UNIVERSITY INSTITUTE OF ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGG.

Bachelor of Engineering (Computer Science & Engineering)

Principles of Artificial Intelligence (20CST-258)

Introduction and Overview to AI

DISCOVER . **LEARN** . EMPOWER

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INTRODUCTION

Course Outcome

CO Number	Title	Level
CO1	Artificial Intelligence History	Remember
CO1	Main Approaches To AI	Understand
CO1	Applications of AI	Understand

Outlines

- Introduction to Artificial Intelligence

- Evaluation of AI

- Approaches to AI

- Examples of Intelligent behavior

- Applications of AI

Artificial Intelligence

- According to the father of Artificial Intelligence, John McCarthy, it is *"The science and engineering of making intelligent machines, especially intelligent computer programs"*.

- Artificial Intelligence is a way of *making a computer, a computer-controlled robot, or a software think intelligently*, in the similar manner the intelligent humans think.

- The term "artificial intelligence" is used to describe machines that mimic "cognitive" functions that humans associate with other human minds, such as "learning" and "problem solving".

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Philosophy of AI

- While exploiting the power of the computer systems, the curiosity of human, lead him to wonder, *"Can a machine think and behave like humans do?"*

- The development of AI started with the intention of creating similar intelligence in machines that we find and regard high in humans.

Goals of AI

- **To Create Expert Systems** − The systems which exhibit intelligent behavior, learn, demonstrate, explain, and advice its users.

- **To Implement Human Intelligence in Machines** − Creating systems that understand, think, learn, and behave like humans.

Real Artificial Intelligence

- **General-purpose AI** like the robots of science fiction is incredibly hard
  - Human brain appears to have lots of special and general functions, integrated in some amazing way that we really do not understand at all (yet).

- **Special-purpose AI** is more doable (non-trivial)
  - E.g., chess/poker playing programs, logistics planning, automated translation, voice recognition, web search, data mining, medical diagnosis, keeping a car on the road.

Evaluation of AI
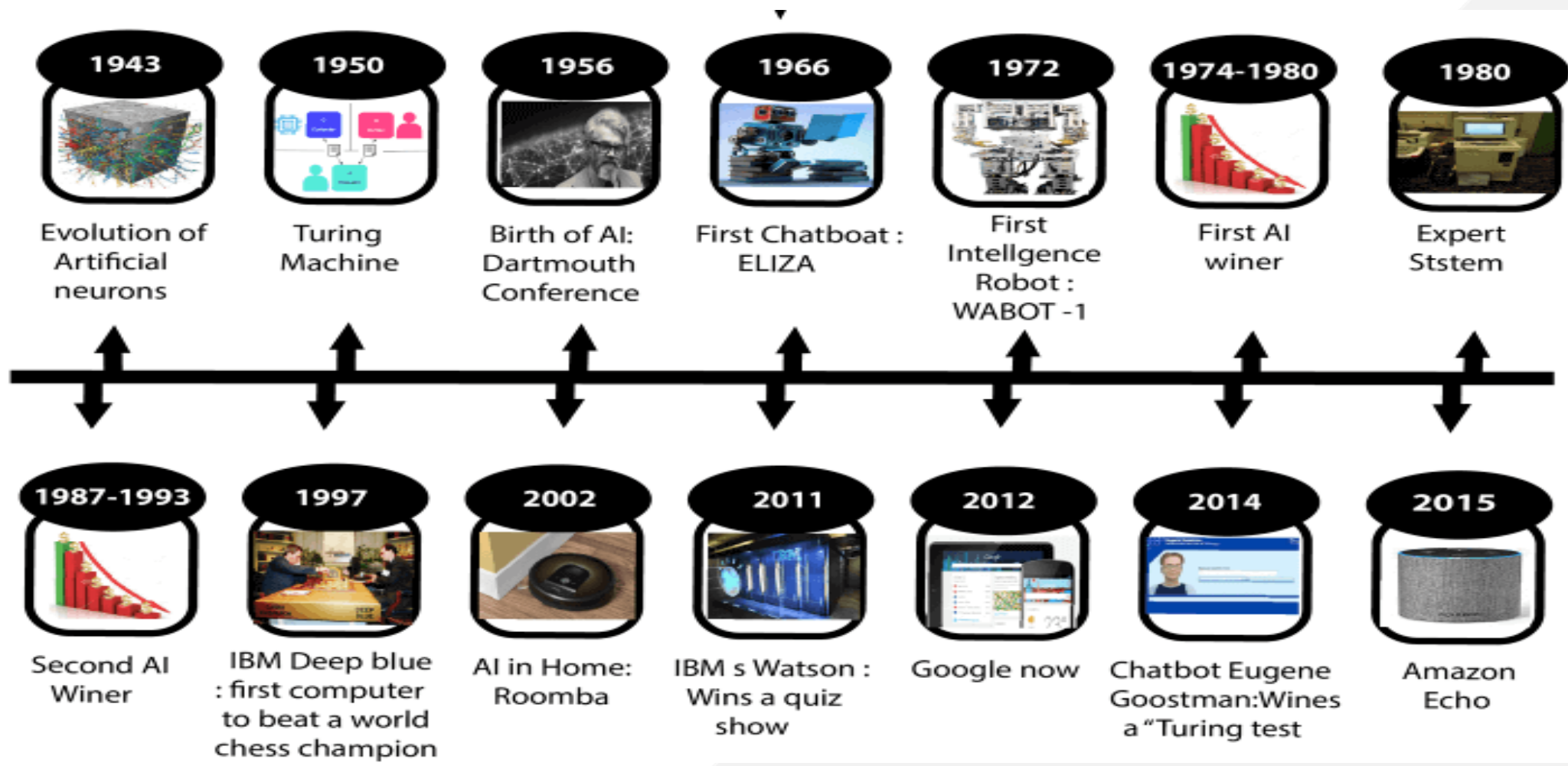
Four main approaches to AI

Systems that think like humans	Systems that think rationally
Systems that act like humans	Systems that act rationally

Approach #1: Thinking Humanly

- AI is: "The exciting new effort to make computers think , *machines with minds*, in the full and literal sense." (Haugeland, 1985)

- AI is: "The automation of activities that we associate with human thinking, activities such as decision-making, problem solving, learning." (Bellman, 1978)

- Goal is to build systems that function *internally* in some way similar to human mind.

Cognitive Intelligence: Workings of the human mind

- Traditional computer game players typically work much differently than human players
  - Massive look-ahead, minimal "experience"
- People think differently in experience, "big picture", etc.
- *Cognitive science* tries to model human mind based on experimentation
- Cognitive modeling approach tries to act intelligently while actually internally doing something similar to human mind

Approach #2: Acting Humanly

- "The art of creating machines that perform functions that require intelligence when performed by people." (Kurzweil,1990)

- "The study of how to make computers do things at which, at the moment, people are better." (Rich and Knight, 1991)

- Ultimately to be tested by the Turing Test.
    - to provide a satisfactory operational definition of intelligence

Intelligent capabilities

- The computer would need to possess the following capabilities:
    - Natural language processing: to enable it to communicate successfully in English.
    - Knowledge representation: to store what it knows or hears.
    - Automated reasoning: to use the stored information to answer questions and to draw new conclusions.
    - Machine learning: to adapt to new circumstances and to detect and extrapolate patterns.
- Intelligence takes many forms, which are not necessarily best tested this way.

Approach #3: Thinking rationally: The "laws of thought" approach

- AI is: "The study of mental faculties through the use of computational models." (Chamiak and McDermott, 1985).

- "The study of the computations that make it possible to perceive, reason, and act." (Winston, 1992).

- Approach firmly grounded in logic.

Approach #4: Acting rationally

- AI is: "Computational Intelligence is the study of the design of intelligent agents." (Poole *et al.*, 1998)

    - Agents: something that acts i.e. perform some action.
    - Rational agent is one that acts so as to achieve the best outcome or, when there is uncertainty, the best expected outcome.

- "AI is concerned with intelligent behavior in artifacts." (Nilsson, 1998)

Acting rationally

- In solving actual problems, it's what really matters.

- Behavior is more scientifically testable than thought.

- More general: rather than imitating humans trying to solve hard problems, just try to solve hard problems.

Recap on the difference in approaches

- Thought vs. behavior
- Human vs. rational

Advantages of Artificial Intelligence

- High Accuracy with less errors
- High-Speed
- High reliability
- Useful for risky areas
- Digital Assistant
- Useful as a public utility

Disadvantages of Artificial Intelligence

- High Cost
- Can't think out of the box
- No feelings and emotions
- Increase dependency on machines
- No Original Creativity

PROJECT IDEAS

- Autonomous Vehicles

- Robotics

- Natural language processing (Google lens, Alexa etc.)

- Building Quake-bots etc.

- To do: Make a list of AI based products/ applications which you use on daily basis.

FAQ

1. Which is not the commonly used programming language for AI?
   a) PROLOG
   b) Java
   c) LISP
   d) Perl
   e) Java script

2. What are the four different kinds of agent programs?

3. Define the terms goal formulation and problem formulation.

REFERENCES

1. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 2nd Edition, Pearson Prentice Hall, 2002.

2. Rich & Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2017.

3. George F. Luger, "Artificial Intelligence: Structures and Strategies for Complex Problem Solving", 5th Edition, Addison Wesley, 2008.

4. Dan W Patterson, "Introduction to Artificial Intelligence and Expert Systems", 1st Edition, Pearson Education India, 2015.

Assessment Pattern

- Internal Marks (MSTs, Quiz, Assignment, Surprise Test, Class Performance and Attendance):- 40 Marks

- External Marks:- 60 Marks

THANK YOU