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# AI & GenAI: Challenges and impact in Society

## AI4SG – AI for Social Good ?

*Eugénio Oliveira*

URJC October 2024

U.PORTO LIACC
artificial intelligence and computer science laboratory

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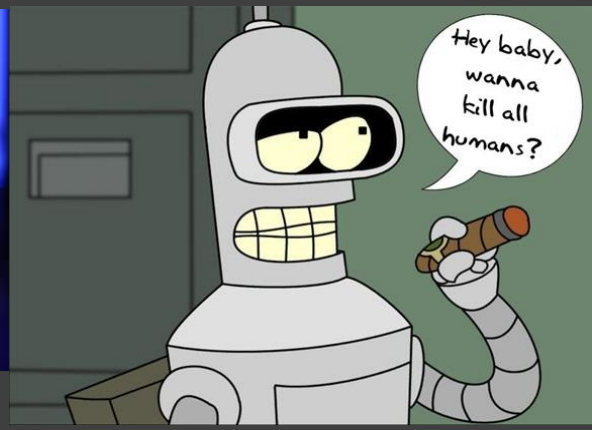
# Generative AI

**Principles,**
**Applications,**
**Challenges,**

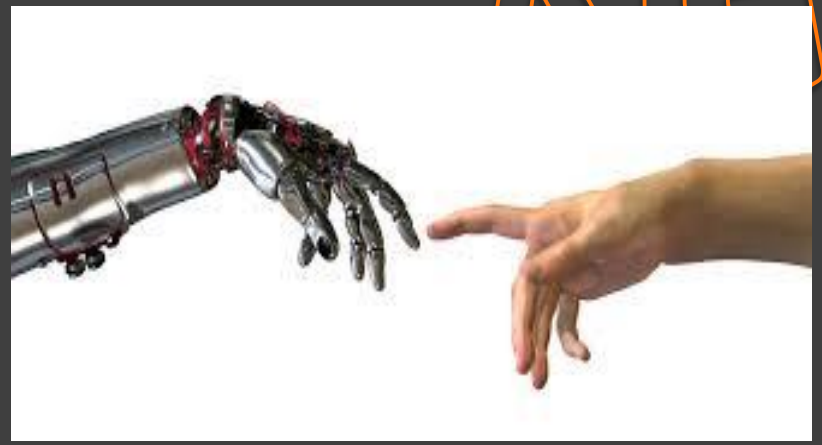
✓ High Computational Power

## PROMISES AND DANGERS

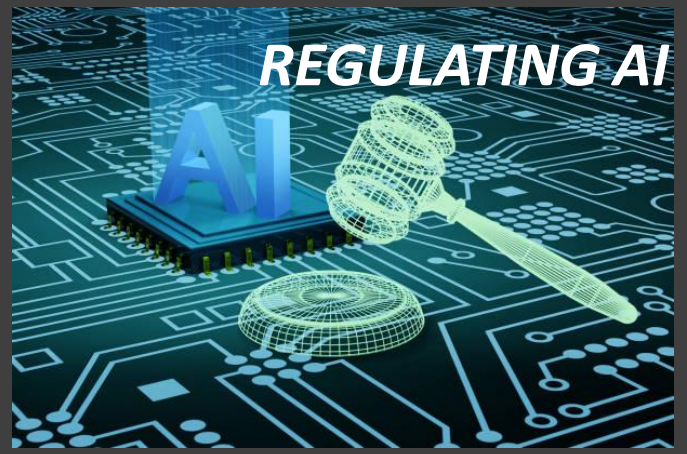



AGENDA

AI4GOOD- Beneficial AI



## REGULATING AI




## ARTIFICIAL GENERAL INTELLIGENCE?

*Eugénio Oliveira*

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# AI- Artificial Intelligence



**Perceive** the environment

Collect and **Interpret** data

Derive **Knowledge** from Data

**Reason** over the Knowledge

**Decide** on potential actions or conclusions

May **GENERATE** new contents

May **Learn and Adapt** their beheviour

**COMPUTATIONAL SYSTEMS**

**Criativity?**

*AI is NATURALLY created by Humans!!*
*Concerning Natural Intelligent, discussion goes on …*

## Five Tribes

- Symbolists
- Connectionists
- Evolutionaries
- Statisticians (Bayesians)
- Analogizers

Knowledge Representation
Knowledge Processing

Logics (Predicates, Temporal, Modal, Intentional…)

Biologic Analogy **(ANN)**

**GA** using simplified laws of **Evolution**

**Entropy** to build **Decision Trees**

Different schools, same objectives:
To develop machine intelligence!

*The Master Algorithm: The ultimate Learning Machine that will remake our world*

*(P. Domingos, Basic Books)*

*Eugénio Oliveira*

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# What is really NEW about AI???

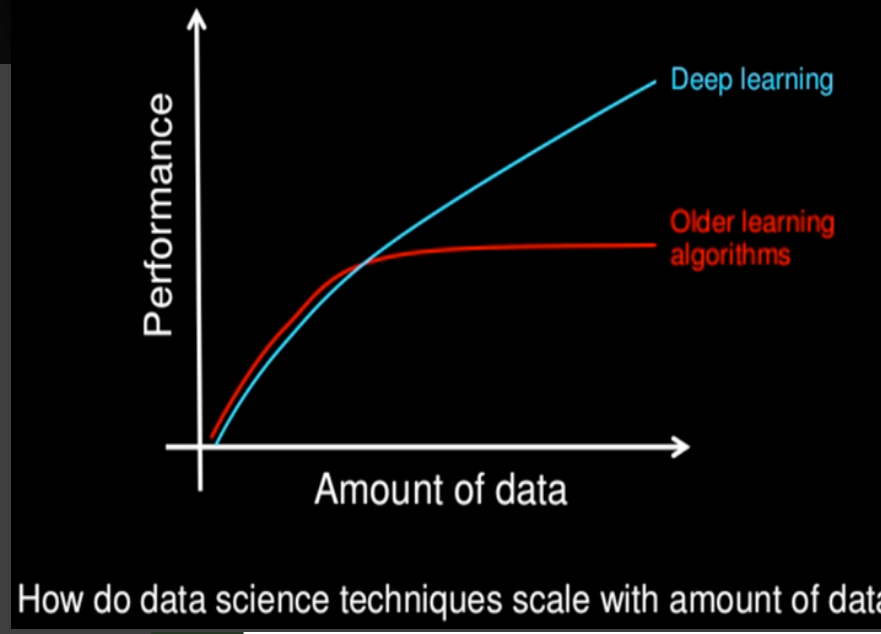


✓**HARDWARE**: High Computational Power

✓**BIG DATA** (> $10^{15}$….)

✓**Algorithms: DEEP LEARNING**

**Artificail Neural Networks based**




IT-friendly **Environments**:
(Domotics, Smart Cities, Health, Defense, Education …)

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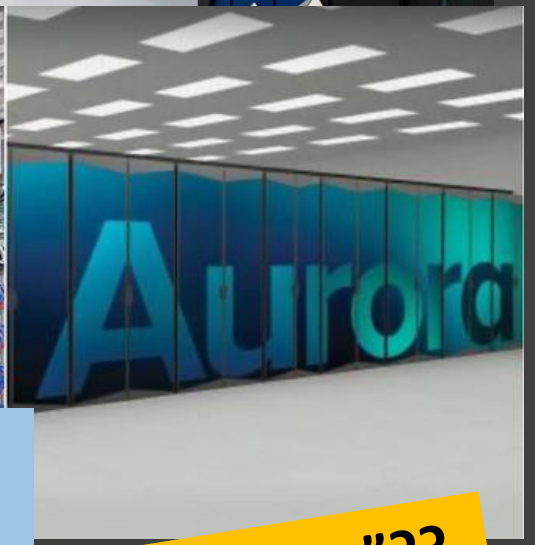
# ✓HARDWARE: High Computational Power


**Summit** supercomputer, at Oak Ridge N. Lab.
area: 2 tennis courts, >27,000 GPUs.
**AI**/ Deep Learning for  understanding climate changes

**US Frontier**:1,206 petaFlops on the LINPACK benchmarks.


**Aurora: (**2024) **exascale** supercomputer US Department of Energy (DOE) and designed by Intel and Cray for the Argonne N. L. 1.012 exaflops (Billion billion = 1000 PF**)**

**"El Capitan"??**


TOP

**Tianhe-3 -** "Xingyi" - supercomputer built by China's National University of Defense Technology.
peak performance **of 2.05 exaflops** and a sustained performance of 1.57 exaflops on High Performance LINPACK.

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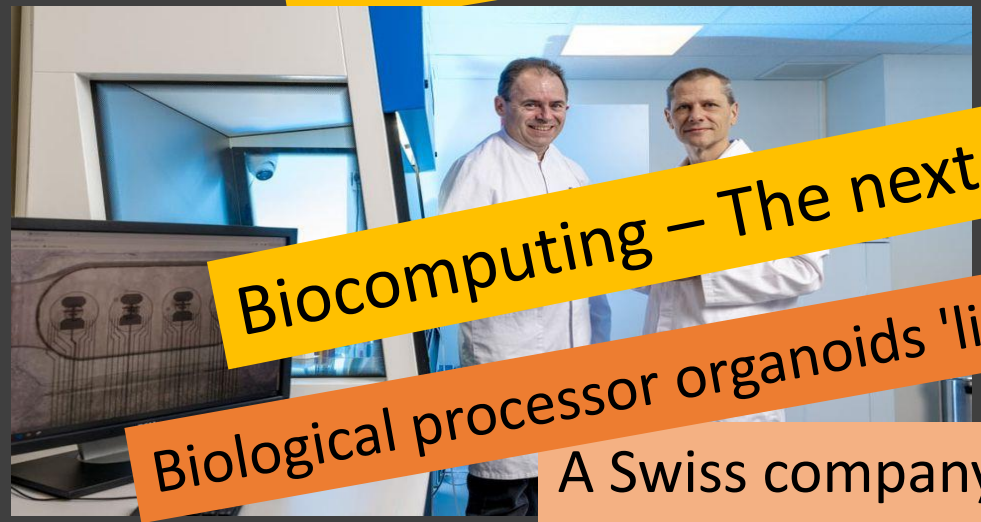
✓HARDWARE

International Centre for Neuromorphic Systems (ICNS) at **Western Sydney University**

**DeepSouth**. IBM Neuromorphic Supercomputer simulating synapsis at the human brain scale.
228 trillion synaptic operations/s,

## Biocomputing – The next evolutionary leap

## Biological processor organoids 'live' about 100 days

A Swiss company, **FinalSpark**, has launched a '**bioprocessing platform**' that uses lab grown **brain tissue to run computing task**s. Their claim is that this tissue uses a million times **less power** than silicon chips

| | System | Peak Petaflops | HPL Petaflops | Compute Efficiency | Concurrent Cores+SMs | Cores+SMs 1 Exaflops HPL |
|---|---|---|---|---|---|---|
| | *NSC/Guangzhou "Tianhe-3"* | *2,050.0* | *1,567.6* | *76.5%* | *???* | *???* |
| | *NSC/Wuxi "OceanLight"* | *1,500.0* | *1,220.0* | *81.3%* | *41,930,000* | *34,368,852* |
| 1 | Oak Ridge "Frontier" | 1,679.8 | 1,194.0 | 71.1% | 8,699,904 | 7,286,352 |
| 2 | Argonne "Aurora" | 1,059.3 | 585.3 | 55.3% | 4,742,808 | 8,102,655 |
| 3 | Microsoft Azure "Eagle" | 846.8 | 561.2 | 66.3% | 1,123,200 | 2,001,426 |
| 4 | RIKEN "Fugaku" | 537.2 | 442.0 | 82.3% | 7,630,848 | 17,263,971 |
| 5 | CSC "LUMI" | 531.5 | 379.7 | 71.4% | 2,725,704 | 7,178,573 |
| 6 | CINECA "Leonardo" | 304.5 | 238.7 | 78.4% | 1,824,768 | 7,644,608 |
| 7 | Oak Ridge "Summit" | 200.8 | 148.6 | 74.0% | 2,414,592 | 16,248,937 |
| 8 | BSC "MareNostrum 5 ACC" | 234.0 | 138.2 | 59.1% | 680,960 | 4,927,352 |
| 9 | Nvidia "Eos" | 188.7 | 121.4 | 64.4% | 485,888 | 4,002,372 |
| 10 | Lawrence Livermore "Sierra" | 125.7 | 94.6 | 75.3% | 1,572,480 | 16,615,385 |

✓ **Algorithms: DEEP LEARNING**

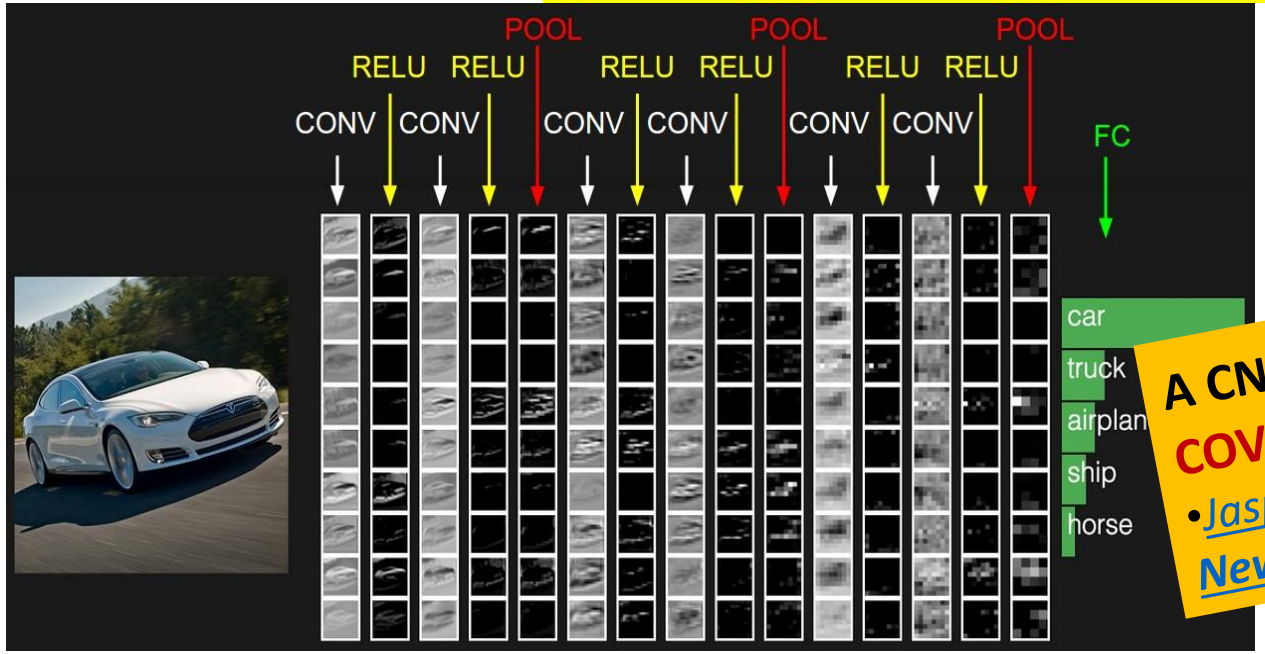
**Artificial Neural Networks based**

**Algorithms that progressively extract higher-level features from the raw input**, using multiple Layers of possible non-linear Transformations.
**Outputs specialize according to the patterns hidden in inputs.**

Progressive **Abstraction** →

Eg.: an **Image**, may be represented through:
vector of **pixels intensity**;
set of lines (**edges**);
space regions (**faces**)
**Object** recognition

# DL: CNN - Convolution Network




**A CNN Transfer Learning-Based Automated Diagnosis of COVID-19 From Lung Computerized Tomography Scan Slices**

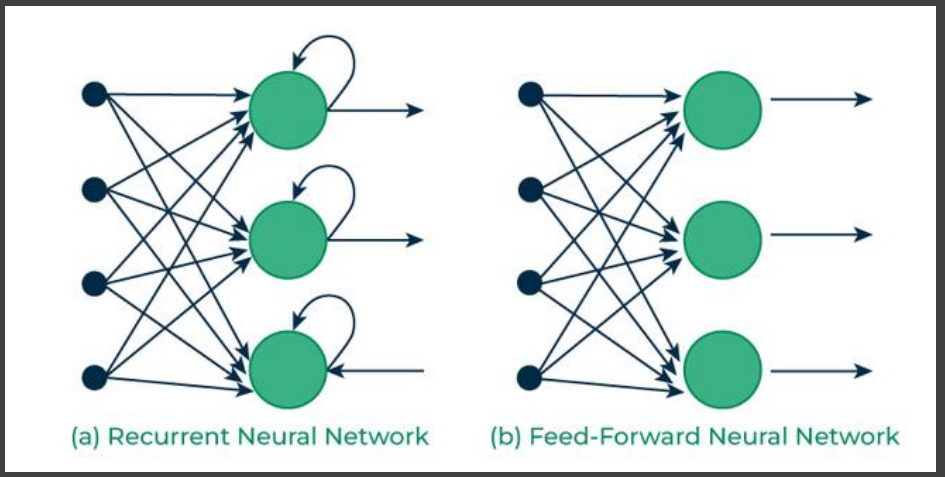
•Jaspreet Kaur & Prabhpreet Kaur

***New Generation Computing* volume 41**, *pages 795–838 (2023)*

CNNs make use of filters (also known as **kernels**), to detect what features, are present throughout an image.

Each CONV layer includes Filters producing Activation Maps.

# Deep Learning (**RNN Recurrent Networks**)




Recurrent Units have the ability to maintain hidden states, allowing the network to capture sequential dependencies.

**LSTM and Gated Recurrent Unit (GRU)** versions improve by remembering previous inputs while processing the RNN's ability to handle **long-term dependencies.**

**Advantage**

An RNN may remember each piece of information through time.

**Disadvantages**

-**Training an RNN is a difficult task.**

-Gradient vanishing and exploding problems.

-It cannot process very long sequences if using *tanh* or **relu** as **an activation function**.

# Differences Summary

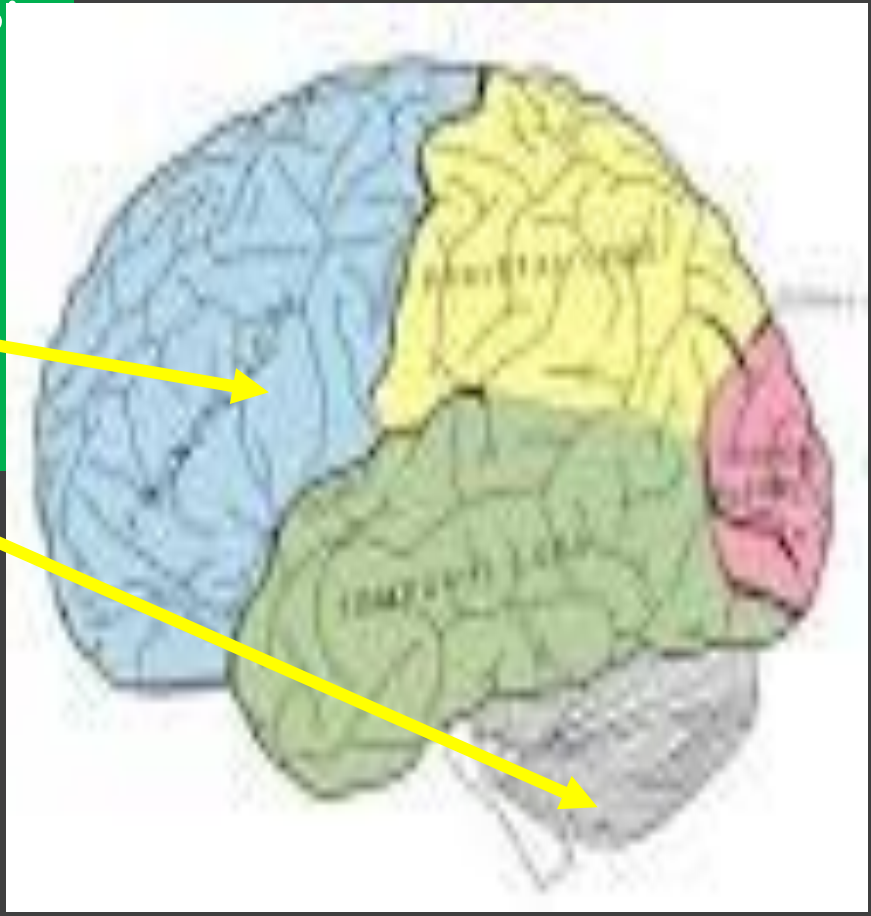
| Feature | CNNs | RNNs |
| --- | --- | --- |
| Primary Use | **Spatial** data (e.g., images, videos) | **Sequential** data (e.g., text, time series) |
| Key Layers | **Convolutional**, pooling | **Recurrent** (e.g., LSTM, GRU) |
| Connection Pattern | **Local** connectivity, parameter sharing | **Temporal** connectivity, shared weights |
| Memory | **No memory** of previous inputs | Maintains **hidden state** for memory |
| Strengths | **Feature extraction**, translation invariance | Sequence modeling, temporal dependencies |
| Common Applications | **Image** recognition and generation, object detection | **Language** modeling, machine translation Text generation |

# ANN functionalities

Different DL NNs:

May be useful for mapping fuctionalities of diferente **Brain lobs**

**occipital** (vision, **ConvNets**),
**frontal** (behaviour, working Memory : **RNN)**
**temporal** (ANN, recognition, **LTM)**
**parietal** (perception, spacial representation: STM)



# Human Brain

~$10^{11}$ Neurons.
$10^4$ synapsis/ neuron
(average value)

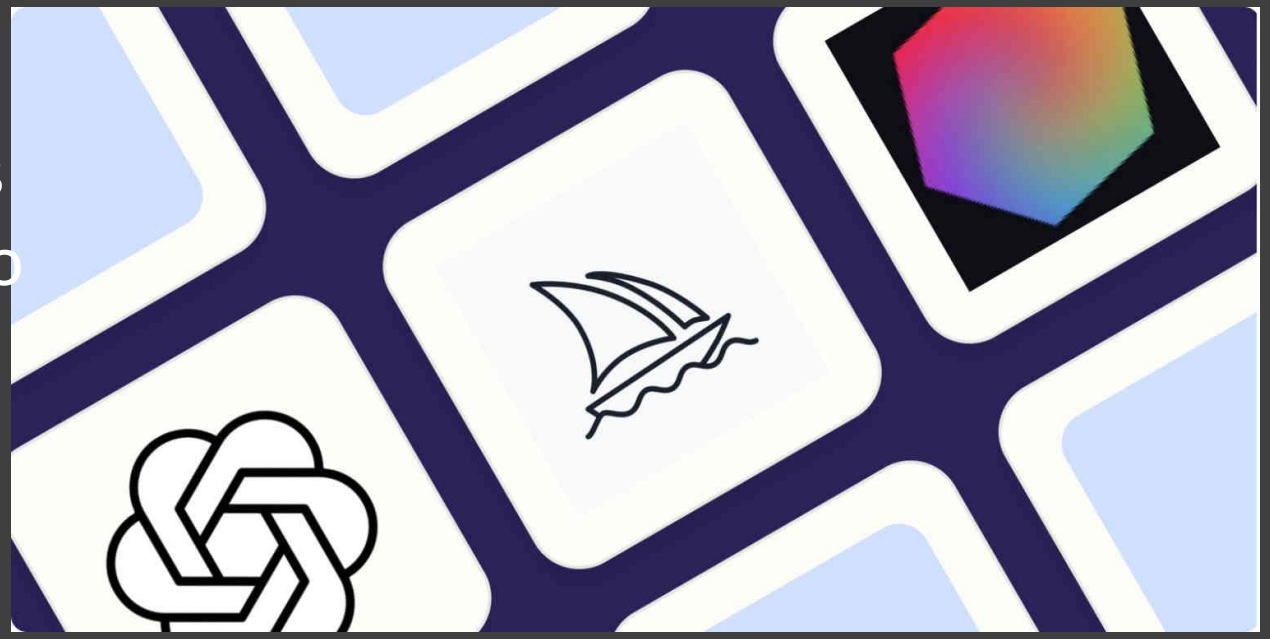
$10^{15}$synapsis*10 spikes/second→$10^{16}$ operations/s
~25 watts very eficient (?up to 100w?)

Cortex: between $10^4$ and $10^5$ neurons per $mm^3$

- Brain operates in a massive parallel way

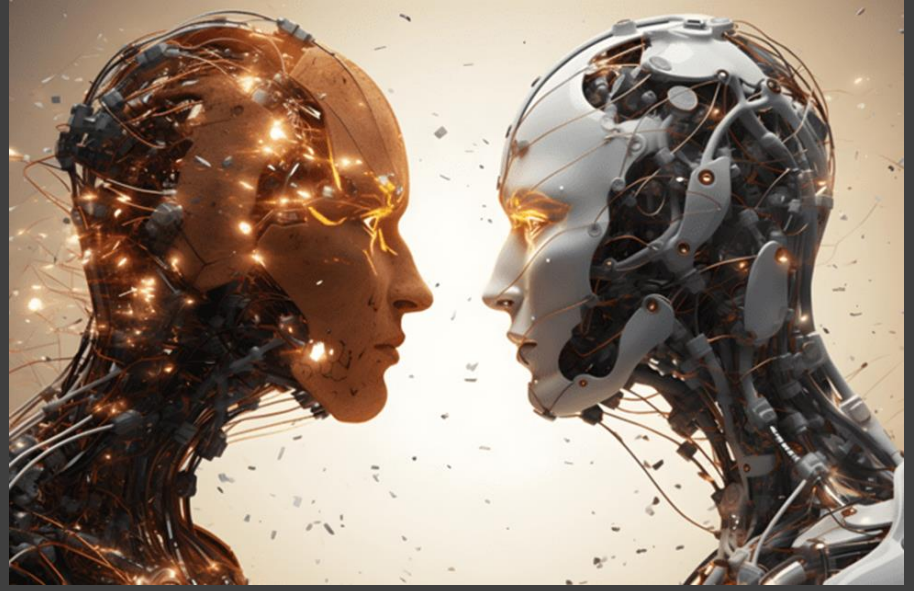
# GENERATIVE AI

Generative AI can produce various types of content, including text, imagery, audio and synthetic data.
**LLMs** mostly use transformers.



**Transformers** use a concept called **attention** that enables models to track the connections between related tokens.
*eg. words across pages, chapters and books,* rather than just in individual sentences. ***words / pixels/code / proteins /chemicals / DNA.***

**"Attention is all you need"** Vaswani NIPS 2017 using the softmax-based attention mechanism proposed by Bahdanau et. al. in 2014 for machine translation but using a scaled (down) dot product



**1960-70**: **Markov** Models – algorithms that generate next states based on probabilities

**2010-20**: AI Algorithms– “Deep Learning” ANN Architectures + powerful **CPUs**

Traditional AI: analyzes Data and get to the Conclusions (Decisions, Previews…)
**GENERATIVE AI**: GENERATES new data related with training data sets.

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https://youtu.be/38-xqTmSUDY

# GENERATIVE AI

Generative pre-trained transformers (**GPT**) are a type of **LLM**

February 14, 2019

**Better Language Models and Their Implications**

**GPT-2** NL Model trained with **8 M web page**

OpenAI launched ChatGPT, with zero fanfare, in November 2022

Users seen as guinea pigs …

GPT-2 "could be" **used** for:

. **Automatic Translation, Text Summarization, …AI Assistants (text generation)**

"**GPT-3** from1.5 to 175 B /(thousands of Millions) parameters

**Business:** released because "is either us or the others" …

"**GPT-4 100 T (Billions) Parameters** **than GPT-3**

**Trained with 45 TBy**

**CHAT GPT** became the fastest-growing consumer product in history

GPT-4o ("o" for "omni"), ChatGPT-o understands text, sound and images, answering the input text with voice or generating images.

GPT-5

AlphaSignal 14/1/24

2T-5T (2,000B-5,000B)

Sam Altman hints at new details of **GPT-5**

June 18th 2024, OpenAI has announced the **training** of GPT-5, which promises to surpass the capabilities of the latest GPT-4o.

**GPT-5** is more focused in the **multimodal** interactions including Audio and Video.

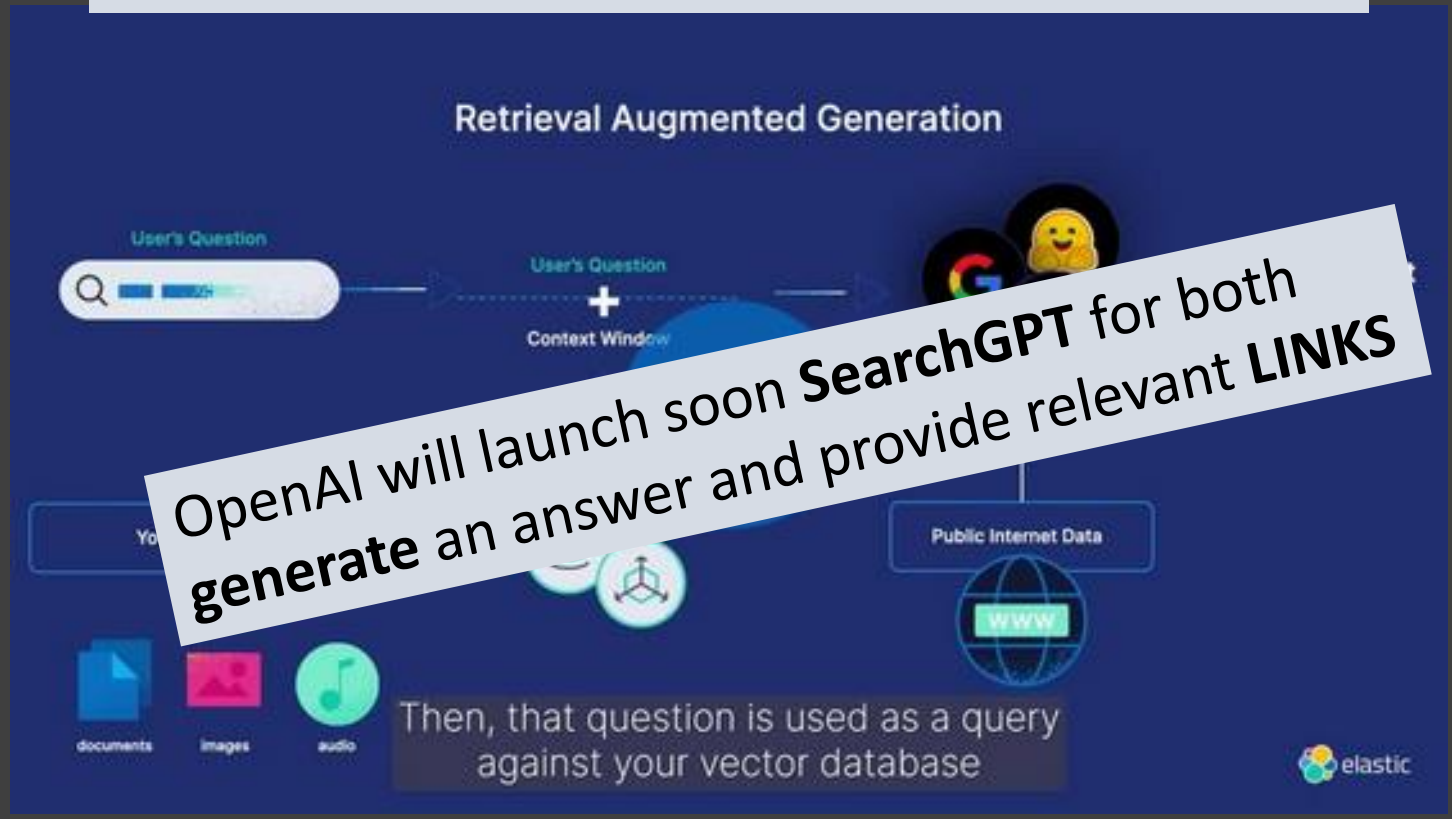
**GPT-5** is said to be more **responsible** by doing **logical** analysis of the information.

# NEW FM Developments

While **vector-based** models are good at retrieving information based on similarity, they're bad at relevance and context.
And require a lot of computational **power**,

RAG solutions remove context when encoding information

## RAG- Retrieval Augmented Generation




OpenAI will launch soon **SearchGPT** for both **generate** an answer and provide relevant **LINKS**

**SLM** - Small language models are still an emerging technology for very focused AI use cases. For example, a tool for building an **internal documentation chatbot** that is trained to provide employees relevant information on the company

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**MY Prompt**: audiance including the kings of Spain, in a talk on Artificial intelligence at an University in Madrid


Midjourney, Inc., São Francisco based Lab

# The best AI image generators at a glance

| | Best for | Access options | Price | Parent company |
|---|---|---|---|---|
| DALLE·3 | Ease of use | ChatGPT Plus or Enterprise; Bing's AI Copilot; API | Included with ChatGPT Plus at $20/month | OpenAI |
| Midjourney | High-quality results | Discord | From $10/month for ~200 images/month and commercial usage rights | Midjourney |
| Stable Diffusion | Customization and control | DreamStudio; Clipdrop; API; and lots of other iterations, including downloading it to a local server | Free for 25 credits; from $10 for 1,000 credits | Stability AI |
| Adobe Firefly | Integrating AI-generated images into photos | firefly.adobe.com, Photoshop, Express, and other Adobe tools | Free for 25 credits; from $4.99 for 100 credits/month | Adobe |
| Generative AI by Getty | Commercially safe images | iStock | From $14.99 for 100 AI generations | Getty (uses NVIDIA Picasso) |

But the best way to use DALL·E 3 is through ChatGPT. If you're a ChatGPT Plus subscriber

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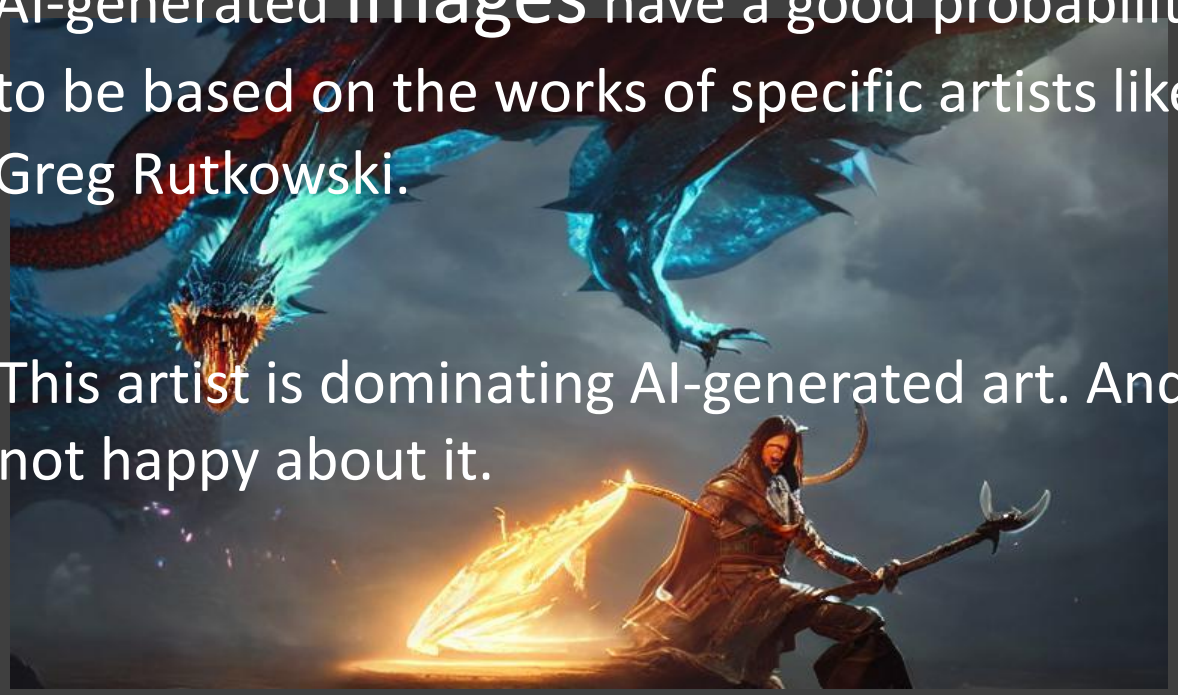
# Hallucinations, Authorship

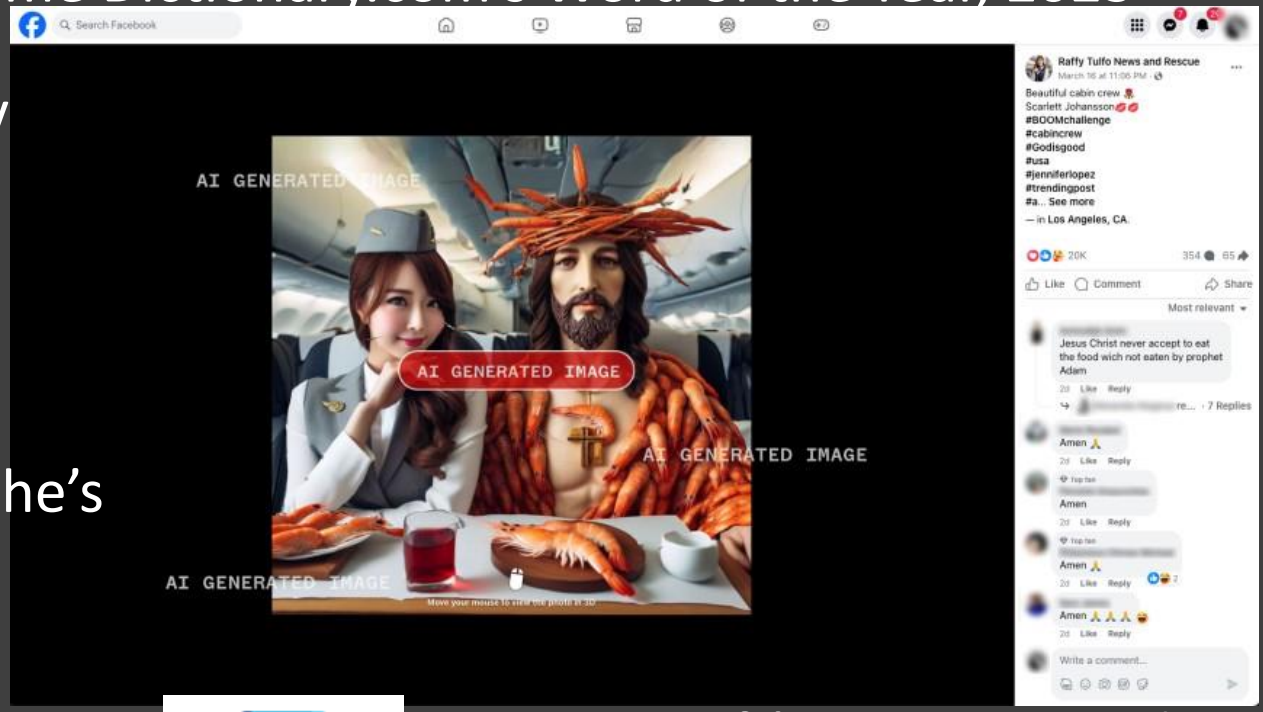
the term "hallucinate" became Dictionary.com's Word of the Year, 2023

AI-generated images have a good probability to be based on the works of specific artists like Greg Rutkowski.



This artist is dominating AI-generated art. And he's not happy about it.

GR is a more popular prompt than Picasso.




Microsoft's Azure AI Studio new built-in safety features to identify and block suspicious inputs in real time.

**AI** is **learning to deceive humans …**
One of the most striking examples is META's CICERO, which turned out to be an expert liar.

May 13

the blueprint BY INTERESTING ENGINEERING

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# Tests find AI tools create **election lies**

By ALI SWENSON, May 31, 2024


Washington, D.C.-based Center for **Countering Digital Hate** created audio clips of five false statements about elections in the voices of eight prominent American and European politicians.

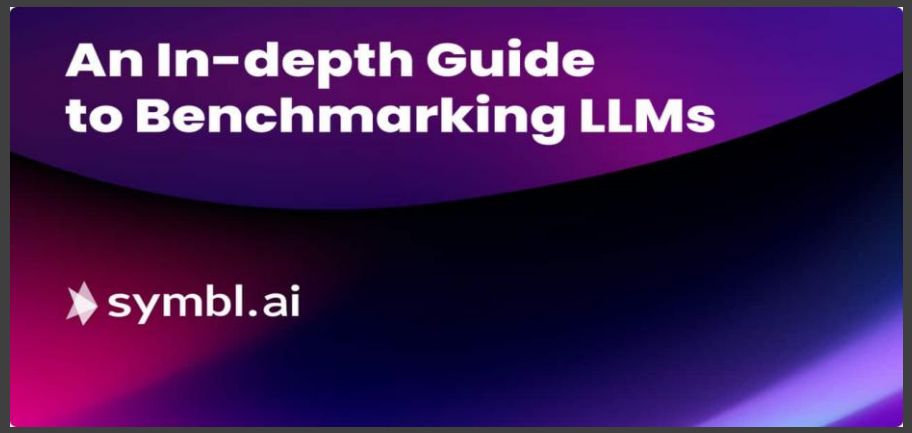
a fake Biden says election officials count each of his votes twice.

a fake Emmanuel Macron warns citizens not to vote because of bomb threats at the polls.

convincing voice clones in 80% of the time

Eugénio Oliveira

# GENERATIVE AI: Benchmarking




**MMLU**: Massive Multitask Language Understanding

**SuperGLUE** General **Language** Understanding Evaluation (GLUE)

**GSM8K** Grade School Math 8K benchmark **mathematical** reasoning abilities.

**HumanEval**-Python measures a model's ability to generate functionally correct **code**

**MT-Bench** evaluates a language model's capability  engage in multi-turn **dialogues**. Measures a model's ability to answer subsequent, related questions

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# LiveBench: A Challenging, Contamination-Free LLM Benchmark

… ,Yann LeCun, and others

work is sponsored by Abacus.AI

**LiveBench**: releases new questions monthly, based on recently-released datasets, arXiv papers, news articles, and IMDb movie synopsis.

Each question has verifiable, objective ground-truth answers

18 different tasks across 6 **categories**

Reasoning + Mathematics (competitions)+ Data Analysis(predicting…)+ Language (word puzzle, Typo removing)+ Instr. Follow (summ., story gen…) + Coding (gen.)

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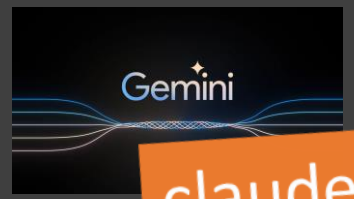


| Model | Global Average | Reasoning Av. |
|---|---|---|
| **gpt-4o-2024-05** | **55.28** | 48.00 |
| **gpt-4-turbo-202404** | **54.59** | 56.00 |
| **claude3opus-202402** | **54.29** | 48.00 |
| **gpt-4**-1106-preview | 51.86 | 42.67 |
| ~gpt-4-0125-preview | 48.99 | 40.67 |
| gemini-1.5-pro-latest | 45.67 | 28.00 |
| claude3sonnet-202402 | | 33.33 |
| | | 38.67 |
| | | 32.00 |
| command-r-plus | 35.7 8 | 34.00 |
| gpt-3.5-turbo-1106 | 3 5.66 | 28.67 |

claude-3.5-sonnet-2024-06-20 Av. 61.16
gpt-4o-2024-05-13 Av. 54.96

At last World AI Conference in Shanghai, SenseTime, a leading Chinese AI firm, unveiled its latest model, **SenseNova 5.5**.SenseTime claims that SenseNova 5.5 is just as good as GPT-4, *Sujita Sinha, "Interesting Engineering" July 09*

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IMPACT

Google DeepMind Researchers Use AI Tool to Find 2 Million **New Materials**

***Financial Times*** *Michael Peel November 29, 2023*

*July 22, 2024*

Accenture published “Reinventing R&D in the age of AI,” outlining how **biopharmaceutical** companies use AI for **drug and therapeutic research** and development pipeline.



U.S. Rep. Jennifer Wexton (D-VA) regained the voice she lost with the **help of an AI voice-cloning program** from ElevenLabs

*Associated Press*; Dan Merica (July 25, 2024)

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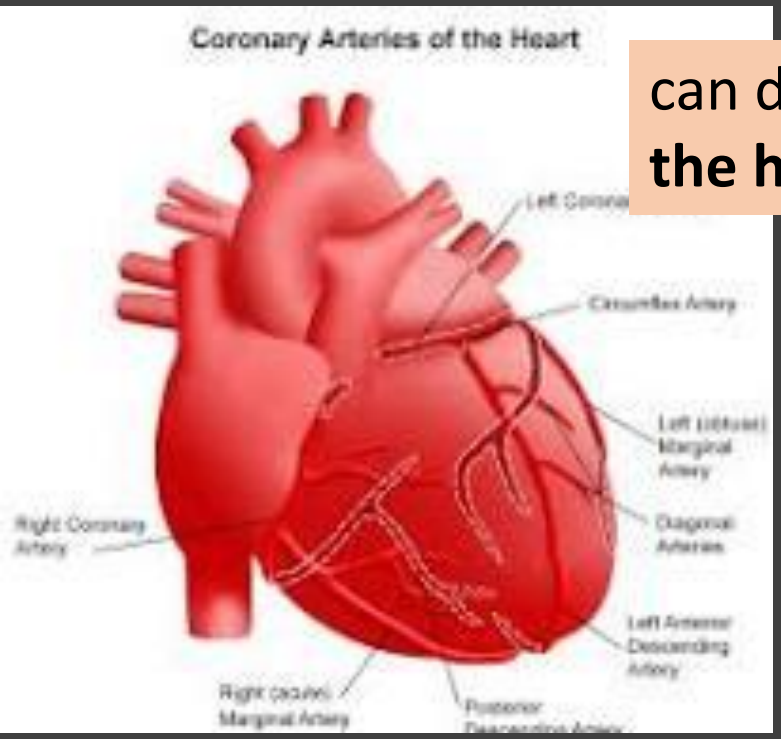
TechTarget | ComputerWeekly.com

ISSUE DATE: June 5, 2024

IMPACT

**University of Oxford** has published a study looking at how AI could help in the **diagnosis of heart disease**.




can detect the **level of inflammation** of the heart arteries, **not visible to the human** eye.

**pilot study** in 4 **NHS hospitals**,
In **around 45% of cases, doctors changed their patients' treatment** plan as a result.



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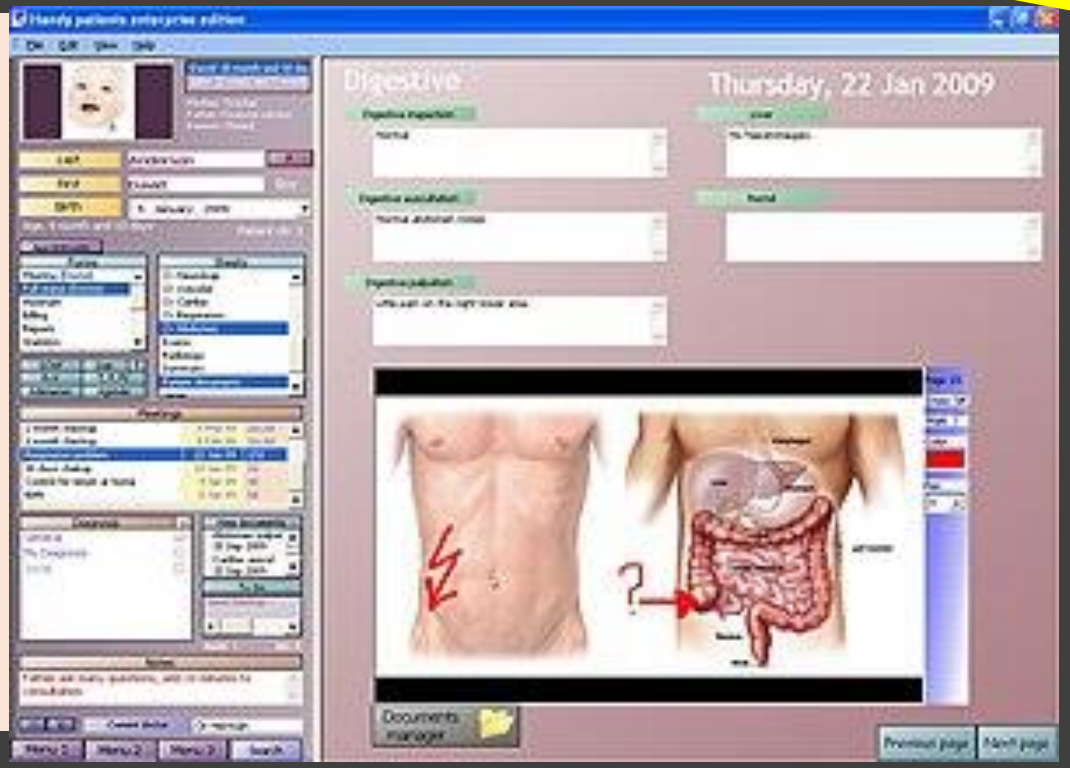
IMPACT

Gen AI to creates **EHR "Electronic Health Records"** in Hospitals USA, sparing Clinicians time.

**Ambient Clinical Intelligence** combines AI tools (Voice recognition, Summarization) to produce in seconds the relevant personalized patient data after the medical consultation.

*TechTarget Hannah Nelson, Assistant Editor09 Aug 2024*




According to a recent study published by JACC: CardioOncology, researchers from "Brigham and Women's Hospital", using **AI successfully detect several types of Arrhythmias** following exposure to radiation during lung cancer treatement.

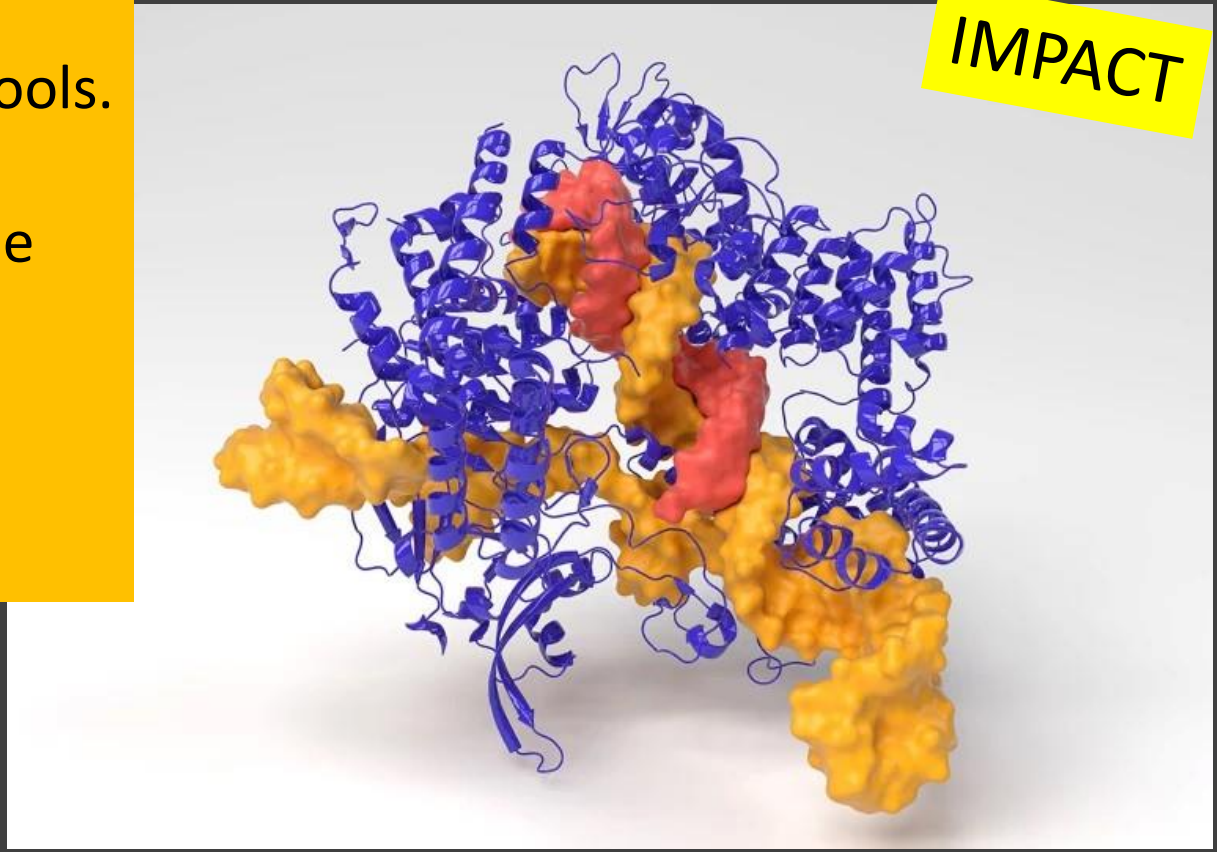
NATURE 29 April 2024

‘ChatGPT for CRISPR’ creates new gene-editing tools.

AI-designed **Gene editors** could be more versatile than those found in nature.

**Providing protection against virus**

IMPACT



CRISPR-designing were trained on vast amount of biological data in the form of **protein or genome sequences**.

The healthcare sector is using **GenAI** for clinical documentation, patient communication and clinical text summarization.

IMPACT

Medical Doctors use Chat GPT : presentations, scientific articles, reports, documentation

**LANCET 7/23** “Ethics of LLMs in medicine and medical research“

## LLMs for Medicine

**BioGPT** (MIT), LaMDA , Med-PaLM 2 (Google),

Sparrow(Deepmind,UK), Pangu Alpha (Huawei, China), OPT-IML (Meta, USA), Megatron Turing MLG (Nvidea, USA)

LLM BioGPT is domain specific. Pre-trained with PubMed DB of scientific articles !

IMPACT


AI increases **software** creation productivity.
*Eg.: Copilot is AI for **code** generation (snippets).*

Microsoft introduced  Windows PCs designed for AI.
**Copilot+ PCs** are the fastest, most intelligent Windows PCs ever built. trillion operations per second, all–day battery life and access to the most advanced AI models



"We're moving from computation towards **cognition** into the age of AI," said **Dell**.

*Published: 20 May 2024  ComputerWeekly.com*

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# GENERATIVE AI: Power Games

Sam Altman, CEO and co-founder of **OpenAI** was dismissed

November 18, 2023[1]

**Open AI workers** said they will leave the company

Sam Altman joined **Microsoft**

Sam Altman returned to **OpenAI**,

The **five-days** interregnum between Altman's firing and his return marked a pivotal moment for the company

**Sutskever and Jan Leike, criticized OpenAI for prioritizing "shiny new products" over vital**

lawsuit filed in federal court in Northern California says that **Altman** "*assiduously manipulated **Musk** into co-founding their spurious non-profit venture*" by promising that OpenAI would be safer and more transparent than profit-driven alternatives.


**co-founder Ilya Sutskever left the company**

# GENERATIVE AI: Power Games


UK former Chancellor announced an "**AI Incubator**" **i.AI** including "an elite team of technical experts at the heart of government".

**UK government** announces £8.5m in grants for AI safety research
*ComputerWeekly.com:* May 22, 2024

Minister of Science, Patrick Vallance said 19/8/24 he sees a great opportunity on AI for Medicine, Materials and Public Services

Reuters says that **Xi Jinping's** governement objective is to make **China self-sufficient** regarding Semiconductors production

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# GENERATIVE AI: Power Games

**Taiwan Semiconductor Manufacturing Company**

so-called the "**most important**" company in the world.

It is estimated to produce 90% of the more advanced semiconductor chips in the world. (eg. NVIDIA)

The Netherlands' ASML Holding and TSMC can disable the world's most sophisticated **chipmaking** machines in the event China invades Taiwan, sources say.
*Bloomberg (May 21, 2024)*

"MacroPolo" think-tank found that nearly **half** of the world's top AI researchers come from **China**
while only around 18% come from U.S. **undergraduate institutions**

AI researchers working in the U.S.: **31%** are American **38%** are from China.

The **U.S. is home to around 42%** of the world's top AI talent
***NYTimes*** *March,22 2024*

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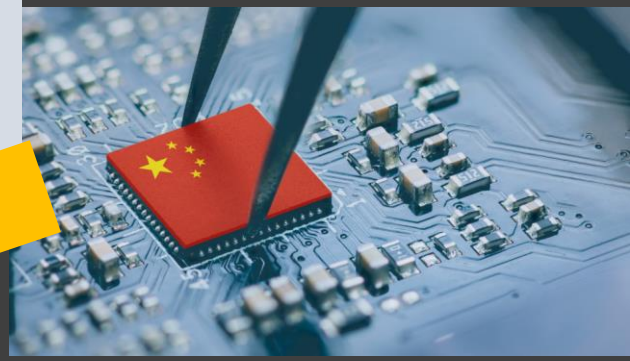
# GENERATIVE AI: Power Games

"One of the most intriguing aspects of the **Tianhe-3** is its processor. "
Like AMD "Antares" **hybrid** MI300A CPU-GPU that is going into El Capitan
*TheNextPlatform*




**FUGAKU Japonese** supercomputer from Fujitsu+I.I.Riken uses **CPUs**, not GPUs "now in short supply due to a fierce global LLM development race." *The Japan Times (May 11, 2024)*

The E.U. Commission has approved, a **€5 billion** German measure to support **European Semiconductor Manufacturing Company** ('ESMC') in the construction and operation of a microchip manufacturing plant in **Dresden**
Deutche Welle (20/8/24) : "joint venture" **TSMC,** Bosch, Infineon, and NXP (The Nederlands)

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**February 26, 2024** edition of **ACM** TechNews

## The highest-paying skill in tech may not surprise you

**Right now, there's nothing more in demand than AI knowledge—and the salaries prove it.**

**average** salary of $174,727

Here's the jobs list:

- Generative AI
- SoC
- Deep learning
- Torch
- PyTorch
- Computer v… …ernlog Mesos Rust Elixir

AI-related jobs offer salaries that are more than **77% higher** than other fields. Some positions start with compensation that's as high as $450,000 per year
*FastCompany.com* 06/06/24



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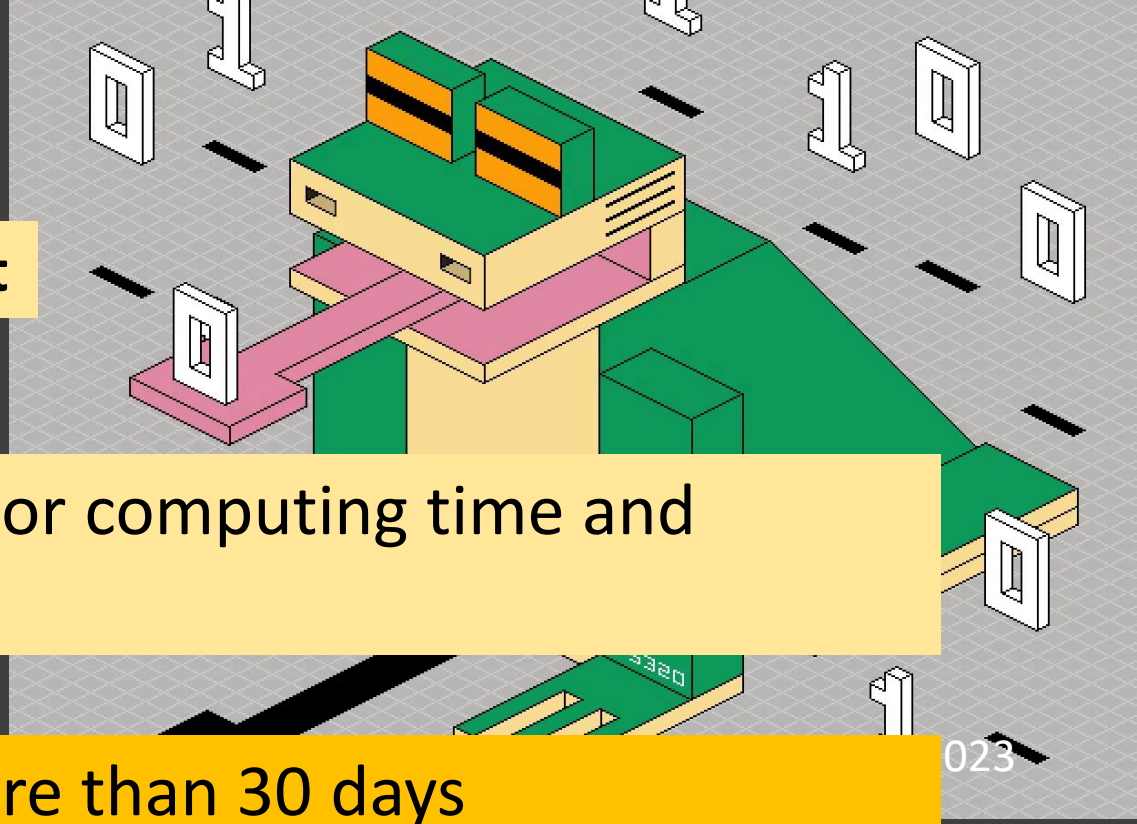
# Power Consumption



"Generative AI revolution comes with a planetary **cost**

GPT3 required 355 years of a single processor computing time and consumed 284,000 kwh of energy to train

**GPT3** was trained using 1000+ GPUs for more than 30 days
**GPT4** 10,000+ GPUs. (equivalent in the US to 23 M Dollars of electricity)

A.de Vries, UVA predicted that GenAI will consume as much **energy yearly** as a country like **Ireland**. (29.3 terawatt-hours per year).
By **2027** the AI sector could consume between 85 to 134 TwattH/y. That's about the same as the annual energy demand of **the Netherlands**.

(*Joule Volume 7, ISSUE 10, P2191-2194, Oct. 18, 2023)*

# Power Consumption

Depending on the hardware, training a LLM of any significant size can take up to weeks or months to complete.

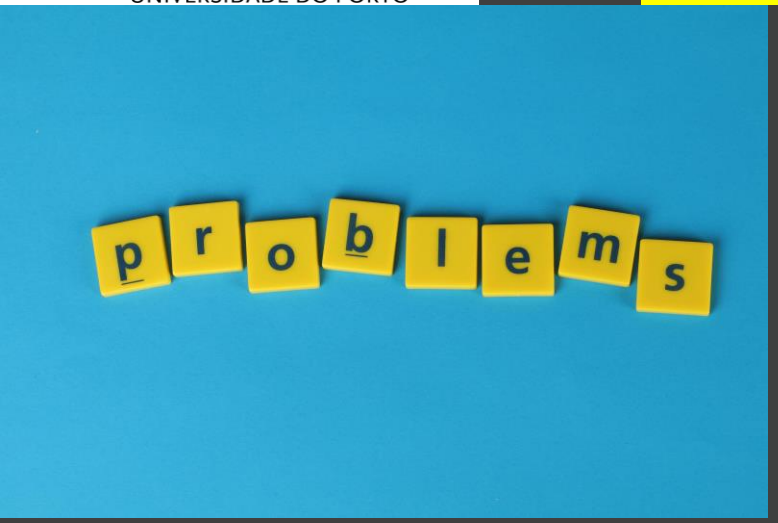
Google, Intel, Nvidia fight for better training LLMs.
**Nvidia** is 1st place, followed by Intel… Google last.

*IEEE Spectrum Samuel K. Moore 12 Nov 2023*

NVIDEA's **Eos** supercomputer can train a 175 billion parameter **GPT-3 model in under 4 minutes**.

NVIDIA **Nemotron**-4 340B family includes base, instruct and reward models that form a pipeline to generate **synthetic data used for training and refining LLMs**.

# Gen AI Drawbacks and Limitations




Doesn't understand the **cause** → **effect** relationship.

Cannot explain the domain principles → **black box**

Lack of **accuracy** since it is trained on internet data publically available.

Potentially **hallucinates** making up false statements.

**Originality**? copyright violations

How is it different from someone learning from many sources and create something based on what he/she learnt?

# Gen AI Drawbacks and Limitations

Impact on **Labor**:
Any automation leads to disruption in job markets.

**impact on the white collar, not on blue collar jobs …**

**Power** consumption: LMMs training is very power intensive

**Bias**: amplify the bias that already exists in the data we produce, on issues of race, gender, language or culture. Abusive associations can result.

# Gen AI Drawbacks and Limitations

Impact on basic **cognitive** skills

Could FM diminish the need for humans to acquire knowledge or get trained professionally?

Will it help humans to operate at higher layers of cognition sooner in age?

**OpenAI o** performance in the qualification for the Mathematical **Olympiad** was modest: **89th** in 500 students (solved 83% of the problems)


How is it going to affect Education, creativity and artistic skills?

# Gen AI Drawbacks and Limitations

**Monopoly** of power players:

DANGER ?!

FM require huge amount of resources

GenAI is dominated by a small number of tech giants.

Need for an **AI Agency** similar to International Atomic Energy Agency to regulate at a supra-national level the use and proliferation of this technology.

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# A desirable world with Responsible AI

**Gen AI to unleash human productivity:** faster discovery of **pharmaceutical** drugs, faster and more bug free **software** coding, quicker text/images/video **creation**, less **bureaucracy**

Let's not fear but master Technology !
Historically, T. has done more benefits to humanity than damage if properly regulated and managed.

USA: almost two-thirds (61%) CEOs, are pushing their organizations to adopt GenAI faster than some people are comfortable with.

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# The Role of Ethics in AI

principles of **fairness, transparency, and accountability**.

AI systems must not operate as black boxes; their decisions need to be comprehensible, transparent, and **justifiable**.

**Privacy** concerns are central to the ethical deplo of GenAI ensuring responsible data collection in compliance with

fundamental factors for long-term sustainability.

**Transparency** informing when interaction is with an AI-driven tool

**YHH Nexus**. “For thousands of years prophets, poets and politicians have used **language to manipulate** and reshape society. Now **computers** are learning how to do it. And they won’t need to send killer robots to shoot us. They could **manipulate** human beings to pull the trigger.”

# WHAT is needed?

**When using AI tool, WHO takes the Responsibility?**: (eg. Medicine)

Who is using it (Medical doctor)?
Who gives permission for using it? (Hospital /Clinic)?
Who should regulate it (M. of Health Justice, Parli[illegible]ent)?
who sells it, distributes it (Compa[illegible]
Who does researc[illegible] Universities)?
Who should Test a[illegible]
Who advertises it?

All?
A lot of Legislation is needed!!

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# Digital afterlife industry?

It is now possible to use technology to raise the dead ...

Today, a “digital afterlife industry” to create reconstructions of dead people **based on the data they have left behind.**

Microsoft has a patent for creating a conversational chatbot of a specific person using their “social data”.


**Character.ai**, a website that hosts chatbots of people living, dead, and fictional. The site provides the ability to chat with notable dead people like Shakespeare, Elizabeth II, Tolkien.

**Postmortem digital possibilities**

Eugénio Oliveira

U.PORTO LIACC

artificial intelligence and computer science laboratory

# Human-like AI?

*How far away are we from* ***building "human-lik***

*the key problems that we need to solve bef*

to

Machines that will have **us believe** they **have a self, or a personality**, should be relatively easy to develop. But whether they would be truly self-aware, we will only know if we **crack the "hard problem of consciousness" first.**

**RL** used with AlphaGo demonstrated how an ANN can learn and **invent** strategies

**abstract** knowledge accumulated by solving a specific problem, and apply this **k** in solving a **different** prob

## Human-level A

| | State of Play |
|---|---|
| | Solved ✓ |
| g taught | Solved ✓ |
| earning | Not yet |
| Common sense | Not yet |
| Self-awareness | Still mysterious |

**hard** problem. The function of human **memory** is perhaps the key to developing **common sense** in machines

role of a sophisticated Body and the emergence of Sentiments and Emotions. under investigation

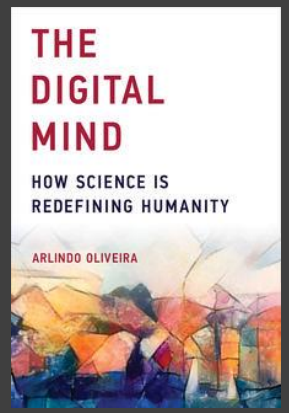
# • Artificial General Intelligence

**AGI** raises the issue of the possibility of artificial consciousness

Deep Blue and Alfa Go: **intelligences without consciousness**

**Could Consciousness be an EMERGENT property out of the complex interactions of many specific intelligent capabilities??**

"The Mind is an **emergent** property of the Brain enabling humans to have a set of cognitive capabilities" *The Digital Mind, Arlindo Oliveira*



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Yann LeCun
@ylecun
Professor at NYU. Chief AI Scientist at Meta.
Researcher in AI, Machine Learning, Robotics, etc.
ACM Turing Award Laureate.

**General intelligence**, artificial or natural, does not exist.
all animals have **specialized intelligence**. They have different collections of skills and an ability to acquire new ones **quickly**.
That's the kind of learning that we need to reproduce in machines before we can get anywhere close to human-level AI.

*Yann LeCun 2024, 24 May*

**Open AI: 5 levels for AGI. We reached level 2**, working on 3(Agents), 4 (Innovations); last one is building up Organizations

# Beneficial AI

**Planetary OBJECTIVE**:

**AI for Environment sustainability (WATER, LAND, AIR)**

**Ethically rewarding**

SMART *: Cities, Homes, Factories

**WEF** pointed out more than 80 possible uses of AI favouring the Environment: **Climatic** protection, and Modeling, Autonomous mobility, Intelligent Power Networks, …

# Beneficial AI

## 17 Goals for a Sustainable Development

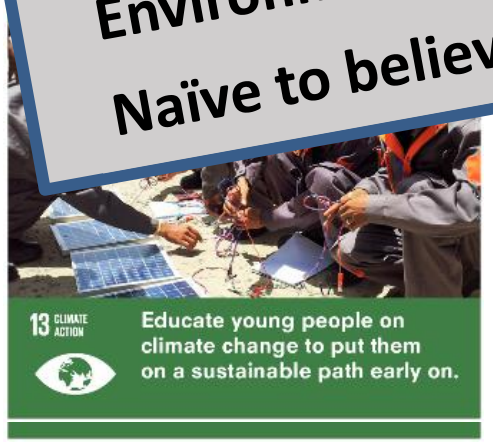
**Satisfying needs of the Present without affecting Future Generations**

WATER

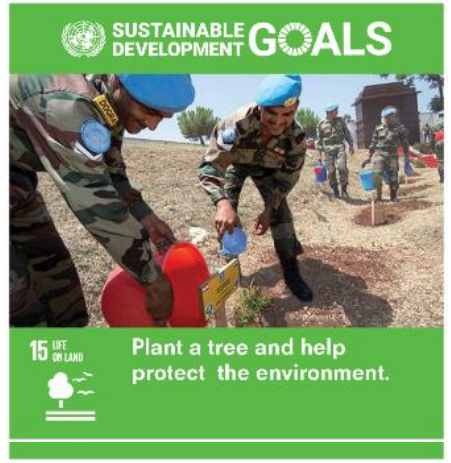

ENERGY



**Three Dimensions of Well-being:**
**Environment Society Economy**
**Naïve to believe 'win-win-win' situations**



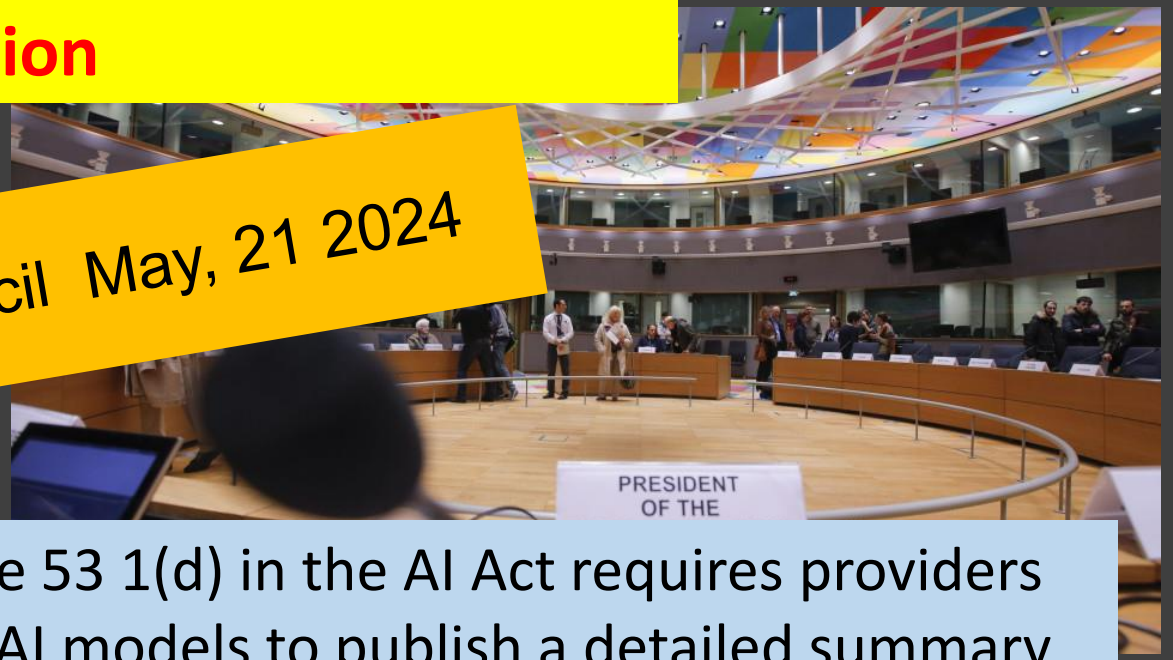

POLUTION


ODS13. Climatic actions ODS14. Protect Ocean Life ODS15. Protect Life on Earth

# Regulation

**EU AI ACT** approved by the European Council May, 21 2024




The EU ACT encompasses various safeguards, including **on GP AI**, limitations on **biometric identification** systems in law enforcement, bans on **social scoring** and AI used to manipulate or exploit user vulnerabilities

Article 53 1(d) in the AI Act requires providers of GPAI models to publish a detailed summary of **training** content. The summaries should cover **data sources** and sets as well as narrative **explanations**.

- UK: The new Labour government should place an outright ban on AI-powered "**predictive policing**" and **biometric surveillance** systems, …

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# EU AI ACT Prohibits AI systems …

- to **predict** the risk of a person committing a criminal offence;
- to create **facial** recognition databases by untargeted scraping of facial images on the internet and closed-circuit television
- **emotion** recognition systems in the workplace and education institutions
- remote **biometric identification** in publicly accessible spaces


The E. Commission collects over 100 AI Pact signatures and an online kick-off plenary for the **GPAI code of practice** is scheduled for **30 September**.

Official Journal of the European Union

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2.7.2024

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of 13 June 2024

laying d… rules on artificial … Regulations (EC) … No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act)

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California LEGISLATIVE INFORMATION

*SENATE BILL NO. 1047*

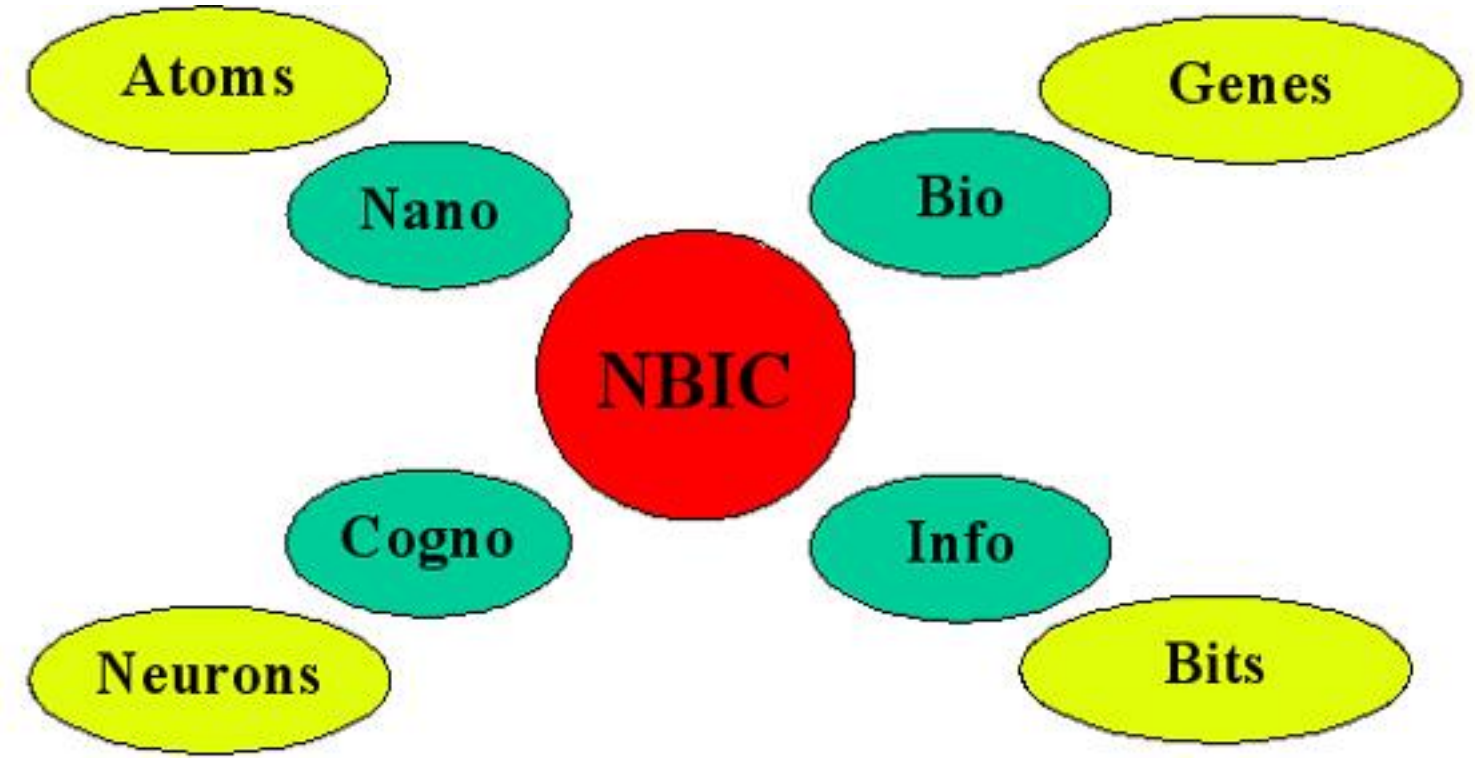
**Safe and Secure Innovation for Frontier Artificial Intelligence Models Act** to re

capability to promptly enact a **full shutdown**
a written safety and security pro
prohibits a d
**cr**
to
p **ions**, including **prohibiting a developer** from preventing
a from disclosing information, or **retaliating** against an **employee** for disclosing information, to the Attorney General or Labor Commissioner if the employee has **reasonable** cause to **believe** the developer **is out of compliance** with certain requirements

California **Governor** Gavin Newsom **vetoed.** Newsom said the legislation "does not take into account whether an AI system is deployed in high-risk environments, involves critical decision-making, or the use of sensitive data." *Politico; Lara Korte; Jeremy B. White* (***September 29, 2024***)

**OpenAI agreements blocked staff from revealing AI risks:**
**The agreement discouraged staffers and investors from expressing to federal authorities regarding safety violations.** Jul 14, 2024 INTERESTING ENGINEERING

# Sciences Synergy will shape the future




ROBOTICS

- ***a "Call to Action"***

**+ ART** as in **ART**ificial Intelligence:

**Accountability, Responsibility, Transparency**

**A**: To **whom** should we address when something goes wrong?

**R**: System providers are responsible for the clarity of the decision-making and identify errors or unexpected results

THE HUMAN IN THE LOOP !

**T**: **Transparency** refers to the need to describe, **inspect and reproduce** the mechanisms through which AI systems make decisions and learn to adapt to the environment, and to the governance of the data used.

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# AKNOWLEDGES


TechTarget | ComputerWeekly.com

acm TechNews

INTERESTING ENGINEERING

IEEE Spectrum

the blueprint BY INTERESTING ENGINEERING

future of life INSTITUTE

AlphaSignal

*Bloomberg/Getty*

***Financial Times***

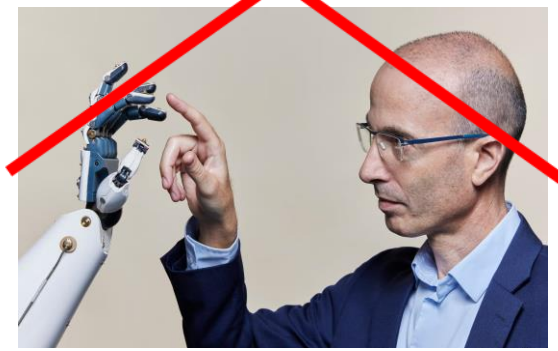
*NYTimes*

AI LOGS BY INTERESTING ENGINEERING

Eugénio Oliveira


U.PORTO LIACC
artificial intelligence and computer science laboratory


I am afraid I just have questions … not answers …

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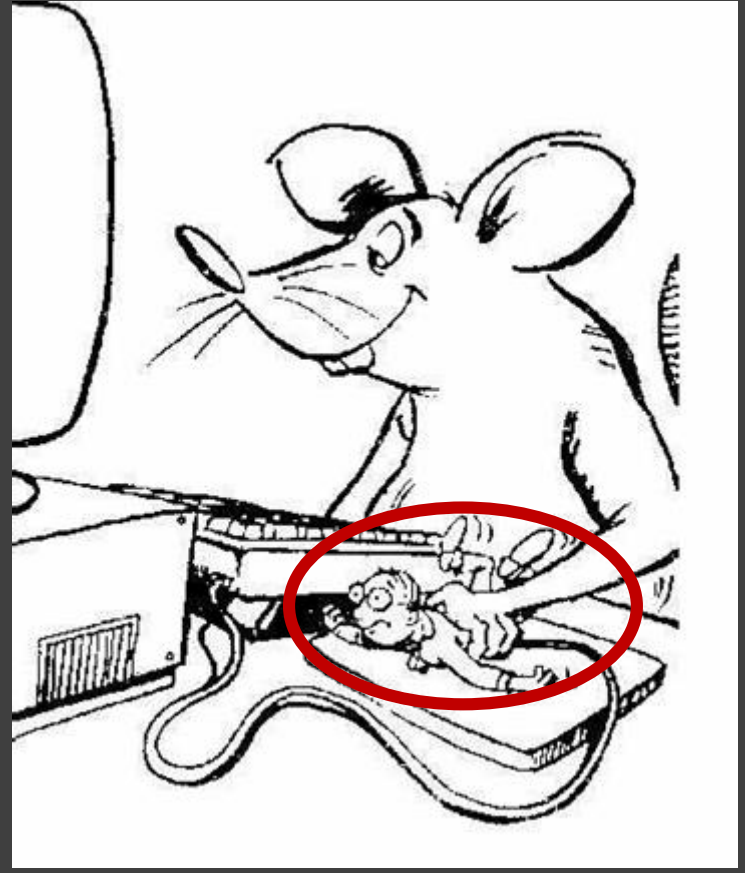
**Ai is fascinating BUT …**
**BE CAREFUL**



THANK YOU!

*Eugénio Oliveira*