



# AI Diploma



# Introduction to Artificial Intelligence and Applications

Semester One | Course One

# Course Content

- 01 Unit 1 : Introduction and Applications to AI**
- 02 Unit 2 : AI Concepts , Terminology, and Application Domains - Part 1**
- 03 Unit 3 : AI Concepts , Terminology, and Application Domains - Part 2**
- 04 Unit 4 : Business and Career Transformation Through AI**
- 05 Unit 5 : Issues, Concerns, and Ethical Consideration**

# Before we start ...

## DS & AI Diploma



<https://discord.tuwaiqadmin.com/invite/cm4zmd25000032ibvz8z6vbns>

# Before we start ...

## Commitment to Learning and Engagement

**Welcome to the course!** Before we dive in, let's take a moment to align on some shared commitments to ensure a successful and enriching learning journey.

### Our Commitments to You:

- **Engaging Content:** We'll provide well-structured, interactive, and up-to-date lessons.
- **Supportive Environment:** Our team is here to answer questions and guide you through challenges.
- **Real-World Applications:** The course focuses on practical skills and knowledge you can use in your career.

### Your Commitments as a Learner:

- **Active Participation:** Engage fully in discussions, activities, and quizzes.
- **Open Mindset:** Be ready to explore new ideas and challenge assumptions.
- **Accountability:** Stay consistent with your learning schedule and complete assignments on time.
- **Collaboration:** Support and learn from your peers in a respectful and constructive manner.
- **Ethics:** Approach AI concepts with responsibility and an understanding of their ethical implications.

# Before we start ...

## Course Overview: Exploring the World of AI

Welcome to this exciting journey into **Artificial Intelligence!** Below is an outline of the key units you will explore during this course, each designed to provide you with a comprehensive understanding of AI concepts, applications, and ethical considerations.

### Unit 1 : Introduction and Applications to AI

- 1.Introduction to AI
- 2.What is Intelligence?
- 3.Weak AI and Strong AI
- 4.Typical (Intelligent) System
- 5.A BRIEF HISTORY OF AI
- 6.Agents & Rationality
- 7.PHILOSOPHY OF AI
- 8.Strong AI
- 9.Classical Search Algorithm CLASSICAL
- 10.Greedy Search Algorithm for Simple Applications (**Application**)
- 11.Adversarial Search
- 12.Knowledge-based Agent
- 13.Introduction to Logical Reasoning
- 14.Forward & Backward Chainings

**To be continued ...**

# Resources

This content was designed using the following resources:

Jackson, P. C. (2019). Introduction to artificial intelligence. Courier Dover Publications.

<https://www.coursera.org/learn/introduction-to-ai/home/module/1>

<https://eecs.wsu.edu/~cook/ai/lectures/p.html>

<https://www.teach.cs.toronto.edu/~csc384h/summer/lectures.html>

Poole & Mackworth, 2010 (<http://artint.info/slides/>), and Russell & Norvig, 2005 (<http://aima.cs.berkeley.edu/>)

Introduction to Artificial Intelligence and Applications  
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# Unit 1 : Introduction and Applications to AI



WHAT IS INTELLIGENCE?

STRONG & WEAK AI

# WHAT IS INTELLIGENCE?

"It is not my aim to surprise or shock you – but the simplest way I can summarize is to say that there are now in the world machines that can think, that learn, and that create.

Moreover, their ability to do these things is going to increase rapidly until — in a visible future — the range of problems they can handle will be coextensive with the range to which human mind has been applied."

by Herbert A Simon (1957)

# STRONG AND WEAK AI

## Weak AI — acting intelligently

- The belief that machines can be made to act as if they are intelligent

## Strong AI — being intelligent

- The belief that those machines are actually thinking

Most AI researchers don't care

“the question of whether machines can think...

...is about as relevant as whether submarines can swim.”

(Edsger W Dijkstra, 1984)

# WEAK AI

**Weak AI** is a category that is flexible as soon as we understand how an AI-program works, it appears less “intelligent”.

And as soon as AI is successful, it becomes an own research area!

e.g., search algorithms, natural language processing, optimization, theorem proving, machine learning etc.

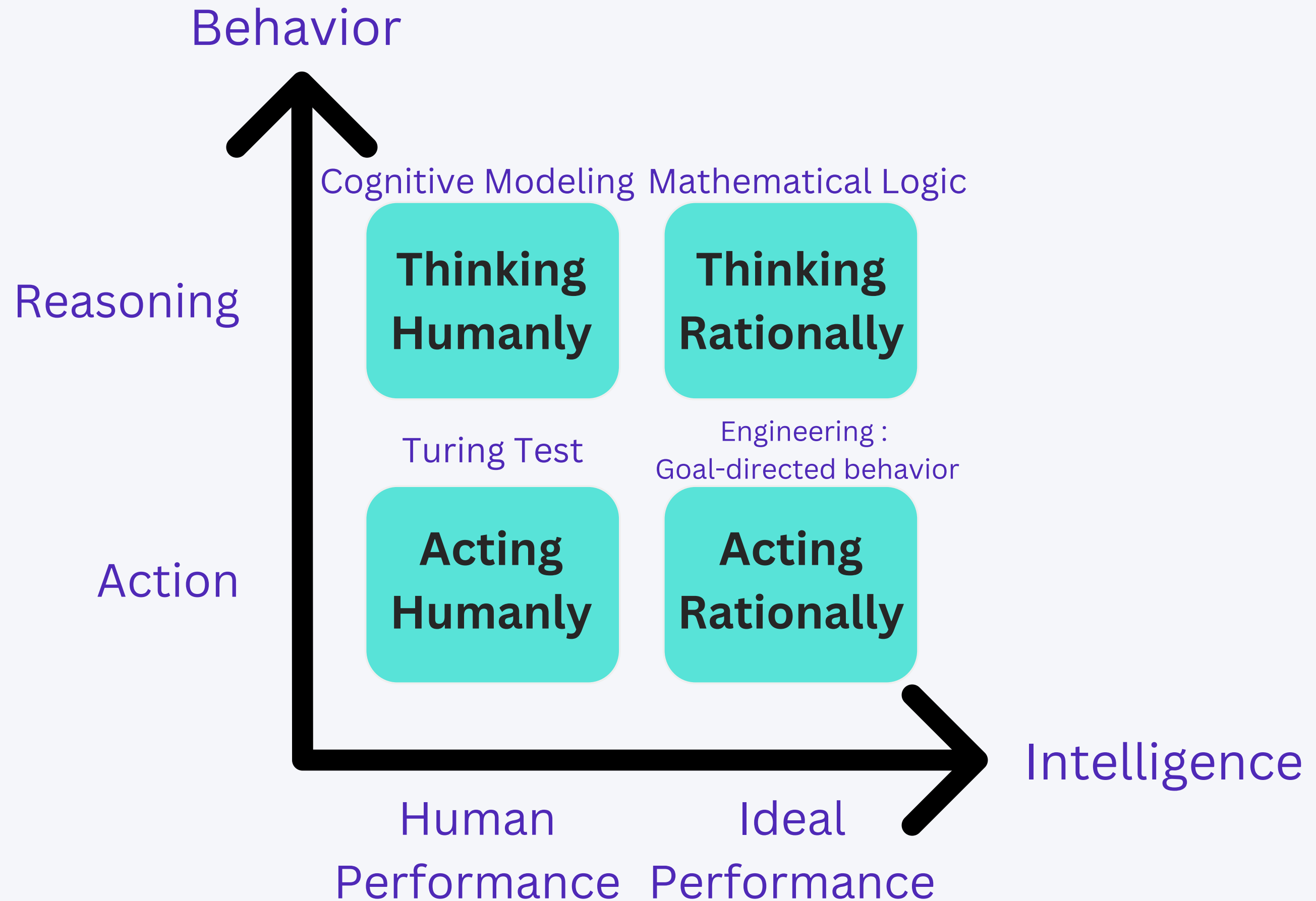
And AI is left with the remaining hard-to-solve problems!

# WHAT IS AN AI SYSTEM?

Do we want a system that...

- thinks like a human?
  - cognitive neuroscience / cognitive modelling
  - AGI = artificial general intelligence
- acts like a human?
  - the Turing test
- thinks rationally?
  - “laws of thought”
  - from Aristotle’s syllogism to modern day theorem provers
- acts rationally?
  - “rational agents”
  - maximise goal achievement, given available information

# AI IS MULTIDISCIPLINARY



# ACTING HUMANLY

- Proposed by Alan Turing (1950) to operationally define **intelligence**.
- A **computer** passes the test if a human interrogator cannot distinguish its responses from a human's.

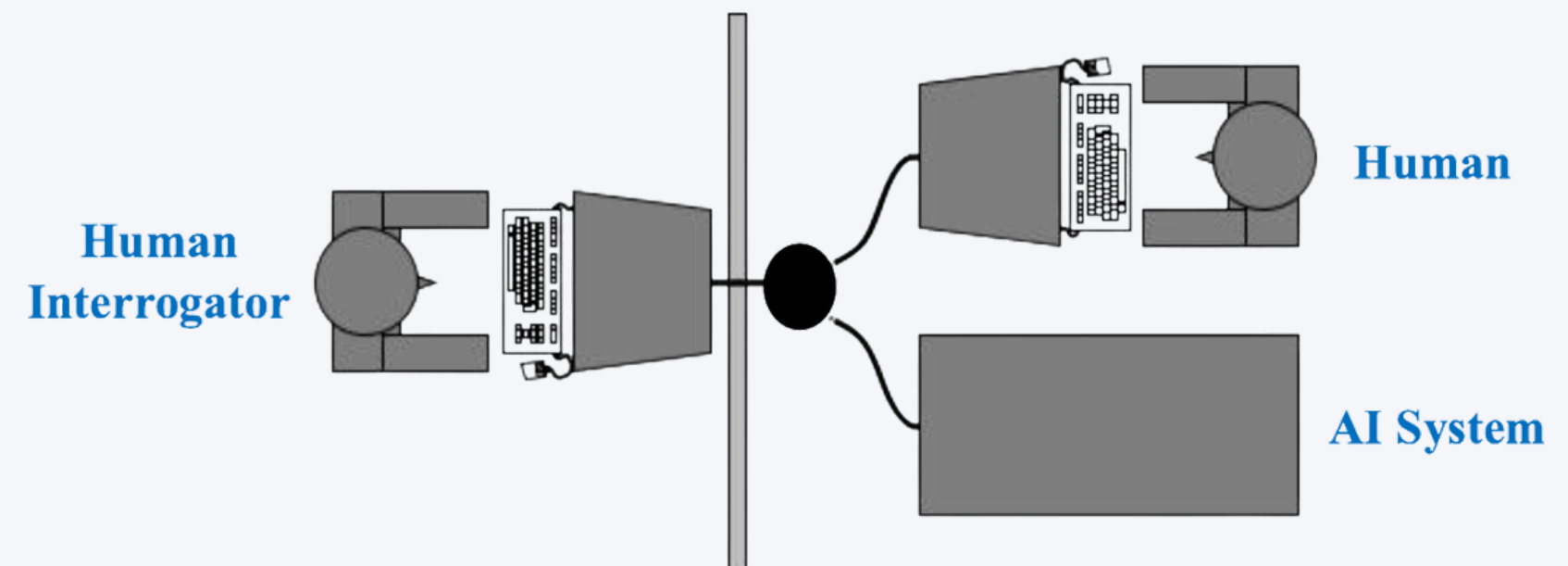
## Capabilities required to pass the standard Turing Test:

- Natural Language Processing: For successful communication.
- Knowledge Representation: To store and use information.
- Automated Reasoning: To answer questions and draw conclusions.
- Machine Learning: To adapt and detect patterns.

The test avoids physical interaction as simulating a person physically isn't essential for intelligence.

## Total Turing Test:

- Includes video signals for testing perceptual abilities and physical object interaction.
- Additional requirements:
  - Computer Vision: To perceive objects.
  - Robotics: For object manipulation and movement.



# THINKING HUMANLY

The **cognitive modeling** approach o Trying to understand and model how the human mind works

- Cognitive Science focuses on modeling how people think.

We need to understand the actual workings of human minds. There are three ways to do this:

- **Introspection – trying to catch our own thoughts as they go by.**
- **Psychological experiments – observing a person in action.**
- **Brain imaging – observing the brain in action.**

The interdisciplinary field of cognitive science brings together computer models from AI and experimental techniques from psychology to construct precise and testable theories of the human mind.



# THINKING RATIONALLY

The "**laws of thought**" approach,

- Trying to understand how we actually think, and model how we should think.
- Use “**symbolic logic**” to capture and manipulated the laws of rational thought as symbols for the derivation for thoughts.

## Limitations?

- Not all intelligent behavior is mediated by logical deliberation.
- Not easy to take informal knowledge and state it in the formal terms required by logical notation, particularly when the knowledge is less than 100% certain.

# ACTING RATIONALLY

The "**rational agent**" approach,

- To achieve one's goals, given one's beliefs or understanding about the world.
- An agent is a system that perceives an environment and acts within that environment.
  - Abstractly, an agent is a function that maps percept histories to actions:  $f: \mathcal{P} \rightarrow \mathcal{A}$
- An intelligent agent is one that acts rationally with respect to its goals.
  - For example, an agent that is designed to play a game should make moves that increase its chances of winning the game!

A **rational agent** is one that acts rationally to achieve the best outcome, or the best-expected outcome when there is uncertainty.

Achieving “**perfect rationality**”, i.e., making the best decision theoretically possible, is not usually possible due to limited resources in a real environment (e.g., time, memory, computational power, uncertainty, etc.).

- The trick is to do the best with the available information and resources.

# TYPICAL (INTELLIGENT) SYSTEM

- Intelligence involves sensing, reasoning, and acting.

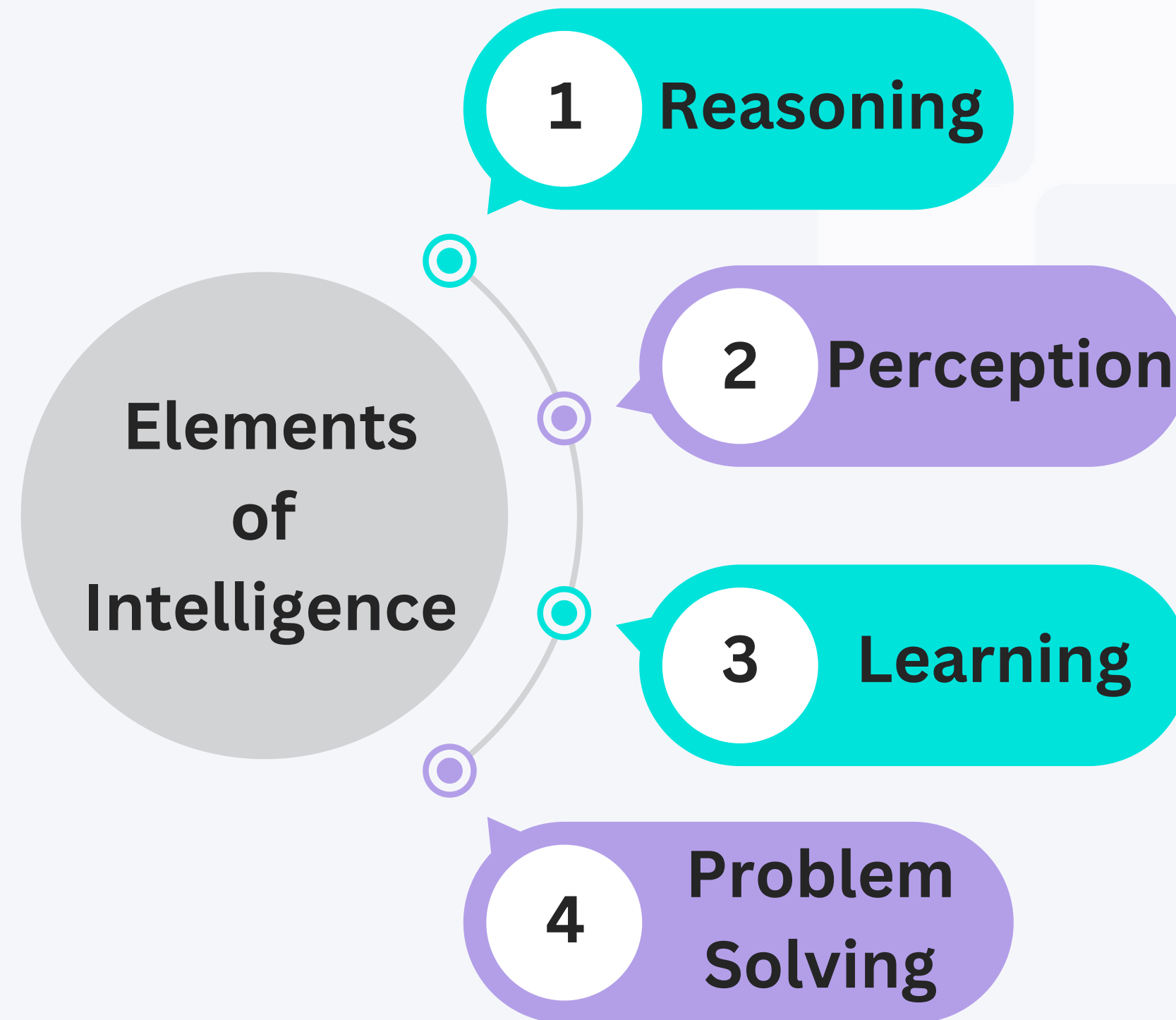
Sensing (Perception)	Reasoning (Cognition)	Acting
Acquisition of sensory inputs (percepts) using sensors, camera, etc.	Manipulation into a conceptual representation using a learner/reasoner: <ul style="list-style-type: none"><li>• Knowledge Representation</li><li>• Problem Solving/Planning</li><li>• Learning (making improvements based on the results of past actions)</li></ul>	Translation of knowledge into (physical) actions: <ul style="list-style-type: none"><li>• Robotics</li><li>• Speech and Language Synthesis</li></ul>



# THE OBJECTVIE OF AI

- The ultimate goal of artificial intelligence is to **reach human-level intelligence on a wide range of tasks.**
- Solve complex problems that human cannot perform, understand, or comprehend.

# ELEMENTS OF INTELLIGENCE



A BRIEF HISTORY OF AI

“THE THREE WAVES OF AI”