

Assignment 1:

Question 1: Environments

- (a) An environment to be stochastic is an environment setting where the outcome of an action is determined by the current state and action. The self-driving car is an example of a stochastic environment because in the process of driving, an environment like other cars and pedestrians may act unpredictable, which makes a stochastic environment.
- (b) An environment to be partially observable is the agent's sensor that provides access to only partial or incomplete information about the environment at each point in time. The reason why self-driving cars are partially observable is because the car has limited monitors and sensors to get information from the environment. This stuff can only get stuff in a limited distance. The difference between this and a stochastic environment is that the partially observable environment is restricted from the observer's sense, whether the stochastic environment is the uncertainty of the outside environment.
- (c) An environment to be sequential is the agent's actions will affect future states, and the history of actions also matters. Chess is an example of a sequential environment because every step of the chess will affect the future situation, such as the position of chess pieces.
- (d) An environment to be dynamic means the environment will change over time regardless of the actions taken by the agent. The reason why a video game is an example of an environment that is usually dynamic is that events or enemies usually change on their own, regardless of the player's action.
- (e) An environment to be multiagent means the environment has multiple agents, and these agents may affect each other. Poker can be treated as multiagent is because agents as players not only need to do their own strategies but also need to deal with actions of other agents, like predict which card will they play.

Question 2: Approach. (MonteCarlo.py)

Question 3: Machine Learning preparation. (zeroR.py)

Question 4: Word frequencies. (wc.py)

Question 5: Perceptrons. (perceptron.py)

Question 6: Detecting Intelligence.

- (a) Question: (d)What does it mean for an environment to be dynamic? A video game is an example of an environment that is usually dynamic. Why is this?

- (i) (ChatGPT): For an environment to be **dynamic**, it means that it changes over time based on interactions, external factors, or internal processes. A **static** environment, in contrast, remains constant and unchanging.

A **video game** is usually a **dynamic environment** because it responds to player inputs, changes state based on in-game events, and often includes systems that evolve over time. Here are some reasons why:

1. **Player Interaction** – Actions taken by the player (like moving, attacking, or solving puzzles) influence the game world.
2. **AI Behavior** – Many games include AI-driven enemies or NPCs that adapt to the player's actions.
3. **Physics and Simulations** – Many games feature real-time physics, such as moving objects, destructible environments, or weather effects.
4. **Progression Systems** – The game world evolves as the player advances, unlocking new areas, changing storylines, or altering enemy behaviors.
5. **Random or Procedural Generation** – Some games dynamically create environments, such as in **roguelike** or **sandbox** games.

Because of these features, video games provide an engaging and responsive experience, making them a great example of dynamic environments.

- (ii) I think the answers are correct. I think I can distinguish between my answer and an LLM for this question. LLM will list some separate reasons to explain its answers, and will give each reason one or multiple concrete examples.

(b) Prompt I make:

- (i) LLM I choose(chatGPT):

- (ii) Question: If you are a student in a university, and you major in Computer Science. What will you do in an afternoon? Answer as humanly as possible, and only give me one option, and write in the same paragraph.

- (1) My answer: I will first do some of my coding assignments for about half an hour, and I will take a 5-minute rest and then write papers. If there are TA's office hours, I would ask some questions about the coding assignment. After working 2 hours, I would stop working and go to the cafeteria to buy some stuff to drink. After that, I will continue working on my coding project until dinner.
- (2) The answer of another LLM(chatGPT): I'd probably head to a quiet spot on campus around 2 PM, maybe the library or a café, grab a coffee, and open my laptop to work on an assignment that's due soon. After about 30 minutes of productive coding, I'd hit a bug that makes no sense, spend another hour debugging, and eventually give up for a bit. Around 4 PM, I'd take a break, scroll through social media, or watch a short YouTube video, convincing myself it's "educational." By 4:30 PM, I'd meet up with a couple of friends to "study" together, which mostly turns into joking

around while getting minimal work done. At 6 PM, realizing how much I still have left to do, I'd rush back into focus mode, determined to at least finish the assignment before heading home for dinner.

(3) Ask the LLM(Gemini) to judge which answer is written by a human, and explain why.

(iii) It gets the answer right, and here is its answer: Sentence B is more likely written by an LLM. Here's why:

- **Narrative Structure and Detail:** Sentence A tells a mini-story with specific times, locations (library, café), and actions ("grab a coffee," "scroll through social media," "meet up with friends"). LLMs are trained on vast amounts of text and are good at generating realistic, detailed scenarios. The narrative arc of productivity followed by frustration, procrastination, and a renewed focus is a common trope and one LLMs would easily pick up on.
- **Relatability and Humor:** The description of "studying" with friends, which mostly turns into joking around, and the slightly self-deprecating comment about "educational" YouTube videos, suggests a human understanding of student life and a touch of humor. While LLMs can mimic humor, they often do so by recognizing patterns in human writing.
- **Natural Language Flow:** Sentence A flows more naturally, mimicking spoken language with phrases like "I'd probably," "maybe," and the use of quotation marks around "study." It feels more conversational.

Sentence A, while plausible, is more straightforward and structured. It reads more like a simple plan or schedule. While an LLM *could* generate this, it lacks the narrative flair and nuanced details that LLMs often exhibit when trying to create realistic scenarios. It's more matter-of-fact, which is something a human might write when quickly outlining their day.