AI Bootcamp

Prompt Engineering, Output Parsers & Agents

Module 22 Day 2

Class Objectives

By the end of class, you will be able to:

1   Apply best practices for engineering AI prompts.

2   Construct prompts in LangChain using prompt templates.

3   Process LLM output using output parsers.

4   Understand the basic concepts related to intelligent agents.

5   Use LangChain agents to handle queries that require multiple steps.

Instructor **Demonstration**

Introduction to Prompt Engineering

Prompts

01

The term prompt refers to the text that a user enters into the text field of an LLM to generate an output.
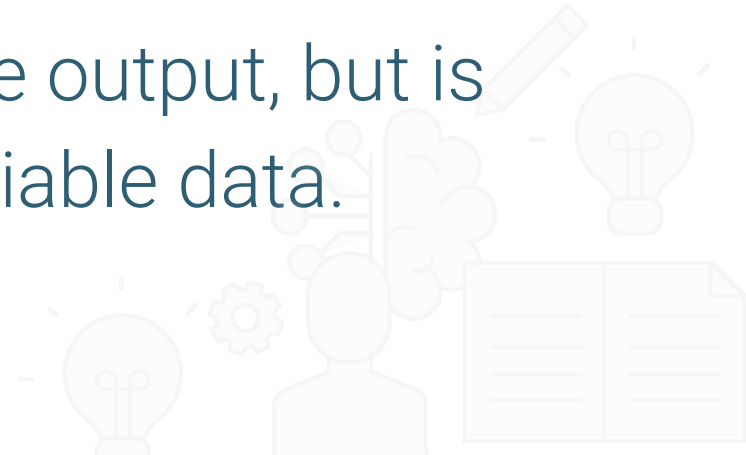
02

Prompts can be short and simple or lengthy and complex.

03

The output of a model is sensitive to small changes in the prompts provided.

Be on the lookout for **AI hallucinations**, which is the phenomenon of an AI model generating content that "feels" like a legitimate output, but is based on unreliable data.

Components of Prompt Engineering

01 Required components

- Instructions
- Questions

02 Optional components

- Input data
- Examples

A simple prompt

MG Write me a dad joke about penguins.

Sure, here's a classic one for you.

Why don't penguins like to talk to strangers at parties?

Because they find it hard to break the ice!

A more specific prompt

MG — Recommend a movie about a killer shark. I like Jaws, The Shallows, and Open Water. I don't like the Sharknado movies or The Meg.

Based on your preferences, I would recommend the movie "The Reef" (2010). It is a suspenseful Australian film that follows a group of friends who become stranded in the middle of the ocean after their sailboat capsizes. As they try to make their way to safety, they are relentlessly pursued by a great white shark. The tension builds steadily throughout the movie, and the shark is realistically portrayed, making it a great choice for fans of Jaws and other more serious shark movies.

Prompts to improve model outputs

Zero-shot prompting

Zero-shot prompts provide the model with no additional pieces of data to make a prediction.

MG Recommend a movie about a killer shark.

One classic movie about a killer shark that I would recommend is "Jaws" (1975), directed by Steven Spielberg. Based on the novel by Peter Benchley, "Jaws" tells the story of a small New England town terrorized by a great white shark that begins attacking swimmers in the local waters. The film stars Roy Scheider, Robert Shaw, and Richard Dreyfuss, and features a score by John Williams that has become one of the most recognizable in film history. "Jaws" is a suspenseful and thrilling film that has become a cultural phenomenon and a classic of the horror genre.

Prompts to improve model outputs

One-shot prompting

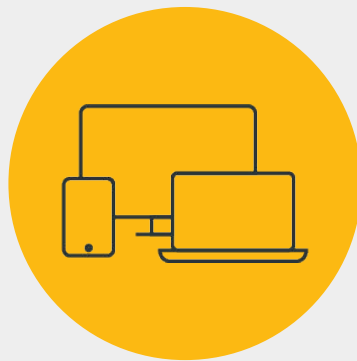One-shot prompts provide the model with one example or piece of data to refine the model's outcome.

MG Recommend a movie about a killer shark. Jaws is my favorite movie.

If you loved Jaws, then would highly recommend the movie "The Shallows" (2016). The movie follows a young surfer named Nancy (Blake Lively) who finds herself stranded on a small rock formation 200 yards from shore while being hunted by a great white shark.

Similar to Jaws, the movie builds up tension and suspense as Nancy tries to find a way to outsmart the shark and make it back to shore alive. The cinematography is also stunning, with beautiful shots of the ocean and great use of camera angles to make the shark seem even more menacing.

Overall, "The Shallows" is a thrilling and intense movie that will keep you on the edge of your seat from start to finish.

Instructor **Demonstration**

Techniques to Improve Outputs

Prompts to improve model outputs

Few-shot prompting

Few-shot prompts provide the model with 2−5 examples or pieces of data to refine the model's outcome.

MG Recommend a movie about a killer shark. I like Jaws, The Shallows, and Open Water. I don't like the Sharknado movies or The Meg.

Based on your preference, I would recommend the movie "The Reef" (2010). It is a suspenseful Australian film that follows a group of friends who become stranded in the middle of the ocean after their sailboat capsizes. As they try to make their way to safety, they are relentlessly pursued by a great white shark. The tension builds steadily throughout the movie, and the shark is realistically portrayed, making it a great choice for fans of Jaws and other more serious shark movies.

Prompts to improve model outputs

Chain-of-thought prompting

CoT prompts provide step-by-step instructions to the models. In general, the user asks the model to explain its reasoning and sometimes the user specifies a format the output should follow.

Standard prompting

Input

Q: Roger has 5 tennis balls. He buys 2 more cans of tennis balls. Each can has 3 tennis balls. How many tennis balls does he have now?

A: The answer is 11.

Q: The cafeteria had 23 apples. If they used 20 to make lunch and bought 6 more, how many apples do they have?

Model output

A: The answer is 27. ❌

Chain-of-thought prompting

Input

Q: Roger has 5 tennis balls. He buys 2 more cans of tennis balls. Each can has 3 tennis balls. How many tennis balls does he have now?

A: Roger started with 5 balls. 2 cans of 3 tennis balls each is 6 tennis balls. 5 + 6 = 11. The answer is 11.

Q: The cafeteria had 23 apples. If they used 20 to make lunch and bought 6 more, how many apples do they have?

Model output

A: The cafeteria had 23 apples originally. They used 20 to make lunch. So they had 23 - 20 = 3. They bought 6 more apples, so they have 3+ 6 = 9. The answer is 9. ✔

Prompts to improve model outputs

Prompting citations

Prompting citations forces the model to only use credible sources, reducing the risk of hallucinations.

MG   Who invented the python coding language? Answer only using reliable sources and cite those sources.

The Python coding language was created by Guido van Rossum in the late 1980s and was first released in 1991.

According to the official Python documentation, Guido van Rossum started working on Python in December 1989, while he was working at the National Research Institute for Mathematics and Computer Science in the Netherlands. He named it after the British comedy group Monty Python, and aimed to create a language that was easy to read and write, yet still powerful and flexible.

This information is also supported by several other reliable sources, including:

- The Python Software Foundation **https://www.python.org/doc/essays/cp4e/**
- The History of Python by Guido van Rossum **https://www.python-history.blogspot.com/2009/01/brief-timeline-of-python.html**
- Python for Everybody Textbook by Charles Severance **https:www.py4e.com/html3-01-intro**

Source

Prompts to improve model outputs

Assigning the model a role

Asking the model to play a specific role is another way to reduce the risk of hallucinations and improve model output.

MG
You are a helpful assistant that translates English to Spanish. Translate the following passage: All the world's a stage, and all the men and women merely players.

Todo el mundo es un escenario y todos los hombres y mujeres son simplemente actores.

Prompts to improve model outputs

Question and answer

Leading the model toward an output through a series of follow up questions is another effective way of steering the model toward the desired output.

MG   Write a sentence with 10 words in it.

   The quick brown fox jumps over the lazy dog.

MG   THAT'S ONLY 9 WORDS!

   Oh, I apologize for that. Here's another sentence with 10 words: She woke up early to watch the sunrise over mountains.

Prompts to improve model outputs

Templates

Developing templates is one of the most effective strategies available for prompting thorough, accurate responses from a transformer model.
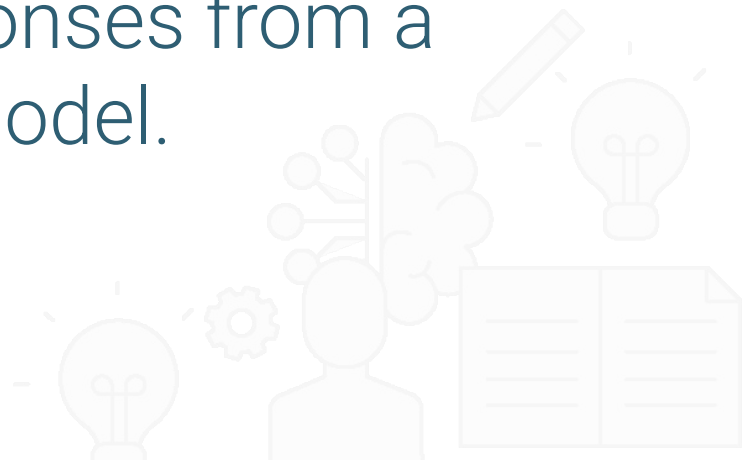
Activity:

AI Travel Agent

In this activity, you will be developing your own generative AI prompt using the techniques you have learned so far.

Suggested Time:

10 Minutes

Time's up!
Let's review

Questions?

Instructor **Demonstration**

LangChain Prompt Templates

LangChain Roles

LangChain provides different types of roles that you can use in creating prompts.

1 `HumanMessage`: This is a `ChatMessage` coming from a human/user.

2 `AIMessage`: This is a `ChatMessage` coming from an AI/assistant.

3 `SystemMessage`: This is a `ChatMessage` coming from the system that is an instruction for how the model should behave.

4 `FunctionMessage`: This is a `ChatMessage` coming from a function call.

When you assign a role, it reflects in the tone of the responses that the LLM chain generates.

Activity:
Quote Generator

In this activity, you will write a program to generate new "quotes" in a particular style by following examples given.

Suggested Time:
10 Minutes

Time's up!
Let's review

Questions?

Break

15 mins
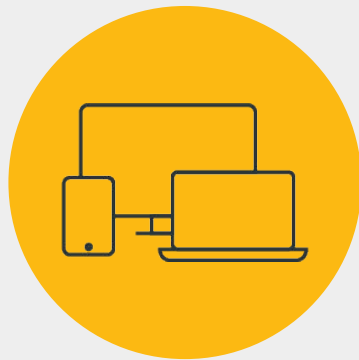
Instructor **Demonstration**

LangChain Output Parsers

LangChain Output Parsers

LangChain provides output parsers that structure the output from LLMs.

There are many parsers available through LangChain, and which one you use will depend on the desired format of the output data. Each parser has format instructions that are either built-in or specified by the user.

The three parsers we will focus on are:

- `CommaSeparatedListOutputParser` which returns the LLM output as a list of comma-separated items.

- `StructuredOutputParser` returns LLM string output as structured information.

- `PydanticOutputParser` returns LLM output in a data structure specified by the user. It is one of the more common and robust parsers.

Activity:

Recipe Selection

In this activity, you will create a more user-friendly recipe suggestion program that allows the user to get more information about dishes they're interested in.
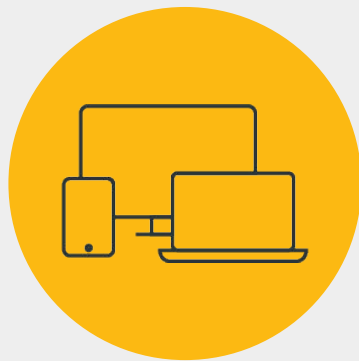
Suggested Time:

10 Minutes

Time's up!
Let's review

Questions?

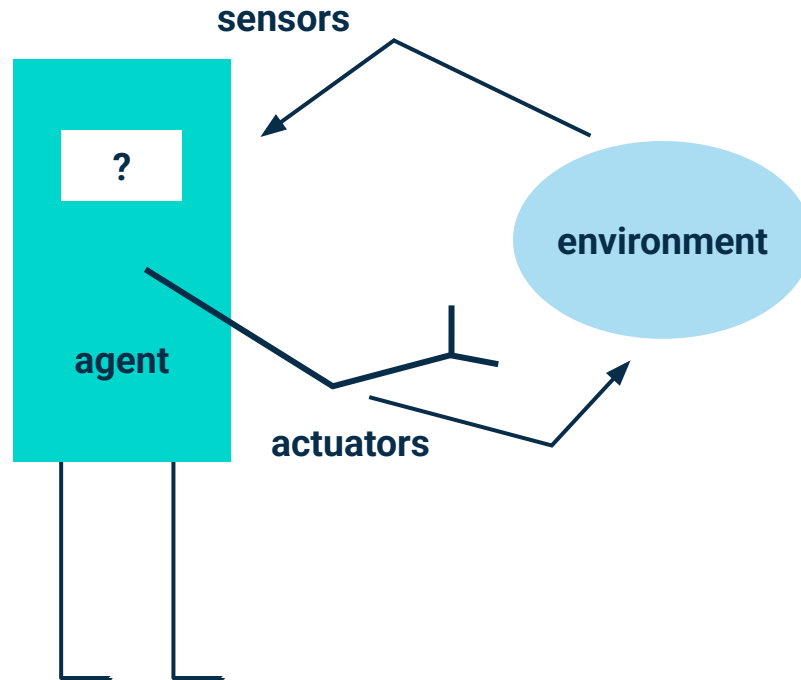# Instructor **Demonstration**

Agent-Based AI

LangChain Agents and Tools

LangChain **agents** allow us to use our LLM to make a decision about which actions to take.

The agent requires a set of **tools** to accomplish its task. As the developer, you will need to carefully consider which tools your agent might need access to and integrate them accordingly.
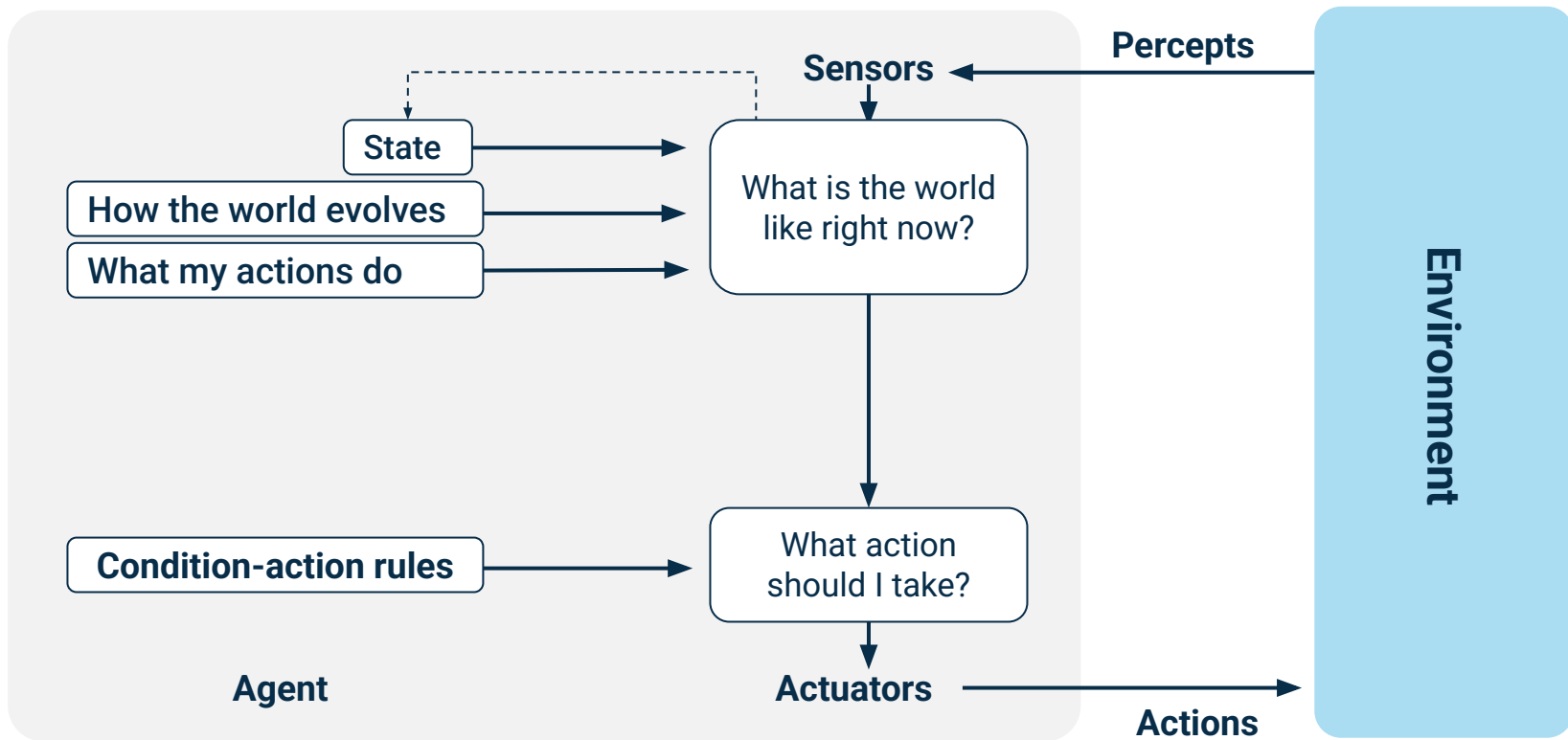
An intelligent agent

An agent's role is to perceive its environment using sensors and to act on that environment using actuators.
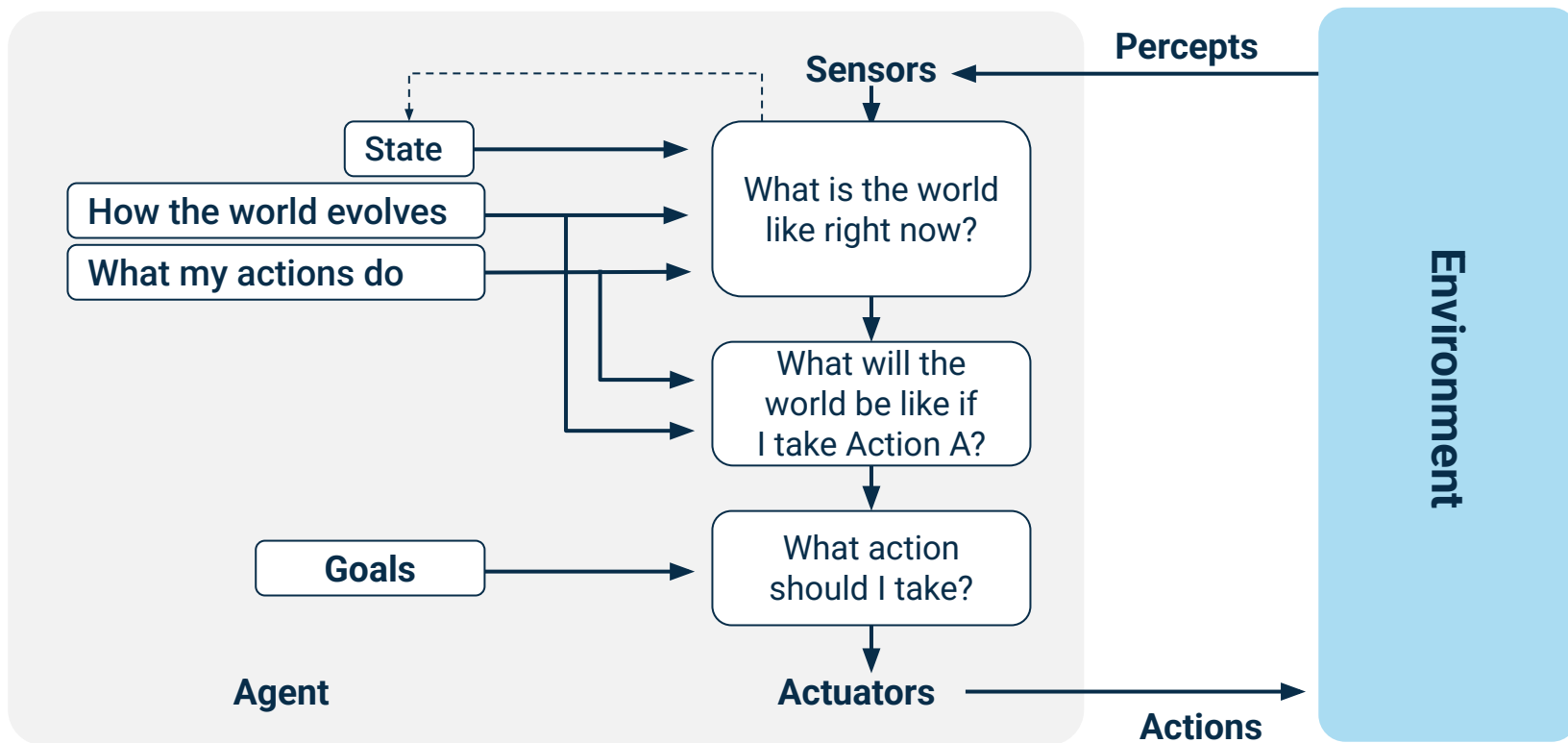
Simple reflex agents
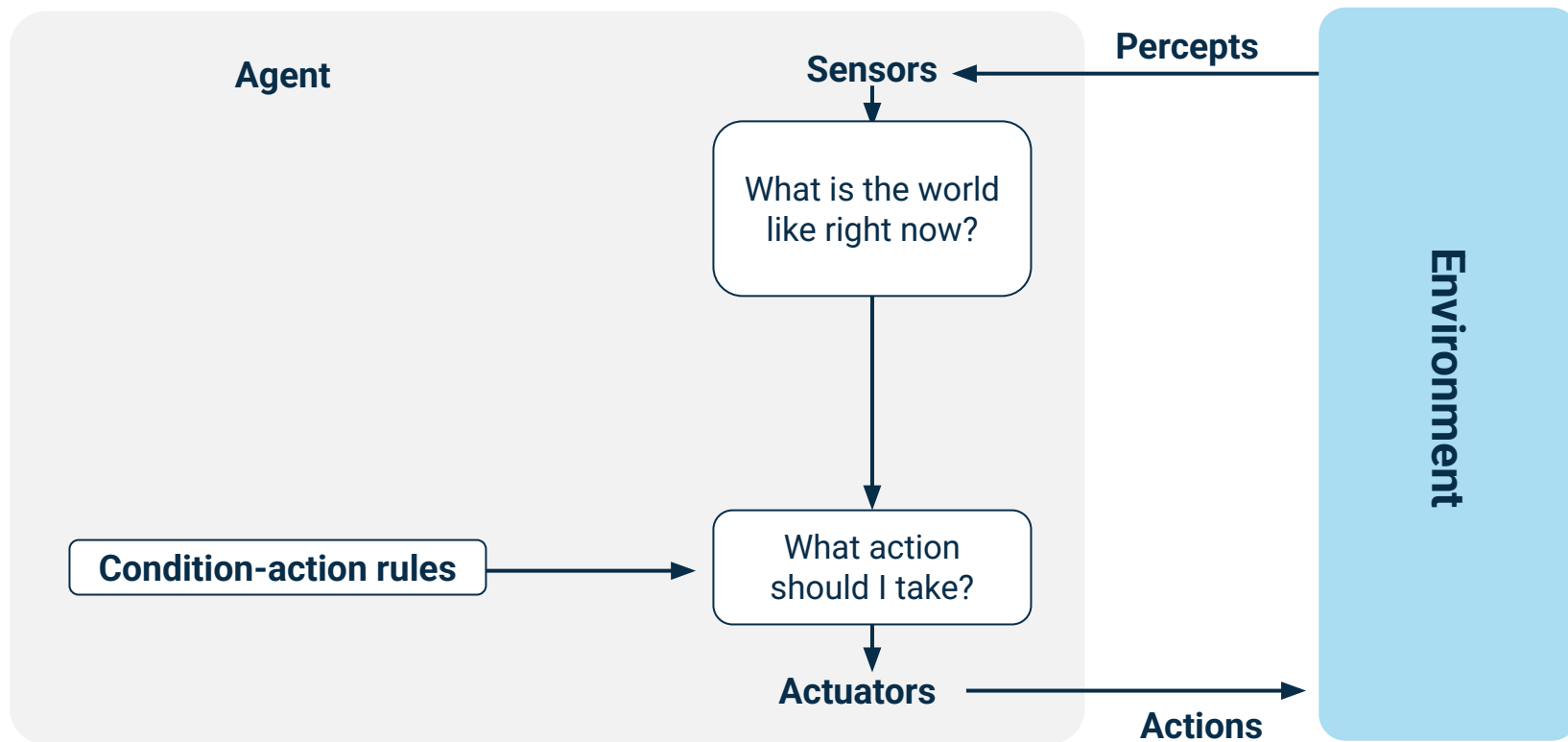
Model-based reflex agents

Goal-based agents

Instructor **Demonstration**

LangChain Agents

Activity:
Activity Planner

In this activity, you will create an agent that helps a user plan a weather-appropriate activity in a city they are visiting.
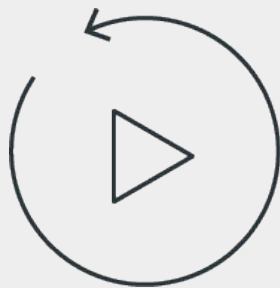
Suggested Time:
15 Minutes

Time's up!
Let's review

Questions?

Let's **recap**

Recap

After today's lesson you are able to:

1. Apply best practices for engineering AI prompts.

2. Construct prompts in LangChain using prompt templates.

3. Process LLM output using output parsers.

4. Understand the basic concepts related to intelligent agents.

5. Use LangChain agents to handle queries that require multiple steps.

Next

In the next lesson, you will critically examine the possible role that AI might play in the future of work and the future of the world.

The End