
CSE 412: Artificial Intelligence

Lecture 1: Introduction

Department of CSE


Daffodil International University

Topic Contents



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What Is AI?


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- A thick blue arrow pointing to the right, positioned below the title 'What Is AI?'.
- ❑ **AI (Artificial Intelligence)** is a branch of computer science concerned with the study and creation of computer systems that exhibit some form of intelligence:
 - systems that learn new concepts and tasks,
 - systems that can reason and draw useful conclusions about the world around us,
 - systems that can understand a natural language or perceive and comprehend a visual scene, and
 - systems that perform other types of feats that require human types of intelligence.

What Is AI?...

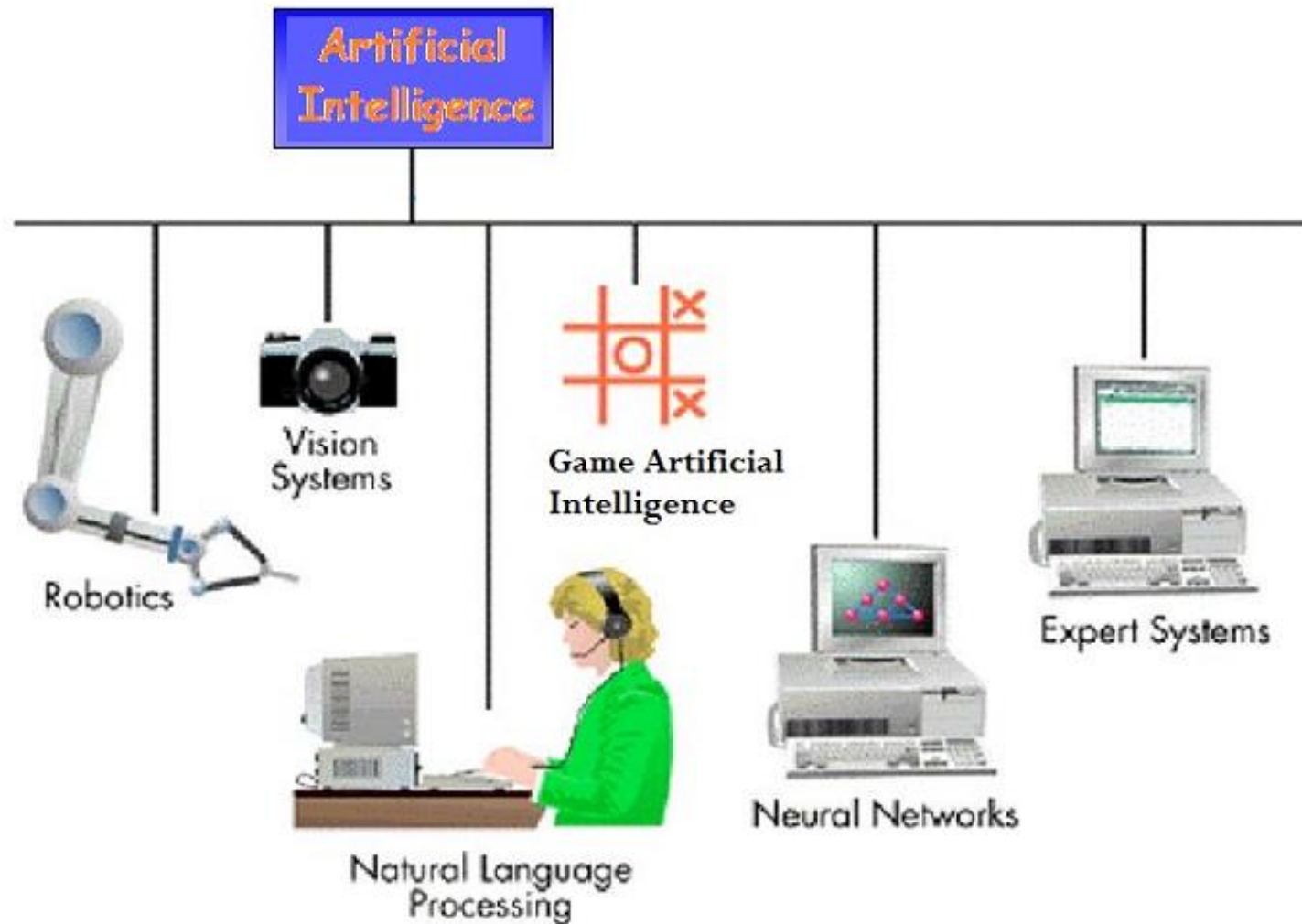
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|--------------------------------|-------------------------------|
| Systems that think like humans | Systems that think rationally |
| Systems that act like humans | Systems that act rationally |

Major Branches of AI

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- A thick blue arrow pointing to the right, spanning the width of the slide, is positioned above the list of AI branches.
- ☐ Artificial Neural Networks
 - ☐ Computer Vision
 - ☐ Expert Systems
 - ☐ Fuzzy Systems
 - ☐ Game Artificial Intelligence
 - ☐ Heuristic Search
 - ☐ Knowledge Management
 - ☐ Machine Learning
 - ☐ Metaheuristic and swarm intelligence
 - ☐ Natural Language Processing
 - ☐ Pattern Recognition
 - ☐ Robotics
 - ☐ Virtual Intelligence
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Major Branches of AI...



The Foundations of AI

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- ❑ A brief history of the disciplines that contributed ideas, viewpoints, and techniques to AI is provided here.
- ❑ The history is organized around a series of questions.
- ❑ It is not wished to give the impression that these questions are the only ones the disciplines address or that the disciplines have all been working toward AI as their ultimate fruition.

The Foundations of AI...

❑ Philosophy (428 B.C. – present)

- Can formal rules be used to draw valid conclusions?
- How does mental mind arise from a physical brain?
- Where does knowledge come from?
- How does knowledge lead to action?

❑ Mathematics (800 B.C. – present)

- How are the formal rules to draw valid conclusions?
- What can be computed?
- How do we reason with uncertain information?
 - Algorithms
 - Intractability
 - NP-completeness
 - probability

The Foundations of AI...


❑ Neuroscience (1861 – present)

- How do brain process information?
 - Neurons

❑ Economics (1776 – present)

- How do we make decisions so as to maximize payoff?
- How should we do this when others may not go along?
- How should we do this when the payoff may be far in the future?
 - Decision theory (probability theory + utility theory)

The Foundations of AI...


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- A thick blue arrow pointing to the right, spanning the width of the slide, is positioned above the list of foundations.
- ❑ **Computer Engineering (1940 – present)**
 - How can we build an efficient computer?
 - ❑ **Cybernetics (1948 – present)**
 - How can artifacts operate under their own control?
 - ❑ **Psychology (1879 – present)**
 - How do human and animals think and act?
 - ❑ **Linguistics (1957 – present)**
 - How do languages relate to thought?
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The Foundations of AI...

❑ What is Cybernetics?

- The term *cybernetics* was coined by **Norbert Wiener**, an American mathematician of the twentieth century.
- The scientific study of communication and control processes in biological, mechanical, and electronic systems.
- The study of human control functions and of **mechanical** and **electronic** systems designed to replace them, involving the application of statistical mechanics to communication engineering.


The Foundations of AI...

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- A thick blue arrow pointing to the right, spanning the width of the slide, is positioned above the list of questions.
- ❑ Are AI and Cybernetics the same subject?
 - ❑ **No.**
 - ❑ **AI** and **Cybernetics** are widely misunderstood to be the same subject.
 - ❑ However, they differ in many dimensions.


The History of AI

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- ❑ The gestation of AI (1943 – 1955)
 - ❑ The birth of AI (1956)
 - ❑ Early enthusiasm, great expectations (1952 – 1969)
 - ❑ A dose of reality (1966 – 1973)
 - Genetic algorithm
 - ❑ Knowledge base systems (1969 – 1979)
 - ❑ AI becomes an industry (1980 – present)
 - ❑ The return of neural network (1986 – present)
 - ❑ AI becomes a science (1987 – present)


The State of the Art

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- ☐ Autonomous planning and scheduling
 - ☐ Game playing
 - ☐ Autonomous control
 - ☐ Medical diagnosis
 - ☐ Logistic planning
 - ☐ Robotics
 - ☐ Language understanding and problem solving
 - ☐ etc.


Philosophical Foundations

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- A thick blue arrow pointing to the right, positioned above the main text.
- ❑ **Philosophers have been around far longer than computers and have been trying to resolve some questions that relate to AI:**
 - **How do minds work?**
 - **Is it possible for machines to act intelligently in the way that people do, and if they did, would they have real, conscious minds?**
 - **What are the ethical implications of intelligent machines?**
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Philosophical Foundations...

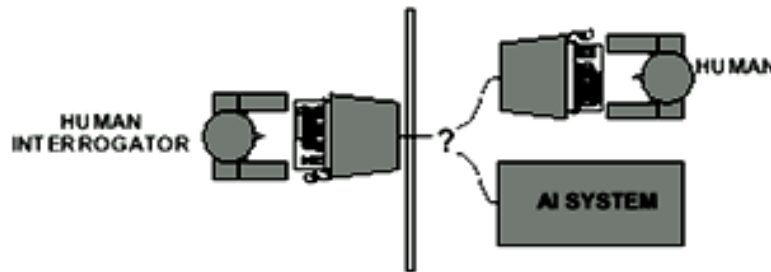
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- A thick blue arrow pointing to the right, spanning the width of the slide, is positioned above the list items.
- ❑ The assertion that machines could act as if they were intelligent is called the *weak AI* hypothesis by philosophers.
 - ❑ The assertion that machines that do so are actually thinking (not just simulating thinking) is called the *strong AI* hypothesis.

Philosophical Foundations...

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- A thick blue arrow pointing to the right, spanning the width of the slide, is positioned above the list items.
- ❑ Philosophers are interested in the problem of comparing two architectures—human and machine.
 - ❑ Furthermore, they have traditionally posed the question not in terms of maximizing expected utility but rather as, "**Can machines think?**"

Philosophical Foundations...

- ❑ **Alan Turing** suggested that instead of asking whether machines can think, we should ask whether machines can pass a behavioral intelligence test, which has come to be called the *Turing Test*.



- The test is for a program to have a conversation (**via online typed messages**) with an interrogator for five minutes. The interrogator then has to guess if the conversation is with a program or a person; the program passes the test if it fools the interrogator 30% of the time.

Philosophical Foundations...

- ❑ Turing conjectured that, by the year 2000, a computer with a storage of 10^9 units could be programmed well enough to pass the test.
- ❑ He was wrong — programs have yet to fool a sophisticated judge.
- ❑ On the other hand, many people have been fooled when they didn't know they might be chatting with a computer.
 - The **ELIZA** program
 - The Internet chatbots such as **MGONZ** and **NATACHATA**
 - The chatbot **CYBERLOVER**

Philosophical Foundations: A Big Controversy



- ❑ **Eugene Goostman** is a chatterbot developed in Saint Petersburg in 2001 by a group of three programmers; the Russian-born Vladimir Veselov, Ukrainian-born Eugene Demchenko, and Russian-born Sergey Ulasen.
- ❑ The Goostman bot has competed in a number of Turing test contests since its creation, and finished second in the 2005 and 2008 Loebner Prize contest.

Philosophical Foundations: A Big Controversy

- ❑ In June 2012, at an event marking what would have been the 100th birthday of the test's namesake, Alan Turing, Goostman won a competition promoted as the largest-ever Turing test contest, in which it successfully convinced 29% of its judges that it was human.
- ❑ On **7 June 2014**, at a contest marking the 60th anniversary of Turing's death, 33% of the event's judges thought that Goostman was human; the event's organiser Kevin Warwick considered it to have passed Turing's test.




Philosophical Foundations: A Big Controversy

- ❑ The validity and relevance of the announcement of Goostman's pass was questioned by critics.
- ❑ Although there had been several claims that the Turing test is not the best way to test a computer's intelligence, Turing test remains the most popular one.

Philosophical Foundations: Some Facts about Turing Test

- ❑ The field of AI as a whole has paid little attention to Turing test.
- ❑ Few AI researchers pay attention to the Turing test, preferring to concentrate on their systems' performance on practical tasks, rather than the ability to imitate humans.
- ❑ Arguments for and against strong AI are inconclusive.
- ❑ Few mainstream AI researchers believe that anything significant hinges on the outcome of the debate.

Logic Programming Language

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- ❑ Logic programming is a type of programming languages, in which a program is written as a set of sentences in logical form, expressing facts and rules about some problem domain.
 - ❑ A program is executed by an inference engine that answers a query by searching these sentences systematically to make inferences that will answer a query.
 - ❑ Major logic programming language families include Prolog, Answer set programming (ASP) and Datalog.

Introduction to Prolog

- ❑ Prolog: **P**rogramming in **L**ogic
- ❑ Prolog is a logic programming language.
- ❑ Programming in Prolog is accomplished by creating a data base of facts and rules about objects, their properties, and their relationships to other objects.
- ❑ Queries can be posed about the objects and valid conclusions will be determined through a form of inferencing control known as resolution.
- ❑ Facts: `sister(sarah, bill).`
`parent(ann, sam).`
`parent(joe, ann).`
`male(joe).`
`female(ann).`

Introduction to Prolog...

□ Rules:

- `grandfather(X, Z) :- parent(X, Y), parent(Y, Z), male(X).`
- For all X, Y, and Z:

X is the grandfather of Z

If X is the parent of Y, and Y is the parent of Z and X is a male.



Thank you
