential problems which requires robot to create connection between key details hide in the previous sentences.

However, we have to admit that AI is becoming surprisingly closer to the image of actual mind. With the increasing power of calculation, the complexity of problem an AI can handle is increasing quickly in each year, and the logic behind their learning are also becoming vaguer each time. At the same time, medical professional and researcher are keep researching on how our mind work. The distance between two are getting closer. This would make Searle' s argument on Brain Simulator less convincing. When watching the calculation power of today' s AI, it would be very hard to compare it with that set of water pipes and valves. It is becoming something beyond that.

Of course, this whole discussion about definition of AI is more a philosophical question than a technical question. It greatly depends on our philosophical definition on what mind is. However, by studying why people think AI doesn' t behave like real human, we can manually make our AI more convincing. As article stated, *"other means besides programming might be devised such that computers may be imbued with whatever does suffice for intentionality by these other means"* ^[1]. By adding specific instruction to act on certain problems, we can easily make AI more "emotional" , just like Kuki who stating she likes Siri. Afterall, AI is a tool we create to help ourselves, and as a product, people who uses AI often cares more about what they get than how it really works.

[1] Internet encyclopedia of philosophy. (n.d.). Retrieved February 16, 2021, from <https://iep.utm.edu/chineser/>