Artificial Intelligence (AI) is when a computer can do things that normally need human intelligence.

These tasks include: **talking, thinking, learning, planning, and understanding**.

AI is also known as **Machine Intelligence** or **Computer Intelligence**.

According to Britannica:

> AI is when computers or robots do tasks that require smart thinking—like reasoning, understanding, and learning.

AI is a science that includes **many parts of Data Science**, such as:

- **Narrow AI** – Does specific tasks (like Siri).
- **Strong AI** – Thinks like a human brain (not common yet).
- **Machine Learning (ML)** – Learns from data.
- **Deep Learning** – More advanced ML using neural networks.
- **Big Data & Data Mining** – Analyze large sets of data.

AI History (Modern):

AI History (Modern)

- Started with **Alan Turing (1936)**: created the **Turing Machine** and the **Turing Test**.
- **Turing Test** checks if a machine can fool a human into thinking it's also human

Alan Turing Test for AI

The **Turing Test** is a way to check if a machine can act like a human.
It was created by **Alan Turing in 1950**.
In this test, a **human judge** has a **text conversation** with two others — one **human** and one **machine**.
The judge's goal: **figure out which is human**.
If the judge **can't tell them apart**, the **machine passes the Turing Test**.

How the Turing Test Works

- A judge chats with both a human and a machine (text only).
- If the judge **can't tell which is which**, the machine passes.
- To pass, the machine needs:
  1. **Natural Language Processing (NLP)** – Understand and talk in human language.
  2. **Knowledge Representation** – Use facts and knowledge to give relevant answers.
  3. **Reasoning** – Show some logic in conversation, even if it's not perfect.
  4. **Learning** – Learn from the conversation and improve its answers.

History of Artificial Intelligence

- **1955**: John McCarthy and others coined the term **"Artificial Intelligence"** — they are the field's founders.
- **1966**: ELIZA, an early chatbot, fooled some people but wasn't very convincing overall.
- Early AI was **not flexible** — it only worked on tasks it was **manually programmed** for.
- **1974–1980**: Progress slowed, funding dropped — this was called the **"AI Winter."**
- **1980**: Japan invested in a big AI project, but it failed, and interest dropped again until **1993**.

Modern Artificial Intelligence

AI is booming now because:

- **Faster computers**, **bigger memory**, and better **algorithms**
- **GPUs** help handle huge datasets faster
- **Machine Learning** is the main method used in AI today

Subfields/Examples of AI in Use Today

AI is used **everywhere**, including:

- **Google Translate**, **spam filters**
- **Voice assistants**: Siri, Alexa, Google Assistant
- **Games**: DeepBlue (chess), AlphaGo (Go)
- **Speech & Image Recognition**
- **Stock Trading**: Automated systems
- **Recommender systems**: Amazon, Google Ads
- **Self-driving cars**

Positives of AI

AI helps in many ways:

- **Personal assistants** help with daily tasks
- **Spam filters** protect from email scams
- **Translation tools** help share information globally
- **Banks** use AI to spot **fraudulent transactions**

Fears About AI

- **Elon Musk** warns AI could be dangerous
- Pop culture shows AI taking over:
  - *Westworld*, *The Matrix*, *Ex Machina*
- But today's AI is **not general intelligence**—it does narrow tasks.

However, today's AI is mostly used for **specific tasks**, not for creating general, human-like intelligence.

Ethical Issues in AI

Big concerns:

- **Privacy** (e.g., Alexa listening)
- **Bias** (racist or sexist AI)
- **Responsibility** in self-driving car crashes or stock trading fails

Key questions:

- Should AI make **life-or-death decisions** (like in war or accidents)?
- Should it be allowed to **learn and improve by itself**?
- Should developers **limit how smart AI can become**?

AI Frontiers: Current and Future Work

- **Robotics** – More natural movement and object detection
- **Language AI** – Understand language better, summarize, reduce bias
- **Content Creation** – Make art, captions, and styles (e.g., DeepMind's tools)

What is Machine Learning?

- A subfield of AI
- **Teaches machines to learn from experience**
- Helps computers improve with data instead of fixed instructions

Traditional Programming vs Machine Learning

Type	Process

Machine Learning Languages

- **R**
- **Python**
- **C++**
- **Java**
- **JavaScript**
- **SQL**

What is R?

- R is a programming language used for **statistics** and **graphics**
- Supported by **R Foundation**
- Used for:
  - Linear and Nonlinear Modeling
  - Statistical Tests
  - Time-Series Analysis
  - Classification
  - Clustering

Linear vs. Nonlinear Modeling

- **Linear Modeling**: Predicts using straight-line relationships
  - *Example*: Size → Price of a house
- **Nonlinear Modeling**: Captures complex, curved patterns
  - *Examples*: Polynomial Regression, Decision Trees, Neural Networks

Statistical Tests

Used to analyze data and make decisions.

Examples:

- **t-test** – Compares **two groups' averages**
- **ANOVA** – Compares **three or more group averages**
- **Chi-square test** – Checks **relationships between categories**

Time-Series Analysis

- Deals with **data over time** (e.g., stock prices, sales, weather)
- Looks for **trends, cycles, or changes**

Classification

- Supervised ML that predicts **categories**
- *Examples*: Spam detection, Image recognition, Medical diagnosis

Clustering

- Unsupervised ML that **groups similar items**
- *Examples*: Customer types, similar articles, gene patterns

R Programming Language

- **R** is a language used for **statistics and graphics**
- It's great for analyzing and **visualizing data**

Basic Graph Types in R

- **Plot** – Makes a basic diagram of points
- **Line Chart** – Connects points to show trends
  —Use the plot() function in R and add type = "l" to make a **line graph**.
- **Scatterplot** – Shows points on a graph (no lines)
- **Pie Chart** – Shows proportions in a circle
- **Bar Chart** – Uses bars to compare data

Machine Learning in JavaScript

JS is becoming popular for ML because:

- Easy to use, no installation
- Runs in browsers (fast, private, cross-platform)
- Can use **hardware acceleration**
- Supports building **web-based AI apps**

Machine Learning in the Browser Means:

- **ML with JavaScript**
- **ML on the web**
- **ML for everyone**
- **ML on more devices**

Advantages:

- **Easy to use** – No setup/install
- **Great graphics** – Uses WebGL in browsers
- **Better privacy** – Data stays on your computer (not sent to a server)
- **Cross-platform** – Works on mobile and desktop

Neural Networks

- Mimic how the **human brain** learns (trial & error)
- Strengthen helpful paths, weaken poor ones
- Used in **machine learning** for solving complex problems

Brain.js

- A **JavaScript library** for **neural networks**
- Hides the **complex math** to make it easier for developers
- You don't need to know how neural networks work to use it
- Offers **different types of neural networks** for different tasks

TensorFlow.js

- Developed by **Google Brain**
- Lets you **train and run ML in the browser**
- Adds AI directly to websites
- JS version of the popular Python TensorFlow library

What is AI?

- AI (Artificial Intelligence) is not just for tech experts anymore. Anyone can use it to solve problems, boost productivity, and create products.

Can Non-Experts Create AI?

Traditional Programming	Data + Algorithm = Result
Machine Learning	Data + Result = Algorithm

So, instead of giving instructions, ML **learns** from **examples**.

- Yes! You don't need deep coding knowledge to create basic AI models or apps.

Types of AI

Type	Also Known As	Description	Example
Narrow AI	Weak AI	Does one task well	Voice assistants, image recognition
General AI	Strong AI	Can do anything a human can do	(Still being developed)

AI terminology:

- **Machine Learning (ML)**
  - **AI learns from data** and improves automatically
  - *Example: YouTube recommending videos*
- **Deep Learning (DL)**
  - Advanced ML using **neural networks**
  - *Example: Self-driving cars recognizing objects*
- **Neural Networks**
  - Computer systems modeled after the **human brain**
  - Helps AI make smart decisions using data