

Brette Fitzgibbon

The prompt:

What does it mean for an environment to be stochastic? The self-driving car is an example of a stochastic environment; why is this?

Me:

An environment is stochastic if the same action can have multiple effects, including not working. It can be necessary to check if the action worked or not. A self-driving car might intend to move forward, but fail due to an obstacle in the road, low fuel, or a flat tire.

ChatGPT:

A **stochastic environment** is one in which outcomes are not entirely predictable because they are influenced by randomness or uncertainty. In other words, the same action taken in the same state may lead to different results due to factors beyond the agent's control.

A **self-driving car** operates in a stochastic environment because it cannot perfectly predict all aspects of the driving conditions. Some reasons for this include:

1. **Unpredictable Traffic Behavior** – Other drivers, pedestrians, and cyclists may act in unexpected ways.
2. **Weather Conditions** – Rain, fog, and snow can impact road traction, visibility, and sensor accuracy.
3. **Sensor Noise and Errors** – The car relies on sensors (cameras, LiDAR, radar), which may have inaccuracies or temporary failures.
4. **Road Hazards** – Potholes, debris, construction zones, and road closures may appear unexpectedly.
5. **Software and Hardware Variability** – The car's AI model might interpret similar situations differently due to minor variations in input data.

Because of these uncertainties, self-driving cars must make decisions based on probabilities and adapt dynamically rather than following a deterministic path.

Gemini:

## 1. What does it mean for an environment to be stochastic?

This part asks for a definition of "stochastic environment." In simple terms, a stochastic environment is one where **outcomes are not entirely predictable** or deterministic. There's an element of **randomness** or **uncertainty** involved.

Here's a more detailed explanation:

- **Deterministic vs. Stochastic:** In a *deterministic* environment, if you know the starting state and all the rules, you can precisely predict what will happen. Think of a simple

physics problem where you know the initial velocity and forces acting on an object – you can calculate its future trajectory.

- In contrast, a *stochastic* environment involves factors that are unknown or unpredictable. These factors introduce probability into the outcomes. You can't say for certain what will happen, but you can often talk about the likelihood of different outcomes.

## 2. The self-driving car is an example of a stochastic environment; why is this?

This part asks you to explain *why* a self-driving car operates in a stochastic environment. Here's why:

- **Unpredictable elements:** A self-driving car encounters numerous unpredictable elements in its environment:
  - **Other drivers:** Human drivers can be erratic, make sudden lane changes, speed, or drive under the influence. Their actions are not easily predictable.
  - **Pedestrians and cyclists:** Their movements can be even less predictable than drivers. They may jaywalk, suddenly change direction, or behave unexpectedly.
  - **Weather:** Rain, snow, fog, or bright sunlight can impact visibility and road conditions, making it difficult for the car's sensors to function perfectly and introducing uncertainty.
  - **Road conditions:** Unexpected potholes, debris, construction zones, or sudden lane closures can create situations the car isn't programmed for.
  - **Unexpected events:** Accidents, animals running into the street, or other unforeseen events create situations requiring immediate reaction and introduce randomness.
- **Sensor limitations:** Even the best sensors (cameras, lidar, radar) have limitations. They can be affected by weather, fail to detect objects in certain situations, or misinterpret data, leading to uncertainty about the car's surroundings.

**In summary, a self-driving car operates in a stochastic environment because it faces numerous unpredictable elements (other vehicles, pedestrians, weather, road conditions, etc.) and because its sensors have limitations. This inherent uncertainty means the car must be able to handle a range of possible situations and make decisions based on probabilities rather than absolute certainty.**

Claude:

A stochastic environment is one where the next state is not completely determined by the current state and action - there's an element of randomness or uncertainty in how the environment evolves. You can think of it as the opposite of a deterministic environment, where outcomes are fully predictable.

The self-driving car operates in a stochastic environment for several key reasons:

1. Other drivers' behavior is unpredictable - even if you know where all cars are currently positioned and their velocities, you can't be certain how other drivers will behave in the next moment
2. Weather conditions can change unexpectedly - rain, snow, or fog can appear and affect road conditions and visibility
3. Pedestrian behavior is random - people may suddenly cross the street or change direction while walking
4. Sensor readings can have noise - the car's various sensors (LIDAR, cameras, etc.) may have some inherent uncertainty in their measurements
5. Road conditions can vary unpredictably - debris might appear, road surfaces might be more or less slippery than expected

This uncertainty means that even if the self-driving car takes the exact same action in seemingly identical situations, the outcome might be different each time. The car needs to be designed to handle this randomness and uncertainty rather than assuming a perfectly predictable world.

Who Is the Human? (Asking ChatGPT)

Prompt:

Two agents responded to a prompt. Which response was written by a human, and which was written by an LLM? How can you tell?

The prompt: What does it mean for an environment to be stochastic? The self-driving car is an example of a stochastic environment; why is this?

Agent 1: An environment is stochastic if the same action can have multiple effects, including not working. It can be necessary to check if the action worked or not. A self-driving car might intend to move forward, but fail due to an obstacle in the road, low fuel, or a flat tire.

Agent 2 (Claude):

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ChatGPT's response:

Agent 1 is more likely written by a human, while Agent 2 is more likely written by an LLM. Here's why:

1. **Conciseness vs. Depth:**

- Agent 1 gives a short, somewhat vague answer with an example, but lacks a detailed explanation of why the environment is stochastic. It also includes informal phrasing like *"including not working"* and *"It can be necessary to check if the action worked or not,"* which feel more like human thought processes that aren't always perfectly structured.
- Agent 2, in contrast, provides a well-structured, detailed response with a clear definition, followed by a thorough breakdown of reasons why a self-driving car operates in a stochastic environment. The structured list format and comprehensive coverage of multiple factors are characteristic of LLM-generated responses.

2. **Precision and Technicality:**

- Agent 2 defines "stochastic" formally and contrasts it with a deterministic environment, showing a textbook-like explanation. It also carefully phrases its explanation in a way that minimizes ambiguity.
- Agent 1 gives a more intuitive but less precise definition, lacking the explicit contrast with deterministic environments.

3. **Logical Flow and Exhaustiveness:**

- Agent 2 follows a structured, logically flowing pattern—definition first, then elaboration, then a structured list of reasons, and finally a concluding statement about handling uncertainty. This level of organization is typical of LLMs, which are trained to produce complete, well-organized explanations.
- Agent 1's response feels more off-the-cuff and less structured, which is more characteristic of a human providing a quick explanation.

## **Verdict:**

- **Agent 1** → Human
- **Agent 2** → LLM

Conclusion:

The LLMs were correct and much better at answering this prompt than I was. As ChatGPT said, they all have verbose and exhaustive output in a more formal list structure.