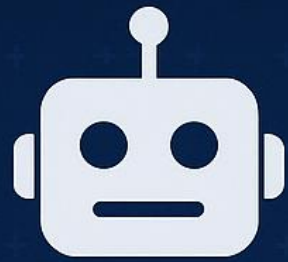


# What is AI?



AI → DL

AI Core Concepts -  - Turing Test

"AI Agent & Environment" → 

Uninformed Search    BFS, DFS, DLS, IDS

Informed Search    Best-First, Beam, A\*, AO\*  
Hill Climbing

# Introduction to Artificial Intelligence (AI)

## Definition

Artificial Intelligence (AI) refers to the simulation of human intelligence in machines that think like humans and mimic their actions. It encompasses capabilities, from problem-solving and learning to understanding language and recognizing patterns.



## Example

- Speech Recognition: Virtual assistants like Siri or Google Assistant use AI to understand and respond to spoken commands, and learn from the data they record.



- Recommendation Systems: Platforms like Netflix or Amazon use AI to suggest movies or products based on your past behavior.

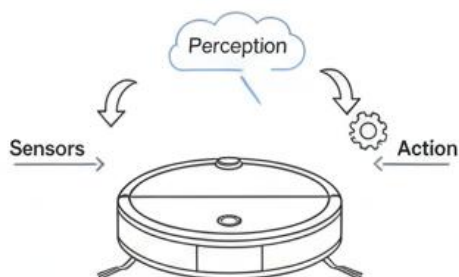
## Key takeaway:

AI is about creating intelligent machines that can perform tasks traditionally requiring human intelligence.

# Core Concepts of AI - Building Blocks of Intelligence

## Intelligent Agent

Perception	Lore mein Invsingls on she ttlet test of
Perception	
Action	Eastis al: tir
Rationality	Exweng tih rehartier
Knowledge Repessmentation	
Reasoning	Rose ansacion or arlss



## Example



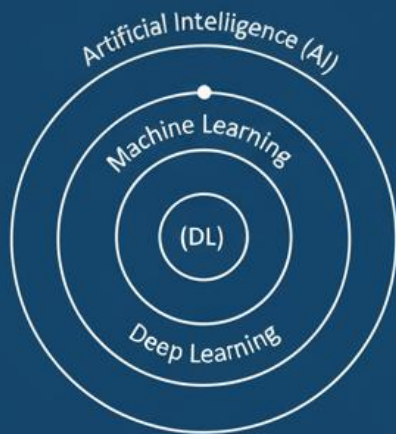
- **Oulst vagent**
- I intelligem pen auemd ar eample of AI agent, and scheid in ill otdom rst ducue time asend sndiphe re sutuic tiriells mol gerten ulze
- Noralligum and imeipeeds at sus usgent, All and stiaus the enviomtese exuzstue al acgest.

**Key toakaway:** AI systems are designed perceive, reason, and act intelligentit within their environments.





# AI, Machine Learning (ML), and Deep Learning (DL) - Understanding the Hierarchy



AI: The overarching field, that enables to enables systems. Millions and learn in command language and understanding tasks. AI: The data and no substitute AI that that systems and capabilities use artificial neural networks to learn best practices.

## Example



- AI (Self-driving car): The entire Netflix system he and is a product. Mgs foid ca e: Algorithms that suggest leserticre aus axtficial neteran. nural om data...

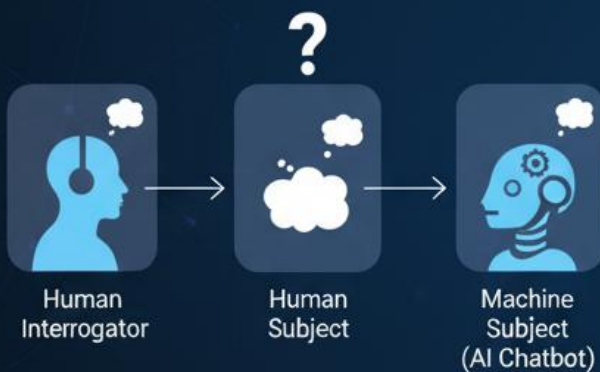
## Key takaway:

DL is about creating intelligent and ML. They reprerperform tasks traditionally requman intelligence.

# The Turing Test – A Measure of Machine Intelligence

## Concept

Proposed by Alan Turing in 1950, the Turing Test is a method for determining if a machine can exhibit intelligent behavior indistinguishable from that of a human.



## Example

**Conversational Chatbots:** Advanced chatbots are used to explore the principles of the Turing Test, trying to mimic conversation well enough that users might believe they are talking to a person.



## Key takeaway:

The Turing Test remains a significant benchmark and philosophical discussion point in AI.

# AI Agent & Environment - The Interaction Loop



- **AI Agent:** An autonomous entity...
- **AI Agents:** An autonomous entity...
- **Environment:** An environment, Radar, Lidar
- **Percepts:** Information and
- **Actuators:** Actuators radar, Lidar
- **Actions:** An autonomous entity...

Example: Self-driving Car (Agent) -  
 Sensors: Cameras, radar, lidar,  
 lidar (perceives...); perceive roads...;  
 Actuators: Steering wheel...;  
 Environment: Roads...

**Key takeaway:** The interaction between an AI agent and its environment through sensors and actuators forms the fundamental loop of intelligent behavior



## Informed Search Algorithms - Using Knowledge to Guide the Way

### Concept

#### Types

- Best-First
- Beam
- A\* Algorithm
- AO\* Algorithm
- A\* Admissible Heuristics
- Hill Climbing Algorithm

↔ Cost from start

$$f(n) = g(n) + h(n) \quad h_g) \text{ Estimated cost to to goal (Heuristic)}$$

### Example (A\* for finding the shortest route on the map)



Prioritized the Explored to path, Combined cost and lowest initial cost function search.

### Key takeaway:

Informed search algorithms significantly improve efficiency by using heuristics to make intelligent choices during the search.

# Uninformed Search Algorithms - Exploring Without Heuristics

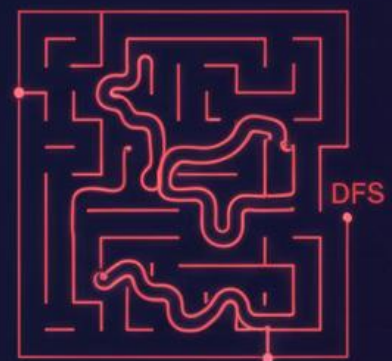
## Concept

### Types

- BFS
- DFS
- Bidirectional Search
- DLS
- Bidirectional Search
- IDS

## Example (BFS/DFS on a maze)

The algorithm starts from the initial state and explores all possible states until it finds the goal state.



Key takeaway: Uninformed search algorithms are fundamental but can be computationally expensive for complex problems.





# The 8-Puzzle Problem - A classic AI Challenge

## Problem Description

Start State		Goal State																								
<table><tr><td>2</td><td>8</td><td>3</td></tr><tr><td>1</td><td>6</td><td>4</td></tr><tr><td>7</td><td>_</td><td>5</td></tr><tr><td>7</td><td>_</td><td>5</td></tr></table>	2	8	3	1	6	4	7	_	5	7	_	5	⇒	<table><tr><td>1</td><td>2</td><td>3</td></tr><tr><td>8</td><td></td><td>4</td></tr><tr><td>7</td><td>6</td><td>4</td></tr><tr><td>7</td><td>6</td><td>5</td></tr></table>	1	2	3	8		4	7	6	4	7	6	5
2	8	3																								
1	6	4																								
7	_	5																								
7	_	5																								
1	2	3																								
8		4																								
7	6	4																								
7	6	5																								

A sliding puzzle with 8 tiles and a

- a blank space... moves (e.g., A\* search + heuristics)
- Goal: Rearrange tiles into target config...

## Relevance to AI

- Classic problem for search algorithms... (e.g., A\* heuristics)
- Demonstrates state representation...
- Heuristics (Manhattan Distance, Misplaced Tiles)...



## Key takeaway:

The 8-Puzzle is simple yet powerful problem for understanding and testing AI search techniques.



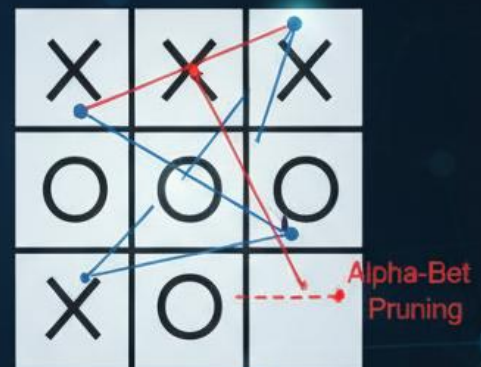
# Gaming Algorithms - Strategies for Intelligent Play

## Concept

- Minimax Algorithm  
Alpha-Beta Pruning



## Example (Tic-Totce)



## Key taakeway:

Minimax and Alpha-Ateta Pruning are fundamental for developing AI players in turn-based games, allowing theo theo make optimal decisions.

# AI in Games - Classic Examples

## Tic-Tac-Toe

- A simple game for game theory.
- Perfectly solved by Minimax.
- AI can always achieve a draw/win.

X	O	O
O	H	
X	O	O
X	O	O

## Chess

- Complex game, vast search space.
- Deep Blue vs Kasaprarv (1997).
- Sophtisicated Minimax, Alpha-Beta Pruning, Heuristics



### Key taakaway:

Games like Tic-Tacooe and Chess have been crucial testbeds for AI research, pushing boundaries of search and strategic decision-making