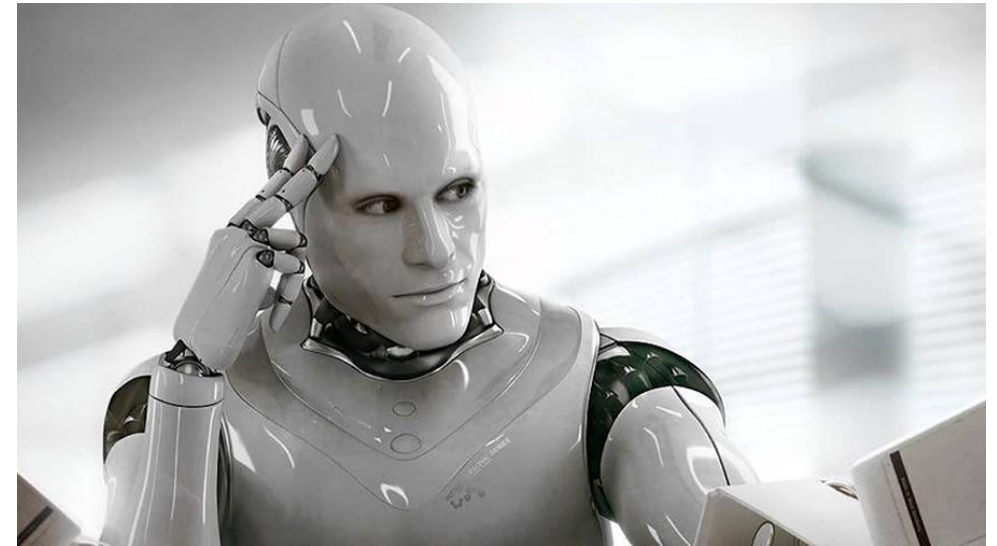


# 20IS603 Architecture of Intelligent Systems

2<sup>nd</sup> Semester M.Tech. IIS

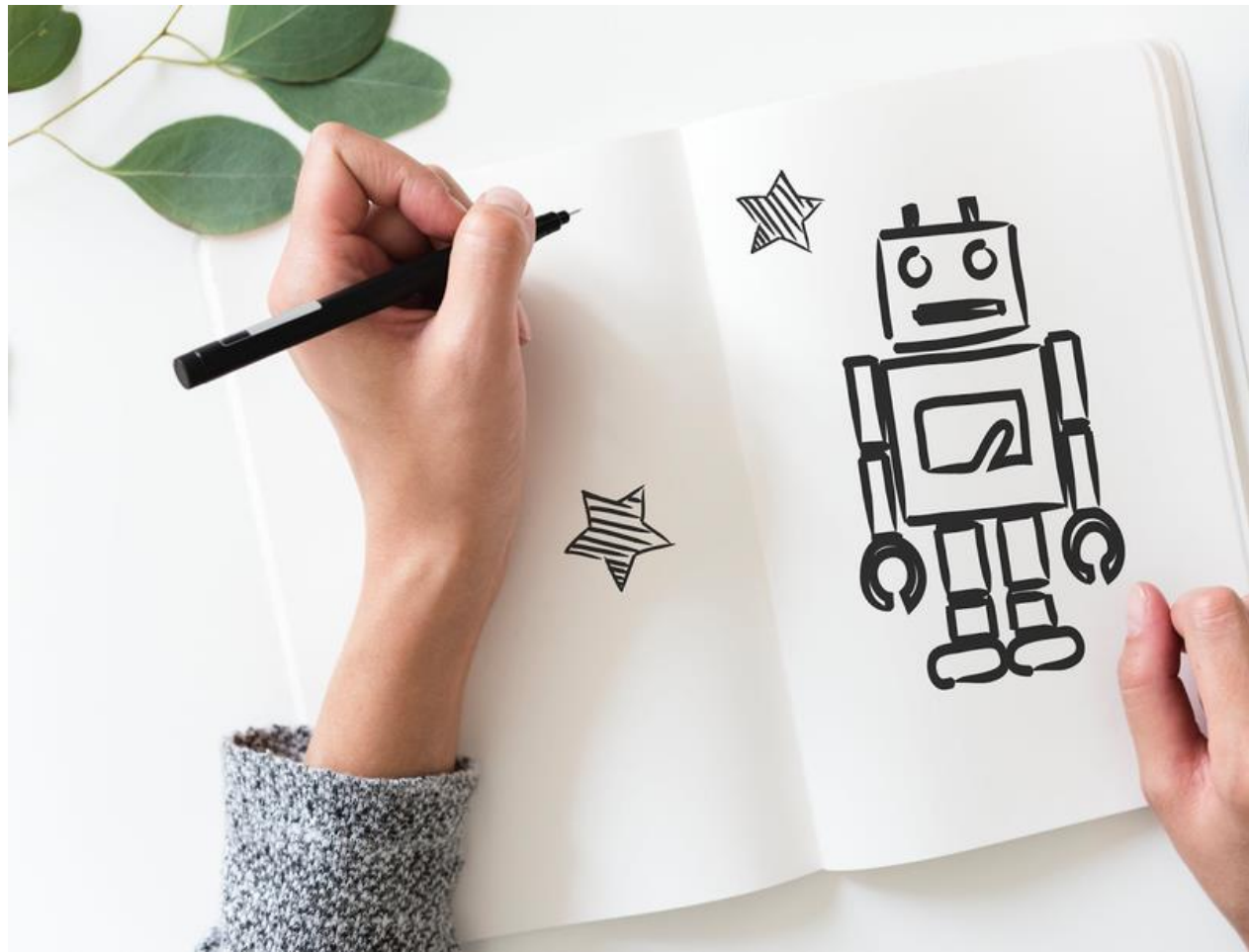
Introduction to the Course











## Scene at the Road

- Why Policemen ask for driving license?
  - Normal checking
  - Fast driving
  - Violated traffic rules

My friend bought a Macbook pro with his credit card

- Why did the bank verified the use of credit card?
  - They have a pattern of every customer normal activity
  - They wanted to be sure that the card was not stolen

## Simple Classification Problem

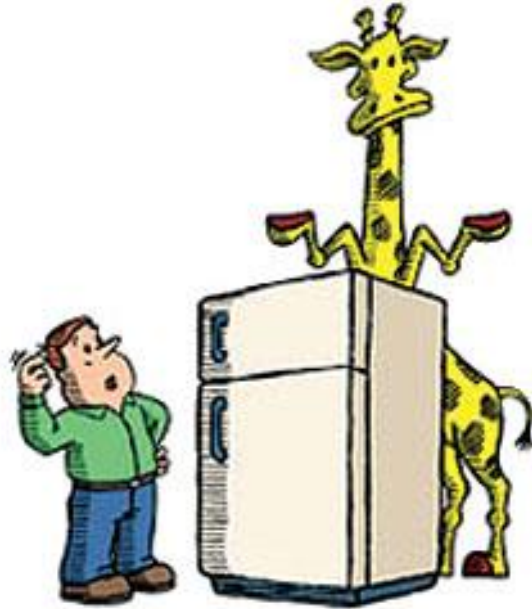
<u>No. of wheels</u>	<u>Length</u>	<u>Noise</u>	<u>No. of seats</u>	<u>What is it?</u>
4	short	quiet	4	Car
2	short	loud	2	Motorbike
6	long	loud	lots	Bus

With a few inputs, You classified the vehicle





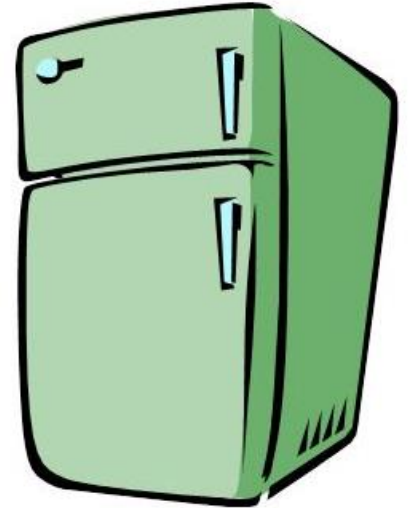
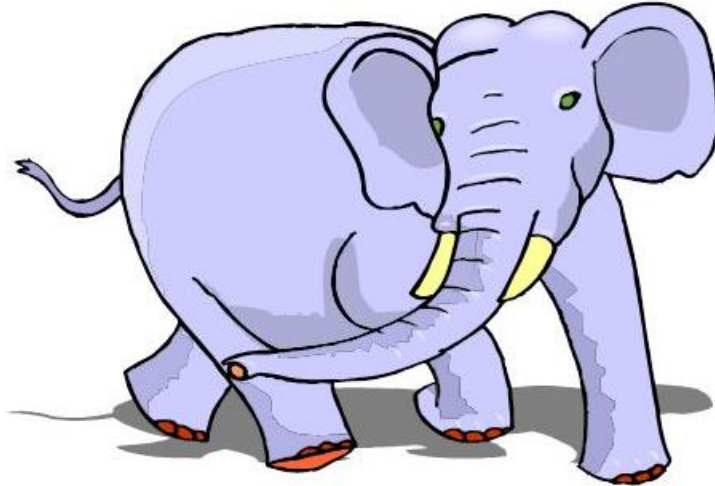
- How do you put a giraffe into a refrigerator?



- **Answer:** Open the refrigerator, put in the giraffe, and close the door.

- How do you put an elephant into a refrigerator?
  - Open the refrigerator, put in the elephant, and close the refrigerator

WRONG ANSWER



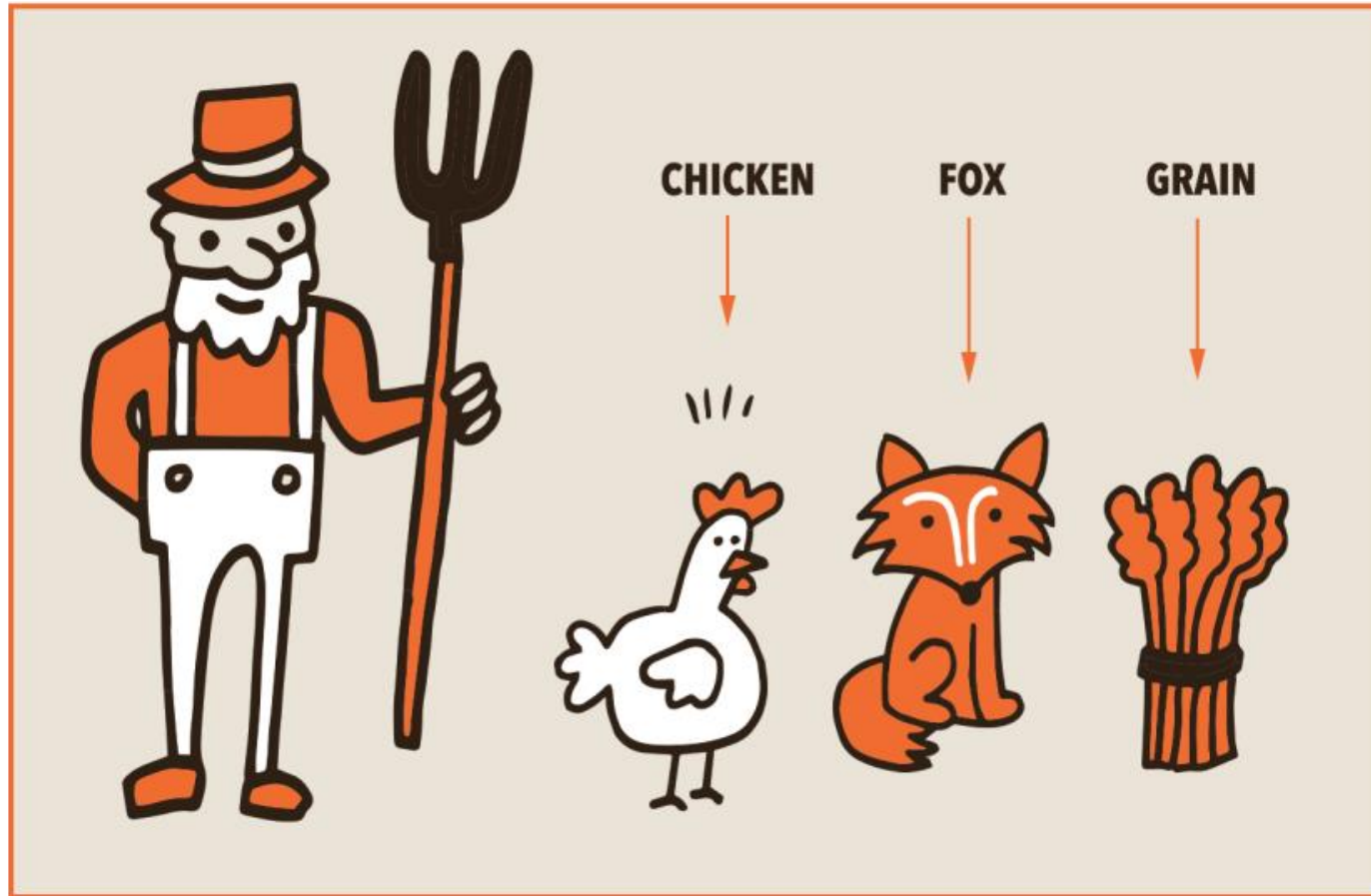
**Answer:** Open the refrigerator, take out the giraffe, put in the elephant and close the door.

- The Lion King is hosting an animal conference. All the animals attend... except one. Which animal does not attend?



- **Answer:** The elephant. The elephant is in the refrigerator.

# Farmer, Fox, Chicken, Grain



# How many countries does the equator crosses in Asia?



# What do these examples have in common?

- Learned data
- From experience
- By example
- From historical data
- Approximate
- Common sense reasoning



# Intelligent Systems

Thinking

+

Perception

+

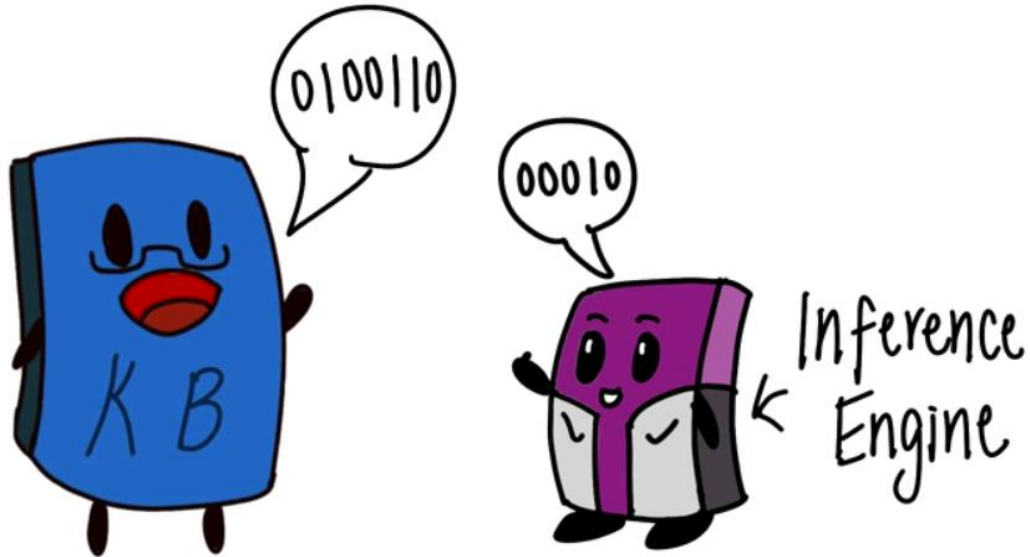
Action



# Intelligent Systems

- Refrigerator
- Aircraft cockpit
- Tic-Tac-Toe
- Your car
- Washing machine
- Robots
- Mobile phone
- Laptops

# Intelligent Techniques



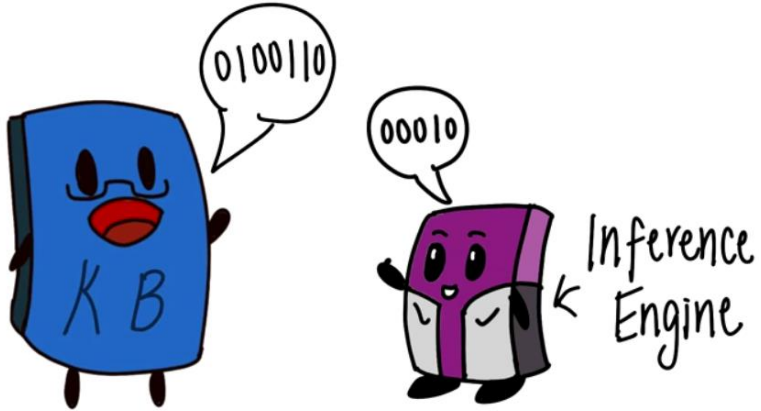
Expert systems



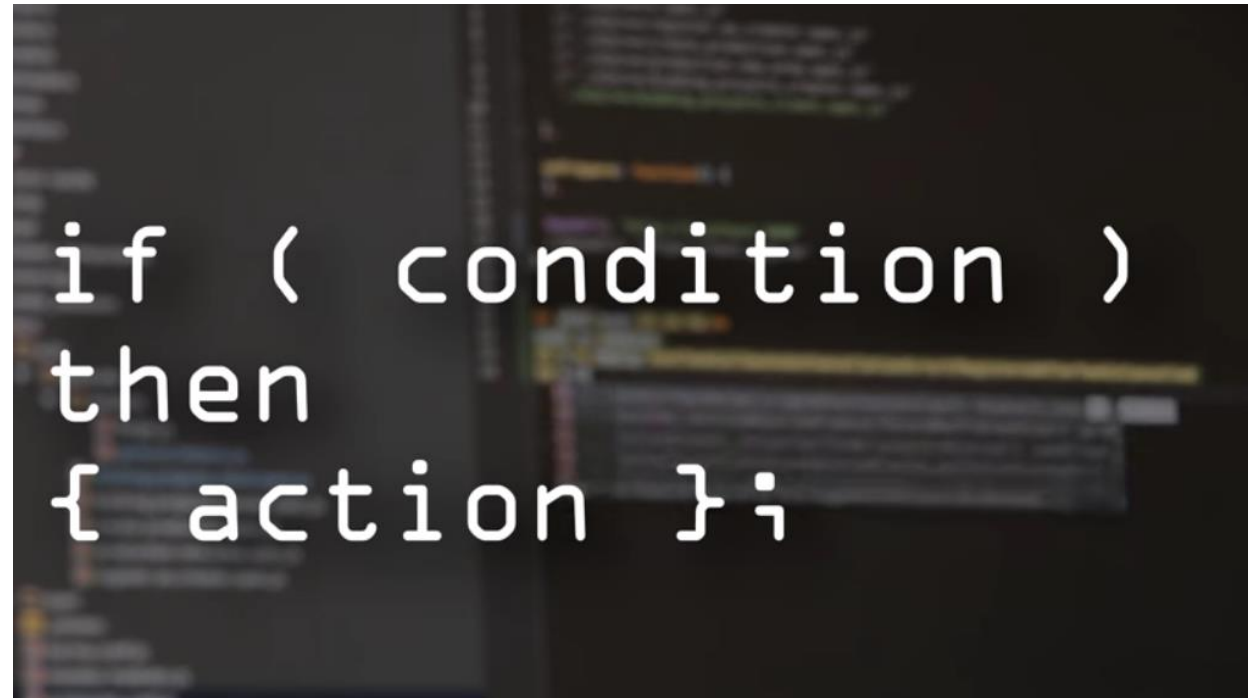
KNOWLEDGE  
BASE



# Intelligent Techniques

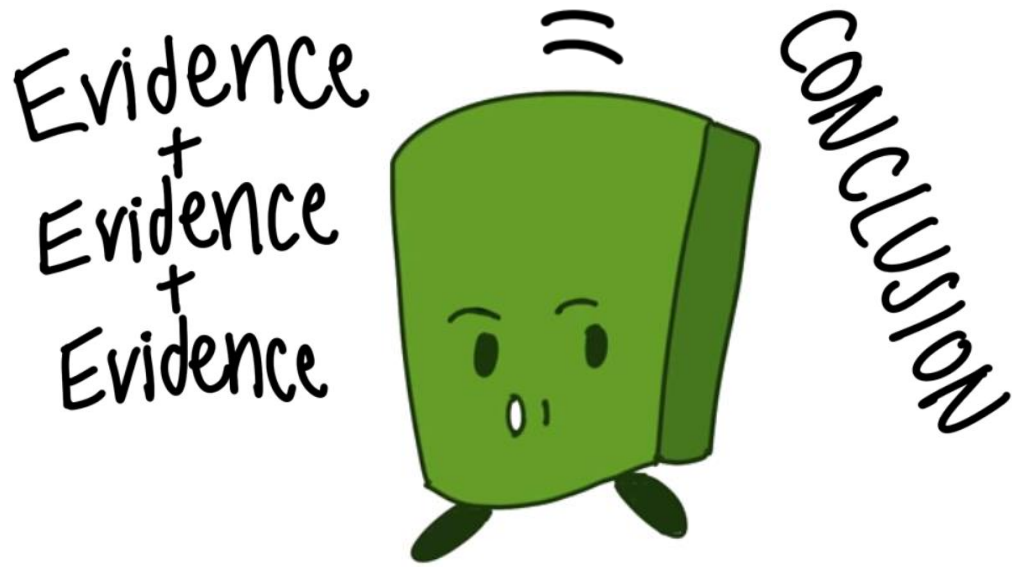


Expert systems



Rule-based systems

# Rule-based strategies

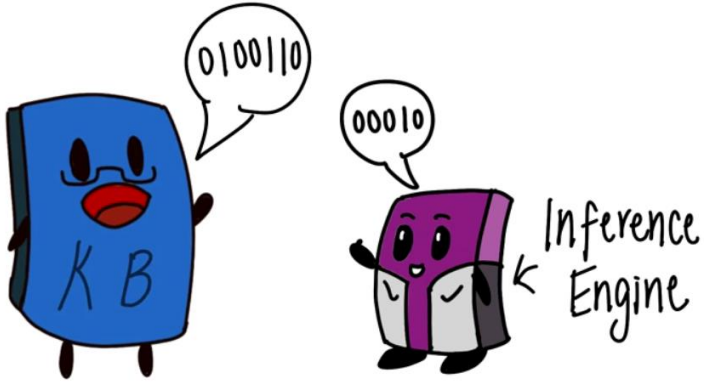


*Forward chaining*



*Backward chaining*

# Intelligent Techniques



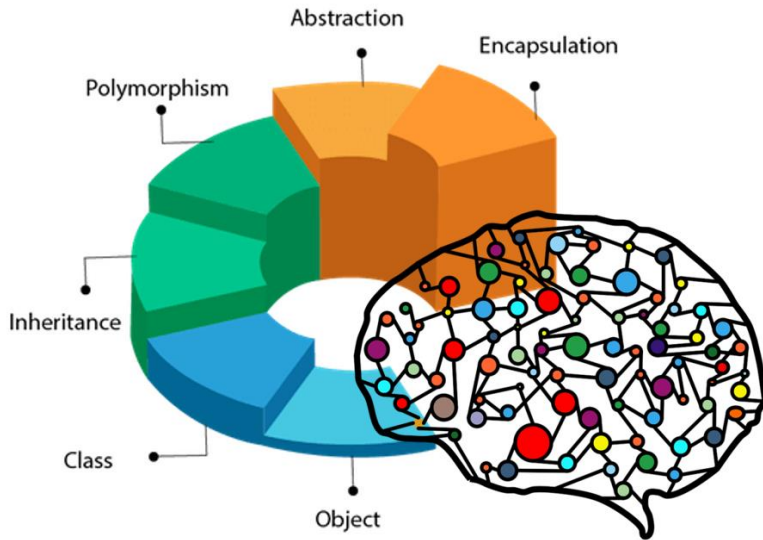
Expert systems

```
if ( condition )  
then  
{ action };
```

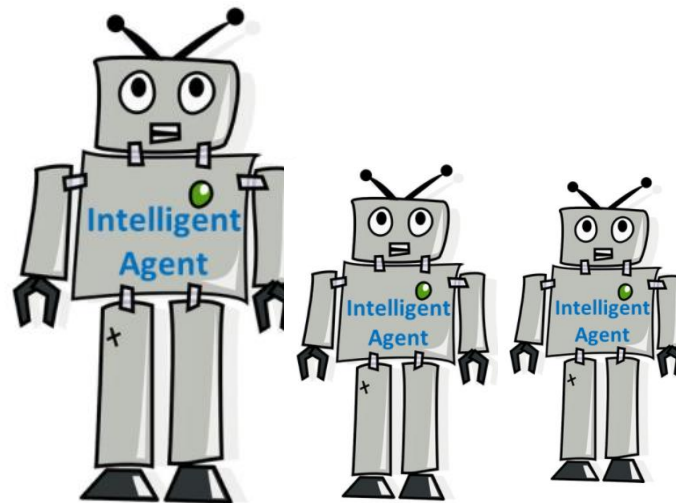
Rule-based systems



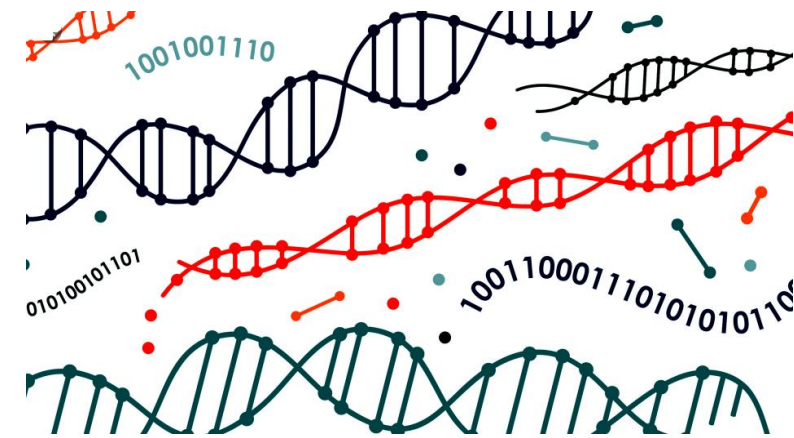
Fuzzy based systems



Object-oriented systems



Intelligent agents



Genetic Algorithms

## Course Objective

- To provide the fundamental concepts of expert systems
- To introduce algorithms for developing agent-based architectures

## What you will learn?

- Knowledge-based systems include expert and rule-based systems, object-oriented and frame-based systems, and intelligent agents
- Genetic algorithms and other optimization algorithms
- Hybrid architectures

# Syllabus

Knowledge-based systems, **Expert systems**, Knowledge acquisition, Computational intelligence, **Rule-based systems**, Forward-chaining, Conflict resolution, Backward chaining

Sources of uncertainty, Bayesian updating, Certainty theory, Possibility theory: **fuzzy sets and fuzzy logic**

Object-oriented systems, Data abstraction, Inheritance, Encapsulation, Unified Modeling Language (UML), Dynamic (or late) binding

Intelligent agents - Characteristics of an intelligent agent, **Agent architectures**, **Multiagent systems**, Symbolic learning, Learning by induction, Case-based reasoning

Hill-climbing and gradient descent algorithms, Simulated annealing, Genetic algorithms

Systems for interpretation and diagnosis, Systems for design and selection, Systems for control, **Hybrid intelligent systems**, application based case studies

## **References:**

1. Adrian A. Hopgood, “Intelligent systems for engineers and scientists”, Second Edition, CRC press, 2001.

## **Course Objective:**

- To provide the fundamental concepts of expert systems
- To introduce algorithms for developing agent-based architectures

## **Course Outcomes**

- CO1: Understand the characteristics of knowledge base systems
- CO2: Apply the object-oriented concepts in intelligent systems
- CO3: Identify the characteristics and architectures of multi agent systems
- CO4: Implement different algorithms for multi-agent systems



# Evaluation Pattern

<b>Component</b>	<b>Assessment</b>	<b>% Weightage</b>
Internal	Periodical 1 & 2	30%
	Quiz / Assignment	10%
	Term paper	10%
External	End Semester	50%
	Viva-Voce	
<b>Total marks</b>		<b>100</b>

Thank you