



**SNS COLLEGE OF ENGINEERING**

**(Autonomous)**

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# Artificial Intelligence & Natural Language Processing

## Rationality-Ideal Rational agent

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# Good Behaviour – The Concept of Rationality

## What is Rationality in AI?

- **Rationality** in AI refers to an agent's ability to make **optimal decisions** based on available knowledge to achieve the best possible outcome.
- A **rational agent** always **maximizes its performance measure** based on what it perceives and its built-in knowledge.

## Characteristics of a Rational Agent

A rational agent should:

- ✓ **Act with available information** – Uses past and present data.
- ✓ **Optimize outcomes** – Always takes the best possible action.
- ✓ **Adapt to new situations** – Can update decisions dynamically.
- ✓ **Handle uncertainty** – Works even with incomplete information.



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Rationality in artificial intelligence refers to an agent's ability to act in a way that maximizes its expected performance based on the information available. A rational agent selects actions that maximize its performance measure, considering:

- 1.The performance measure that defines success.
- 2.The agent's prior knowledge about the environment.
- 3.The possible actions the agent can take.
- 4.The percept sequence (observations) gathered so far.

Rationality differs from omniscience—an omniscient agent knows actual outcomes, while a rational agent makes decisions based on expected outcomes.



# Types of Rationality

**1.Perfect Rationality:** The agent always chooses actions that maximize expected utility. However, perfect rationality is impractical due to computational limits.

**2.Calculative Rationality:** The agent eventually selects the best action based on initial information, but real-world constraints make this impractical as delays in decision-making can render solutions obsolete.

**3.Bounded Rationality:** Proposed by Herbert Simon, this concept suggests that agents use "satisficing" (finding a good enough solution rather than an optimal one) due to limited computational resources.

**4.Bounded Optimality:** The best practical approach, where the agent performs as well as possible within its computational limits.



# Ideal rational agent

An **ideal rational agent** acts to maximize expected utility given its perceptual inputs and available computational power. It does not require omniscience but should adapt based on learned information. An agent that learns from its environment and improves decision-making over time is more effective than one relying purely on preprogrammed rules.

Bounded optimality provides a strong theoretical foundation for AI because it ensures that agents are designed to work efficiently within the constraints of real-world environments.



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## Examples of Rational Agents

- Google Search Engine:** Always provides the most relevant results.
- Autonomous Vehicles:** Navigate safely by following traffic rules and avoiding obstacles.
- Virtual Assistants (Siri, Alexa):** Provide helpful responses based on user queries.

## Challenges in Achieving Rationality

- Computational limitations:** Some decisions require excessive processing.
- Uncertainty in data:** AI may not always have complete information.
- Conflicting goals:** Agents must prioritize multiple objectives.



Thank you