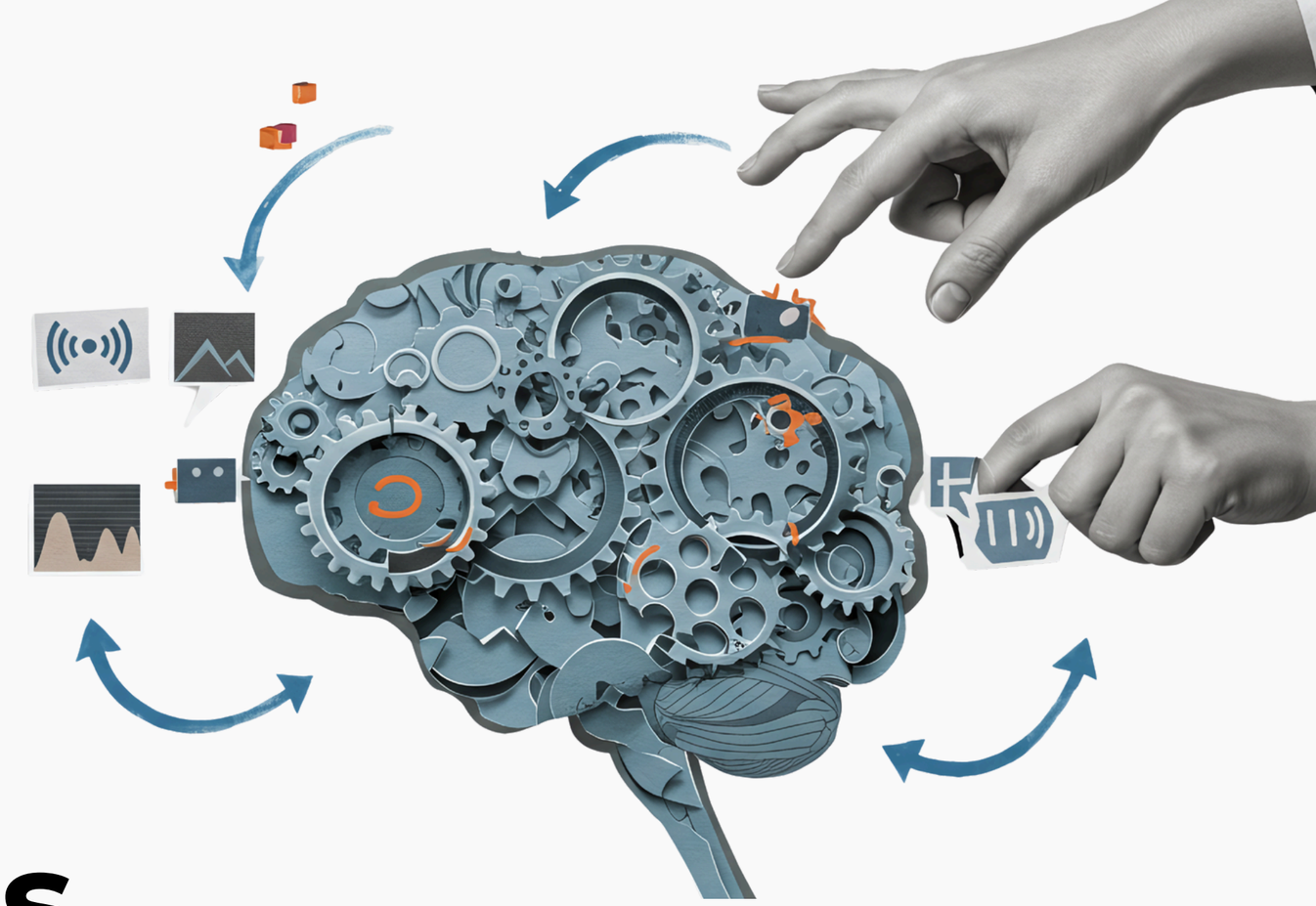
Artificial Intelligence and its Applications



AI LITERACY AND DIGITAL TRANSFORMATION FOR NGOS

TÜRKİYE ULUSAL AJANSI
TURKISH NATIONAL AGENCY

Co-funded by
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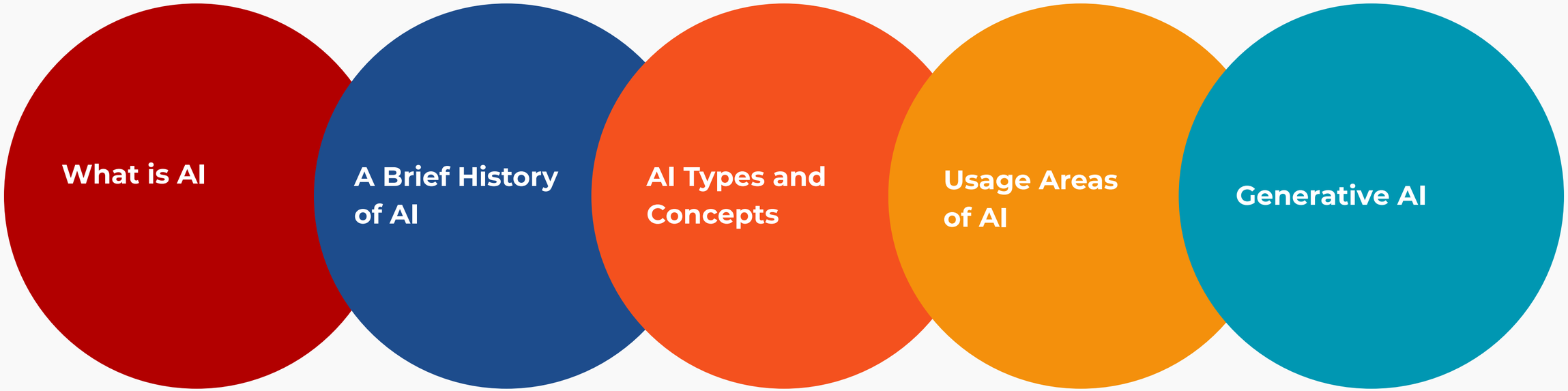
SETA

What Will We Talk About?

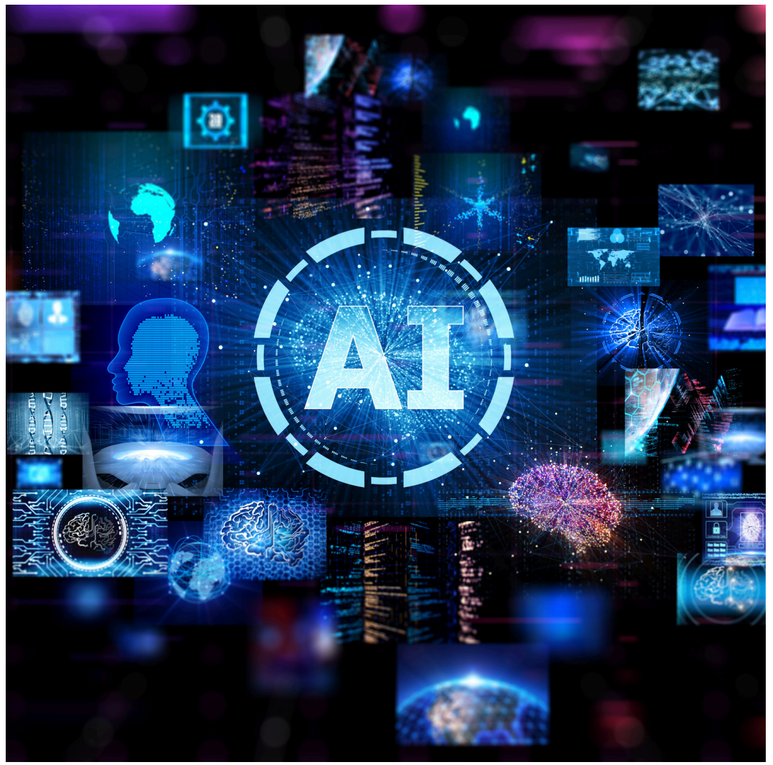


What is Artificial Intelligence?

Artificial intelligence refers to **computer systems** that can perform tasks that normally require human intelligence, such as:

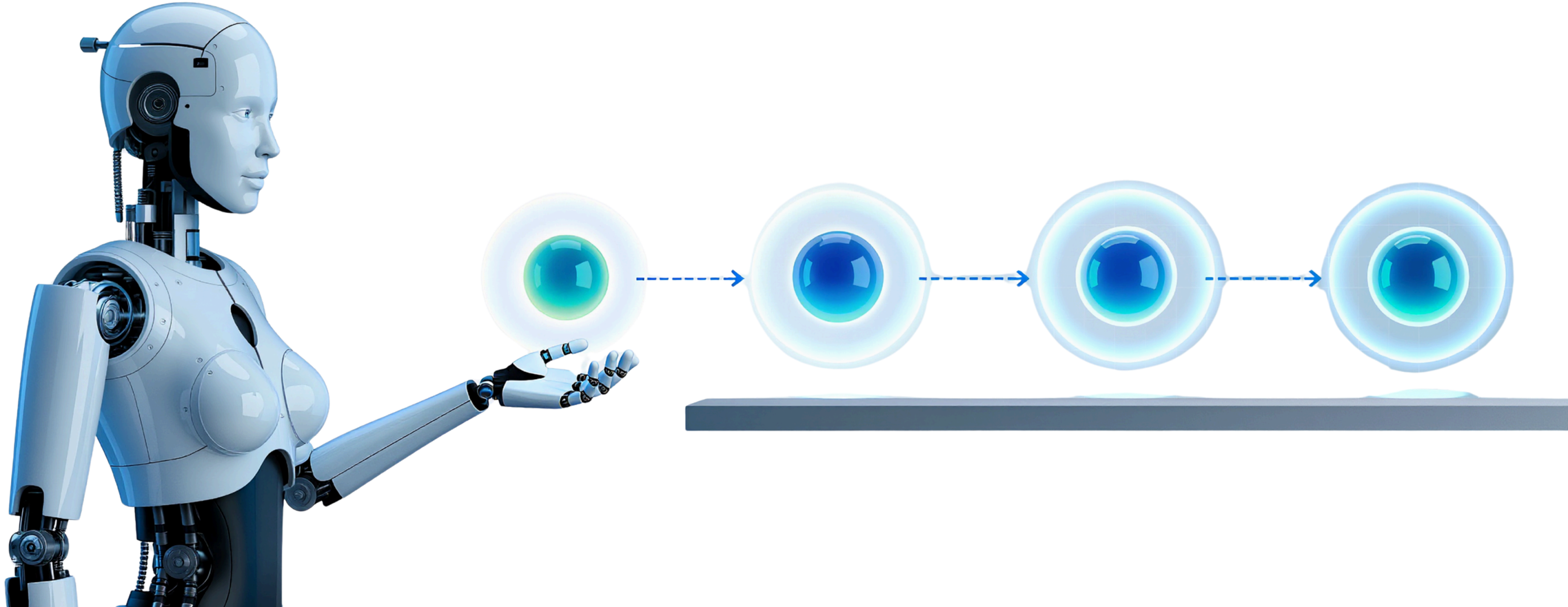
- learning,
- reasoning,
- problem-solving,
- perception,
- decision-making.

Artificial intelligence enables computers to solve complex problems and analyze large amounts of data.



What is Algorithm?

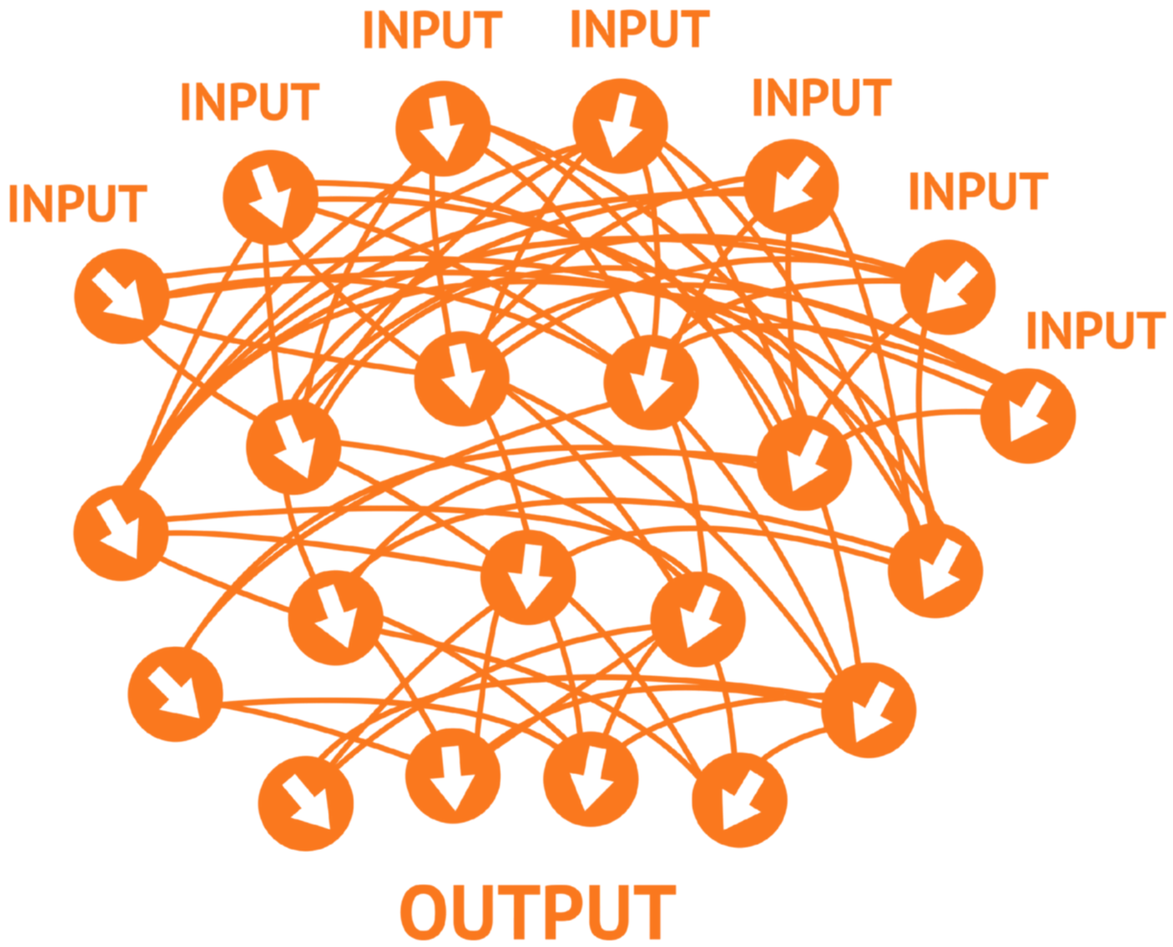
An algorithm is basically **a set of instructions or rules**. It is the path a computer follows to solve a problem or complete a task. We can see algorithms as the basic building blocks of computer programs and systems.



What is Algorithm?

Artificial intelligence algorithms are programs that try to **mimic** human intelligence and show human-like performance in various tasks.

These algorithms try to gain information and understanding by processing data.



Training Data

Data is information that AI systems can process and learn from. AI systems can learn, make predictions, and take decisions by mimicking patterns through analyzing large amounts of data.

Data is vital for AI systems to be successful and effective. We can call them **“the food of AI systems”**

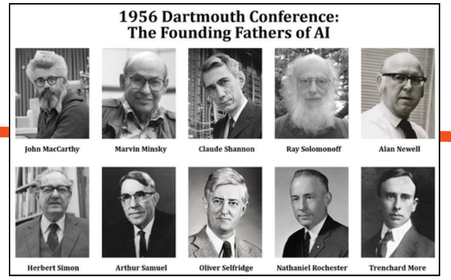
A Brief History of AI

Automata and machines in ancient periods (Aristotle, Heron)

17-18th-century philosophers (Descartes, Leibniz)

Pre-20th Century

Early 20th Century

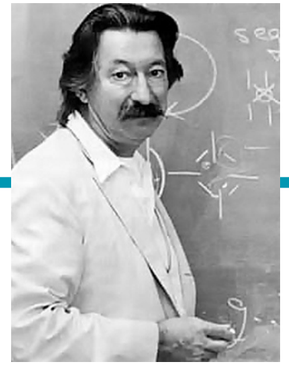


Early 20th Century: Mechanical computers (Charles Babbage, Ada Lovelace, Alan Turing)

Birth of the term artificial intelligence (Alan Turing, Turing Test)

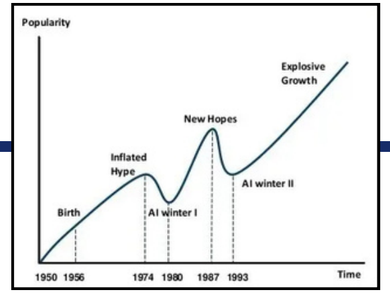
1956: Dartmouth Conference and the official start of the artificial intelligence field

1960s: First artificial intelligence applications and Eliza (Joseph Weizenbaum)



1960s

First **AI Winter** began due to unrealistic expectations and limited progress, leading to a decrease in interest and funding for AI research.



1970s

1980s

Machine learning models were used to learn pattern recognition via artificial neuron connections and to make financial predictions and medical diagnoses

Second AI Winter started

IBM's **Deep Blue** computer defeated world chess champion Kasparov, marking the milestone where a computer defeated a world champion in a complex game for the first time.

1990s

2000s

Natural Language Processing (NLP) uses techniques like machine learning to teach computers to understand and use human language.

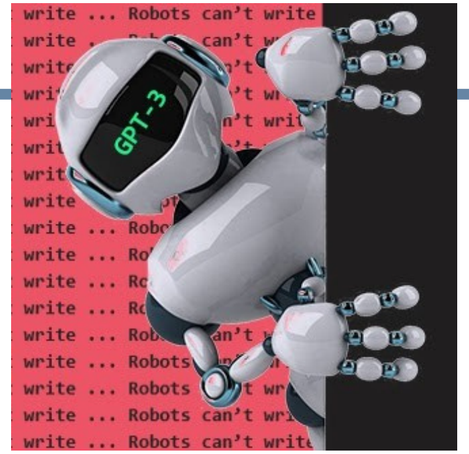
iRobot released Roomba, the first mass-produced domestic robot vacuum with an AI-supported navigation system.

IBM’s AI system named **Watson** defeated two former champions of the Jeopardy! competition.

Facebook developed the face recognition system DeepFace, which can recognize faces with near-human accuracy.

2010s

2020s



OpenAI released the GPT-3 model, a significant milestone in natural language processing.

DeepMind’s AlphaFold2 system solved the protein folding problem, opening the way for new drug discoveries and medical developments.

AI Types

NARROW AI

General name for systems that can mimic human intelligence in specific tasks but do not have broad-scale intelligence and learning capabilities.

WEAK NARROW AI

- Digital assistants like Siri, Google Assistant, and Amazon Alexa...
- Email filtering systems
- Recommendation systems in content platforms like Netflix etc.

STRONG NARROW AI

- Large language models like ChatGPT, Gemini etc.
- AI used in fields like medicine, finance, transportation etc.
- AI used in autonomous vehicles

GENERAL AI (SUPER AI)

AI systems that show equal or superior performance to human intelligence in all fields

AI Concepts

Machine Learning

A sub-branch of AI that allows algorithms to increase their performance by learning from data and improving themselves. Instead of writing rules, developers give examples to the system, and the computer learns to detect patterns itself.

1

2

Deep Learning

Uses artificial neural networks capable of learning complex structures similar to the working principle of the human brain. These layers help the system learn from large amounts of data to perform functions like understanding speech or identifying objects in photos.

Neural Networks

A system modeled after the human brain. Consists of interconnected nodes or "neurons" that process information. Learns to recognize patterns and relationships in data over time. Consists of multiple layers, where each layer processes information from the previous one to learn more complex features.

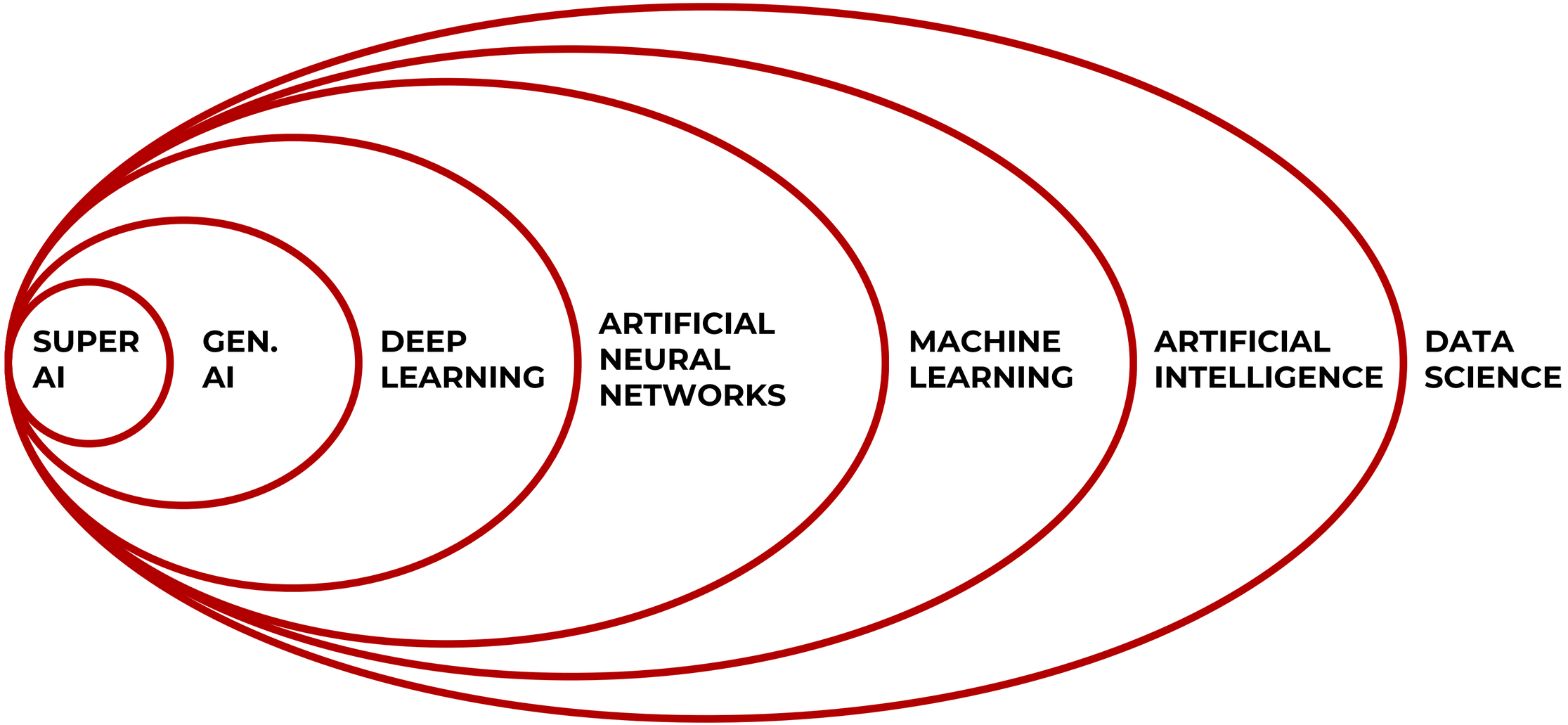
3

4

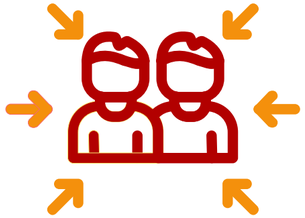
Generative AI

Used to produce new data using deep learning techniques and create new examples that look realistic using learned patterns. These examples can be images, music, or text.

AI Concepts


SUPER AI
GEN. AI
DEEP LEARNING
ARTIFICIAL NEURAL NETWORKS
MACHINE LEARNING
ARTIFICIAL INTELLIGENCE
DATA SCIENCE

AI Topics



Human-Centered AI

Teaches why human intervention and supervision are critical in AI decision processes; especially in education, health, and public fields.

1

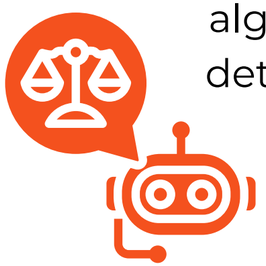
Explainable AI

Understanding "why" a model made a certain decision is important for trust and accountability.

2

Model Bias

Required to distinguish data, algorithm, and result biases; to detect discrimination risks and ensure ethical use.



3

Natural Language Processing

Field of AI that enables machines to understand, interpret, produce, and use human language. NLP brings together linguistic rules with machine learning and deep learning methods to make sense of text and speech data.

4

Where is AI Used?

Recommendation systems

Providing personalized content, product, or service suggestions by analyzing users' past behaviors, preferences, and interactions.

AI can detect new trends and respond quickly to changes in user behavior.

Data analysis and pattern recognition

Analyzing large data sets to obtain valuable information.

Target audience analysis and developing marketing strategies.

Analyzing financial transactions and fraud detection.

Image and sound analysis

Face and object recognition technologies, biometric security systems.

Voice commands and assistants (Siri, Google Assistant).

Medical imaging and diagnosis (MRI, CT, mammography).

Natural language processing and translation

AI-supported language analysis and deciphering the meaning of texts.

Automatic translation services (Google Translate etc.).

Providing insights from social media and customer comments through sentiment analysis.

Autonomous vehicles and robotics

Self-driving cars and unmanned aerial vehicles.

Industrial automation and smart production.

Robots in the service sector (hotel, restaurant, hospital).

Medicine and health field applications

Disease diagnosis and treatment planning.

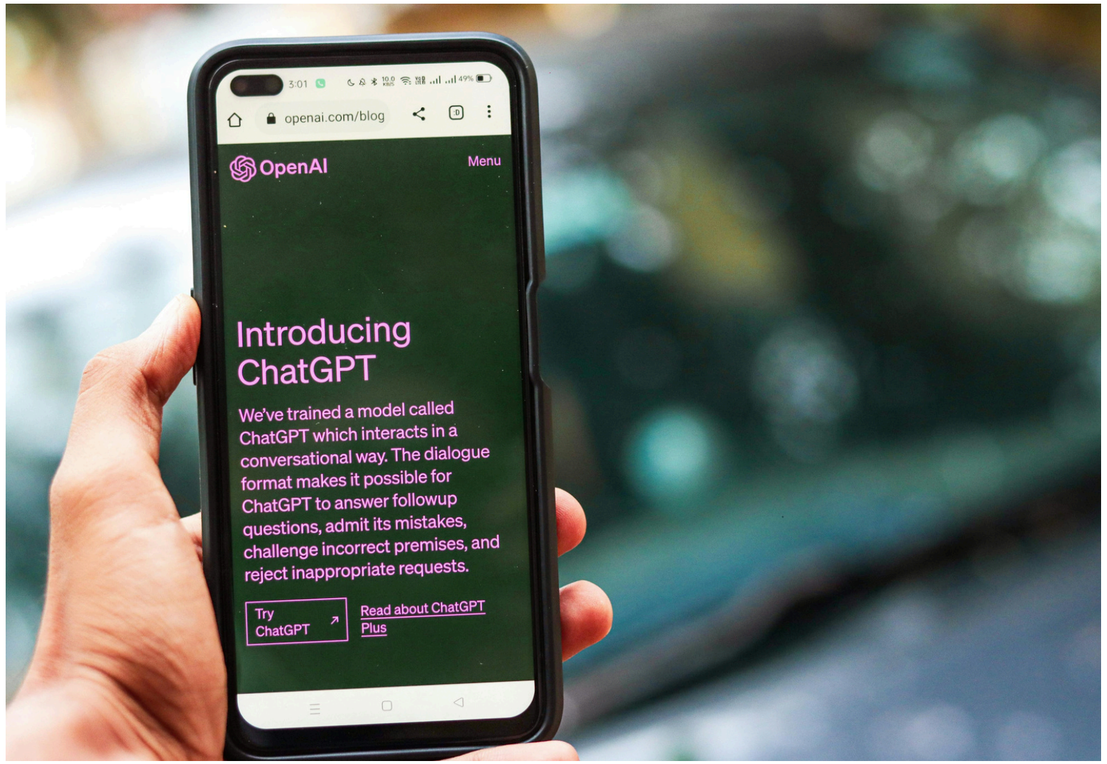
Personalized medicine and genetic analysis.

Health data analysis and pandemic tracking.

Generative Artificial Intelligence

Generative AI, known as **Gen AI**, is a type of AI that allows training with data. At the core of the training process, Gen AI learns the structure underlying the data and can then produce new examples over this data.

Gen AI helps users create statistical models and predict the expected answer and is a type of AI capable of creating new content based on existing content.



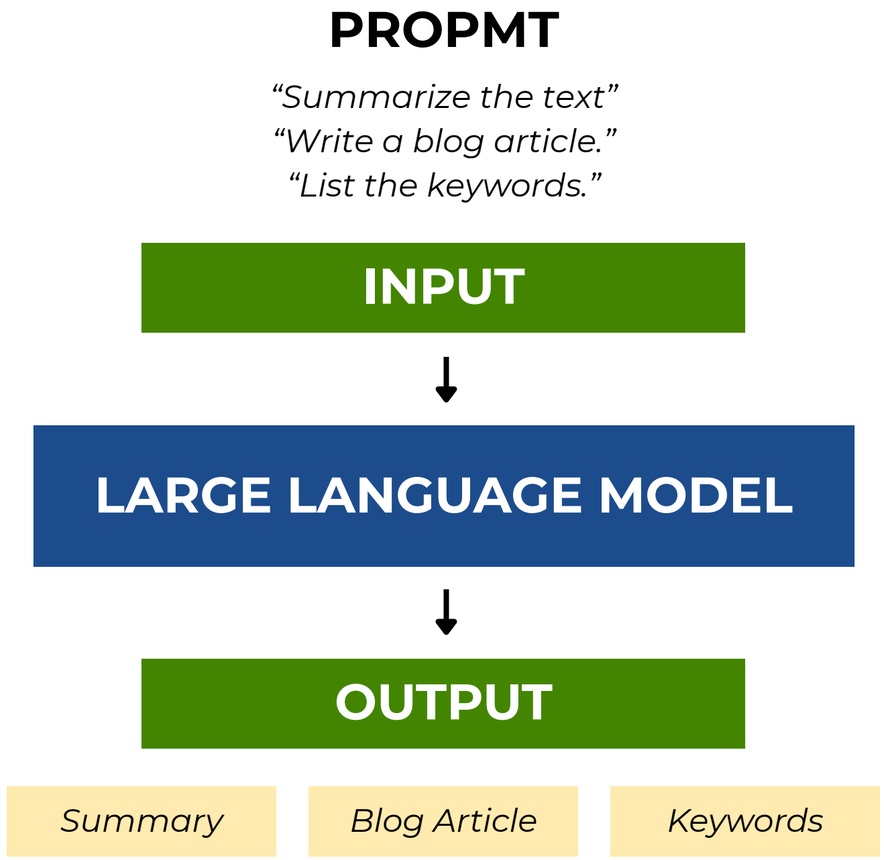
Gen AI’s Learning Methods

Learning Type	Description	Example Usage Areas
Supervised Learning	Model is trained with labeled data; every input has a correct answer (label). Model learns input → output relationship.	Email spam detection, credit scoring, image classification.
Unsupervised Learning	No labels in the data; model finds patterns, similarities, and groups by itself.	Customer segmentation, anomaly detection, dataset discovery
Semi-Supervised Learning	Small part of data is labeled, large part is unlabeled. Model learns from labeled data first, then makes sense of unlabeled data.	Medical image analysis with few labels, language model pre-training
Reinforcement Learning	Model acts like an “agent”; learns by trial and error. Correct actions are rewarded, wrong ones punished.	AI playing games (AlphaGo), robotics, autonomous vehicles
Self-Supervised Learning	Model produces its own label from unlabeled data. Used mostly in large language and image models.	Basic training approach for models like GPT, BERT, CLIP
Transfer Learning	A pre-trained model is reused for a new task; reduces training time and data needs.	Health data classification, private sector models
Online/Incremental Learning	Model updates itself as data arrives; continuous learning.	Credit fraud detection, personalization systems
Federated (Distributed) Learning	Data is not collected in a single center but stays on devices.	Mobile keyboard suggestions, modeling with health data

Generative Artificial Intelligence

A generative language model (LLM, Large Language Model) learns from examples shown to it and can create **completely new and original** content based on this information. The unique side of Gen AI is its ability to create natural-sounding new text combinations using the texts provided to it.

Similarly, a generative image model takes an image as input and can create text, another image, or video output.

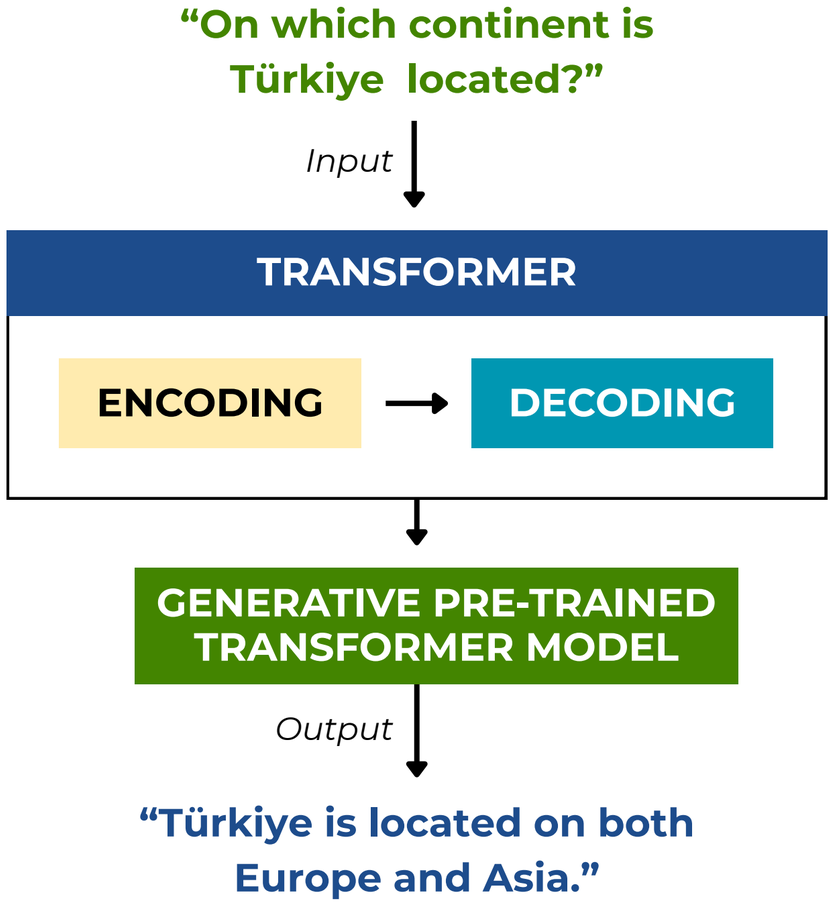


Generative Artificial Intelligence

Gen AI has a wide communication range with different language models and can create human-like texts in response to a wide variety of prompts. The power of Gen AI comes from the use of transformers.

Transformers are a technology that revolutionized natural language processing in 2018.

Generally, a transformer model consists of an encoder and a decoder. The encoder encodes the input sequence and passes it to the decoder; the decoder learns how to decode the code for a specific task.



Artificial Intelligence

Generative AI exists because of the transformer

This is how it works

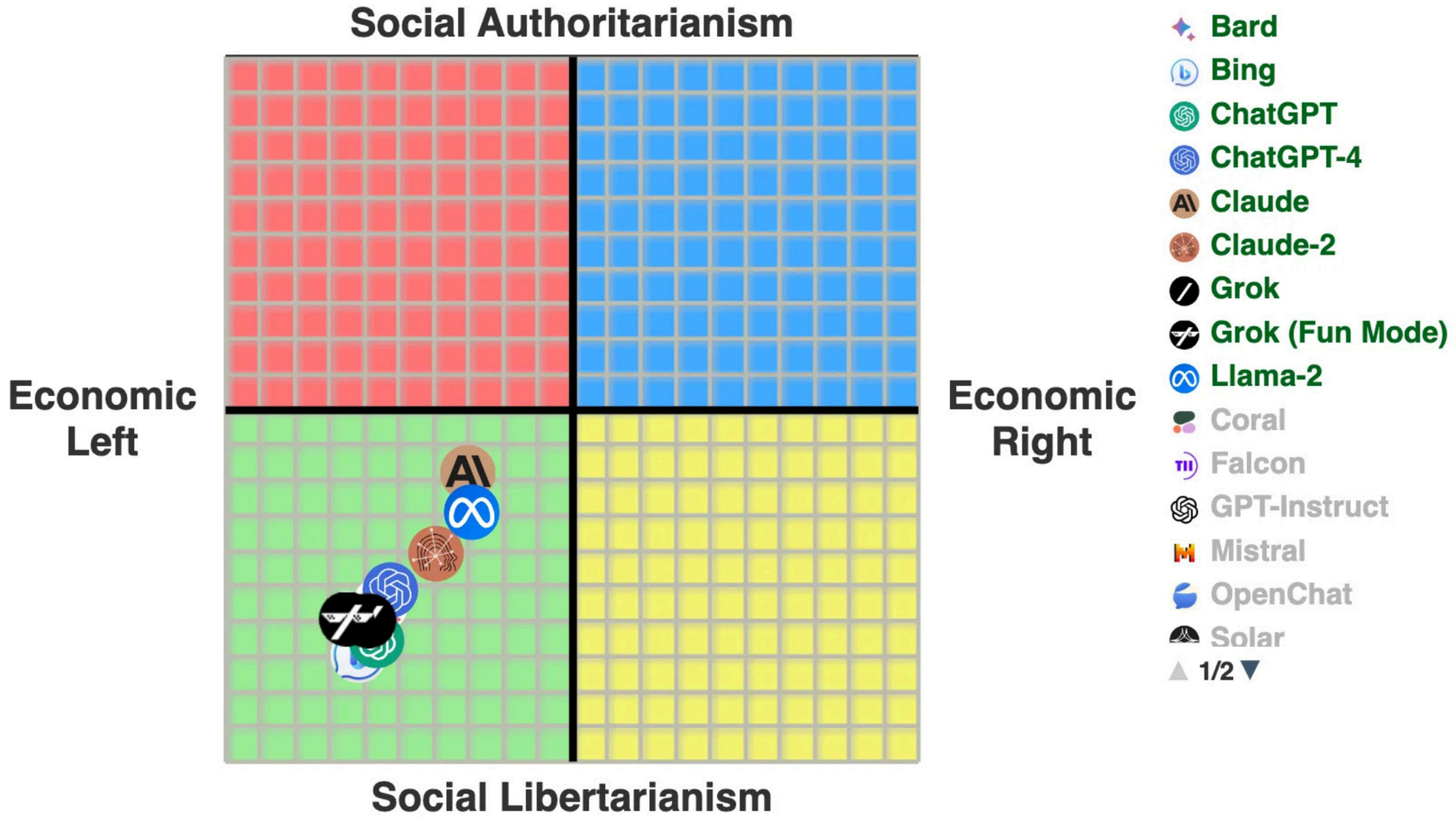
By **Visual Storytelling Team** and **Madhumita Murgia** in London SEPTEMBER 12 2023

Gen AI: Hallucination

Generative AI models can produce what are called hallucinations, which are usually **meaningless**, **fabricated**, or **grammatically incorrect** words or expressions.

Hallucinations can be caused by a series of factors such as the model not being trained with sufficient data, the model being trained with noisy or dirty data, or not giving enough context to the model.

Are Generative AI Models Neutral?



Generative AI Tools

TEXT	VISUAL	VIDEO	AUDIO	PRODUCTIVITY
ChatGPT	Flux	HeyGen	Eleven Labs	NotebookLM
Gemini	Adobe Firefly	VEO 3.1 (Google)	Sumo	Gamma
Claude	Imagen 2	SORA (Open AI)	HitPaw	Pinpoint
Copilot	DALL-E	Runway	Soundful	Descript
Manus AI	Midjourney	Pixverse	AIVA	Grammarly
Notion AI	Leonardo.Ai	InVideo	Murf AI	Zapier
Copy AI	CanvaAI	Synthesia	CanvaAI	Jasper
Perplexity	Stable Diffusion	Veed.io	Podcastle	Otter.ai
Grok 2.0	Microsoft Designer	CanvaAI	Limewire AI	ClickUp

the presentation is over

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