

# Assignment 1

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## Question 1

Please explain the difference in examples in detail instead of explaining the concept

▼ What does it mean for an environment to be stochastic?

1. In stochastic environment if any move is made it may or may not result in only one result. It can have other result which might not have been predicted. For example Mars rover, Chandrayan
2. A Deterministic environment can be a chess game, a sudoku game
3. If we take the above sudoku game, the individual players determine the outcome of the game.
4. But for example in Mars rover there are several external factors which can come into picture like before landing is the environment feasible to land. If the rover has the laser, will the laser work in the environment where it is situated. If we take the example of Waymo., self driving taxi external environment plays a crucial role as if the environment is foggy, the sensors are not able to work as expected. But in case of chess game, players the outcome of the game is entirely based on players and not the environment

▼ What does it mean for an environment to be partially observable? Please give an example of an environment that is fully observable, an environment that is partially observable, and explain the difference.

1. Partially observable is the situation where everything in the environment is not clear for the agent. Some things it might need to guess. Examples - autonomous driving vehicles, mars rover
2. Fully Observable is situation where the agent has all the necessary information to make a decision. It would not be required to make any guesses. For example chess, sudoku game

3. For partially observable all the aspects in the environment are not clear whereas in fully observable it is clear. Partially observable might need to make guess as all the things are not clear. Whereas in fully observable no guessing is required. In Case of Mars rover for example it might need to make a decision on how to land even if the visibility is less for the rover to land

▼ What does it mean for an environment to be sequential? Please give an example of an environment that is episodic and an environment that is sequential, and explain the difference.

1. Series of actions must be taken to complete a task
2. If a task needs to be completed, all the subset of tasks must get completed
3. Example of episodic is thermostat
4. Example of sequential can be something like google assistant, alexa, autonomous vehicles
5. In episodic there are no sequence of steps, all the tasks are independent no past information is required to complete another task whereas in sequential, there are sequence of steps, tasks are dependent and past information might be useful to complete a future task. For example alexa, If we tell alexa to set an alarm and it has to remember the task before it triggers at a particular time, so there are set of tasks involved. But in case of Thermostat, it only needs to check the current temperature, it does not need to remember what the past temperatures were.

▼ What does it mean for an environment to be dynamic? Please give an example of an environment that is static, an environment that is dynamic, and explain the difference

1. In Dynamic environment, the environment changes while agent is deciding the action
2. Example of static environment, is chess game. No external environment forces the agent to change their move.
3. Example of Dynamic environment, Mars rovers. They have to act according to the environment they are in.

4. Static environment remain same there is no change in the environment when the agent is making decision whereas in dynamic environment the environment changes so while agent is making a decision, the environment might be changing at that time

▼ What does it mean for an environment to be online? Please give an example of environment that is offline, an environment that is online, and explain the difference.

1. If the labeled details, labeled data upfront then it is called an offline.
2. In an online environment the data arrives continuously so there must be interleave learning which take place
3. Example of offline environment is chatgpt, decision tree algorithm
4. Example of online environment is Traffic Control
5. In case of chat gpt for example the data is taken upfront and the model is trained while in case of Traffic control, the data is arriving continuously and real time decision making is required

## Question 4

1. Code can be ran as below

```
python3 wc.py Test --strip --convert --load=freq_dist --save=freq_dist -s
```

2. If file is not present, then

```
python3 wc.py Test --strip --convert --save=freq_dist -s
```

## Question 5

```
python3 pandasExercise.py breast-cancer.data
```

## Question 6

### LLM

#### ▼ ChatGPT

##### ▼ Response

In the context of decision-making, especially in fields like artificial intelligence, robotics, and game theory, the terms "stochastic" and "deterministic" refer to the nature of the environment or system in which decisions are made. These terms describe how predictable and random the outcomes of actions are within that environment.

#### 1. **Stochastic Environment:**

- A stochastic environment is one where outcomes are not entirely predictable; instead, they have some element of randomness or uncertainty associated with them. In a stochastic environment, the same action taken in the same circumstances may lead to different outcomes on different occasions due to the inherent randomness.

##### **Example of a Stochastic Environment:**

Imagine a game of dice, where you roll a fair six-sided die. The outcome of rolling the die is stochastic because, while each face of the die has an equal chance of landing face up, you cannot predict with certainty which number will come up on any given roll. It depends on the inherent randomness of the dice throw.

#### 2. **Deterministic Environment:**

- A deterministic environment is one where the outcomes are entirely predictable, given a specific set of initial conditions and actions. In such an environment, there is no randomness or uncertainty; every action will lead to the same result under the same circumstances.

##### **Example of a Deterministic Environment:**

Consider a simple physics experiment, such as dropping an object from a certain height. In a deterministic environment, if you know the initial conditions (e.g., height, gravitational acceleration), you can precisely predict the object's position and velocity at any given time using deterministic equations like Newton's laws of motion. The outcome is entirely determined

by the initial conditions and the laws governing the system, with no randomness involved.

### **Difference Between Stochastic and Deterministic Environments:**

The key difference between stochastic and deterministic environments lies in predictability:

- In a stochastic environment, there is an inherent element of randomness or uncertainty, making it impossible to predict outcomes with certainty. Instead, we typically work with probabilities or statistical distributions to model and make decisions in such environments.
- In a deterministic environment, outcomes are entirely predictable, given a specific set of initial conditions and actions. There is no randomness involved, and you can calculate the exact consequences of your actions.

In practice, many real-world environments fall somewhere on a spectrum between purely stochastic and purely deterministic, with varying degrees of uncertainty. Understanding the nature of the environment is crucial for making informed decisions and designing appropriate strategies or algorithms, whether in gaming, robotics, finance, or other fields.

#### ▼ Are they correct?

Yes the response is correct

#### ▼ How do they differ?

1. ChatGPT and Bard gave long response where as Claude give short response. Bard gave most examples among all the models.
2. The way they structured the sentences are different
3. For example ChatGPT gave definition of Stochastic environment then gave example of Stochastic environment. Then it gave example of Deterministic environment and an example of the same. At last the difference between the two
4. On the other hand Bard, It gave the definitions first and then examples and then the difference
5. Moreover Claude also gave the response in the same way

▼ Can you distinguish between your answer and an LLM?

Yes

▼ Prompt

I will be giving you a question and will provide you two answers to that question. Determine which answer was written by human and why was it written by a human.

Question: What does it mean for an environment to be stochastic? Please give an example of an environment that is stochastic, and one that is deterministic, and explain the difference.

Answer 1:

1. In stochastic environment if any move is made it may or may not result in only one result. It can have other result which might not have been predicted. For example Mars rover, Chandrayan
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Answer 2:

A stochastic environment is one in which the next state is not completely determined by the current state and the agent's action. There is an element of randomness or uncertainty in the environment.

A deterministic environment is one in which the next state is completely determined by the current state and the agent's action. There is no element of randomness or uncertainty in the environment.

Here are some examples of stochastic and deterministic environments:

A game of roulette is a stochastic environment. The outcome of each spin is determined by a random number generator, so there is no way to know for sure what number will land.

A game of chess is a deterministic environment. The outcome of each move is determined by the rules of the game, so there is no element of randomness.

The weather is a stochastic environment. The weather tomorrow cannot be perfectly predicted, even if we know the weather today and all the other relevant factors.

The stock market is a stochastic environment. The price of a stock tomorrow cannot be perfectly predicted, even if we know all the relevant factors, such as the company's financial performance and the overall state of the economy.

The difference between a stochastic environment and a deterministic environment is important for artificial intelligence (AI). AI agents that are designed to operate in stochastic environments must be able to deal with uncertainty. They must be able to learn from their experiences and adapt their behavior to the changing environment.

In contrast, AI agents that are designed to operate in deterministic environments can rely on their knowledge of the environment to make decisions. They do not need to learn or adapt as much.

In general, stochastic environments are more challenging for AI agents to operate in than deterministic environments. However, they are also more realistic. Many real-world problems involve uncertainty, so it is important for AI agents to be able to deal with it.

#### ▼ Reply

Based on the content and style of the responses, I believe Answer 2 was likely written by a human. Here's why:

1. **Clarity and Conciseness:** Answer 2 is more concise and to the point. It provides a clear and straightforward definition of stochastic and deterministic environments, followed by concise examples. It avoids unnecessary repetition and unrelated information.
2. **Structured Format:** Answer 2 is well-structured, with distinct sections for defining stochastic and deterministic environments and providing examples. It is organized and flows logically, making it easier to follow.

3. **Technical Language:** Answer 2 uses technical language and terminology commonly associated with the topic. It discusses the concept of the "next state" and the importance of dealing with uncertainty in AI agents, indicating a deeper understanding of the subject matter.
4. **Lack of Repetition:** Answer 2 avoids repeating the same points multiple times, as seen in Answer 1, where the concept of deterministic and stochastic environments is reiterated in different ways.

While Answer 1 provides some relevant information, it is less structured, contains unnecessary repetition, and lacks the technical precision and clarity of Answer 2. These characteristics suggest that Answer 2 is more likely to have been written by a human who is familiar with the topic and has effectively conveyed the information.

#### ▼ Bard

##### ▼ Response

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- A game of chess is a deterministic environment. The outcome of each move is determined by the rules of the game, so there is no element of randomness.
- The weather is a stochastic environment. The weather tomorrow cannot be perfectly predicted, even if we know the weather today and all the other relevant factors.



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▼ Can you distinguish between your answer and an LLM?

Yes, Because the way the answers are structured are different for LLM and I structure the sentences in a different way

#### ▼ Reply

I would say that Answer 2 was written by a human. Here are the reasons why:

- It provides a clear and concise definition of stochastic and deterministic environments.
- It provides examples of both types of environments.
- It explains the difference between the two types of environments in a way that is easy to understand.
- It uses correct grammar and punctuation.
- It does not contain any personal pronouns or emotional content.

Answer 1, on the other hand, is not as clear or concise. It also makes some inaccurate statements, such as saying that a sudoku game is a deterministic environment. Sudoku games are actually stochastic environments, because the outcome of each move is not completely determined by the current state of the board and the player's move.

In addition, Answer 1 uses some informal language, such as the phrase "might not have been predicted." This is not the kind of language that an AI model would typically use.

Overall, I believe that Answer 2 was written by a human and Answer 1 was written by an AI model.

#### ▼ Claude

##### ▼ Response

A stochastic environment is one that involves randomness or probability, whereas a deterministic environment is completely predictable without any randomness.

An example of a stochastic environment would be the stock market - stock prices go up and down seemingly randomly day to day. There is an element of unpredictability and probability involved.

A deterministic environment, on the other hand, would be something like a chess game. Given the same initial board setup and the same moves made by each player, the game will always evolve in the same way. There is no randomness, only determinism based on the rules of the game.

The key difference is that in a stochastic environment, you cannot perfectly predict the future state based only on the current state. There is inherent randomness that introduces uncertainty. A deterministic environment is completely predictable based on the current state and the rules governing state transitions.

▼ Are they correct?

Yes

▼ Can you distinguish between your answer and an LLM?

Yes

▼ Response

Based on the content and writing style, I believe Answer 1 was written by a human and Answer 2 was not. Here are a few reasons why:

- Answer 1 uses more conversational language, run-on sentences, and examples that require world knowledge, like mentioning the Mars rover and self-driving cars. This indicates a human's natural, imperfect way of explaining concepts.
- Answer 2 is written in a very structured, textbook-like manner with clear definitions, concise examples, and an academic tone. The perfect grammar and lack of colloquialisms indicates it was likely generated by an AI.
- Answer 1 provides specific real-world examples that require broader context about robotic systems, while Answer 2 uses more theoretical examples like games of chance. This further suggests Answer 1 comes from human experience.
- Answer 2 specifically mentions the importance of stochastic environments for training AI agents. A human would not be as likely to analyze the answers from an AI perspective.

- Overall, Answer 1 feels more informal, conversational, and rooted in real-world knowledge rather than technical definitions. This reflects a human's natural voice and thought process.

▼ Now pick one of the LLMs and craft a prompt in which you give it the original question, your answer, and an answer from one of the other LLMs, and ask it to determine which answer was written by a human and why. Does it get the answer right?

ChatGPT and Bard were unable to determine which answer was written by whom. But Claude was able to detect it

## Question 7

1. It asks question whether robot has a mind. If it has a mind then it should have above emotions
2. It talks about emotions like fear, hope and that mind has it
3. Machine could have a mind is a theory and which is known as Functionalism. It states that mental state/belief is function which serves the purpose

▼ Summarize the Chinese Room argument.

If a person/computer program manipulates symbols only based on their position or shape and even if it passes the Turing Test cannot be said to understand a language

▼ What does this have to do with computers?

1. If a computer program has the ability to manipulate shapes/symbols cannot be said to understand the language.
2. John Searle explains this with a scenario where there is a person in a room and that person receives papers with text written in chinese. The person inside the room does not understand chinese but the person has ways to manipulate symbols and come up with appropriate response
3. But Searle's argument is that even though the person responded like a native chinese speaker by manipulating symbols it does not mean that the person inside the room understand chinese

▼ Why does Searle believe that it shows that a computer can pass the Turing test without understanding?

Because the intermediary cannot distinguish between a computer and a human as even if Searle was able to provide answer to the questions native speakers had, he did not understand the language but was able to fool the native speakers in believing that the person inside is an intelligent person who understands Chinese. But in reality Searle was just looking at positioning of the symbol and giving answers based on that

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

1. While countering The System's Reply, Searle has countered that for example Our stomach does processing of food, can we say that the stomach has a brain
2. While Countering the Robot Reply, Searle has countered that even if the robot inside which a computer is situated moves with people, the robot will still manipulate symbols and based on the position will respond to people
3. Searle counters Brain Simulator reply by providing the mechanical pipes example, he says that even if a pipe system is designed where you open a valve and it will give Chinese answers. Even if such a system is built he counters that it is a mechanical set of instructions without meaning and it does not mean the person or water pipe understands Chinese. He states that physical processes are not enough to create understanding
4. To counter The combinations reply, Searle states that even if all the ideas are combined, it does not tell us that the machine is intelligent, it may behave as if it is intelligent without any thoughts or feelings. It could be following set of rules
5. Searle's counters The Other Minds Reply that if a computer's behavior suggests that it is a person, then it has the ability to think. But Searle states that behavior does not mean understanding. Understanding is more than just performing tasks. He states that understanding goes deeper than just the output or the tasks performed
6. Many Mansions states that there may be other methods, besides those which are currently known to mankind, that could give computers the ability to understand.. Searle counters this by saying this statement damages the original

thought process to create machines which think like human. If we change the definition of AI to computers that produce intelligent behaviors even if it understands or not, he says changes the purpose of AI. He states that thinking ability cannot be achieved only through computations over defined things

I find above arguments mentioned by Searle convincing