



# **SNS COLLEGE OF ENGINEERING**



**Kurumbapalayam(Po), Coimbatore – 641 107**

**Accredited by NAAC-UGC with 'A' Grade**

**Approved by AICTE, Recognized by UGC & Affiliated to Anna University, Chennai**

## **Department of AI &DS**

**Course Name – 23ADT201 ARTIFICIAL  
INTELLIGENCE**

**II Year / III Semester**

**Unit 1-INTELLIGENT AGENTS  
Topic CONCEPT OF RATIONALITY**





# CONCEPTS OF RATIONALITY



Case Study: Autonomous Vehicle Navigation and Decision Making

Background:

Autonomous vehicles (AVs) use advanced decision-making to navigate through cities, taking into account traffic, pedestrians, and rules.



# RATIONALITY



Rationality in the context of artificial intelligence (AI) refers to the ability of an AI agent to make decisions that maximize expected utility, given its knowledge and goals.  
Let's delve into the key concepts of rationality in AI:



# Concepts of Rationality in AI:



1. **Definition:** Utility refers to the measure of desirability or goodness of an outcome or state of the world.

- **Purpose:** AI agents aim to maximize utility, making decisions that lead to outcomes with the highest expected utility based on available information.
- **Utility Function:** A utility function quantifies the agent's preferences over possible outcomes, assigning a numerical value to each possible state or action.

1. **Decision Theory:**

- **Framework:** Decision theory provides formal methods for reasoning about decisions under uncertainty.
- **Elements:** It includes components such as probabilities (likelihood of different outcomes), utilities (values assigned to outcomes), and actions (choices available to the agent).
- **Optimal Decision Making:** Rational AI agents use decision theory to select actions that maximize expected utility, considering probabilities of outcomes and their associated utilities.

2. **Expected Utility Maximization:**

- **Goal:** Rational AI agents aim to select actions that maximize the expected value of their utility function.
- **Calculation:** Expected utility is computed by summing the utilities of all possible outcomes weighted by their probabilities.
- **Trade-offs:** Agents may face trade-offs between different objectives (e.g., speed versus accuracy) and must balance these to achieve optimal decisions.



# Concepts of Rationality in AI:



## 4. Reasoning Under Uncertainty:

- **Uncertainty:** Rational AI agents often operate in environments with incomplete or uncertain information.
- **Probabilistic Reasoning:** Agents use probabilistic models to reason about uncertain outcomes and make informed decisions.
- **Learning and Adaptation:** Over time, agents may update their beliefs and strategies based on new information or experience.

## 5. Multi-Agent Systems:

- **Interaction:** In scenarios involving multiple AI agents or human participants, rationality extends to strategic decision-making and game theory.
- **Coordination and Cooperation:** Rational agents may cooperate or compete strategically to achieve individual or collective goals efficiently.

## 6. Ethical Considerations:

- **Value Alignment:** Ensuring AI systems' decisions align with human values and ethical principles.
- **Fairness:** Considering fairness and equity in decision-making processes, especially in sensitive domains like healthcare or finance.

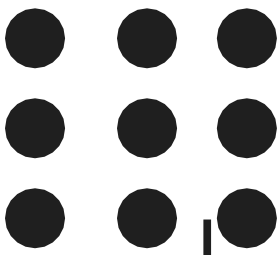


# Applications of Rationality in AI:



**Autonomous Vehicles:** Making decisions about navigation, safety, and responding to dynamic traffic conditions.

- **Medical Diagnosis:** Recommending treatments based on patient data to maximize health outcomes.
- **Finance:** Optimizing investment portfolios based on risk preferences and market conditions.
- **Robotics:** Planning and executing actions to achieve goals efficiently in complex environments.



**THANK YOU**