

Prayer

CLASSROOM RULES

- **Maintain Order:** Observe silence and decorum.
- **Respect Others:** Treat classmates and teachers with courtesy.
- **Keep Cleanliness:** Preserve a tidy and hygienic classroom environment.
- **Be Punctual:** Arrive on time for class.
- **Attend Regularly:** Maintain good attendance.



CS ELEC 3

Artificial Intelligence

FIRST SEMESTER A.Y. 2024-2025

- I. **COURSE TITLE:** CS ELEC 3 – INTELLIGENT SYSTEM
- II. **PREREQUISITE:** NONE
- III. **COURSE DESCRIPTION**

This course introduces the students to the basic concepts and techniques in the area of artificial intelligence. Concepts and techniques include knowledge representations, searching and problem solving.

Artificial intelligence (AI) is the study of solutions for problems that are difficult or impractical to solve with traditional methods. It is used pervasively in support of everyday applications such as email. Word-processing and search, as well as in the design and analysis of autonomous agents that perceive their environment and interact rationally with the environment. The solutions rely on a broad set of general and specialized knowledge representations schemes, problem solving mechanisms and learning techniques. They deal with sensing (e.g., speech recognition, natural language understanding, computer vision), problem-solving (e.g., search, planning), and acting (e.g., robotics) and the architecture needed to support them (e.g., agents, multi-agents). The study of Artificial Intelligence prepares the student to determine when an AI approach is appropriate for a given problem, identify the appropriate representation and reasoning mechanism, and implement and evaluate it.

Furthermore, the course is designed to expose undergraduate students to functional and symbolic programming and use of an expert system shell.

I. COURSE CONTENT

Specific Objectives	Topics	No. of Hours	Student Learning Outcomes (SLO) At the end of the topic the student can:
Introduction to Artificial Intelligence	<ul style="list-style-type: none">• Introduction to Artificial Intelligence• History of Artificial Intelligence	3	<ul style="list-style-type: none">• define Artificial Intelligence;• give examples of AI machines and software• state the origin of Artificial Intelligence
discuss problem formulation;	<ul style="list-style-type: none">• Single-state problem;• Multiple – State problem• Contingency problem• Exploration problem	4	<ul style="list-style-type: none">• differentiate and apply the different problem formulations

Knowledge representation;	<ul style="list-style-type: none"> • Knowledge and representation • Different types of knowledge • Category of knowledge • Knowledge typology map • Framework of Knowledge framework • KR System requirements • KR Schemes 	5	<ul style="list-style-type: none"> • identify the difference between knowledge and representation; • Differentiate the knowledge types; • Explain the different categories of knowledge; • Understand the KR Typology map; • Understand the framework of knowledge; • Identify the KR System requirements; • Understand KR Schemes.
Discuss Logic Programming	<ul style="list-style-type: none"> • Logic Programming • Concept of logic programming • Characteristics of logic programming 	5	<ul style="list-style-type: none"> • Understand the concept of logic programming and its characteristics

Create and conduct research for Artificial Intelligence	<ul style="list-style-type: none"> Expert Systems / Robotics 	10	<ul style="list-style-type: none"> Propose a project for artificial intelligence
	Midterm Examination		
Apply Artificial Intelligence in a certain object.	<ul style="list-style-type: none"> Artificial Intelligence for Humans 	27	<ul style="list-style-type: none"> Create an Artificial Intelligent Machine
	No Final Term Examination		

Total Number of Hours: **54 hours**

Grading System:

Summative Evaluations	Percentage
Class Standing	70%
Major Examinations	30%
Total	100%

What is Human Intelligence?

It is a composition of the abilities like:



Learning



Reasoning



Perceiving

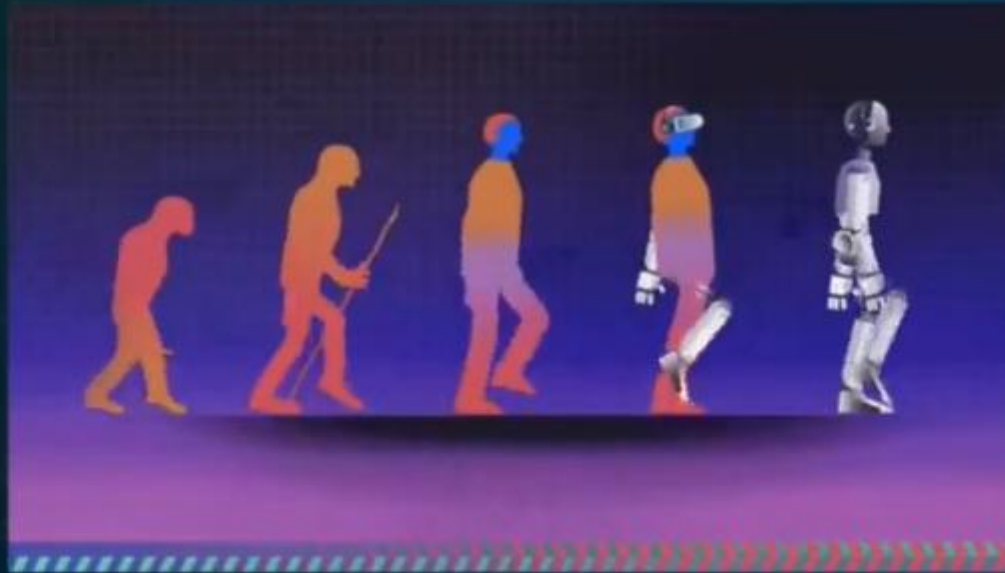


Understanding a
Language



Feeling

What is Artificial Intelligence?



Artificial Intelligence is the science and engineering of making intelligent machines.

John McCarthy

Father of Artificial Intelligence

Coined the term “Artificial Intelligence” in Dartmouth Conference in 1956



What is Artificial Intelligence?

- AI is the field of study that aims to create machines capable of performing tasks that require human intelligence.
- Examples of AI tasks include learning, reasoning, problem-solving, understanding natural language, and perception.

Artificial Intelligence is composed of two words **Artificial** and **Intelligence**, where Artificial defines "*man-made*," and intelligence defines "*thinking power*", hence AI means "*a man-made thinking power*."

So, we can define AI as:

"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."

Types of AI:

- **Narrow AI:** AI designed for a specific task (e.g., voice assistants, image recognition).
- **General AI:** Hypothetical AI that can perform any intellectual task that a human can do.

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- **Superintelligent AI:** An AI that surpasses human intelligence across all fields.

Examples of Narrow AI:

- 1. Siri and Alexa:** Virtual assistants like Apple's Siri and Amazon's Alexa are examples of narrow AI. They can perform tasks like setting reminders, playing music, or providing weather updates, but they cannot perform tasks outside their programmed capabilities.
- 2. Chatbots:** Many customer service chatbots are narrow AI. They can handle customer inquiries, provide support, and guide users through troubleshooting processes, but their capabilities are limited to the specific domain they're designed for.

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- 1. Recommendation Systems:** Netflix's movie recommendation engine or Amazon's product recommendation system are narrow AI. They analyze your past behavior and suggest content or products you might like, but they don't possess any general understanding beyond that.
 - 2. Facial Recognition Software:** This AI can identify or verify a person's identity using their facial features. It's commonly used in security systems, social media tagging, and photo organization.
 - 3. Spam Filters:** Email services use narrow AI to identify and filter out spam emails based on specific criteria. It's highly effective in this specific task but doesn't extend beyond that.

General AI:

1. Fictional Examples:

1. **HAL 9000** from "2001: A Space Odyssey": HAL is an AI that can perform a wide range of tasks, from operating a spaceship to engaging in complex conversations with humans. It demonstrates an understanding and reasoning ability across various domains.
2. **Skynet** from the "Terminator" series: Skynet is an AI system that becomes self-aware and possesses the capability to perform a wide range of tasks, including military strategy, robotics control, and even self-preservation, much like a human intelligence.
3. **Samantha** from "Her": An AI assistant that evolves beyond its initial programming to understand and experience emotions, form relationships, and engage in a wide variety of intellectual and emotional tasks.

Human Level Artificial General Intelligence

1. Theoretical Example:

1. **Human-Level AGI:** Imagine a robot or computer that could do everything a human can—learn new languages, solve any problem, create art, have meaningful conversations, and even possess self-awareness. This kind of AGI would not just follow predefined rules but could understand context, adapt to new situations, and apply knowledge across various domains, just as humans do.

Superintelligent AI

1. The Architect (The Matrix Series):

1. The Architect is a superintelligent AI that designed and maintains the Matrix, a simulated reality. It has a comprehensive understanding of human psychology and vast computational power, making decisions and predictions that are beyond human capability.

- **Superintelligent AI in Theory:**

- **Nick Bostrom's Paperclip Maximizer:**

- Philosopher Nick Bostrom proposed a thought experiment where an AI designed to create as many paperclips as possible could become superintelligent and turn all resources, including humans, into paperclips. This example illustrates how a superintelligent AI could follow its goals to extreme lengths, demonstrating power far beyond human control.

History of Artificial Intelligence

- **Early Foundations:**
 - **Turing Test (1950):** Proposed by Alan Turing to determine whether a machine can exhibit intelligent behavior indistinguishable from a human.
 - **Early AI Programs:** Logic Theorist (1955), General Problem Solver (1959).

Significant Milestones:

- **1956:** Dartmouth Conference – The birth of AI as a formal field of research.
- **1960s-1970s:** The development of expert systems, such as DENDRAL and MYCIN.
- **1980s:** AI winter – periods of reduced funding and interest due to unmet expectations.

Significant Milestones:

- **1990s-2000s:** Revival with successes like IBM's Deep Blue defeating world chess champion Garry Kasparov.
- **2010s-Present:** Rapid advancements in machine learning, deep learning, and AI applications (e.g., AlphaGo, self-driving cars).

Applications of Artificial Intelligence

- **Everyday Applications:**
 - **Search Engines:** Google uses AI to improve search results.
 - **Virtual Assistants:** Siri, Alexa, and Google Assistant use AI to process voice commands and provide responses.

Applications of Artificial Intelligence

- **Email Filtering:** AI helps in filtering spam emails.
- **Recommendation Systems:** Netflix, Amazon, and Spotify use AI to suggest content based on user behavior.

Advanced Applications:

- **Autonomous Vehicles:** AI powers self-driving cars.
- **Healthcare:** AI is used in diagnostics, personalized medicine, and drug discovery.
- **Finance:** AI assists in fraud detection, trading algorithms, and customer service.
- **Robotics:** AI-driven robots perform tasks ranging from manufacturing to surgery.

Key Concepts in Artificial Intelligence

- **Knowledge Representation:**
 - How to represent information about the world in a form that a computer system can use to solve complex tasks.
- **Search Algorithms:**
 - Techniques for exploring possibilities to find solutions to problems (e.g., pathfinding, optimization).

- **Machine Learning:**

- Methods that allow computers to learn from data and improve performance over time without being explicitly programmed.
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- **Natural Language Processing (NLP):**

- Enabling machines to understand and respond to human language in a meaningful way.

- **Robotics:**

- The design and use of robots that can interact with the physical world.

The Role of AI in Society

- **Benefits:**
 - Increased efficiency and automation.
 - Enhanced decision-making capabilities.
 - Potential to solve complex global challenges.

- **Challenges:**

- Ethical considerations: Bias in AI, privacy concerns.
- Job displacement due to automation.
- The need for regulations and governance.

Future of Artificial Intelligence

- **Trends:**
 - Continued growth in AI research and development.
 - Increasing integration of AI in everyday life.
 - Potential for breakthroughs in General AI and superintelligent AI.

- **Ethical and Social Considerations:**

- The importance of ethical AI design.
 - Preparing society for AI's impact on the workforce and daily life.
- Addressing the digital divide and ensuring equitable access to AI technologies.

Conclusion

- **Recap of Key Points:**

- AI is a multifaceted field with applications in various industries.
- Understanding AI's history, concepts, and societal impact is crucial for leveraging its potential responsibly.

Activity no. 1:

- What excites you most about AI?
- What are some potential risks of AI development?
- How can we ensure AI is developed and used ethically?

ASSIGNMENT

- Research a real-world AI application and present its impact.