SNS COLLEGE OF ENGINEERING
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Artificial Intelligence & Natural Language Processing

Agent Terminology

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Agent Terminologies in AI

In Artificial Intelligence (AI) and Natural Language Processing (NLP), agents play a crucial role in perceiving their environment, processing information, and taking appropriate actions. Here are key agent terminologies used in AI and NLP:

- Agent
- Percept
- Percept Sequence
- Agent Function
- Actuators
- Sensors
- Rational Agent
- Autonomous Agent
- Utility Function
- Environment

The Structure of Agents

1. Agent

An **agent** is an entity that **perceives** its environment and **takes actions** to achieve specific goals.

It interacts with the environment through **sensors (input)** and **actuators (output).**

Example: A self-driving car perceives traffic through cameras and makes driving decisions.

2. Percept

A **percept** is the **input** received by an agent from its environment. It consists of raw data from **sensors** or external sources.

Example:

•A **robot** perceives objects using a camera.

•A **chatbot** receives a user's query as text input.

Contd…

3. Percept Sequence

A **percept sequence** is the **history of all past percepts** received by an agent. Agents can use this to make better decisions.

Example:

•A **stock market AI** remembers past stock trends before making a prediction.

•A **voice assistant** recalls past conversations to improve responses.

4. Agent Function

The **agent function** maps **percept sequences to actions**. It defines how an agent reacts to a given situation.

Example:

•A **self-driving car** detecting a red traffic light (percept) and stopping (action).

•A **spam filter** detecting certain words in an email and marking it as spam.

Contd…

5. Actuators

Actuators are the **output devices** that allow an agent to take action based on its decision.

Example:

•A **robot arm** moving objects in a factory.
•A **chatbot** generating and displaying a response.

6. Sensors

Sensors **gather data** from the environment, allowing an agent to perceive changes and make decisions.

Example:

•**Cameras & LiDAR** in a self-driving car.
•**Microphone & Text Input** in a voice assistant like Alexa.

7. Rational Agent

A **rational agent** makes the best possible decision based on the **available information** and its **goal**. It always chooses actions that maximize its success.

Example:

•A **Netflix recommendation system** suggesting content based on viewing history.
•A **Google Maps agent** finding the fastest route based on live traffic.

Contd…

8. Autonomous Agent

An **autonomous agent** operates **independently** without human intervention, learning and adapting over time.

Example:

•A **self-driving Tesla** adjusting speed and direction autonomously.

•A **personalized chatbot** improving responses over multiple interactions.

9. Utility Function

A **utility function** measures how "good" or "bad" a certain action is, helping the agent choose the best decision.

Example:

•**Stock Trading AI** choosing a trade with the highest profit probability.

•**Robot vacuum (Roomba)** deciding the best cleaning path based on room size.

Contd…

10. Environment

The **environment** is everything **outside the agent** that it interacts with. Environments can be **static/dynamic, fully/partially observable, deterministic/stochastic**.

Example:

•**AI playing chess** has a fully observable, deterministic environment.

•**Voice assistants** operate in a dynamic, partially observable environment.

Agent Terminology in NLP

Agents in **Natural Language Processing (NLP)** interact with human language. Here are important NLP-specific agent terminologies:

- NLP Agent
- Speech Recognition
- Natural Language Understanding
- Natural Language Generation
- Knowledge Base

Contd…

11. NLP Agent
An **NLP agent** processes human language, extracts meaning, and generates responses.

Example: Chatbots like **ChatGPT, Siri, Alexa**.

12. Speech Recognition
The ability of an agent to **convert spoken language into text**.

Example: Google Voice Assistant transcribing voice commands.

13. Natural Language Understanding (NLU)
The process of **understanding and interpreting** human language by breaking it into meaning and structure.

Example: Sentiment analysis detecting emotions in text.

Contd…

14. Natural Language Generation (NLG)
The process of **creating human-like text responses** from structured data.

Example:
•AI writing a **news article summary** based on raw data.

15. Knowledge Base
A **repository of information** that an agent uses to improve responses.

Example:
•**Chatbots using FAQs** to answer customer questions.

Understanding **agent terminology** helps in designing AI and NLP systems that **interact intelligently** with their environment. Whether in **self-driving cars, chatbots, or recommendation systems**, agents play a crucial role in making autonomous, data-driven decisions.


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