ADITYA ENGINEERING COLLEGE (A)

Course : ARTIFICIAL INTELLIGENCE

UNIT-1

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Learning Outcomes

At the end of this unit, Student will be able to:

LO1: Introduction and brief history of AI, intelligence systems, foundations of AI and applications of AI

INTRODUCTION TO AI

Form of Human Intelligence:

- *learning new concepts,*
- *understanding natural language and visual scene,*
- *performing types of feats, and*
- *reasoning & draw useful conclusion.*

What is Artificial Intelligence?

- A program that
  - Acts like human (Turing test)
  - Thinks like human (human-like patterns of thinking steps)
  - Acts or thinks rationally (logically, correctly)

  - It is a branch of computer science by which we can create intelligent machines which can behave like a human, think like humans, and able to make decisions.

Russell and Norvig: the study of [rational] agents that exist in an environment and perceive and act.

Rich and Knight: the study of how to make computers do things which, at the moment, people do better.

Difference Between Human Brain and Computer

- Living Device Vs Non-Living Device
- Self willed & Creative Vs Dependent & Must be programmed
- Has continuous nature Vs Discrete in nature
- Limited memory size Vs Un-limited memory size
- Basic unit is Neuron Vs basic Unit is RAM
- Storage devices are electro-chemical Vs electronics & magnetic
- Speed of transmission 50-100 ms Vs movement of electron is appx speed of light
- Has inductive & detective Vs no reasoning power
- Has emotion Vs no-emotion
  Has capacity to learn Vs Must be programmed for all
- Power consumption is appx 10W Vs 500W
- Logic adopted is Fuzzy Logic Vs Binary Logic

Knowledge

- Knowledge plays the important role in building intelligence real world system.
- Knowledge needs familiarity with language, concepts, procedures, rules, ideas, abstractions, places, customs, facts and association.
- Knowledge also needs above familiarity coupled with an ability to use these notations effectively in modeling different aspects of the world.
- It means, it is set of data and information and also ability to use of data and information.

Knowledge may be Procedural or Declarative.

- Procedural Knowledge is compiled knowledge related to the performance of some task.

  For example: make result of student.

- Declarative Knowledge is passive knowledge expressed as statement of facts about the world.

  For example: Personal data in a database is declarative knowledge.

Heuristic Knowledge

- It is used by humans to solve complex problems.
- They are the knowledge used to make good judgments or the strategies, tricks or rules of thumb used to simplify the solution of problems.
- Heuristic are usually acquired with much experience.
- *For Exp*

  Find fault in software or in hardware.

History of AI

- The birth of AI (1943 – 1956)
  - Pitts and McCulloch (1943): simplified mathematical model of neurons (resting/firing states) can realize all propositional logic primitives (can compute all Turing computable functions)
  - Allen Turing: Turing machine and Turing test (1950)
  - Claude Shannon: information theory; chess playing computers
- Early enthusiasm (1952 – 1969)
  - 1956 Dartmouth conference John McCarthy (Lisp);
    Marvin Minsky (first neural network machine); Alan Newell and Herbert Simon (GPS);
  - Emphasize on intelligent general problem solving GSP (means-ends analysis);
    Lisp (AI programming language);
    Resolution by John Robinson (basis for automatic theorem proving);
    Heuristic search (A*, AO*, game tree search)
    Knowledge representation (KR) paradigms (1966 – 1974)

History of AI …

- 1950 Alan Turing developed a machine "Turing Machine" to exhibit human behaviour.
- 1955 Allen Nowell & H A Simon created first AI program "Logic Theorist" to prove mathematics theorems.
- Knowledge-based systems (1969 – 1999)
  - DENDRAL: the first knowledge intensive system (determining 3D structures of complex chemical compounds).
  - MYCIN: first rule-based expert system diagnosing blood infectious diseases).
  - PROSPECTOR: Knowledge-based system (geological ES for mineral deposits).
- AI became an industry (1980 – 1989)
  - wide applications in various domains, commercially available tools
- Current trends (1990 – present: Intelligence Agents)
  - 1997 IBM's Deep Blue – Chess playing computer
  - 2002 Roomba – Vacuum Cleaner
  - 2017 Google's Alpha Go program – super computer for board game
  - Distributed AI and intelligent software agents
  - Nowadays companies like Google, Facebook, IBM, and Amazon are working with AI and creating amazing devices.

INTELLIGENT SYSTEMS

What are intelligent systems?

- Intelligent systems are **technologically advanced machines that perceive and respond to the world around them**. Intelligent systems can take many forms, from automated vacuums such as the Roomba to facial recognition programs to Amazon's personalized shopping suggestions.

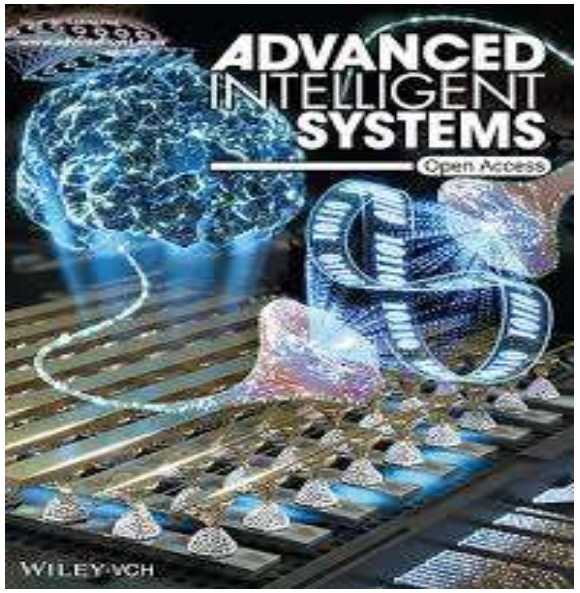
- One way that such systems can perceive their environment is through vision. The study of how computers can understand and interpret visual information from static images and video sequences emerged in the late 1950s and early 1960s.
- It has since grown into a powerful technology that is central to the country's industrial, commercial, and government sectors.

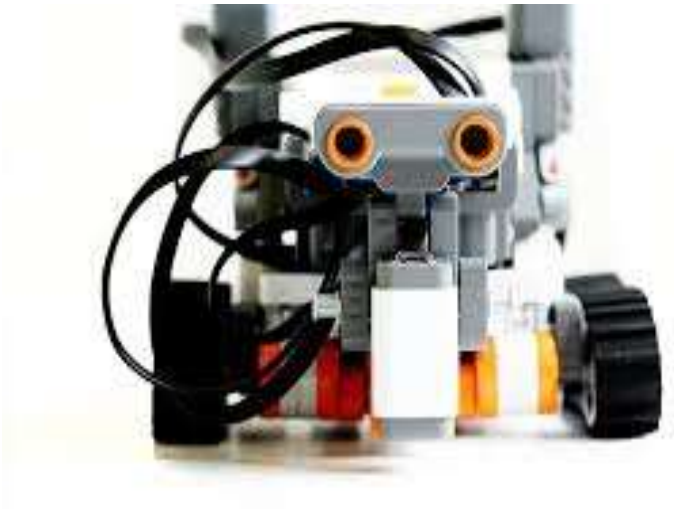
INTELLIGENT SYSTEMS…

- The field of intelligent systems also focuses on how these systems interact with human users in changing and dynamic physical and social environments.
- Early robots possessed little autonomy in making decisions: they assumed a predictable world and perfumed the same action(s) repeatedly under the same conditions.
- Today, a robot is considered to be an autonomous system that can sense the environment and can act in a physical world in order to achieve some goals.

Applications of intelligent systems

- Factory automation
- Field and service robotics
- Assistive robotics
- Military applications
- Medical care
- Education
- Entertainment
- Visual inspection
- Character recognition
- Human identification using various biometric modalities (e.g. face, fingerprint, iris, hand)
- Visual surveillance
- Intelligent transportation





FOUNDATIONS OF AI

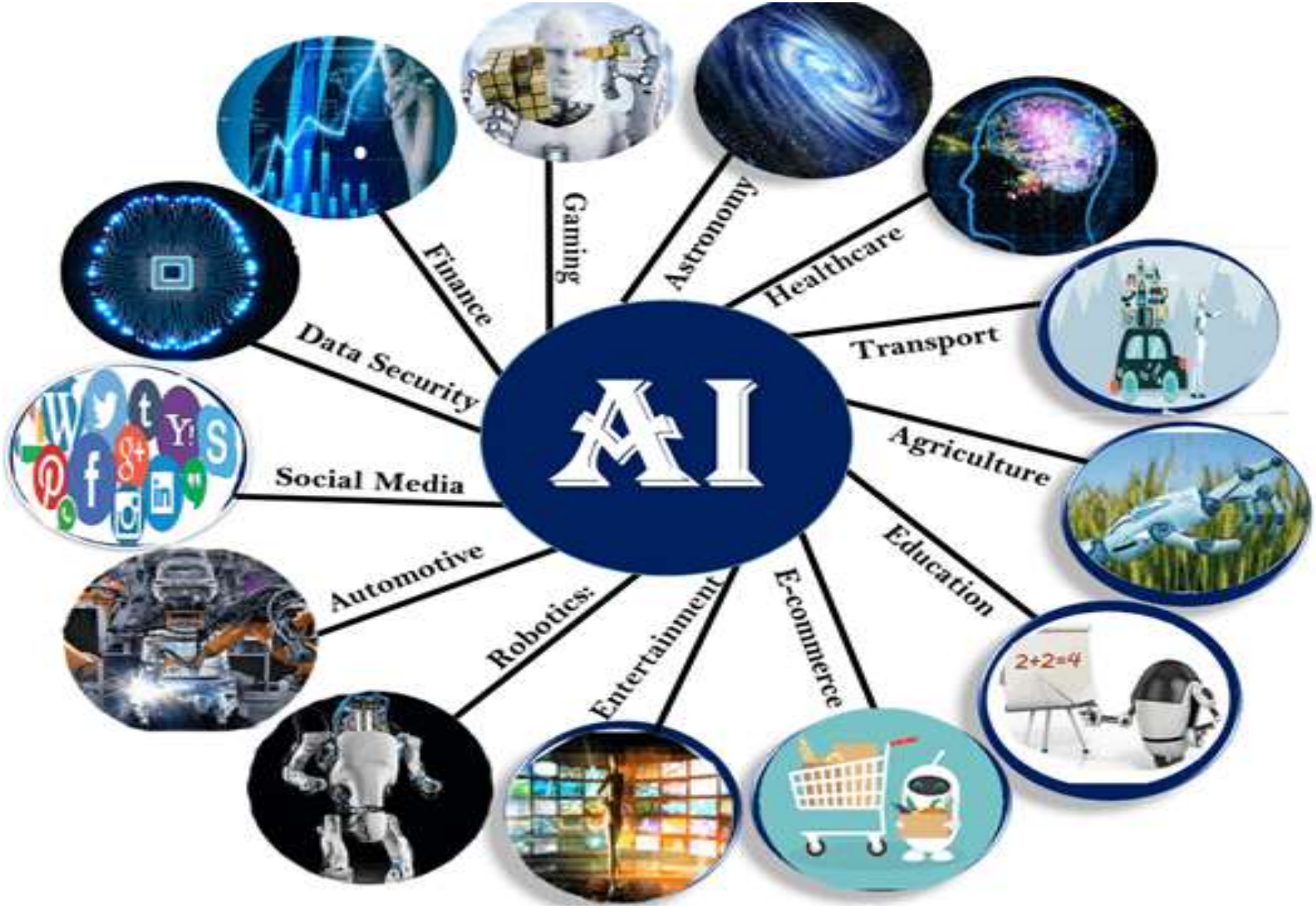
The Foundation of Artificial Intelligence
Academic Disciplines of AI

• Philosophy	Logic, methods of reasoning, mind as physical system, foundations of learning, language, rationality.
• Mathematics	Formal representation and proof, algorithms, computation, (un)decidability, (in)tractability
• Probability/Statistics	modeling uncertainty, learning from data
• Economics	utility, decision theory, rational economic agents
• Neuroscience	neurons as information processing units.
• Psychology/	how do people behave, perceive, process cognitive
• Cognitive Science	information, represent knowledge.
• Computer engineering	building fast computers
• Control theory	design systems that maximize an objective function over time
• Linguistics	knowledge representation, grammars

FOUNDATIONS OF AI

- **Philosophy** e.g., foundational issues (can a machine think?), issues of knowledge and believe, mutual knowledge.
- **Psychology and Cognitive Science** e.g., problem solving skills.
- **Neuro-Science** e.g., brain architecture.
- **Computer Science and Engineering** e.g., complexity theory, algorithms, logic and inference, programming languages, and system building.
- **Mathematics and Physics** e.g., Theorem proving, statistical modelling, continuous mathematics, Data driven discovery in physics.
- **Statistical Physics, and Complex Systems**.

APPLICATIONS OF AI



APPLICATIONS OF AI

1. AI in Astronomy

•Artificial Intelligence can be very useful to solve complex universe problems. AI technology can be helpful for understanding the universe such as how it works, origin, etc.

2. AI in Healthcare

•Healthcare Industries are applying AI to make a better and faster diagnosis than humans. AI can help doctors with diagnoses and can inform when patients are worsening so that medical help can reach to the patient before hospitalization.

3. AI in Gaming

•AI can be used for gaming purpose. The AI machines can play strategic games like chess, where the machine needs to think of a large number of possible places.

APPLICATIONS OF AI…

4. AI in Finance

•The finance industry is implementing automation, chatbot, adaptive intelligence, algorithm trading, and machine learning into financial processes.

5. AI in Data Security

•The security of data is crucial for every company and cyber-attacks are growing very rapidly in the digital world. AI can be used to make your data more safe and secure.

6. AI in Social Media

•Social Media sites such as Facebook, Twitter, and Snapchat contain billions of user profiles, which need to be stored and managed in a very efficient way. AI can organize and manage massive amounts of data.

7. AI in Travel & Transport

•AI is becoming highly demanding for travel industries. AI is capable of doing various travel related works such as from making travel arrangement to suggesting the hotels, flights, and best routes to the customers.

8. AI in Automotive Industry

•Some Automotive industries are using AI to provide virtual assistant to their user for better performance. Such as Tesla has introduced TeslaBot, an intelligent virtual assistant.

APPLICATIONS OF AI…

9. AI in Robotics:

•Artificial Intelligence has a remarkable role in Robotics. We can create intelligent robots which can perform tasks with their own experiences without pre-programmed.

•Humanoid Robots are best examples for AI in robotics, which can talk and behave like humans.

10. AI in Entertainment

•We are currently using some AI based applications in our daily life with some entertainment services such as Netflix or Amazon.

11. AI in Agriculture

•Now a day's agriculture is becoming digital, and AI is emerging in this field. Agriculture is applying AI as agriculture robotics, solid and crop monitoring, predictive analysis.

12. AI in E-commerce

•AI is providing a competitive edge to the e-commerce industry, and it is becoming more demanding in the e-commerce business. AI is helping shoppers to discover associated products with recommended size, color, or even brand.

13. AI in education:

•AI can automate grading so that the tutor can have more time to teach. AI chatbot can communicate with students as a teaching assistant.

Summary

Conclude Learning Outcomes:

At the end of this lecture, Students have learnt:

LO1: Introduction and brief history of AI, intelligence systems, foundations of AI and applications of AI