

Introduction to Artificial Intelligence

Introduction to Artificial Intelligence (AI)

Course?level overview – concise, organized, and easy to read

1. What Is AI?

Definition	Key Idea
Artificial Intelligence is the field of computer science that creates systems capable of performing tasks that normally require human intelligence.	• Perception (seeing, hearing) • Reasoning & decision ?making • Learning from data • Natural language understanding • Motor control (robotics)

Alternative terms: Machine Intelligence, Cognitive Computing, Intelligent Automation.

2. Historical Milestones

Year	Event	Significance
1950	Alan Turing’s “ <i>Computing Machinery and Intelligence</i> ” (Turing Test)	First formal question: <i>Can machines think?</i>
1956	Dartmouth Workshop (John McCarthy, Marvin Minsky, etc.)	Birth of AI as a research discipline; term “Artificial Intelligence” coined.
1966–1974	Early expert systems (e.g., DENDRAL, MYCIN)	Demonstrated rule?based reasoning in narrow domains.
1980s	Rise of connectionism – neural networks (back?propagation)	Shift from symbolic AI to data?driven learning.
1997	IBM Deep Blue defeats world chess champion Garry Kasparov	First high?profile victory of AI in a complex game.

Introduction to Artificial Intelligence

Year	Event	Significance
2012	AlexNet wins ImageNet competition	Deep learning breakthrough; GPUs enable large-scale neural nets.
2016	AlphaGo defeats Go champion Lee Sedol	Demonstrates AI's ability in highly strategic, intuitive tasks.
2020-present	Generative models (GPT-3/4, DALL·E, Stable Diffusion)	AI can produce human-like text, images, and code.

3. Core Subfields

Subfield	Primary Goal	Typical Techniques
Machine Learning (ML)	Learn patterns from data without explicit programming	Supervised/unsupervised learning, reinforcement learning, decision trees, SVMs
Deep Learning	Build hierarchical representations using multi-layer neural networks	Convolutional NN, Recurrent NN, Transformers
Natural Language Processing (NLP)	Enable computers to understand and generate human language	Tokenization, embeddings, language models, parsing
Computer Vision	Interpret visual information from images/video	CNNs, object detection, segmentation, optical flow
Robotics	Integrate perception, planning, and actuation to interact with the physical world	SLAM, motion planning, control theory
Knowledge Representation & Reasoning	Model facts and infer new knowledge	Ontologies, logic programming, Bayesian networks
AI Ethics & Policy	Study societal impact, fairness, accountability	Bias mitigation, explainability, regulation frameworks

4. Fundamental Concepts

Introduction to Artificial Intelligence

1. Agents

- *Definition:* An entity that perceives its environment through sensors and acts via actuators.
- *Types:* Reactive, deliberative, hybrid.

2. Search & Optimization

- *Uninformed search:* Breadth?first, depth?first, uniform?cost.
- *Informed search:* A* (heuristic), greedy best?first.
- *Optimization:* Genetic algorithms, simulated annealing.

3. Learning Paradigms

- **Supervised:** Labeled data ? predict output.