EDUGAME

1ST INTERNSHIP VALENCIA 2024

AI BASICS FOR EDUCATORS

1. Intelligence

Definition

There is no universally agreed upon definition of **intelligence**. Different fields and disciplines have their own definitions and concepts of intelligence, and there is ongoing debate and research in the field of artificial intelligence (AI) and cognitive science about what constitutes intelligence.

Some definitions of intelligence focus on cognitive abilities such as problem-solving, perception, autonomous reasoning, planning, and learning, while others include traits such as emotional intelligence or social intelligence.

Additionally, there is ongoing debate about whether certain characteristics, such as consciousness, are necessary for intelligence.

1. Intelligence

Understanding

Are computers able to ‘understand’?

A really opened debate.

1. Intelligence

Creativity

- Intelligence, understanding, creativity?
- Only human properties?
- We will see creativity to some extend, and again, now there's a debate if computers can or cannot be creative.
- Are intelligence and creativity black/white, to have/not to have, or are they grey?
- Are maybe facing new forms of intelligence and creativity?

1. Intelligence

Consciousness

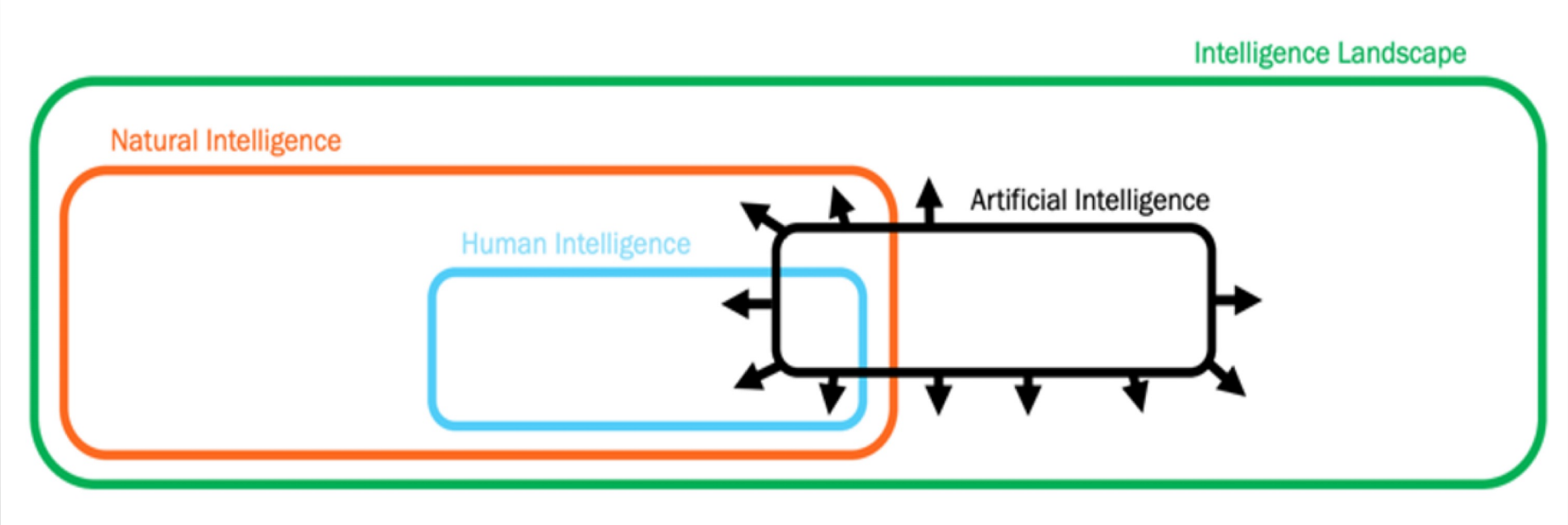
Better we talk about it another day…

However, do you think consciousness is a must-have property for intelligence?

1. Intelligence

Anthropocentric vision of intelligence: maybe a mistake

BTW: I'm behaviorist

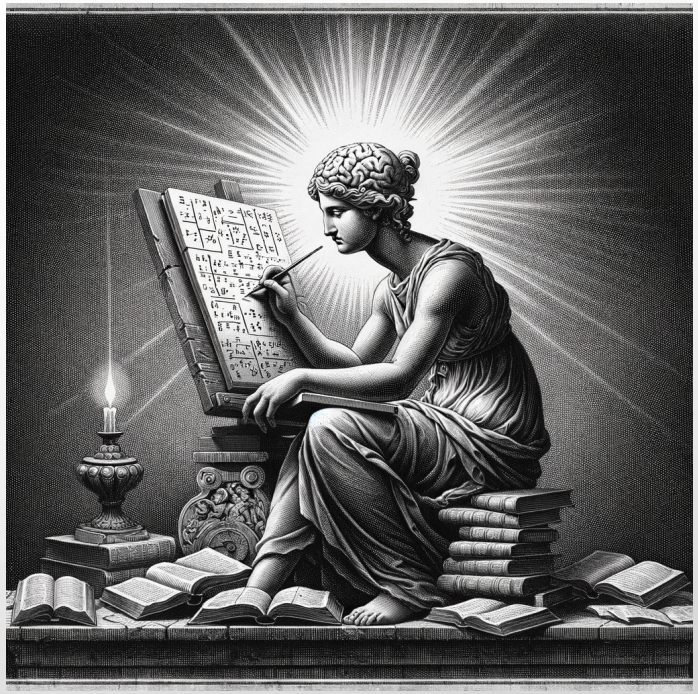


1. Intelligence

Anthropocentric vision of intelligence: maybe a mistake

Some components that we associate with intelligence:

- Learning
- Reasoning and logic
- Perception and interpretation
- Memory
- Creativity
- Autonomy
- Communication



1. Intelligence

Anthropocentric vision of intelligence: maybe a mistake

The aspiration to be creators of intelligent entities is not new:

- Thalos
- Golem
- Da Vinci's Automaton
- And so on.

2. Artificial Intelligence

Definition

Different fields such as computer science, psychology, philosophy, and cognitive science have **their own definitions and concepts of AI**, and the definition can change over time as the field of AI advances.

There are several definitions of AI, depending on the context and the field of study. Here are some common definitions of AI:

2. Artificial Intelligence

Definition

- AI as a simulation of human intelligence.
- AI as a system that can perform tasks that typically require human intelligence.
- AI as a system that can learn from data.
- AI as a system that can reason and solve problems.
- AI as a system that can exhibit intelligent behavior.
- AI as a system that can improve itself.
- AI as a system that can understand or generate human-like natural language.
- AI as a system that can perceive, act, and adapt to its environment.

2. Artificial Intelligence

Categories – regarding its scope

Narrow, weak or specific AI

It is designed to perform a specific task, like facial recognition or playing chess. These are designed for a specific task, and do not have general intelligence.

General or strong AI

It refers to machines that have the ability to understand or learn any intellectual task that a human being can. It is a hypothetical form of AI that can perform any task that a human can, and it is not yet achieved.

2. Artificial Intelligence

Why the current hype?

DEEP LEARNING (NEURAL NETWORKS) STARTED TO CHANGE EVERYTHING 12 YEARS AGO.

IN **2012, ALEXNET** (AN ARTIFICIAL NEURAL NETWORK) WAS ABLE TO BEAT ANY PREVIOUS APPROACH TO A HUGE IMAGE CLASSIFICATION PROBLEM.

SINCE THEM WE HAVEN'T STOPPED.

2. Artificial Intelligence

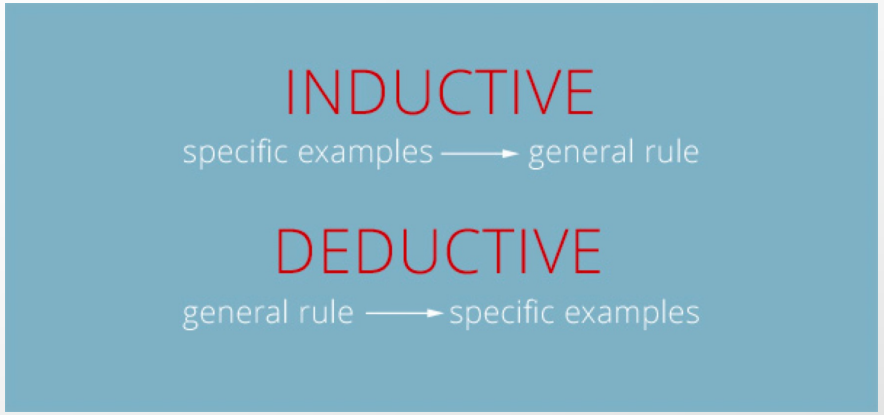
A paradigm shift

A paradigm shift took place with **Machine Learning** techniques.

From **deduction** to **induction**.

In front of complex problems, it is not possible many times to describe a clear set of instructions to solve it (deduction).

If we have a set of real examples, we can develop techniques able to learn **rules** from these **examples** (patterns), and then create a model able to make predictions in front of new inputs.

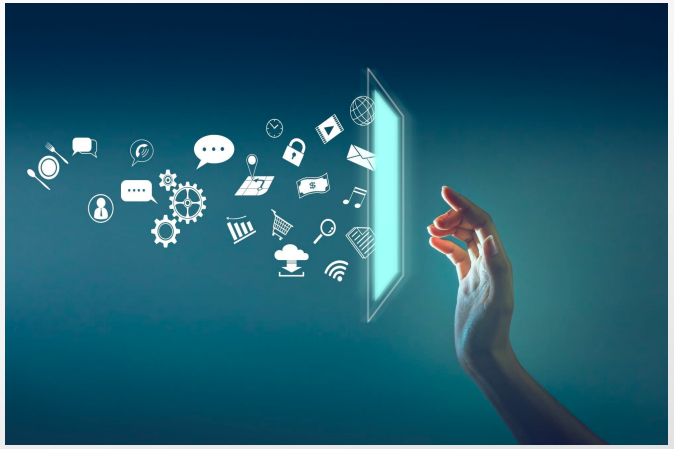


3. Deep Learning and Neural Networks

The current engine of generative tools (and more)

The three main components:

- Advanced neural networks architectures
- High computational power
- Huge amount of data -> Internet

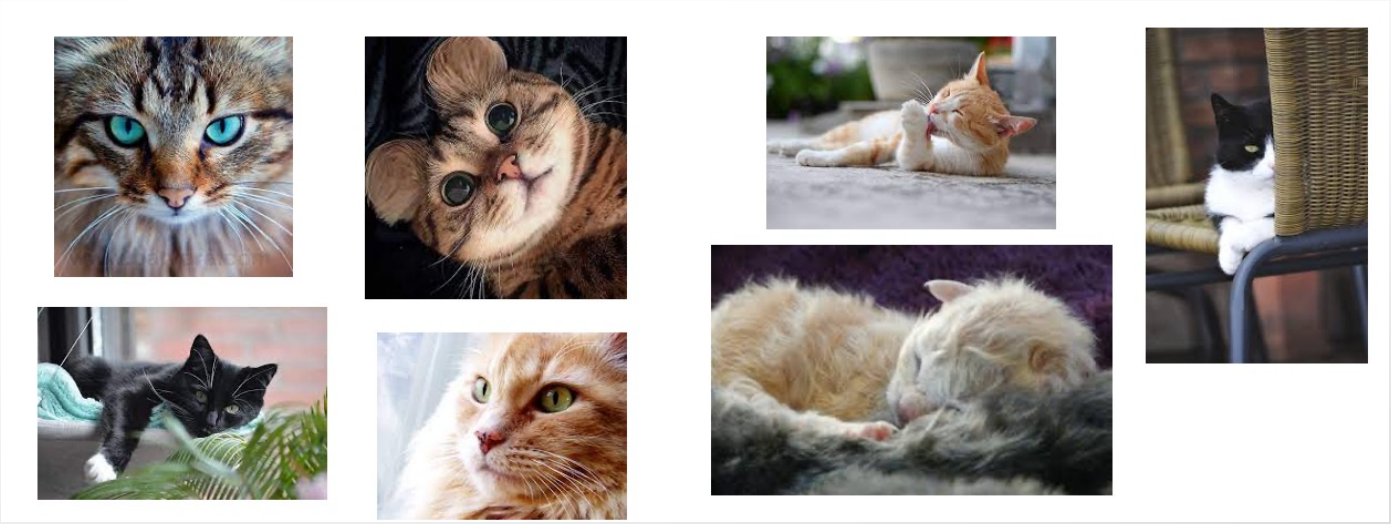


Current generative techniques need incredible amount of data for their training process.

3. Deep Learning and Neural Networks

The current engine of generative tools (and more)

What makes a cat a cat?



It seems simple, right?

Perception and interpretation is hard.

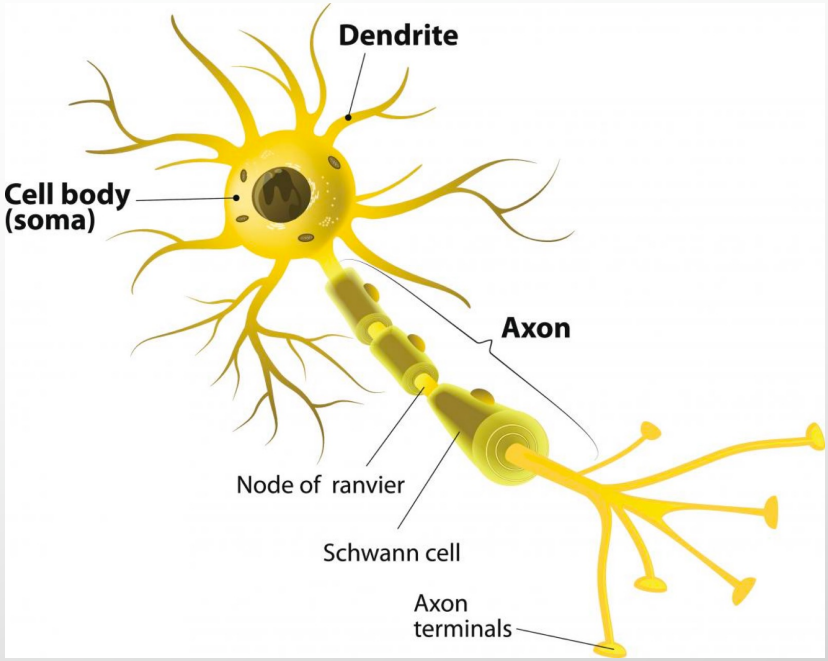
Reasoning and planning are even worse.

3. Deep Learning and Neural Networks

Neurons

The connectionist approach

- Traditional deductive approach: powerful CPU's able to understand complex programming languages and follow a strict set of rules.
- Is it how our brain seems to work?
- What if we mimic somehow how it works? Neurons, many, interconnected
- Neurons perform not complex problems, simple 'calculations'
- However, in a huge network, they provide our intelligence



3. Deep Learning and Neural Networks

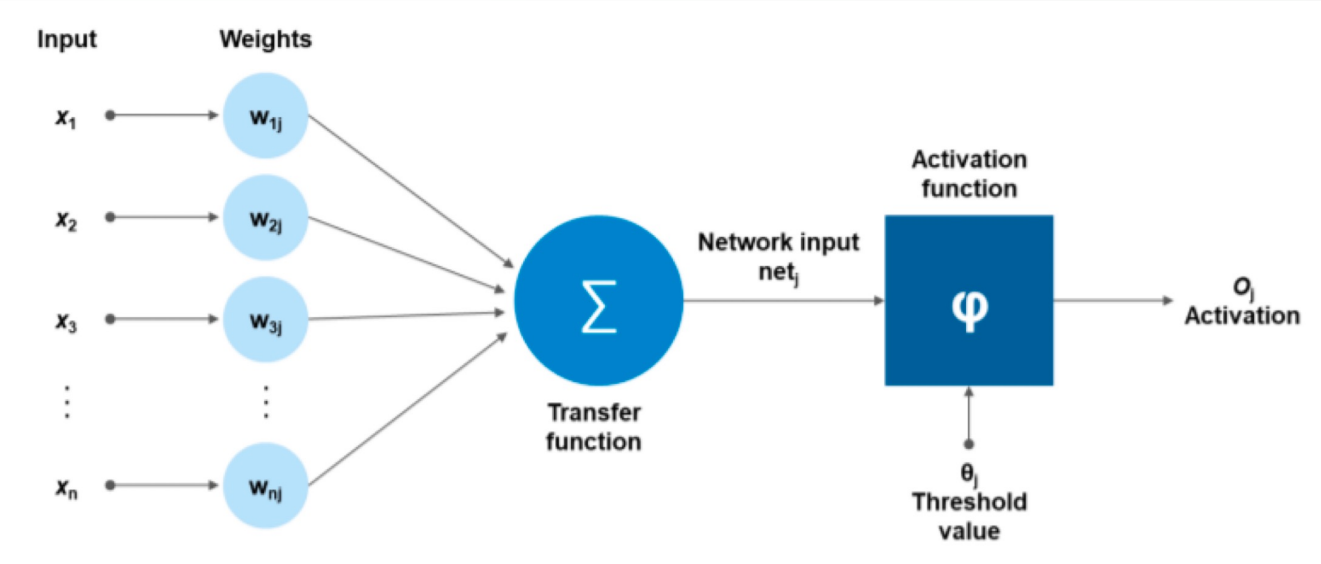
Artificial neuron

The artificial neuron

- Bio-inspiration (sort-of)
- A simple function
- Inputs are multiplied by weights, we sum everything and a simple function is applied
- The result is then provided

Weights are the knowledge

- Weights are random at the beginning
- With some sort-of of supervised learning algorithm, the weights will be modified using the input examples



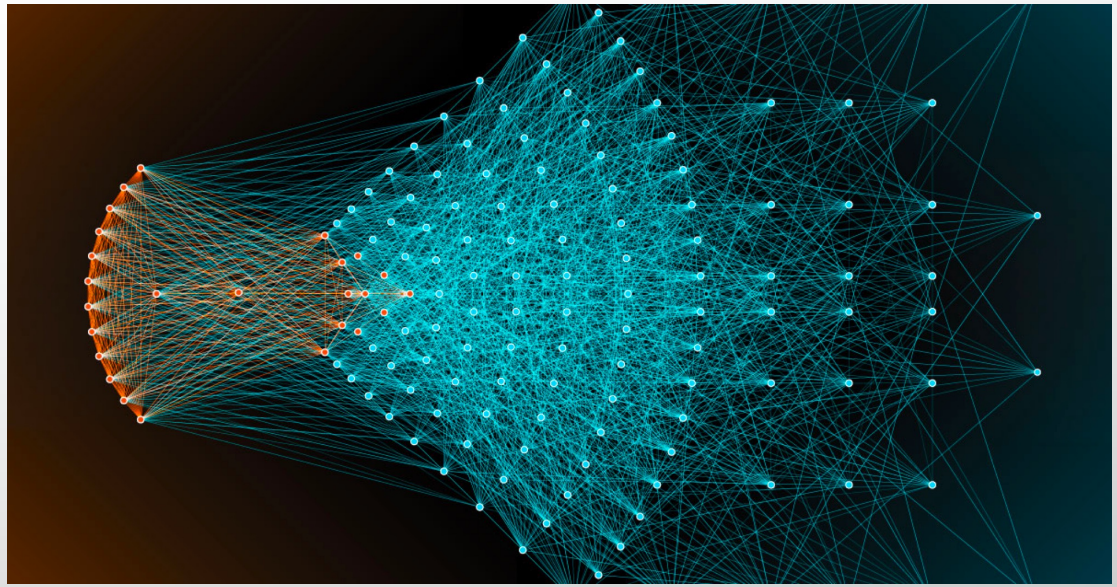
3. Deep Learning and Neural Networks

Artificial neural networks

The artificial neural network (NN)

- Brain strategy, can we solve complex problems with highly dense artificial networks?

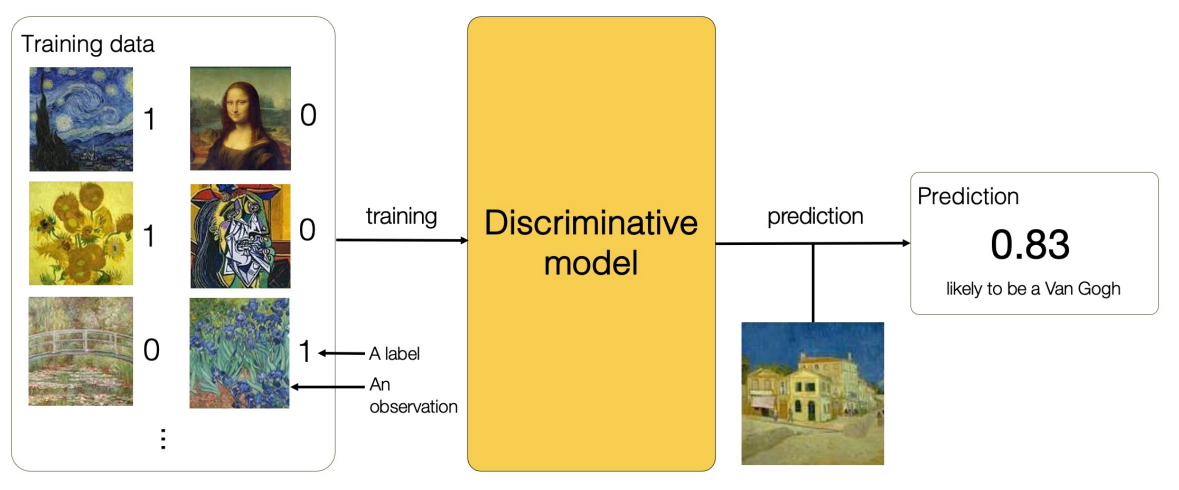
- Discrimination, finding complex patterns, prediction

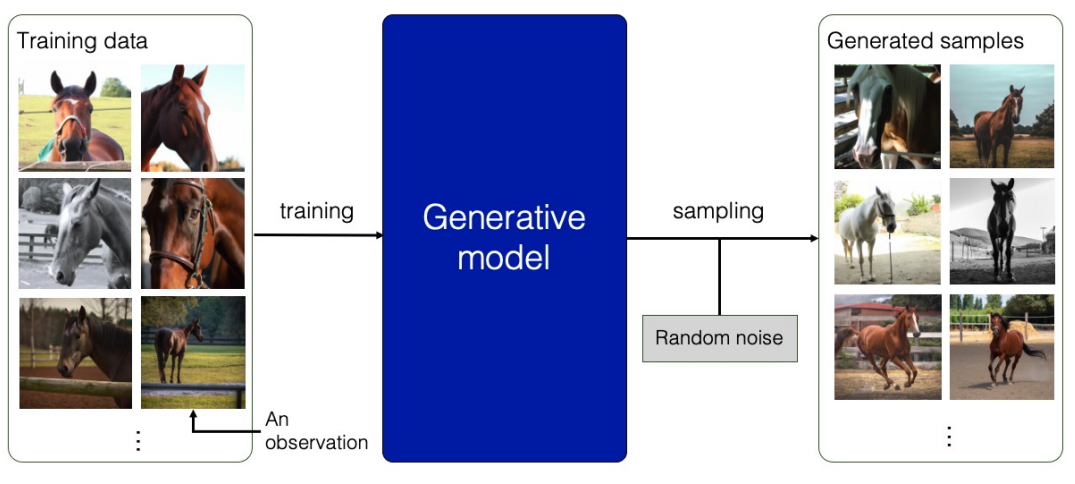


4. From Discriminative to Generative AI

Generating new information?

- **Discriminative AI** models learn to classify or predict outputs based on inputs.
- **Generative AI** models learn to generate new data instances (creativity as random noise)





5. Large Language Models (LLMs)

The core of tools such as chatGPT, Claude, Gemini, and others

- What is the word that more likely follows a sequence of words?
- Learning semantics by just consuming huge corpora of text (transformers)
- NN as a function able to predict the next word in a sequence after intensive huge learning process

5. Large Language Models

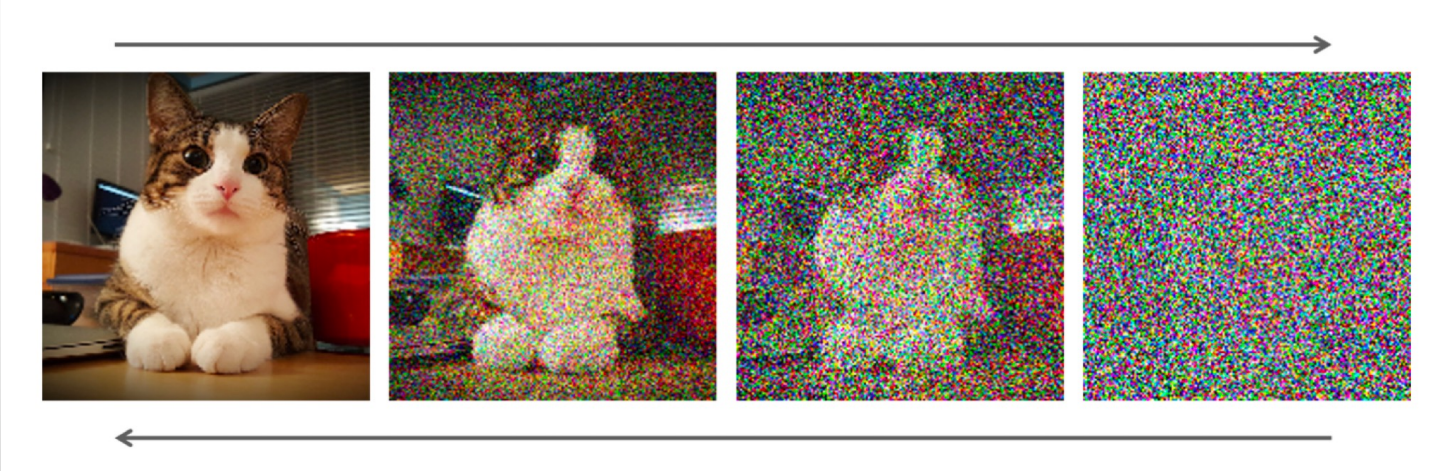
Emergence abilities

- Unexpected skills
- Zero-shot, few-shot learning
- Composition
- Basic reasoning
- Translation
- Chain of thoughts
- Etc.

6. Other generative tools

Image generation? Artwork? What?

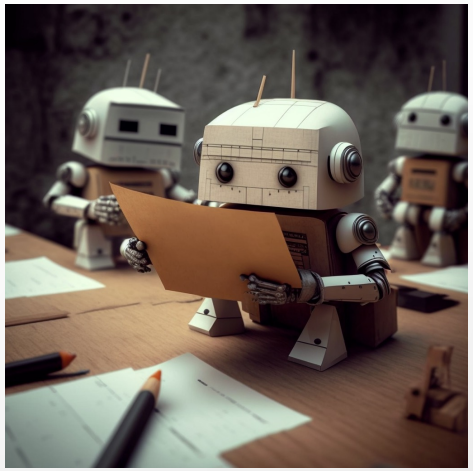
- Training with thousands of millions of images and their text description
- NN able to get semantics from text and relate them with actions, objects, illumination etc. of the images
- The NN ‘understands’ how to draw/paint/photograph



7. Not copy and paste

No, it’s not copy and paste

- The learning process just retains the ‘**weights**’ or ‘**parameters**’ of the neurons, no the original information from the training, no collage, no ‘verbatim’ text copy
- So, somehow, as we also do, NN are able to synthesize the input training data, get their patterns, the essence of the information, and then, is able to generate new items with random variations and user guidance
- If plagiarism, only because high overfitting



8. Open fields in AI

Reinforcement learning and beyond

- Not all is either discriminative or generative AI
- AI has been used from the very beginning to **reasoning and planning**, mainly on areas of high search spaces

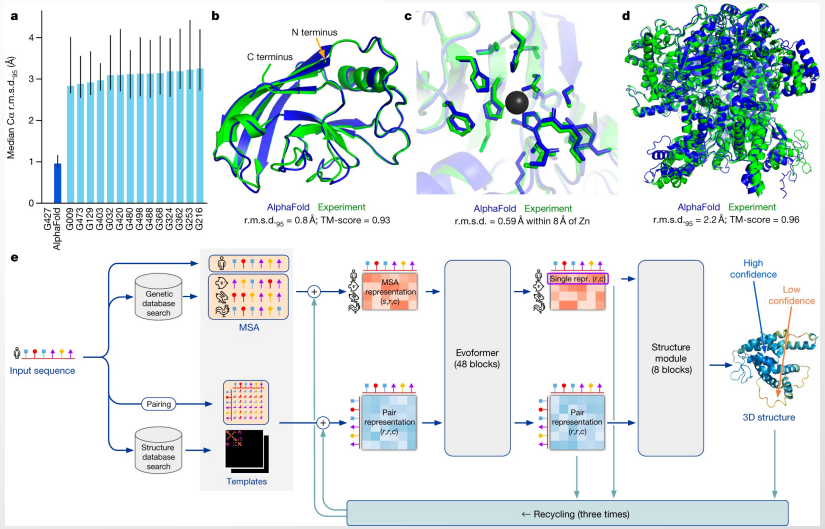
- **Reinforcement learning**
- Instead of learning by examples, learning by experiences (try/error)
- NN are also boosting now new reinforcement learning techniques
- AlphaGo, AlphaZero… more steps towards computer-based creativity?

- **From system 1 to system 2**?
- (Thinking, Fast and Slow: Kahneman, Daniel)

8. Open fields in AI

Reinforcement learning and beyond

- The end of experimental sciences?
- A new era in medicine?
- Solutions to energy and climate change?
- … we humans don't have enough cognitive power to solve everything
- **Reinforcement Learning for Creativity:** Some research aims to develop AI systems that can generate creative artifacts like music, images, stories, etc. Reinforcement learning is used to provide feedback to the generative models based on how creative their outputs are. The goal is to make the models more creative over time based on the reinforcement signals.



8. Open fields in AI

Towards AGI

Dividing our cognitive abilities:

Daniel Kahneman ”Think Fast, Think Slow”

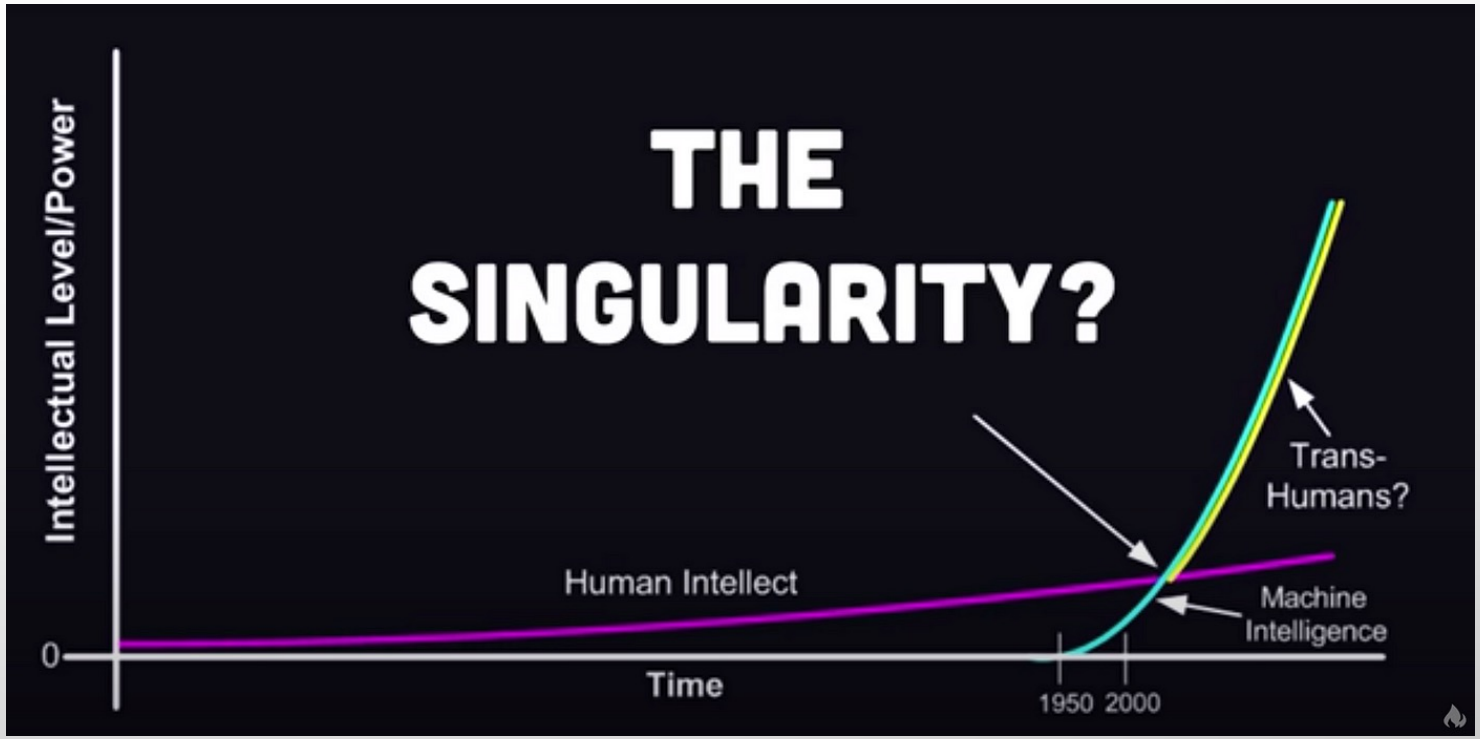
System 1: Fast, Intuitive, Automatic, Emotional, Subconscious

System 2: Slow, Analytical, Deliberative, Logical, Conscious

8. Open fields in AI

Singularity

”The Singularity Is Near” by Ray Kurzweil



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