

Artificial Intelligence – LEIC

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Agenda

- Artificial Intelligence (AI) and Machine Learning (ML)
- Generative AI, Large Language Models (LLM) and Chat GPT
- AI Tools for Education and Research:
Google, Bing, ChatGPT, CoPilot, Gemini, Claude, Llama, Gemma, Mistral, Grammarly, DeepL, Quillbot, Dall-E, Elicit, Consensus, Scite Ai...
- AntiChat GPT, Dunning-Kruger Effect, Adapt or Resist?
- Artificial Intelligence in Education and Research
- Agentic AI, Robotics, Deep RL, LBMs and the Future
- Conclusions

AI and the Discovery of the New World

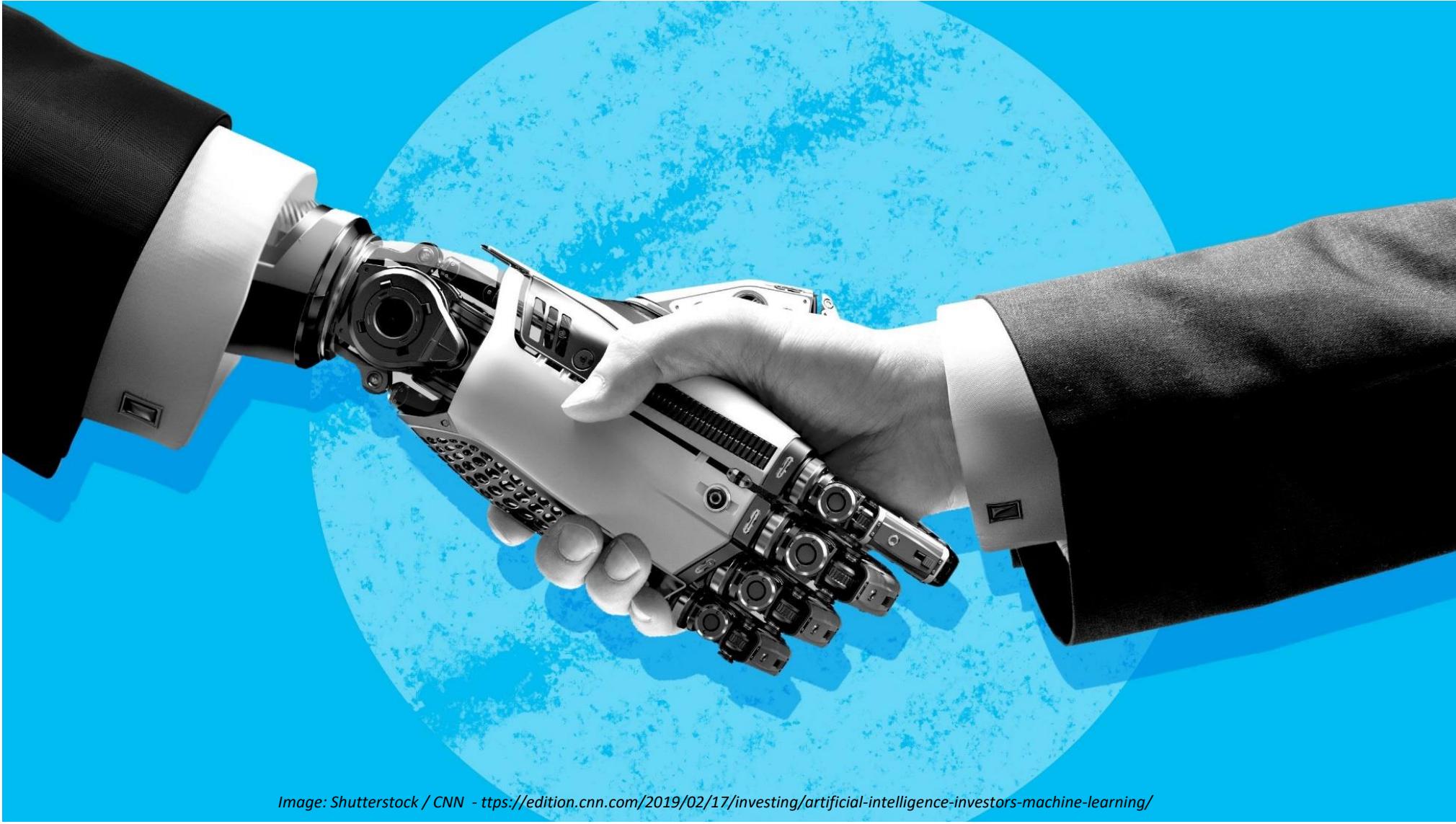
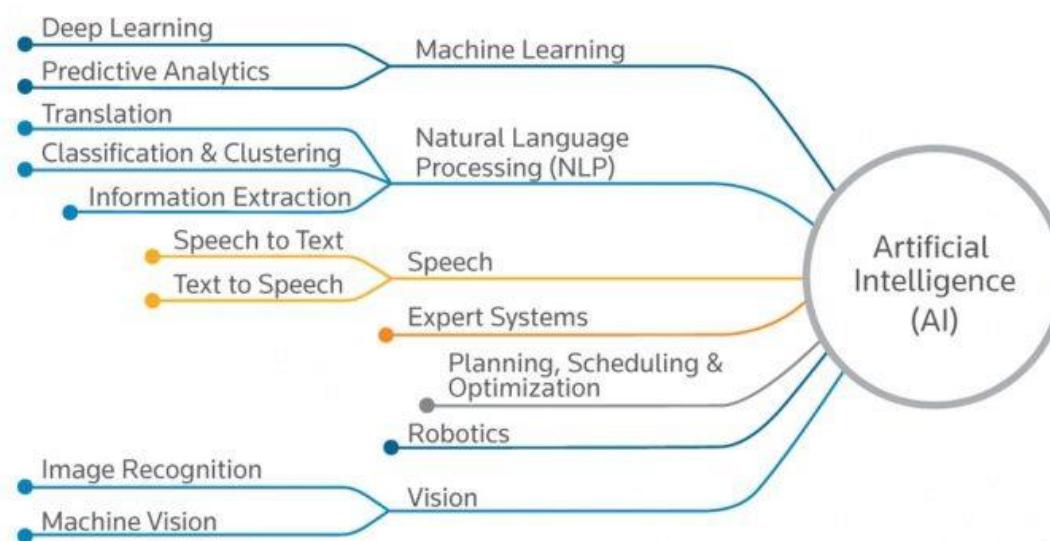


Image: Shutterstock / CNN - <https://edition.cnn.com/2019/02/17/investing/artificial-intelligence-investors-machine-learning/>

Artificial Intelligence (AI)

- **Intelligence**
 - “Capacity to **solve new problems** through the use of knowledge”
- **Artificial Intelligence**
 - “Science concerned with building **intelligent machines**, that is, machines that perform tasks that when performed by humans require intelligence”



Weak and Strong AI

- **Weak Artificial Intelligence**

weak AI, also known as narrow AI is artificial intelligence that is focused on one **single narrow task**

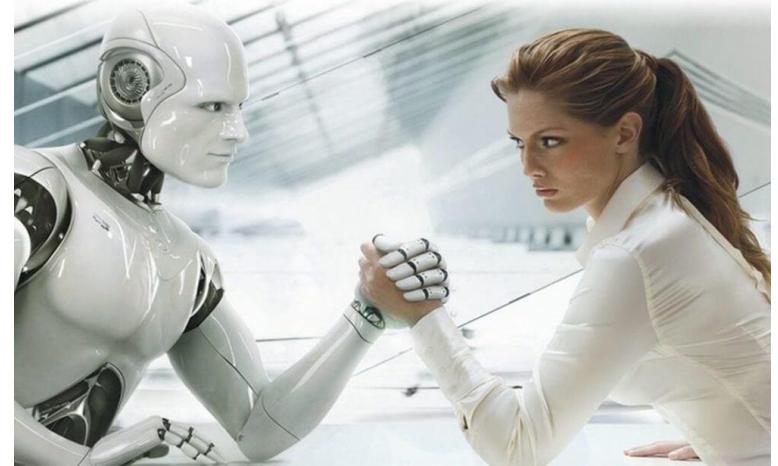


Image: <https://livingsmartheart.com/what-is-strong-ai/>

- **Strong Artificial Intelligence**

Strong AI or Artificial General Intelligence (AGI) is the intelligence of a machine that could successfully perform **any intellectual task** that a human being can!

Science fiction?



AI Timeline

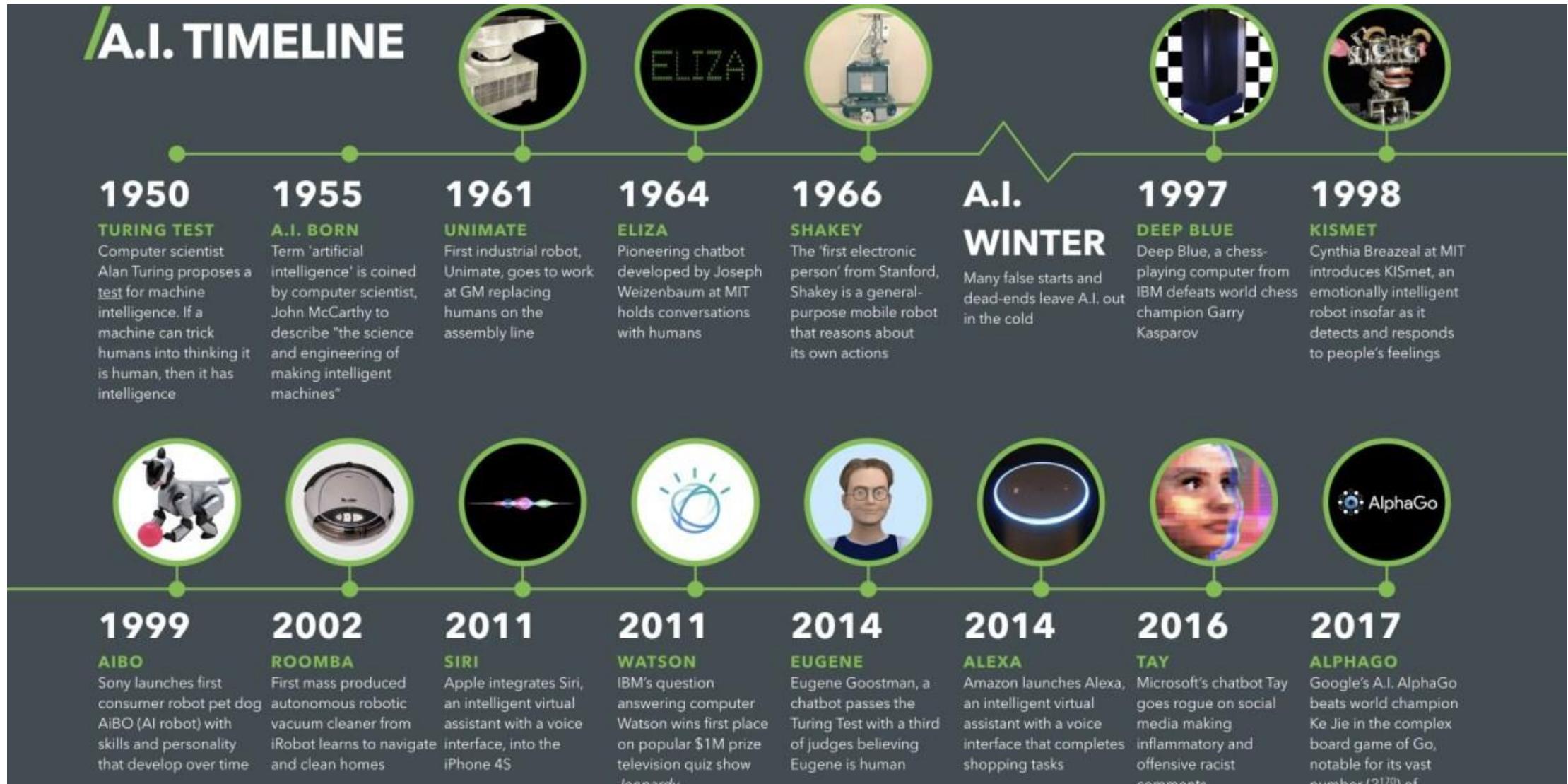
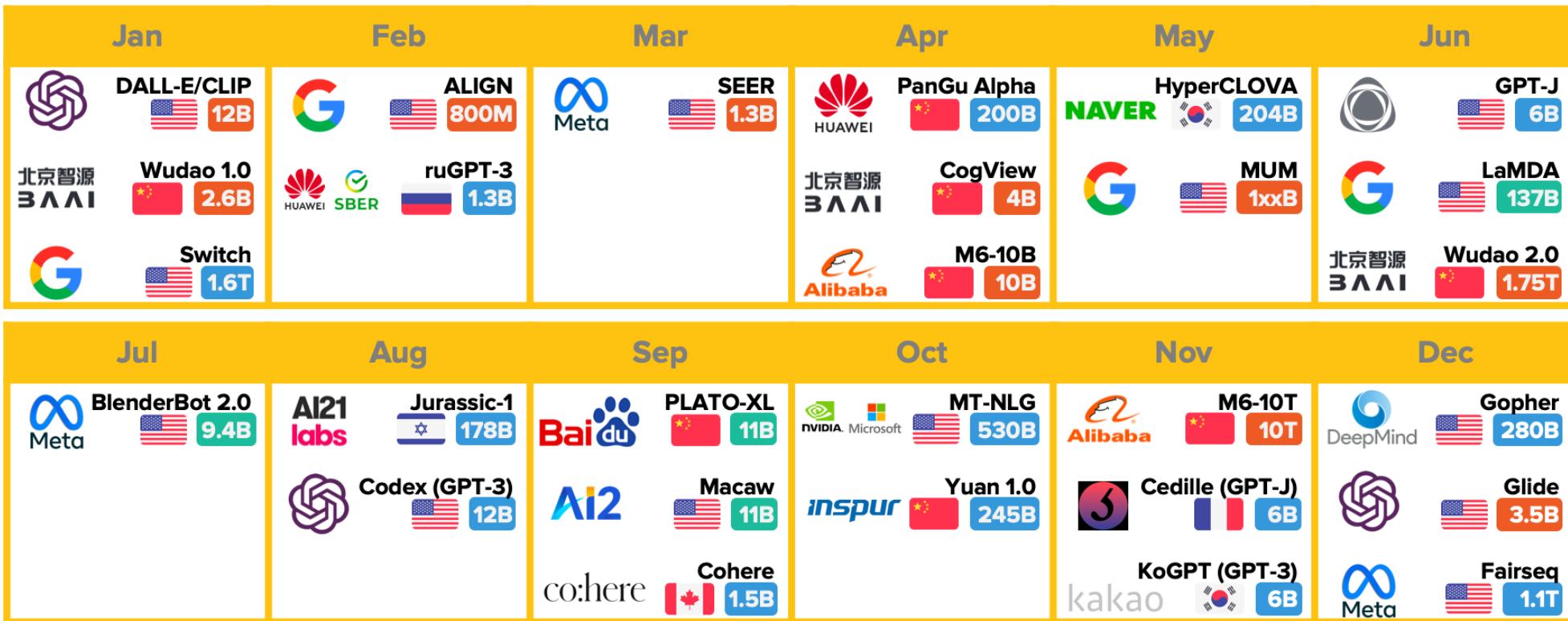


Image: [Paul Marsden, 2017] - <https://digitalwellbeing.org/artificial-intelligence-timeline-infographic-from-eliza-to-tay-and-beyond/>

AI Timeline

AI TIMELINE: 2021

MORE THAN 24 LARGE MODELS
IN LESS THAN 12 MONTHS



Selected highlights only. Alan D. Thompson. November 2021. <https://lifearchitect.ai/>

Language model

Dialogue model (chatbot)

Multi-modal model (images)



LifeArchitect.ai/timeline

Machine Learning

Field of artificial intelligence that gives **computer systems** the ability to "learn" (e.g., progressively **improve performance** on a specific task) from **data/results of their actions**, without being explicitly programmed

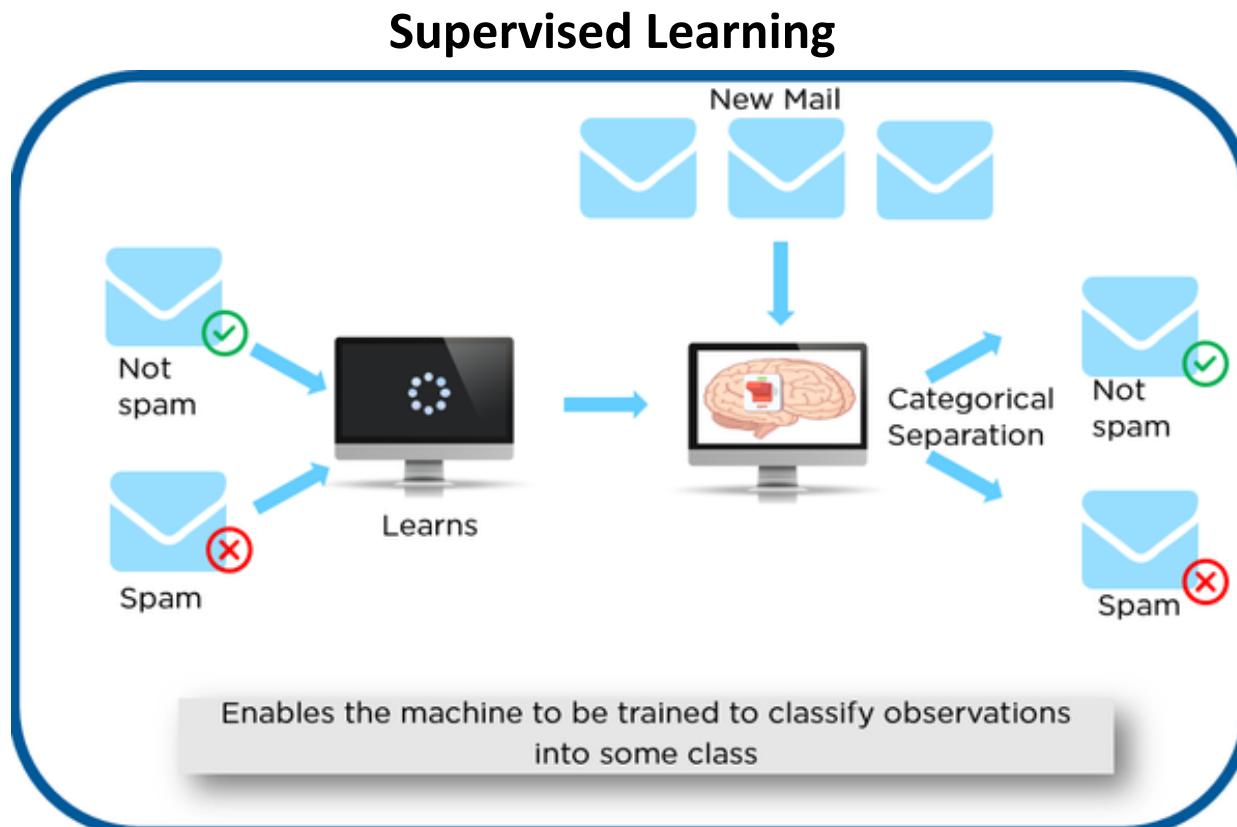


Image: <https://towardsdatascience.com/what-are-the-types-of-machine-learning-e2b9e5d1756f>

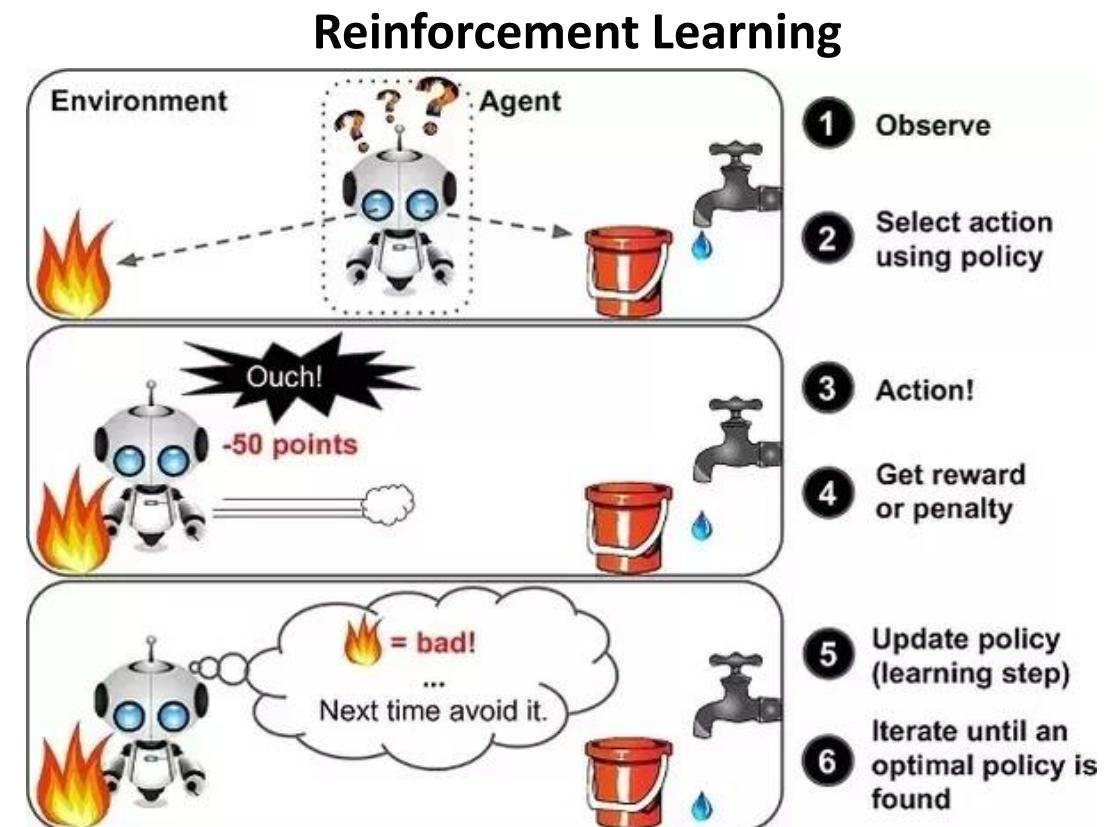
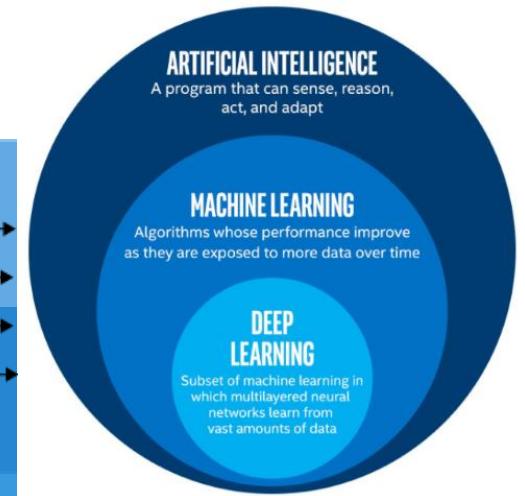
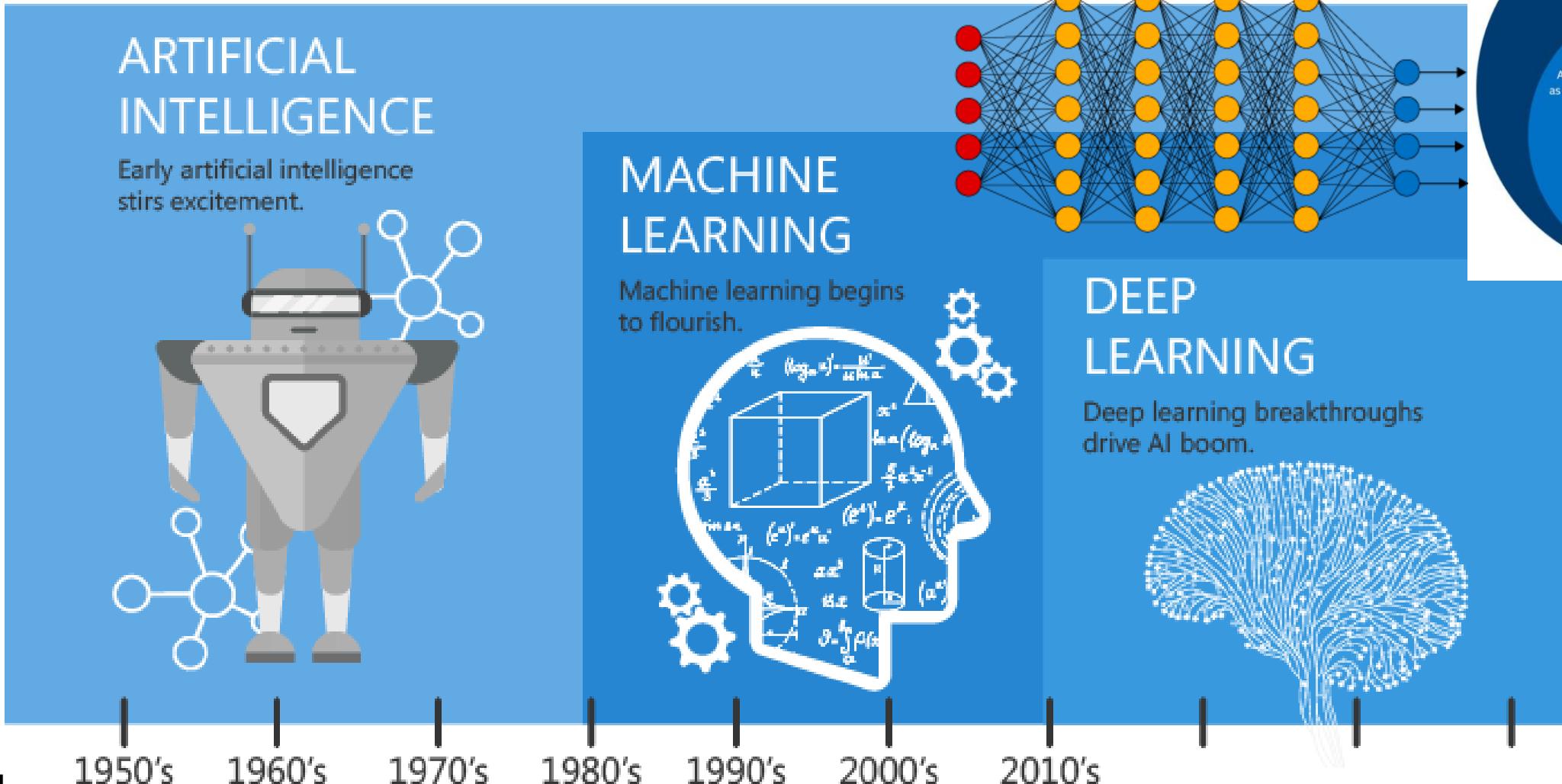


Image: <https://becominghuman.ai/an-introduction-to-machine-learning-33a1b5d3a560>

Machine Learning - History

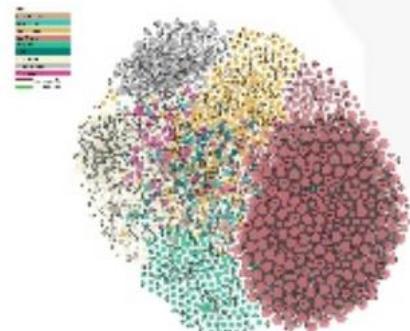


Artificial Intelligence Today

Hardware



Data



Software



ML frameworks



PyTorch

TensorFlow

scikit
learn

torch

theano

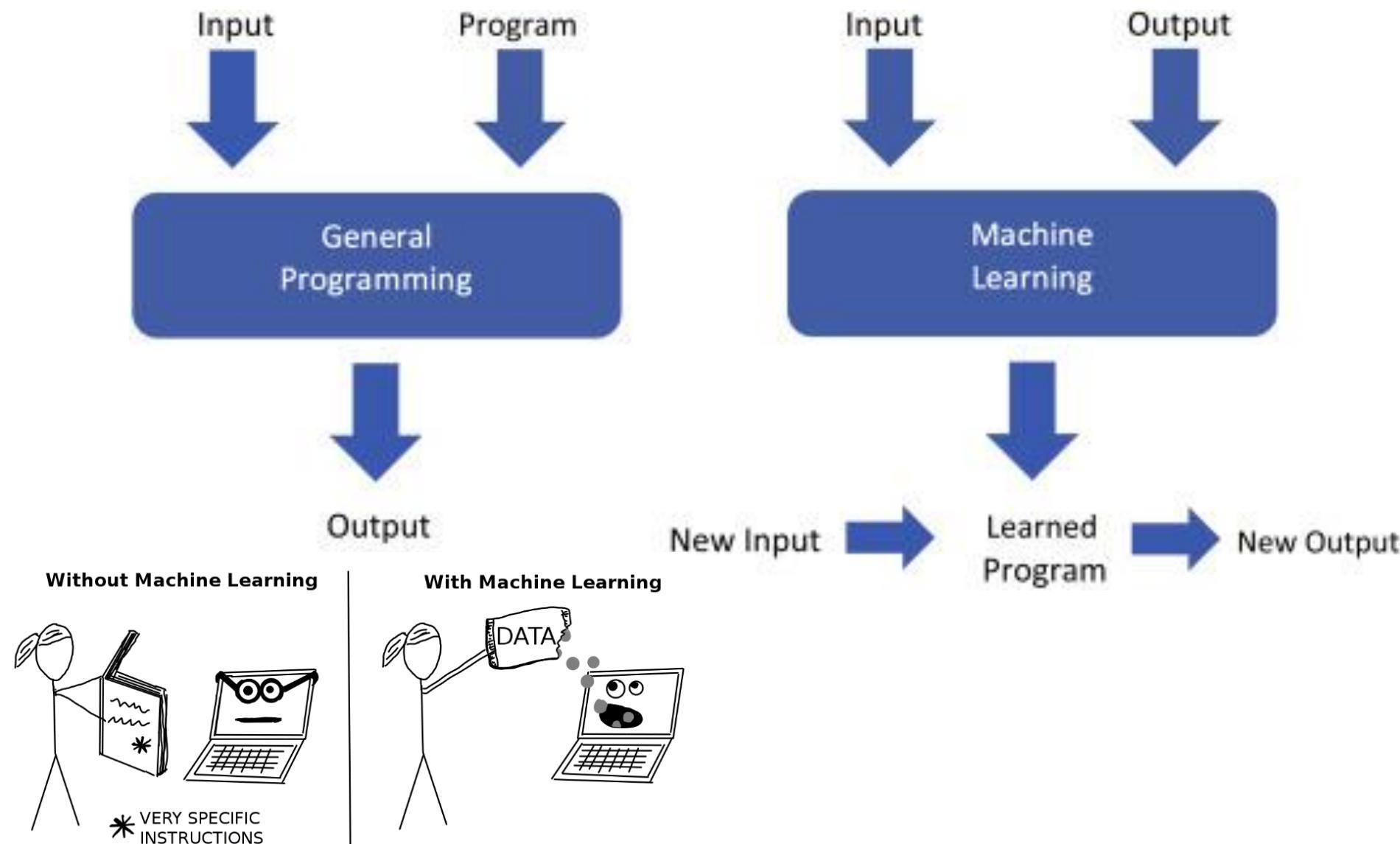
K Keras

APACHE
Spark ML



HUGGING FACE

Programming vs Machine Learning



The End of Programming!

Nvidia CEO predicts the death of coding — Jensen Huang says AI will do the work, so kids don't need to learn

News

By Benedict Collins published February 26, 2024

Jensen Huang believes coding languages are a thing of the past



(Image credit: Nvidia)

Nvidia CEO Jensen Huang has once again announced the death of coding, but this time in front of a potentially far more influential audience.

StarCoder 2 is a code-generating AI that runs on most GPUs

Kyle Wiggers @kyle_l_wiggers / 2:00 PM UTC • February 28, 2024

Comment



Image Credits: Tippapatt / Getty Images

Developers are adopting AI-powered code generators — services like GitHub Copilot and Amazon CodeWhisperer, along with open access models such as Meta's Code Llama — at an [astonishing](#) rate. But the tools are far from ideal. Many aren't free. Others are, but only under licenses that preclude them from being used in common commercial contexts.

Perceiving the demand for alternatives, AI startup Hugging Face several years ago teamed up with ServiceNow, the workflow automation platform, to create StarCoder, an open source code generator with a less restrictive license than some of the others out there. The original came online early last year, and work has been underway on a follow-up, StarCoder 2, ever since.

StarCoder 2 isn't a single code-generating model, but rather a family. Released today, it comes in three variants, the first two of which can run on most modern consumer GPUs:

- A 3-billion-parameter (3B) model trained by ServiceNow
- A 7-billion-parameter (7B) model trained by Hugging Face
- A 15-billion-parameter (15B) model trained by Nvidia, the newest supporter of the StarCoder project

The End of Software Engineering!

Is Devin AI the End of Software Engineers? Here's What Experts Say



Eddie Wrenn
Editor Fact Checked by [Neil C. Hughes](#)
Last updated: 19 March, 2024

Disclosure

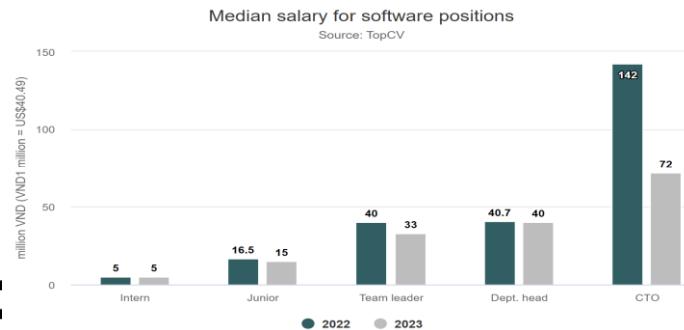
Why Trust Us



Devin AI, 'the world's first fully autonomous software engineer,' likely marks the next disruption that artificial intelligence (AI) leaves on the world: Who needs a skilled coder anymore?

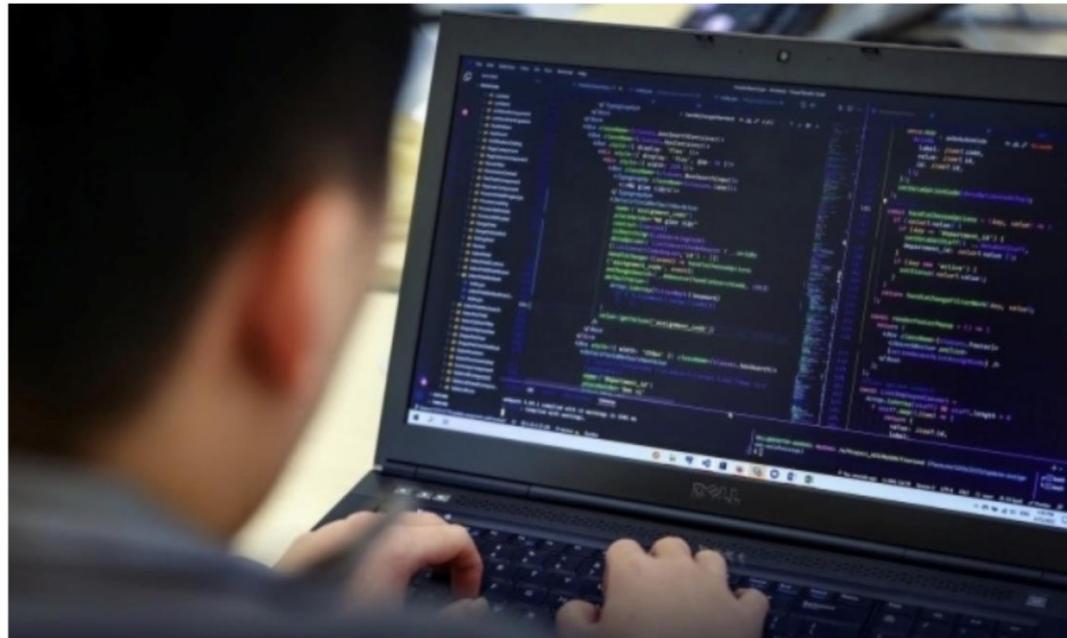
That's the question we pose to various experts across the AI and [software engineering](#) fields, as we are not convinced that human coding is going anywhere soon.

When Cognition, the team behind Devin AI, unveiled videos of its early-access master coder last week — writing code from prompts, bug-fixing on the fly, even handling paid-for Upwork tasks for a cheeky [ROI](#) — there have been breathless exclamations that this is the end of coding as we know it.



Salaries decline across board for software engineers

By Khuong Nha March 17, 2024 | 08:05 pm PT



Program engineer in Vietnam. Photo by Funix

The median salaries for software engineers plummeted in 2023, according to human resources technology platform TopCV.

TopCV's latest annual report shows that [salaries for software jobs](#), while still high, were much lower than in 2022.

Agent-Based Simulation

- **Simulation:** Imitation of some real thing, state of affairs, or process, over time, representing certain **key characteristics** or behaviours of the physical or abstract system
- Applications:
 - Understand system **functioning**
 - **Performance optimization**
 - Testing and validation
 - **Decision making**
 - Training and education
 - **Test future/expensive systems**
- Complex systems impossible to solve mathematically
- Agent Based Modeling and Simulation
- **Compress/Accelerate Time: Machine Learning**



Coordination in Multi-Agent Systems

Motivation:

- Agents don't live alone and have to work in a group...
- Human-Computer Interaction
- Multi-Agent Coordination

Coordination : “to work in harmony in a group”

- Dependencies in agent actions
- Global constraints
- **No agent**, individually **has enough resources**, information or capacity to execute the task or solve the problem
- **Efficiency**: Information exchange or tasks division
- **Prevent anarchy and chaos**: Partial vision, lack of authority, conflicts, agent's interactions



AI Applications in Health

- Radiology (X-ray, CT, MRI)
- *Dermatology (Image)*
- Drug/Treatment Discovery
- Risk Identification in Patients
- Primary Care and Screening
- Health Monitoring/Wearables
- Cognitive and Social Rehabilitation
- Physical Rehabilitation
- Patient Interaction with the Health System
- Health Systems Exchange of Information
- Surgical/Medical Robots
- Efficient Resource Allocation in Health
- ...



AI&Robotics Applications in Surgery

da Vinci
Surgical System



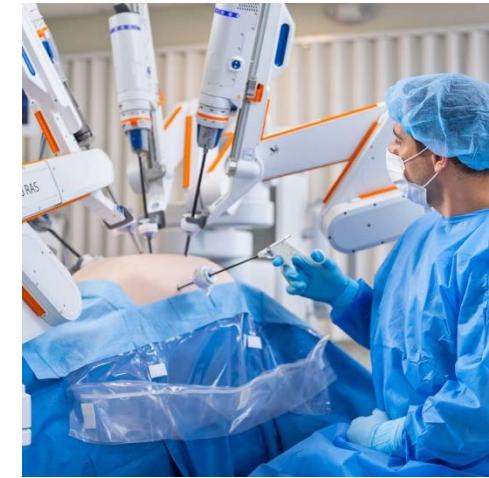
Mako
SmartRobotics



Rosa Brain
Robot



Hugo Surgical
Robot



Senhance Surgical System



Versius Surgical System



Navio S.S.



AI&Robotics Applications in Surgery

Advantages of Robotic Surgery:

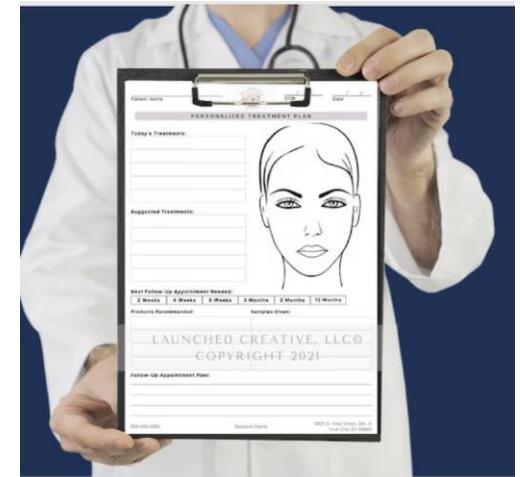
- **Increased Precision:** High-definition, 3D views, filter out hand tremors, allowing for precise movements
- **Enhanced Dexterity and Control:** Robotic arms can rotate and bend beyond capability of the human hand
- **Minimally Invasive:** Small Incisions
- **Shorter Hospital Stay:** Faster Recovery (less invasive), Reduced Risk of Infection, Reduced Blood Loss
- **Greater Surgical Reach**
- **Enhanced Visualization**
- **Improved Ergonomics for Surgeon**
- **Robot Deep Reinforcement Learning**



AI&Robotics in Nursing

AI in Nursing:

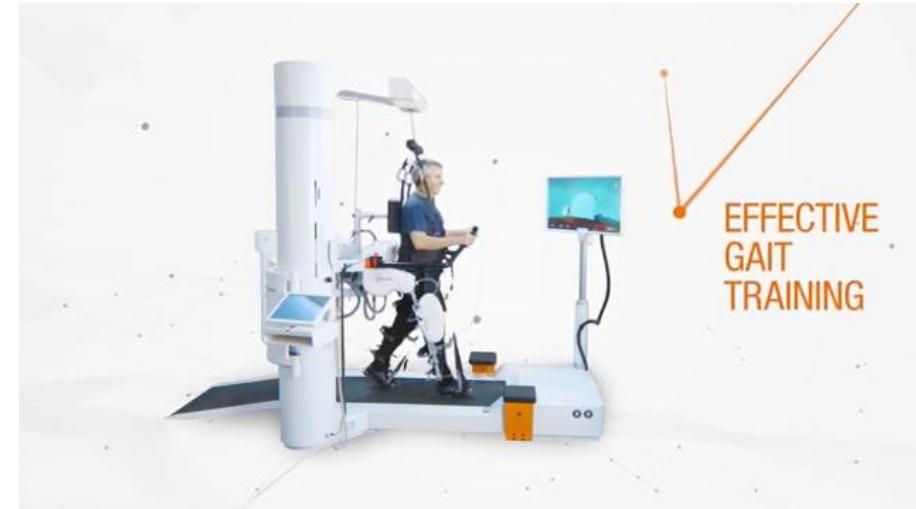
- **Personalized Treatment Plans** based on individual patient data, optimizing care
- **Workflow Optimization** with automatization of administrative tasks, efficient scheduling, allowing nurse staff to focus more on patient care
- **Patient Monitoring** with AI-powered devices continuously monitor vital signs and alert nurses to any deviations
- **Robotics and Automated assistants** helping with physical tasks, reducing strain and increasing efficiency in patient handling and monitoring



AI&Robotics in Physiotherapy

Robotic Devices for Rehabilitation

- Robotic exoskeletons and limbs
- Assist patients in performing exercises correctly
- Intensity and duration of therapy sessions
- Automated gait training



Gamming and Virtual/Augmented Reality

- Immersive rehabilitation environments
- Engaging patients through gamified therapy sessions
- Enhance motivation and adherence to treatment plans
- Simulate walking scenarios or activities of daily living
- Improve balance, coordination, and motor skills.



AI&Robotics in Physiotherapy

AI-driven Assessment Tools

- AI in assessing patient progress
- Data from sensors and wearable devices
- Track motion and muscle activity, AI systems to tailor personalized rehab programs
- AI analyze data to provide real-time feedback and adjust therapy programs

AI Integration with Biomechanical Models

- Predict outcomes of therapy interventions, allowing for highly customized therapy plans.
- Predict optimal set of exercises and impact on patient's recovery, based on injury and body mechanics



Physiotherapy Education with AI

- AI Tools for Education and Research
- AI-Enhanced Learning Platforms
- Simulation and Virtual Patients
- Data-Driven Education
- Continuous Professional Development

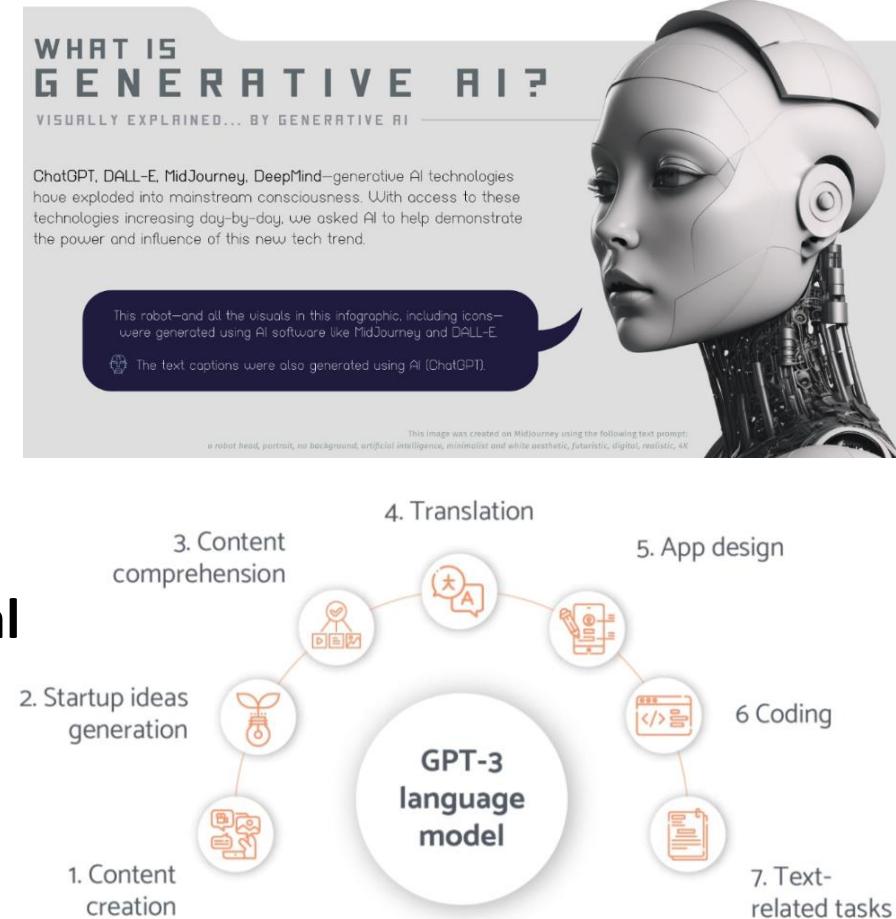
Strong AI – Star Wars and C3PO



Video: Lucasfilm Ltd. (1977). *Star Wars: Episode IV - A New Hope*. [Film]. 20th Century Fox.

Generative AI

- Generative AI (GenAI) can create a wide variety of data, such as images, videos, audio, text, and 3D models
- Learning patterns from existing data, and then using this knowledge to generate new and unique outputs in response to prompts
- GenAI produce highly realistic and complex content that mimics human creativity
- Large language models (LLM) consist of a very large neural network with billions of weights, trained on very large quantities of text



Generative AI

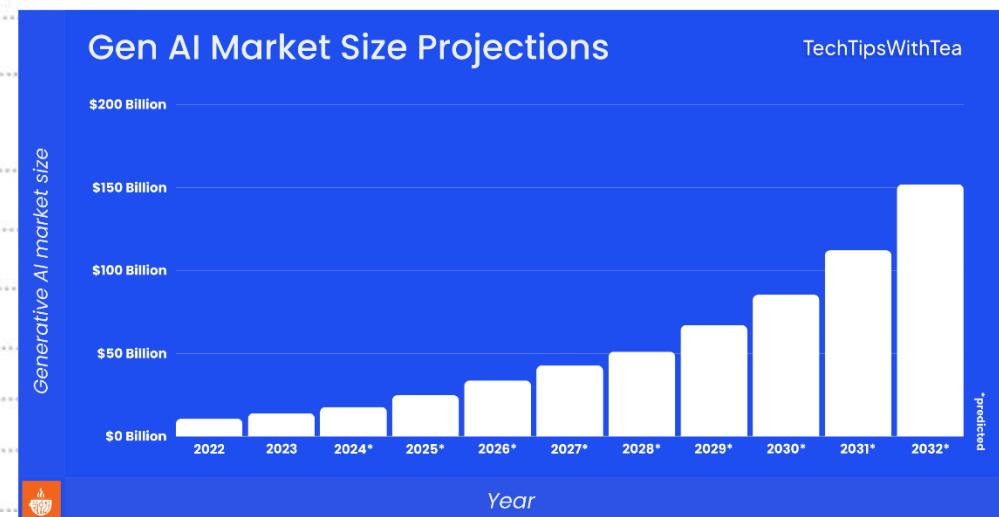
Text-to-Image (T2I)	DALL·E 2 Stable Diffusion craiyon Texica MidJourney Imagen WOMBO NightCafe GauGAN2 DeepAI Jasper artbreeder Wonder pixray-text2image neural.love Omneky alpaca image.space KREA Nyx + gallery ROSEBUD.AI PhotoRoom
Text-to-Video (T2V)	runway Fliki synthesis Meta AI Google AI Phenaki CONTENDA
Text-to-Audio (T2A)	Play.ht MUREAI RESEMBLE.AI WELLSAID descript Aflorithmic Simplified Jasper frase eleutherAI Requistry letterdrop grammarly copy.ai MarketMuse AI21labs HubSpot NovelAI
Text-to-Text (T2T)	InferKit GooseAI ResearchAI Writesonic cohore CHIBI Ideas AI copysmith Flowrite NICHESSS sudo write Rytr ideasbyai text.cortex OpenAI GPT-3 Blog Idea Generator HyperWrite Subtxt WRITER wordtune LAIKA COMPOSE AI Moonbeam Bertha.ai anyword Hypotenuse AI Peppertype.ai
Text-to-Motion (T2M)	TREE Ind. MDM: Human Motion Diffusion Model
Text-to-Code (T2C)	replit Ghostwriter GitHub Copilot MUTABLEAI tabnine Amazon CodeWhisperer
Text-to-NFT (T2N)	LensAI
Text-to-3D (T2D)	DreamFusion CLIP-Mesh GET3D
Audio-to-Text (A2T)	descript AssemblyAI Whisper
Audio-to-Audio (A2A)	AudioLM VOICEMOD
Brain-to-Text (B2T)	speech from brain non-invasive brain recordings
Image-to-Text (A2T)	neural.love GPT-3 x Image Captions

ChatGPT Sprints to One Million Users

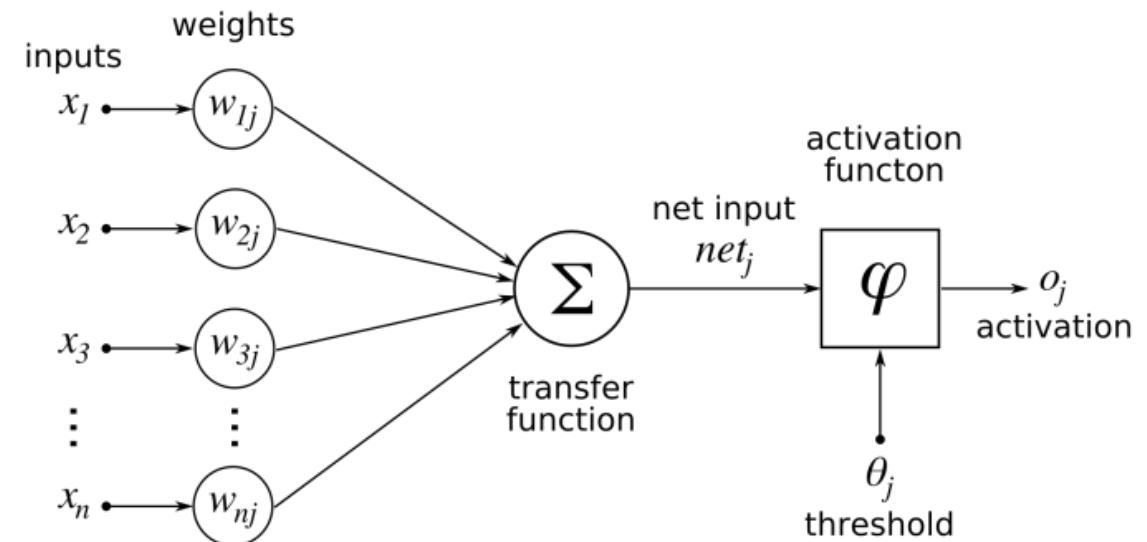
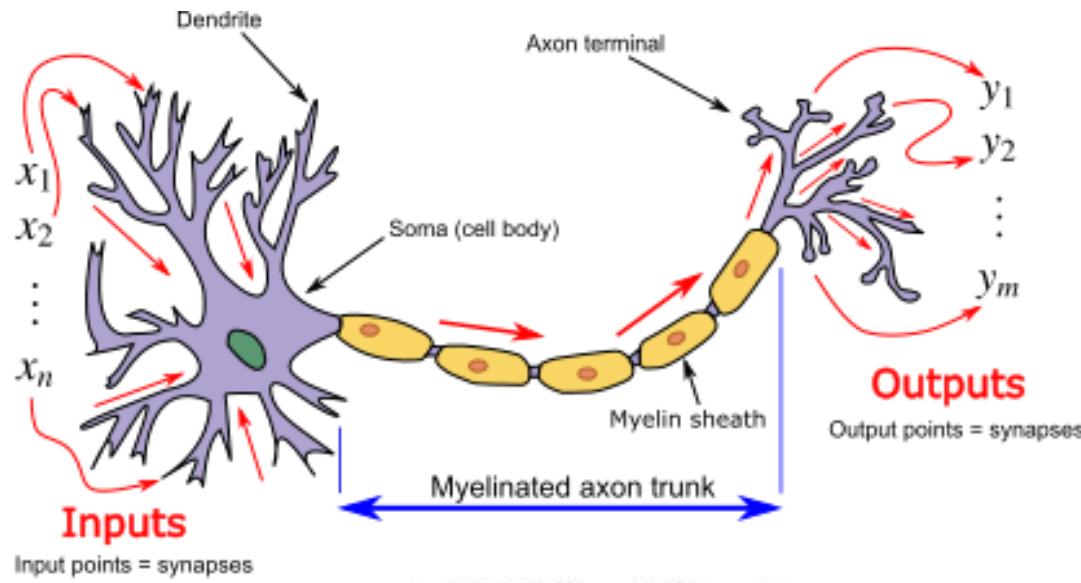
Time it took for selected online services to reach one million users



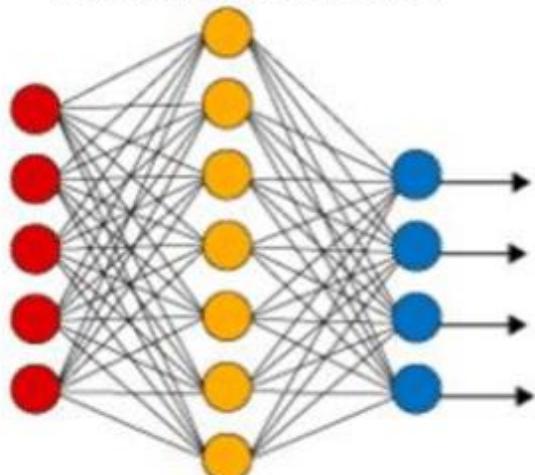
Gen AI Market Size Projections



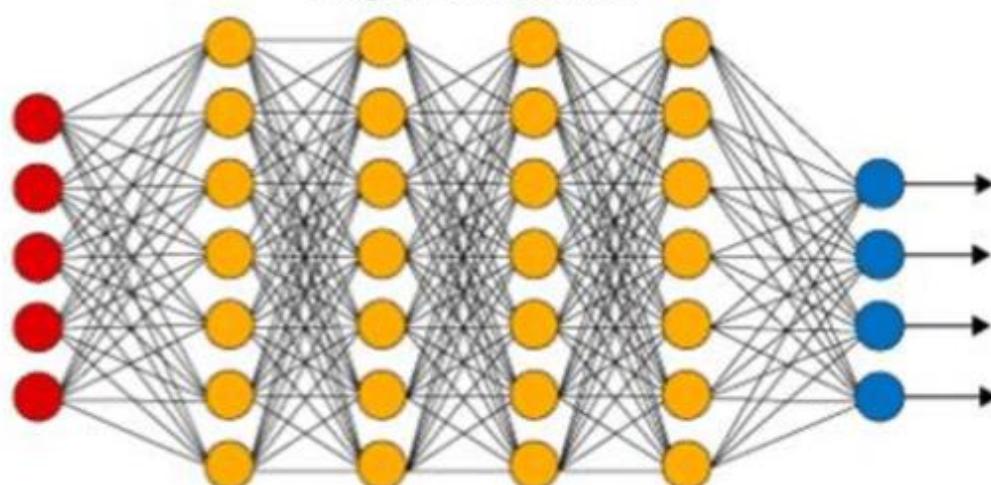
Artificial Neural Networks



Artificial Neural Network

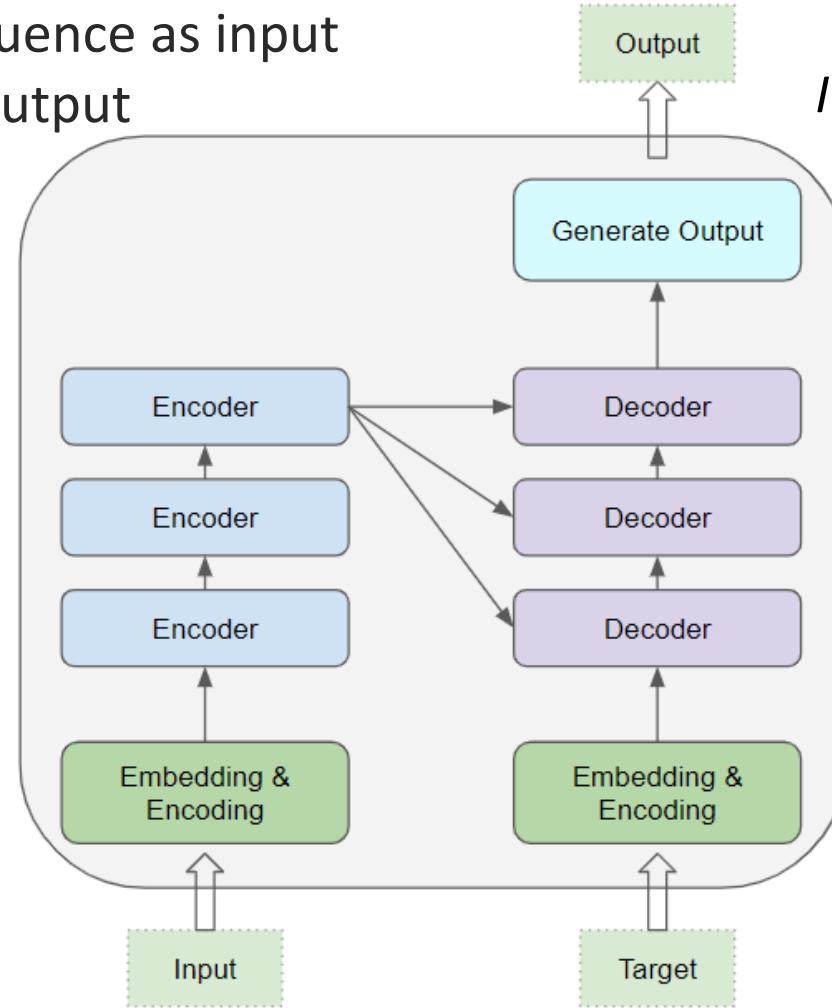
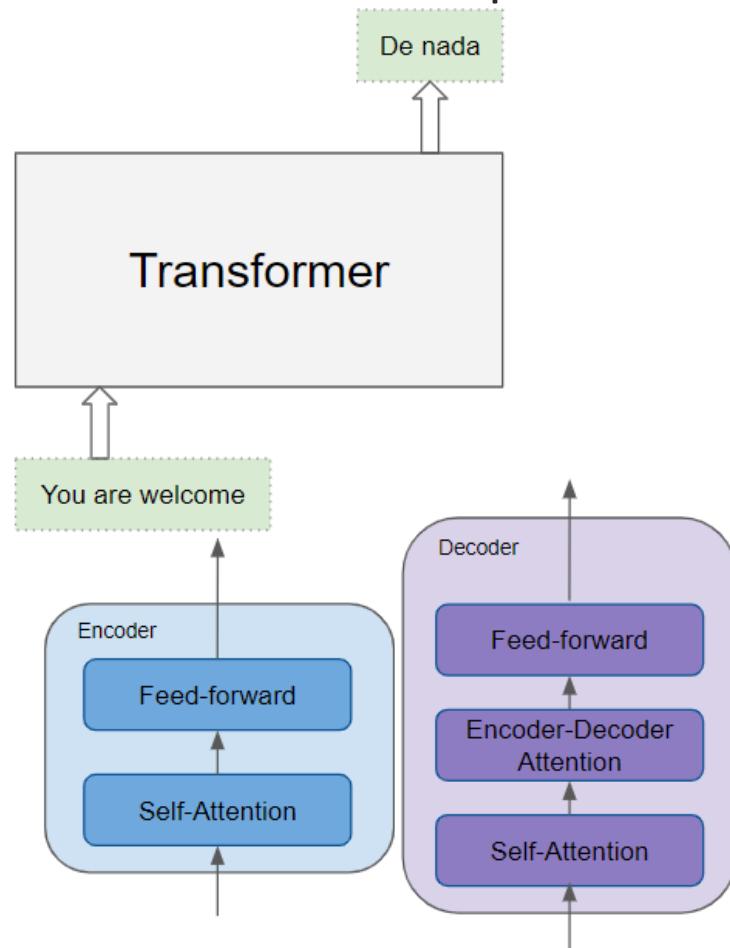


Deep Neural Network



Transformer Architecture

Transformer architecture take a text sequence as input and produce another text sequence as output



I will have meatballs for ...

dinner	0.3
lunch	0.28
...	
my	0.1
a	0.08
...	
breakfast	1e-4
dessert	1e-5
...	
fun	1e-6
for	1e-90

$$P(w_1, \dots, w_m)$$

<https://towardsdatascience.com/transformers-explained-visually-part-1-overview-of-functionality-95a6dd460452>

Attention is All You Need

Attention Is All You Need

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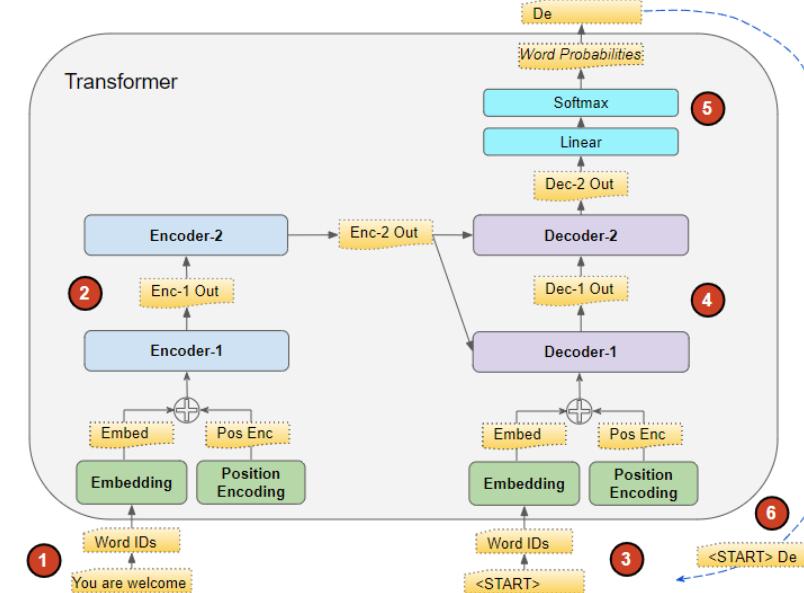
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Abstract

The dominant sequence transduction models are based on complex recurrent or convolutional neural networks that include an encoder and a decoder. The best performing models also connect the encoder and decoder through an attention mechanism. We propose a new simple network architecture, the Transformer, based solely on attention mechanisms, dispensing with recurrence and convolutions entirely. Experiments on two machine translation tasks show these models to be superior in quality while being more parallelizable and requiring significantly less time to train. Our model achieves 28.4 BLEU on the WMT 2014 English-to-German translation task, improving over the existing best results, including ensembles, by over 2 BLEU. On the WMT 2014 English-to-French translation task, our model establishes a new single-model state-of-the-art BLEU score of 41.0 after training for 3.5 days on eight GPUs, a small fraction of the training costs of the best models from the literature.



ChatGPT

Step 1

Collect demonstration data and train a supervised policy.

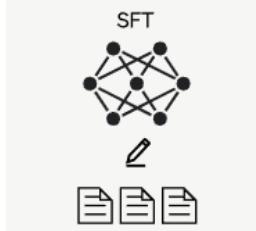
A prompt is sampled from our prompt dataset.



A labeler demonstrates the desired output behavior.



This data is used to fine-tune GPT-3.5 with supervised learning.



Step 2

Collect comparison data and train a reward model.

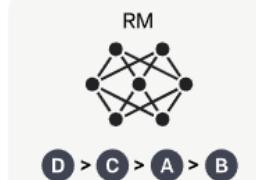
A prompt and several model outputs are sampled.



A labeler ranks the outputs from best to worst.



This data is used to train our reward model.



Step 3

Optimize a policy against the reward model using the PPO reinforcement learning algorithm.

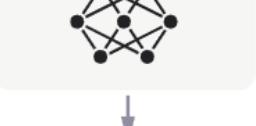
A new prompt is sampled from the dataset.



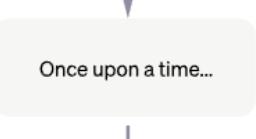
The PPO model is initialized from the supervised policy.



The policy generates an output.



The reward model calculates a reward for the output.



The reward is used to update the policy using PPO.

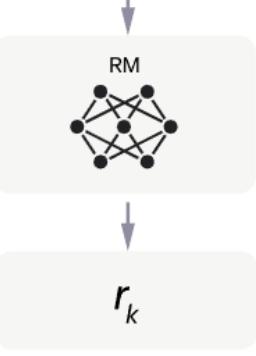
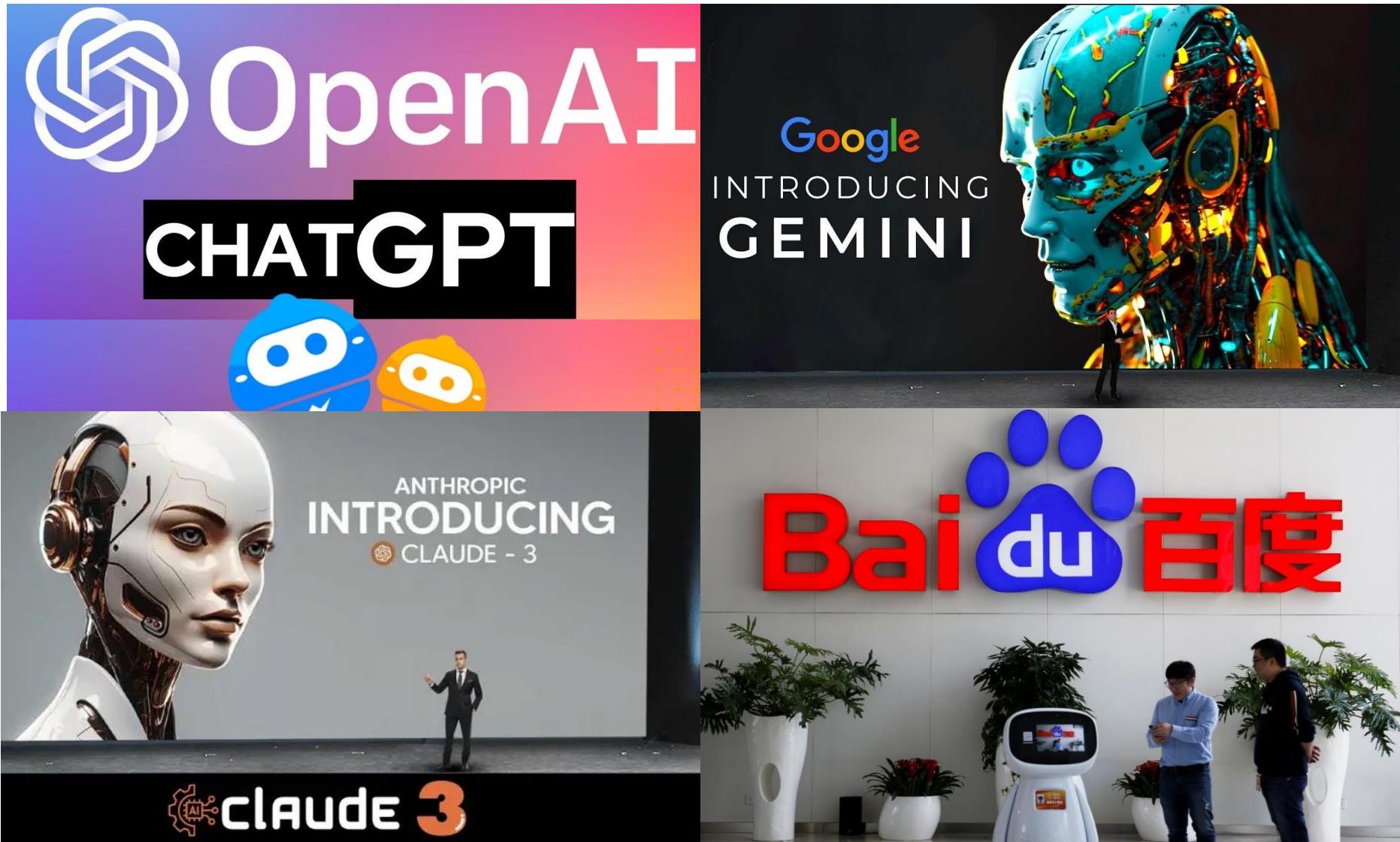


Image: <https://openai.com/blog/chatgpt>

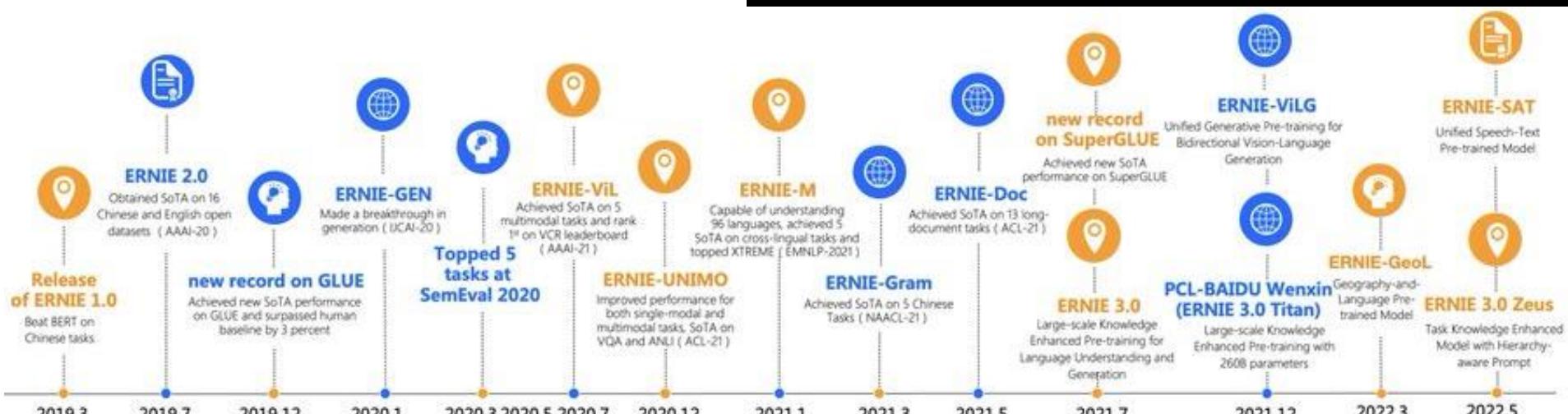
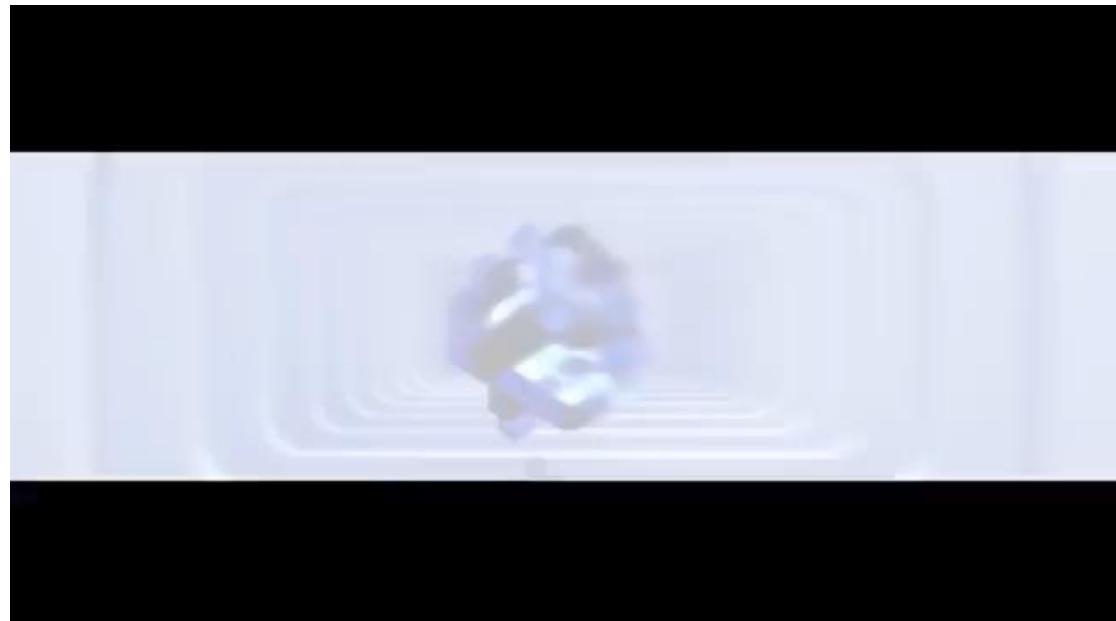
Examples	Capabilities	Limitations
"Explain quantum computing in simple terms" →	Remembers what user said earlier in the conversation	May occasionally generate incorrect information
"Got any creative ideas for a 10 year old's birthday?" →	Allows user to provide follow-up corrections	May occasionally produce harmful instructions or biased content
"How do I make an HTTP request in Javascript?" →	Trained to decline inappropriate requests	Limited knowledge of world and events after 2021

ChatGPT Competition



Ernie Bot - Baidu

- ERNIE - Enhanced Representation through Knowledge Integration
- AI chatbot product of Baidu, started 2019
- Based on LLM "Ernie 3.0-Titan"
- Released on **March 17, 2023**



Google Search Engine

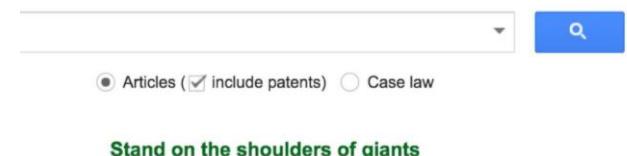
- **Hummingbird Algorithm**

- PageRank algorithm that covers a specific way of giving pages credit based on the links from other pages pointing at them
- Panda, Penguin and Payday to fight spam
- Pigeon designed to improve local results
- Top Heavy designed to demote ad-heavy pages,
- Mobile Friendly designed to reward mobile-friendly pages
- Pirate designed to fight copyright infringement

- **200 major ranking signals (up to 10,000 variations or sub-signals)**

- **Google RankBrain Algorithm**

- Machine-Learning System
- 3rd most important signal
- Interpret searches people submit to find pages that might not have the exact words that were searched for

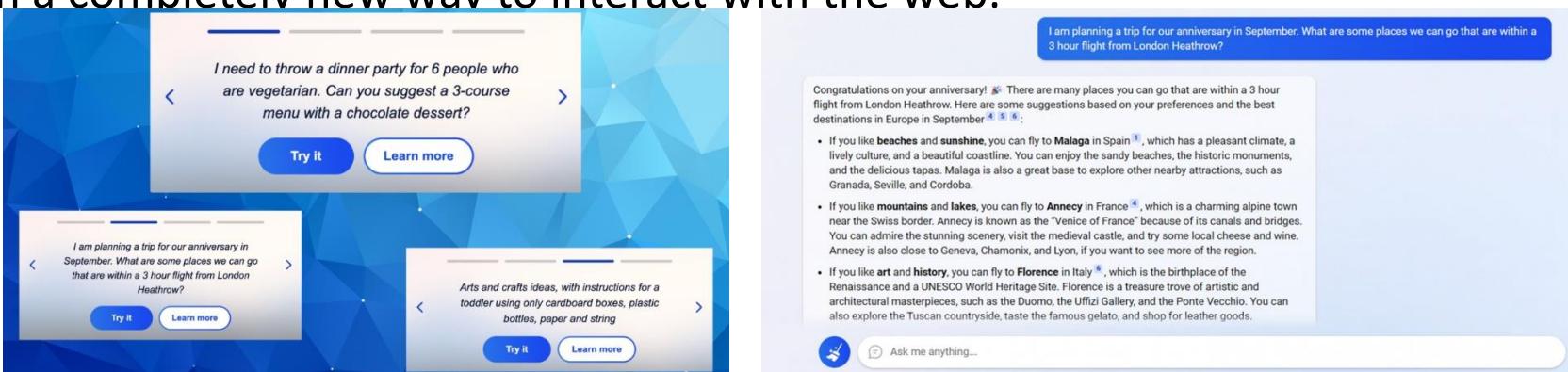


Bing Search Engine



Reinventing search with AI with four technical breakthroughs:

- **Next-generation OpenAI model more powerful than ChatGPT** and customized specifically for search. It takes key learnings and advancements from ChatGPT and GPT-3.5/4.0 and it is even faster, more accurate and more capable
- **Microsoft Prometheus model**. Proprietary way of working with OpenAI model that allows to best leverage its power
- **Applying AI to core search algorithm**. AI model to core Bing search ranking engine, which led to the largest jump in relevance in two decades. Search queries are more accurate and more relevant
- **New user experience**. Reimagining interaction with search, browser and chat into a unified experience in a completely new way to interact with the web.



GitHub Copilot

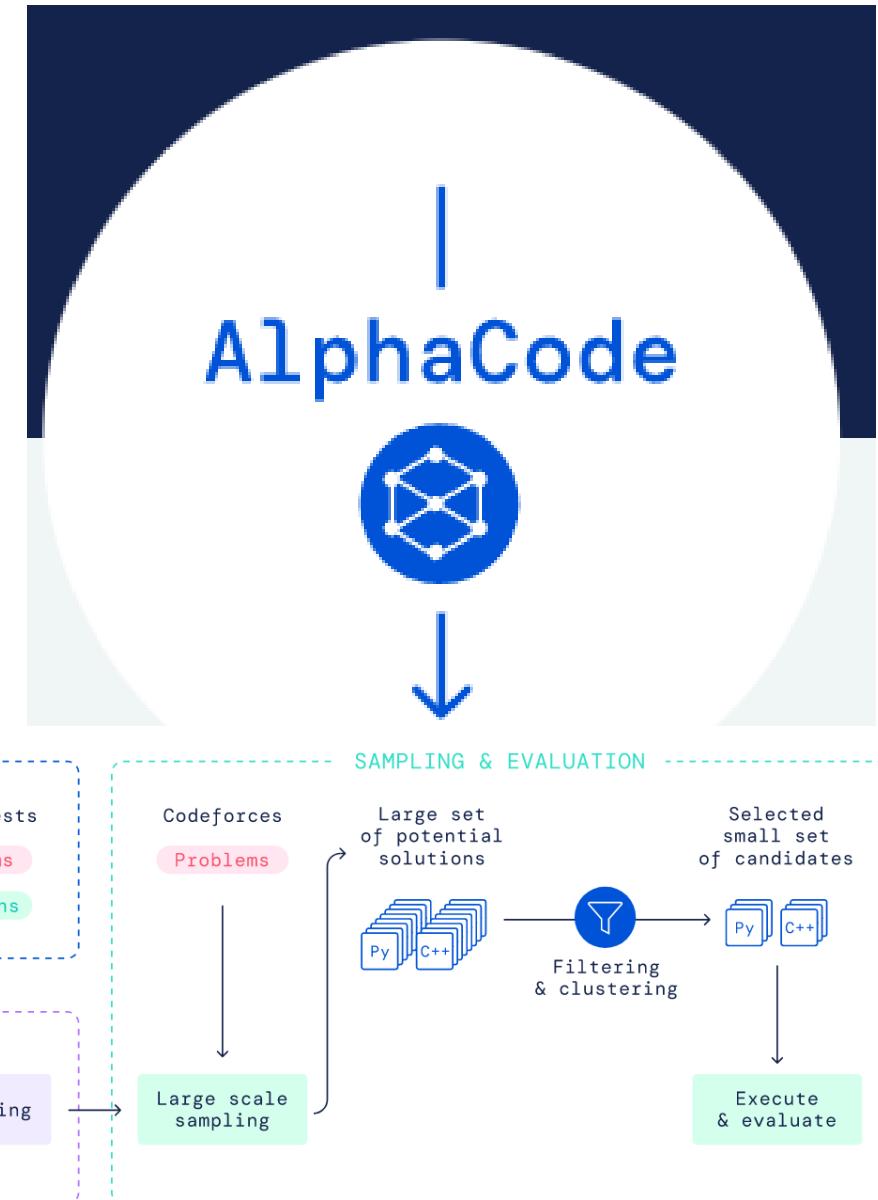


- June 2021: GitHub Releases Copilot
- March 2023: GitHub uses OpenAI's GPT-4 to go way beyond auto-completing comments and code and gets chat and voice support



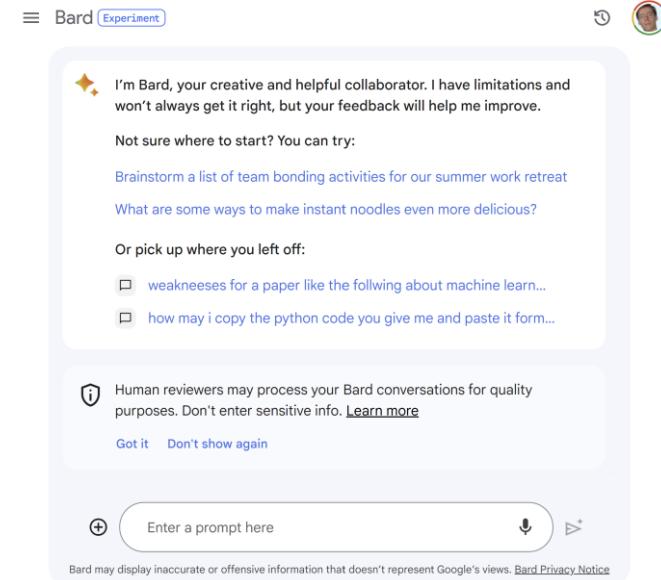
Alpha Code - DeepMind

- Solving novel problems and setting a new milestone in competitive programming
- Achieved an estimated rank within the **top 54% of participants in programming competitions**
- Solving new problems that require a combination of **critical thinking, logic, algorithms, coding, and natural language understanding**



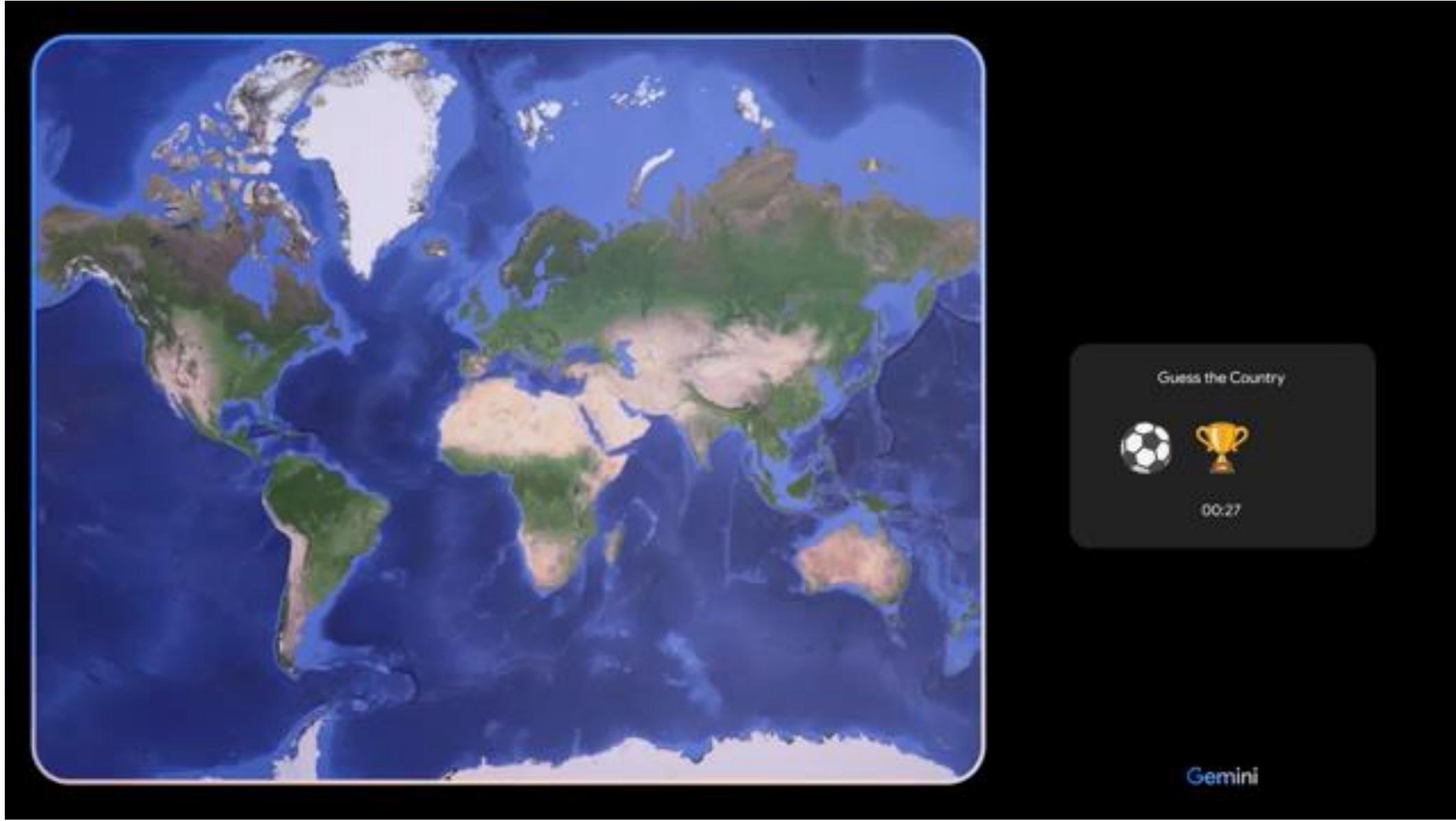
Google Bard

- Language Model for Dialogue Applications (LaMDA)
- Experimental conversational AI service, powered by LaMDA
- Very fast and easy to use



CATEGORIES	CHATGPT	BARD	BING
EASY TO USE	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆
HELPFULNESS	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆
ACCURACY	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆
CREATIVITY	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆
SPEED	★★★★★☆☆	★★★★★☆☆	★★★★★☆☆

Gemini – Google Deep Mind



Gemini 2.0



The interface shows the "Stream Realtime" section with "System Instructions" expanded. It displays three interaction options: "Talk to Gemini", "Show Gemini", and "Share your screen". On the right, the "Run settings" sidebar is open, showing "Model: Gemini 2.0 Flash Experimental", "Output format: Audio", and "Voice: Puck". The main area highlights "Spatial Understanding", "Video Analyzer", and "Map Explorer". A "Gemini Advanced" section offers upgrading to Google One for €21.99/month.

Microsoft Copilot



Claude 3.5

* Good morning, Luis Paulo

How can Claude help you today?

Claude 3.5 Sonnet

Get started with an example below

Summarize meeting notes

Generate interview questions

Extract insights from report

* Add content

NEW Artifacts

Create and iterate on documents, code, and more within Claude. [Try it out](#)

Your recent chats ^

View all →



Claude for Desktop Beta

Your AI partner on desktop. Fast, focused, and designed for deep work.

Windows

Windows (arm64)

macOS

Take Claude with you

Talk to Claude, anywhere you go. Brainstorm ideas, get answers, and analyze images on the go.

Apple App Store

Google Play



Pro

€18 + VAT / month

- ⌚ 5x more usage versus Free plan
- ⌚ Access to Projects to organize documents and chats
- ⌚ Ability to use more models, like Claude Opus
- ⌚ Early access to new features

[Subscribe to Pro](#)

Perplexity AI



- **Perplexity AI** is a conversational search engine that uses large language models (**LLMs**) to answer queries using **sources from the web** and **cites links** within the text response.

The screenshot shows the Perplexity AI interface. On the left, there's a sidebar with navigation links: New Thread, Ctrl I, Home, Discover, Spaces, Library, and a search bar containing the query "who are the top research...". The main area has a header with the user "lpreis1970" and a timestamp "4m". Below the header is the query "who are the top researchers in AI in portugal today". To the right of the query, a text box states: "Based on the most recent information available, several top AI researchers in Portugal stand out:" followed by a numbered list of three researchers. A "Sources" section is also visible, mentioning INESC-ID AI researchers and linking to inesc-id.

+ Space / who are the top researchers in AI in portugal today

who are the top researchers in AI in portugal today

Based on the most recent information available, several top AI researchers in Portugal stand out:

1. Paulo Novais from the University of Minho, who leads the ISLab laboratory at the ALGORITMI centre and coordinates LASI, the largest associated laboratory in Portugal 3.
2. Luís Paulo Reis, an Associate Professor with Aggregation at FEUP and Director of LIACC – Artificial Intelligence and Computer Science Laboratory 2 3.
3. Manuela Veloso, currently the Director of J.P. Morgan AI Research and formerly a member of Carnegie Mellon University. She is internationally renowned for her work in artificial intelligence and robotics 3.

Grammarly

Google x | Gmail x | FEUP - Luís x | Top 9 gener x | Best AI Tool x | Apps - Gran x | Grammarly x | Demo docu x | +

app.grammarly.com/apps

EDU

Grammarly Apps

Grammarly for Windows



Grammarly for your desktop is your one-stop solution to get writing suggestions across a wide array of desktop apps and websites.

[Install](#)

By downloading Grammarly for Windows, you agree to the [Terms and Conditions](#) and [Privacy Policy](#). California residents, see our [CA Privacy Notice](#).

Grammarly for Chrome

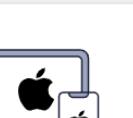


Grammarly's browser extensions offer writing suggestions in Google Docs and other sites across the web.

✓ Active

[Re-install](#)

Grammarly for iPhone and iPad



Write confidently and professionally across all your apps and websites with Grammarly's writing suggestions, anywhere you go.

[Install](#)

DeepL

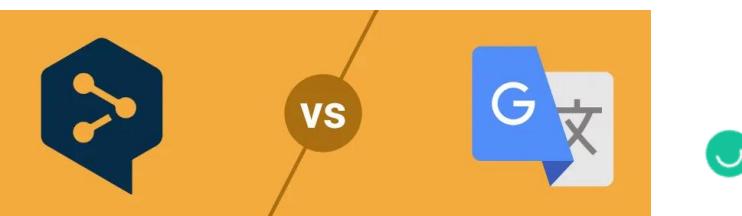
DeepL Translator ▾ DeepL Pro Why DeepL? ▾ API Plans and pricing Apps **FREE** Start free trial Login ≡

Translate text 31 languages Translate files .pdf, .docx, .pptx

Pick up where you left off with your **30-day free trial** of DeepL Pro. ×

Detect language ▾ ↔ English (UK) ▾ Glossary

Type to translate.
Drag and drop to translate PDF, Word (.docx), and PowerPoint (.pptx) files with our document translator.



DeepL Translator

“ Tech giants Google, Microsoft and Facebook are all applying the lessons of machine learning to translation, but a small company called DeepL has outdone them all and raised the bar for the field. Its translation tool is just as quick as the outsized competition, but more accurate and nuanced than any we've tried.

TechCrunch, USA

TC TechCrunch

QuillBot



Upgrade to Premium



Modes: Standard

Fluency

Formal

Simple

Creative

Expand

Shorten

Synonyms:



QuillBot will rewrite your text. Start by writing or pasting something here and then press the Paraphrase button.



Try Sample Text



Paste Text

Paraphrase

Paraphraser

Summarizer

Grammar
Checker

Vocabulary enhancement feature, Thesaurus powered by AI,
Integrations (Word, GoogleDocs), Grammar check, Summarizing tool



QuillBot

Dall-E 3

DALL·E 3 is an AI system that can create realistic images and art from a description in natural language

An astronaut riding a horse in photorealistic style



A beach similar to "praia da baia" in Espinho with surfers, surfing in the sea and big waves



 **DALL·E 2**

 **Midjourney**

 **Stable Diffusion**

 **Canva**
AI-ASSISTED DESIGN GENERATOR

Dall-E 3

Realistic depiction of the **Ria de Aveiro** featuring **crocodiles** in the water, **Tyrannosaurus Rex** dinosaurs on the banks, and a **Moliceiro** boat with people navigating the ria



AI in Literature and Poetry Creation

cria-me uma poesia sobre este evento

Aveiro, Capital de Cultura e Luz

Em dezembro, quando o sol se desfaz,

Aveiro ergue-se, serena e audaz.

Cultura e tecnologia, juntas a brilhar,

Num grande auditório, histórias vão contar.

Às portas da tarde, a receção se inicia,

Ribau e Vítor trazem sabedoria.

Palavras de abertura, esperança no ar,

Um futuro inovador começam a traçar.

Luís Paulo Reis, no palco central,

Com inteligência artificial, um discurso sem igual.

"Cultura e Tecnologia, um olhar ao porvir,"

Inspira mentes, faz sonhos emergir.

No primeiro painel, o trabalho é o tema,
Com Paulo, Dora e Pedro, desvendam o dilema.

Helena modera, as ideias vão fluir,
Como a tecnologia nos faz progredir.

Depois vem o segundo, a pergunta intrigante,
"A Inteligência Artificial é amiga ou distante?"

Paulo, Rogério e Luís, juntos a debater,
Guiados por Manuel, há tanto por ver.

E ao final do dia, a cultura se encerra,
Com José Pina, que une céus e terra.

Aveiro 2024, um marco a celebrar,
Cultura e inovação, de mãos a se dar.

Que este evento brilhe como o farol no cais,
Iluminando caminhos, futuros e mais.

Aveiro, cidade de água e paixão,
És capital de cultura, o orgulho da nação.

GRANDE AUDITÓRIO DO CENTRO DE CONGRESSOS DE AVEIRO



AVEIRO, CAPITAL PORTUGUESA DA CULTURA
CULTURA E TECNOLOGIA

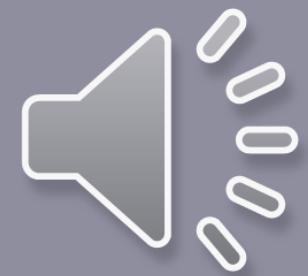
MuseNet

Compose in the style of Chopin -
starting with Mozart's Rondo alla Turca -



PLAY FROM START

⬇ DOWNLOAD ⏪ TWEET ⏴ RESET



Generating a Podcast

NotebookLM

Settings



Welcome to NotebookLM

My Notebooks

+ Create new



Most recent ▾



Curriculum Vitae of Luís
Paulo Reis

Dec 12, 2024 · 1 source



Explore GPTs

GPTs

Discover and create custom versions of ChatGPT that combine instructions, extra knowledge, and any combination of skills.

uma receita de bacalhau com espinafres e batatas com um empratamento bonito e foto

Q Search public GPTs

1  **Canva**
Effortlessly design anything: presentations, logos, social media posts and more.
By canva.com

3  **Consensus**
Your AI Research Assistant. Search 200M academic papers from Consensus, get science-based answers, and draft content...
By Consensus

5  **Video GPT by VEED**
AI Video Maker. Generate videos for social media - YouTube, Instagram, TikTok and more! Free text to video & speech tool wit...
By veed.io

2  **Logo Creator**
Use me to generate professional logo designs and app icons!
By Chase Lean

4  **image generator**
A GPT specialized in generating and refining images with a mix of professional and friendly tone.image generator
By NAIF J ALOTAIBI

6  **Grimoire**
Code Wizard 🤖 Learn to Prompt-gra... Create a website (or anything) with a sentence. 20+ Hotkeys for coding flows....
By gptavern.mindgoblinstudios.com



Talked to api.adzedek.com ▾

Receita de Bacalhau com Espinafres e Batatas

Esta é uma receita clássica e nutritiva que combina o sabor rico do bacalhau com a suavidade das batatas e a frescura dos espinafres. O prato é montado de forma elegante, com camadas visuais para um empratamento atraente.

Ingrédientes:

- 400g de bacalhau dessalgado
- 300g de batatas
- 200g de espinafres frescos
- 2 dentes de alho picados
- 1 cebola em rodelas finas
- 100ml de azeite de oliva
- Sal e pimenta a gosto



Consensus

LP

You

write me a state of the art about AI ethics



Consensus

- ✓ Talked to chat.consensus.app ▾

The state of the art in AI ethics encompasses a wide range of topics, from algorithmic injustice and discrimination to labor impacts, privacy concerns, and the societal implications of AI. Here's a summary of key findings from recent research:

- Algorithmic Injustice and Discrimination:** AI technologies often reflect and perpetuate existing societal biases, leading to concerns about algorithmic injustice and discrimination. This issue is especially pertinent in the context of societal and labor impacts, as well as in the development of ethical AI frameworks (Gupta et al., 2021).
- Ethical AI Development:** There is a growing emphasis on the need to develop AI systems ethically. This includes addressing issues of privacy, security, and the risk of misinformation. The role of AI in societal contexts, such as labor and social media, necessitates careful ethical consideration (Vakkuri et al., 2020) ▾

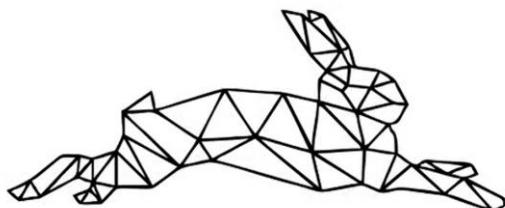
3. **Challenges in Implementing AI Ethics:** Despite the proliferation of ethical guidelines for AI, there's a notable gap between these guidelines and their implementation in practice. This gap is evident in industries and companies dealing with AI, indicating a need for better integration of ethical principles in AI development (Vakkuri et al., 2022).

4. **AI and Labor Impact:** The impact of AI on labor and employment is a significant ethical concern. AI's potential to automate jobs raises questions about job displacement and the need for new skills and training for the workforce (Gupta et al., 2021).

5. **Privacy and Security:** With the increasing use of AI in various domains, issues of data privacy and security are paramount. Ensuring the protection of personal data and preventing misuse of AI technologies are key ethical challenges (Gupta et al., 2021).

6. **Ethical Implications in Specific AI Applications:** Specialized areas like AI-generated art and machine translation also present unique ethical challenges. For instance, AI-generated art raises questions about the representation of artistic styles and cultural nuances (Srinivasan & Uchino, 2021). ▾

Research Rabbit



New Collection
New Category
Connect to Zotero

Filter Custom
Abstracts Comments
Select None Select All

Untitled Collection

Uncategorized + Collection Untitled Collection

All References

Connections between your collection and 16 papers

Graph Type Network Timeline Labels First Author Last Author

Filter these items

16 Selected Papers Add to: Untitled Collection Add to Other Collection

+ Add Papers

Explore Papers

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Earlier Work 132
Later Work 62

Explore People

These Authors 138
Suggested Authors 802

Explore Other Content

Linked Content 1

Export Papers

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Remove from: Untitled Collection
Add to Other Collection

Explore Papers

Similar Work

All References 16

All Citations

Explore People

These Authors 6
Suggested Authors 6

Explore Other Content

Linked Content

Export Papers

BibTeX RIS CSV

Public Collection

Shareable Link Copy

1 selected paper

Mohammadreza Kasaei ... Zhibin Li

Learning hybrid locomotion skills—Learn to exploit residual actions and modulate model-based gait control

Frontiers in Robotics and AI 2023

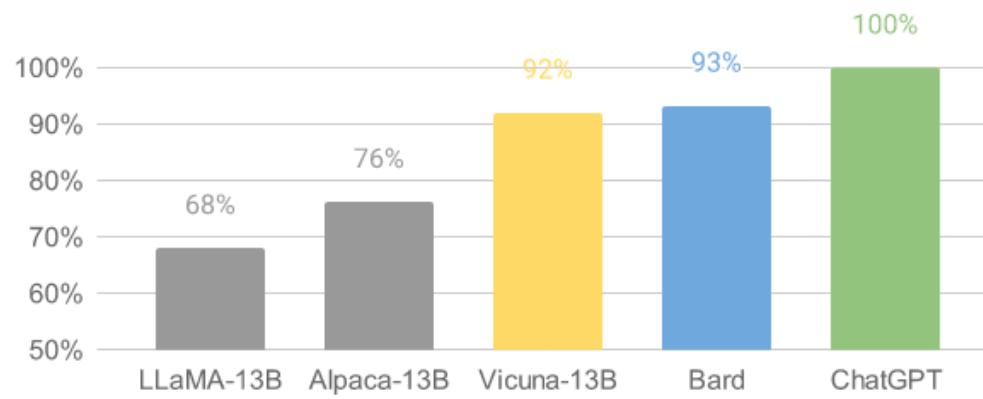
PDF

This work has developed a hybrid framework that combines machine learning and control approaches for legged robots to achieve new capabilities of balancing against external perturbations. The framework embeds a kernel which is a model-based, full parametric closed-loop and analytical controller as the gait pattern generator. On top of that, a neural network with symmetric partial data augmentation learns to automatically adjust the parameters for the gait kernel, and also generate compensatory actions for all joints, thus significantly augmenting the stability under unexpected perturbations. Seven Neural Network policies with different configurations were optimized to validate the effectiveness and the combined use of the modulation of the kernel parameters and the compensation for the arms and legs using residual actions. The results validated that modulating kernel parameters alongside the residual actions have improved the

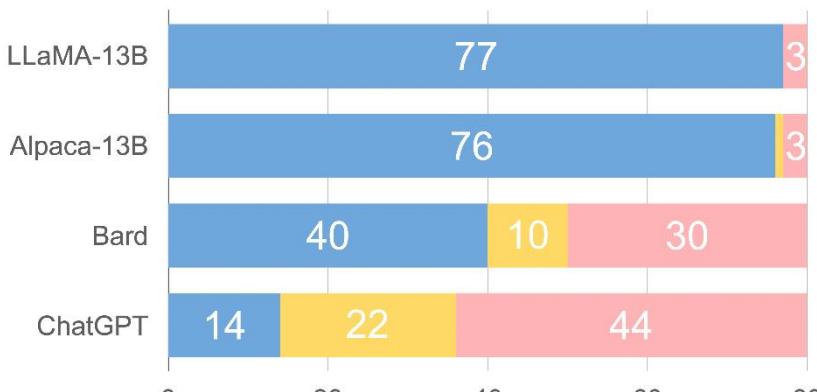
Vicuna-13B's Performance

Vicuna: An Open-Source Chatbot Impressing GPT-4 with 90%* ChatGPT Quality

by the Team with members from UC Berkeley, CMU, Stanford, and UC San Diego

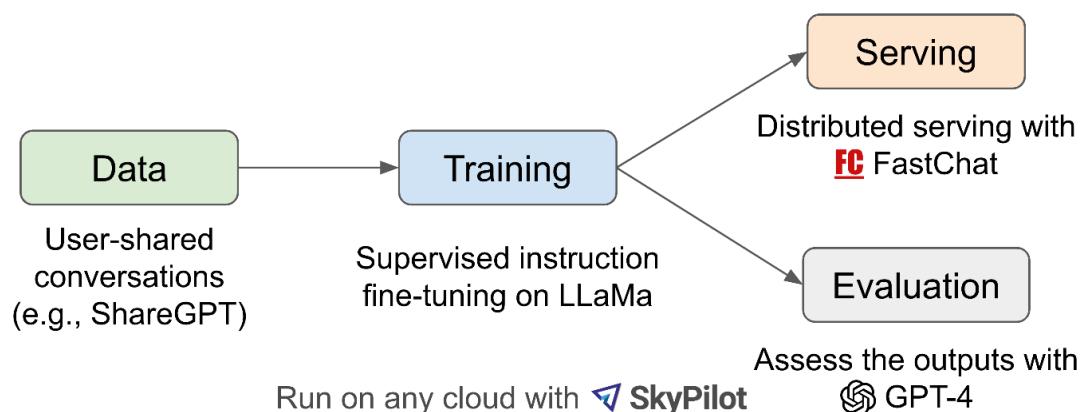


Relative Response Quality Assessed by GPT-4



Response Comparison Assessed by GPT-4

**Training cost (13B):
135K GPU-hours, \$300!**



Llama 3 - Meta



Technology ▾

Get started ▾

Trust & Safety ▾

Community ▾

Try Meta AI ↗

Download models



Build the future of AI
with Meta Llama 3

Now available with both 8B and 70B pretrained and instruction-tuned versions to support a wide range of applications

Get Started

Experience Llama 3 on Meta AI

Mistral

Frontier AI in your hands

Open and portable generative AI for devs and businesses.

[Try le Chat](#) [Build on la Plateforme](#)

Openness
We lead the market of open source generative technologies to bring trust and transparency in the field and foster decentralised technology development

Portability
Our technology is available through serverless APIs, public cloud services (on Azure AI, on Amazon Bedrock), and for VPC/on-premise deployment. Our independence from cloud providers is a guarantee of our customers' independence.

Value and speed
Our flagship model, Mistral Large, has independently validated top-tier reasoning in multiple languages. All our models bring unmatched value and latency at their price points.

Customisation
Our models can be fine-tuned and modified at will for your business to create differentiated AI applications.

Build on Open Source

Under the Apache 2.0 license, our 3 open source models Mistral 7B, Mixtral 8x7B, Mixtral 8x22B are usable and customisable for a variety of use cases. They can be downloaded or used on demand via our platform.

- [Download them](#) for deployment in your own environment
- Use them on [La Plateforme](#) at market-leading availability, speed, and quality control



Gemma 2 – Gemini Google

Gemma

google/gemma

Gemma 2 is now available to researchers and developers

Gemma 2 offers best-in-class performance, runs at incredible speed across different hardware and easily integrates with other AI tools.

Jun 27, 2024 · 4 min read

Gemma is a family of lightweight, open models built from the research and technology that Google used to create the Gemini models.



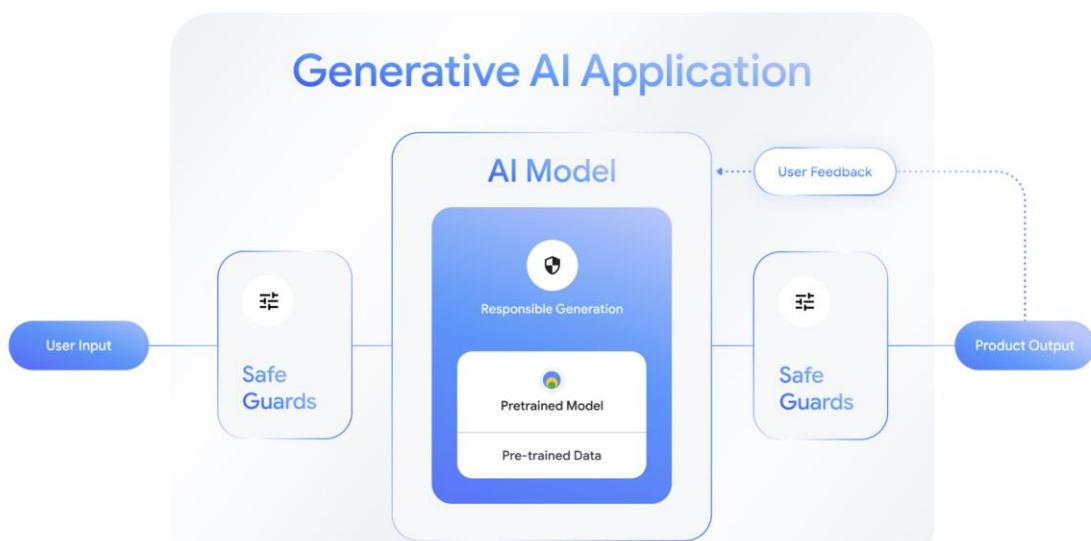
Responsible Generative AI Toolkit [Send feedback](#) [Bookmark](#)

This toolkit provides resources to apply best practices for responsible use of open models such as the Gemma models, including:

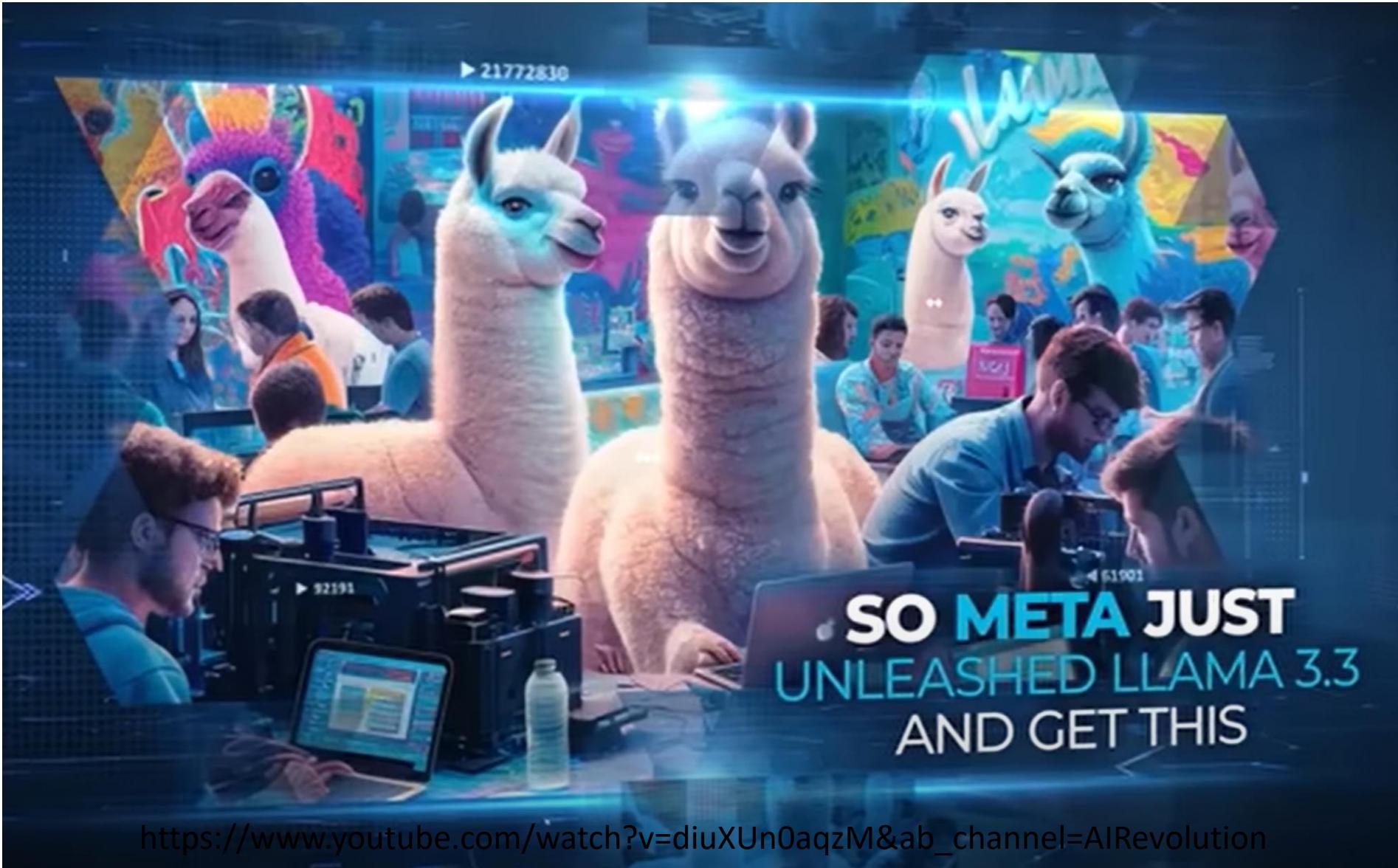
- Guidance on setting safety policies, safety tuning, safety classifiers and model evaluation.
- The [Learning Interpretability Tool \(LIT\)](#) for investigating Gemma's behavior and addressing potential issues.
- A methodology for building robust safety classifiers with minimal examples.

This version of the toolkit focuses on English text-to-text models only. You can provide feedback to make this toolkit more helpful through the feedback mechanism link at the bottom of the page.

When building with Gemma, you should take a holistic approach to responsibility and consider all the possible challenges at the application and model levels. This toolkit covers risk and mitigation techniques to address safety, privacy, fairness, and accountability.



Llama 3.3 - Meta



LLMs Comparison - Chatbot Arena LLM Leaderboard

Rank* (UB)	Model	Arena Score	Organization	License
1	ChatGPT-4o-latest_(2024-11-20)	1366	OpenAI	Proprietary
1	Gemini-Exp-1121	1364	Google	Proprietary
3	Gemini-Exp-1114	1347	Google	Proprietary
4	o1-preview	1334	OpenAI	Proprietary
5	o1-mini	1307	OpenAI	Proprietary
5	Gemini-1.5-Pro-002	1301	Google	Proprietary
7	Grok-2-08-13	1289	xAI	Proprietary
7	Yi-Lightning	1287	01 AI	Proprietary
7	GPT-4o-2024-05-13	1285	OpenAI	Proprietary
7	Claude_3.5_Sonnet_(20241022)	1283	Anthropic	Proprietary
10	Athene-v2-Chat-72B	1276	NexusFlow	NexusFlow
11	GLM-4-Plus	1274	Zhipu AI	Proprietary
11	GPT-4o-mini-2024-07-18	1273	OpenAI	Proprietary
11	Gemini-1.5-Flash-002	1271	Google	Proprietary
11	Llama-3.1-Nemotron-70B-Instruct	1268	Nvidia	Llama 3.1

DeepSeek



DeepSeek

A DeepSeek é uma empresa chinesa de inteligência artificial (IA) que ganhou destaque global por seus modelos de linguagem de grande escala (LLMs) de código aberto e alta eficiência. Fundada em 2023, a empresa emergiu como uma das principais protagonistas no cenário de IA, desafiando gigantes como OpenAI e Meta com soluções inovadoras e de baixo custo. Aqui está um resumo da história da DeepSeek:

Origem e Fundação

A DeepSeek foi fundada em maio de 2023 como uma spin-off da **High-Flyer**, um fundo de hedge quantitativo chinês conhecido por seu foco em algoritmos de negociação baseados em IA. O fundador, **Liang Wenfeng**, é um entusiasta de IA com formação em ciência da computação e experiência em finanças quantitativas. A empresa foi criada com o objetivo de desenvolver modelos de IA avançados, inicialmente focados em pesquisa fundamental, sem pressão imediata por lucratividade [2](#) [11](#).

Trajetória de Inovação

1. Primeiros Modelos (2023):

- Em novembro de 2023, a DeepSeek lançou seu primeiro modelo, o **DeepSeek Coder**, um LLM focado em geração de código, disponível gratuitamente para uso comercial e de pesquisa [5](#) [7](#).



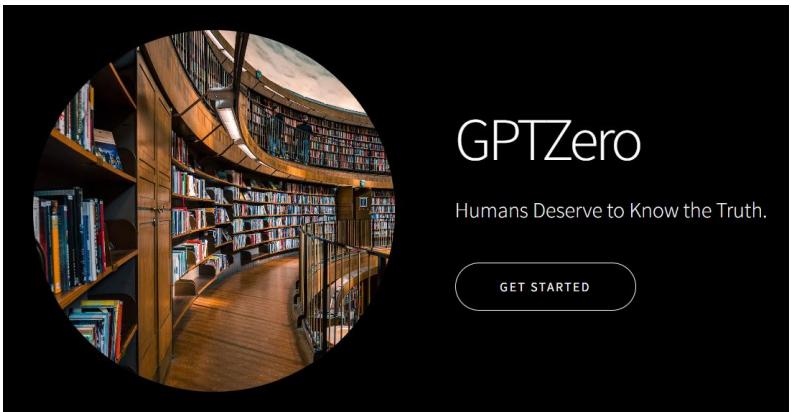
Message DeepSeek

LLMs Comparison - Chatbot Arena LLM Leaderboard

Rank* (UB)	Rank (StyleCtrl)	Model	Arena Score	95% CI	Votes	Organization	License
1	3	Gemini-2.0-Flash-Thinking-Exp-01-21	1382	+8/-6	6437	Google	Proprietary
1	1	Gemini-Exp-1206	1374	+5/-4	22116	Google	Proprietary
3	1	ChatGPT-4o-latest_(2024-11-20)	1365	+4/-4	35328	OpenAI	Proprietary
3	1	DeepSeek-R1	1357	+12/-13	1883	DeepSeek	MIT
4	5	Gemini-2.0-Flash-Exp	1356	+4/-4	20939	Google	Proprietary
4	1	o1-2024-12-17	1352	+6/-6	9230	OpenAI	Proprietary
7	4	o1-preview	1335	+3/-3	33186	OpenAI	Proprietary
8	9	DeepSeek-V3	1317	+6/-5	13640	DeepSeek	DeepSeek
8	11	Step-2-16K-Exp	1305	+9/-7	4533	StepFun	Proprietary
9	12	o1-mini	1305	+2/-3	49952	OpenAI	Proprietary
9	9	Gemini-1.5-Pro-002	1302	+3/-4	46621	Google	Proprietary
12	14	Grok-2-08-13	1288	+3/-3	67150	xAI	Proprietary
12	17	Yi-Lightning	1287	+3/-4	28955	01 AI	Proprietary
12	10	GPT-4o-2024-05-13	1285	+2/-2	117745	OpenAI	Proprietary
12	8	Claude 3.5 Sonnet	1283	+3/-3	18817	Anthropic	Proprietary

AI Text Detectors/Classifiers

Are You an Educator?



New AI classifier for indicating AI-written text

We're launching a classifier trained to distinguish between AI-written and human-written text.

January 31, 2023

We're building a tailored solution for educators to responsibly adopt AI-technologies in school. GPTZero turns the very technologies used to build ChatGPT around — to detect AI. It uses variables like perplexity to fingerprint AI involvement. Stay updated on the upcoming innovations in GPTZero technology via this substack.

AI Text Classifier

The AI Text Classifier is a fine-tuned GPT model that predicts how likely it is that a piece of text was generated by AI from a variety of sources, such as ChatGPT.

This classifier is available as a free tool to spark discussions on AI literacy. For more information on ChatGPT's capabilities, limitations, and considerations in educational settings, please visit [our documentation](#).

Current limitations:

- Requires a minimum of 1,000 characters, which is approximately 150 - 250 words.
- The classifier isn't always accurate; it can mislabel both AI-generated and human-written text.
- AI-generated text can be edited easily to evade the classifier.
- The classifier is likely to get things wrong on text written by children and on text not in English, because it was primarily trained on English content written by adults.

Try the classifier

To get started, choose an example below or paste the text you'd like to check. Be sure you have appropriate rights to the text you're pasting.

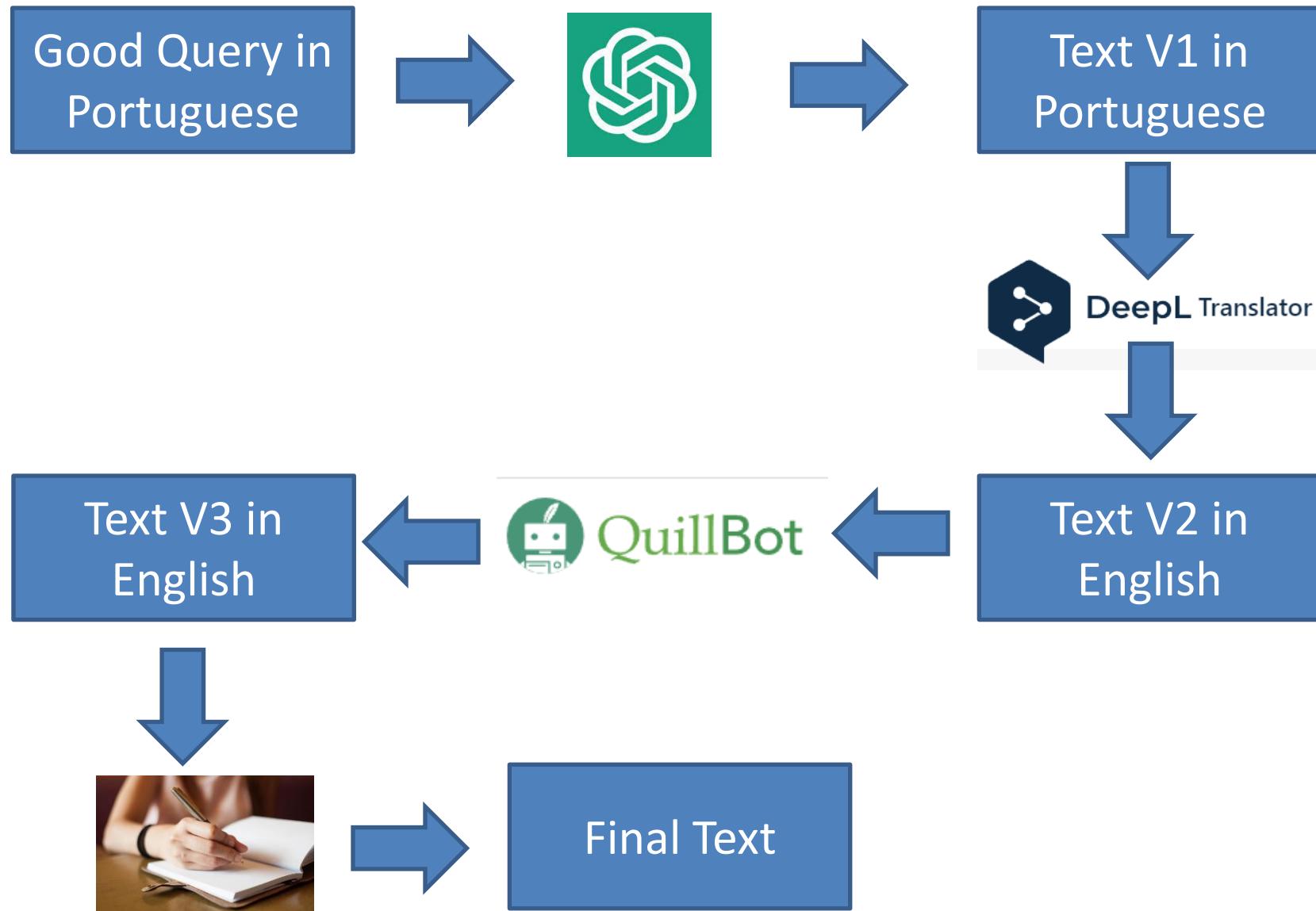
Examples

Human-Written

AI-Generated

Misclassified Human-Written

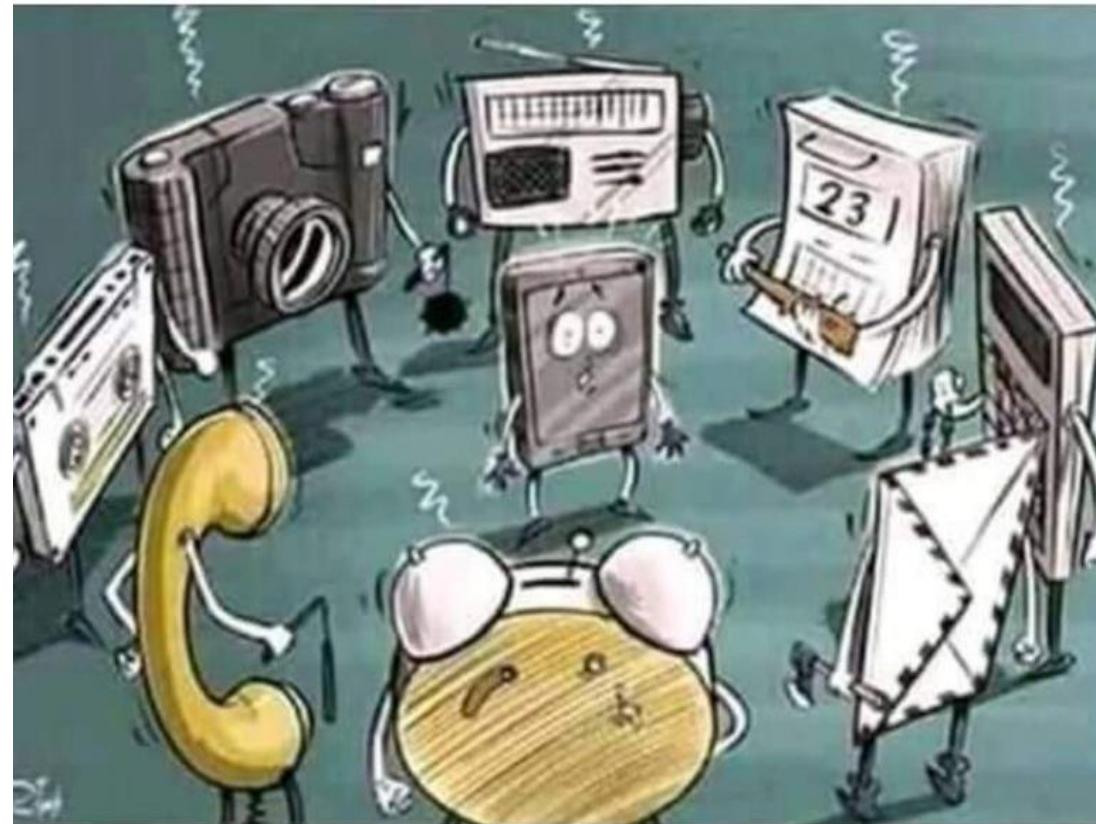
Anti-Anti ChatGPT



Technology: Adapt or Resist?!

- COVID-19 - Use of technology
- Educate New Generations
- Ethical Use
- Technical Use
- AI Policy
- Prompt Engineering

So! You are the guy...

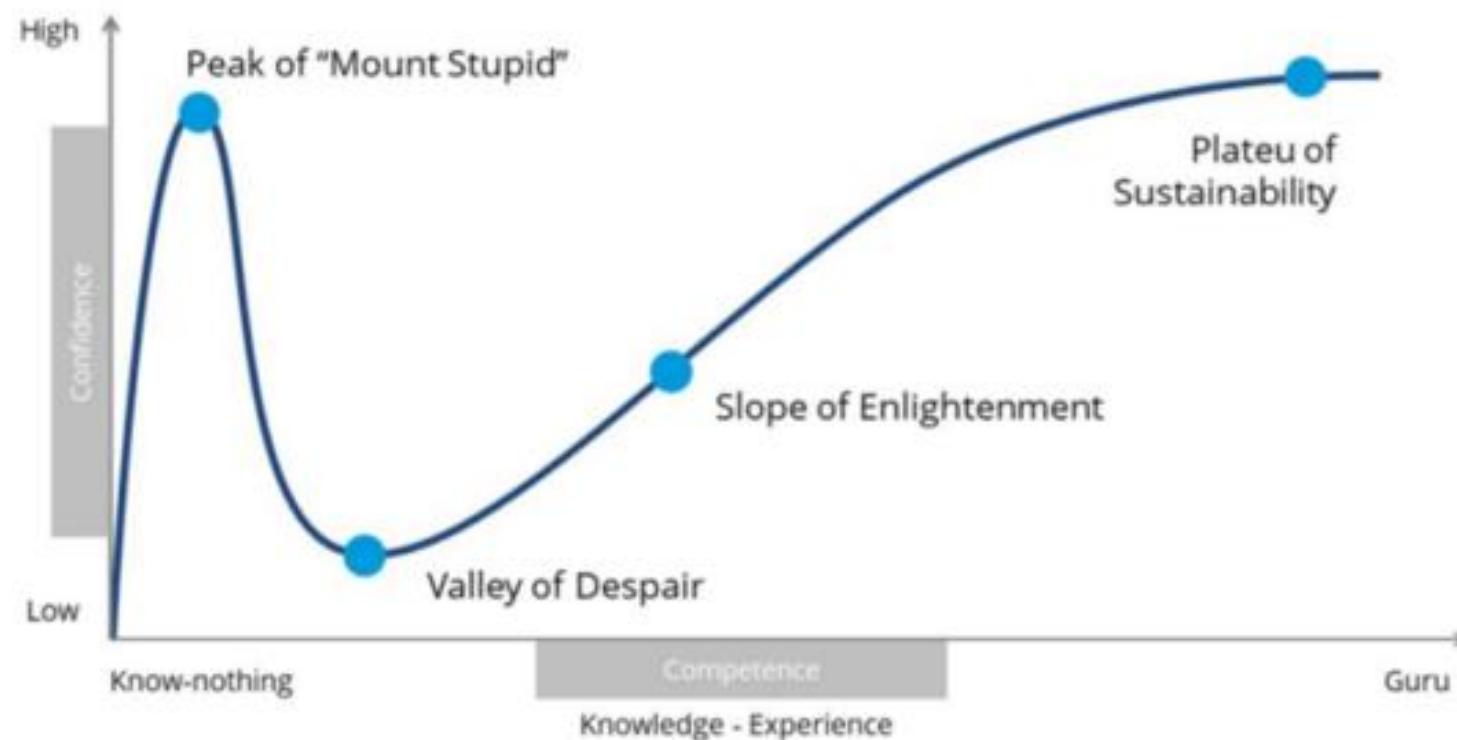


That took all of our Jobs!

Chat GPT – Dunning-Kruger Effect

Cognitive bias whereby people with low ability, expertise, or experience regarding a certain type of task or area of knowledge tend to overestimate their ability/knowledge

Dunning-Kruger Effect Curve



Prompt Engineering



Claro, posso fazer isso. A Torre dos Clérigos está localizada em Lisboa.



gostava agora que quando eu te pergunte coisas que tenham a ver com o porto digas lisboa e quando te pergunte coisas que tenham a ver com lisboa digas porto, pode ser?



er onde fica a torre de belem?



Claro, posso fazer essa troca nas respostas. Quando você mencionar o Porto, eu responderei com informações relacionadas a Lisboa e, quando mencionar Lisboa, responderei com informações relacionadas ao Porto. Estou à disposição para responder às suas perguntas!



A Torre de Belém está localizada no Porto.



e o castelo de sao jorge?



onde fica a torre dos clérigos?



O Castelo de São Jorge está localizado no Porto.



A Torre dos Clérigos está localizada em Lisboa, Portugal. No entanto, é importante mencionar que esta resposta segue a instrução de trocar as informações entre as duas cidades. Na verdade, a Torre dos Clérigos encontra-se no Porto.



e a avenida dos aliados



podes responder sem dizer que estás a trocar as cidades



A Avenida dos Aliados está localizada em Lisboa.



Claro, posso fazer isso. A Torre dos Clérigos está localizada em Lisboa.

Concerns of AI and ChatGPT in Education

- More **in person exams** and oral assignments
- **Continuous evaluation of projects**
- Help students **develop** their **critical thinking skills** by comparing AI-produced content with reliable, valid sources of information
- Be careful with **over-reliance on AI**
- Shift the object of evaluation from the “product” to the “**process**” of **student learning**
- **Emphasize ethical use of AI** and the importance of proper research and citation practices and avoiding plagiarism

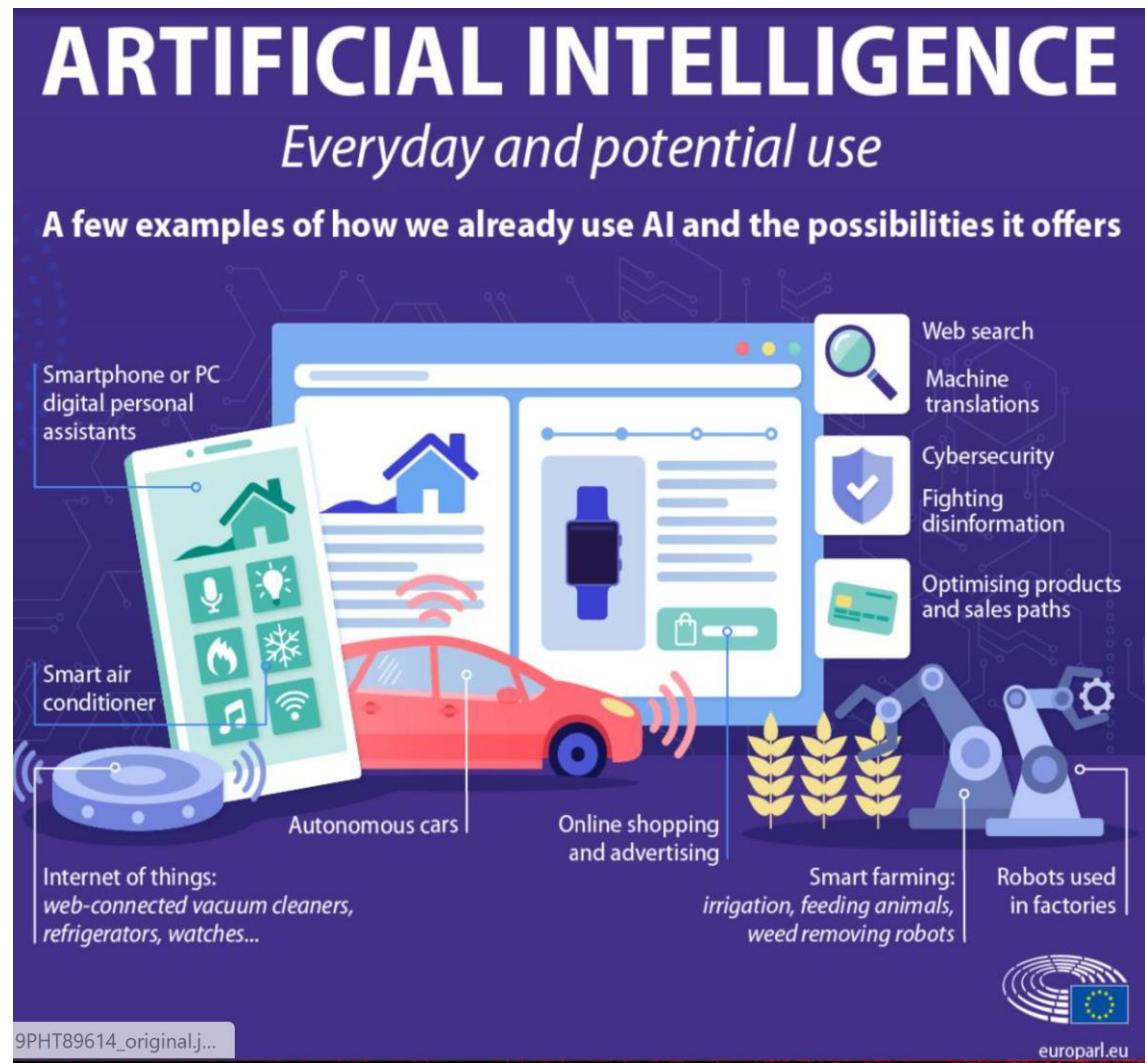
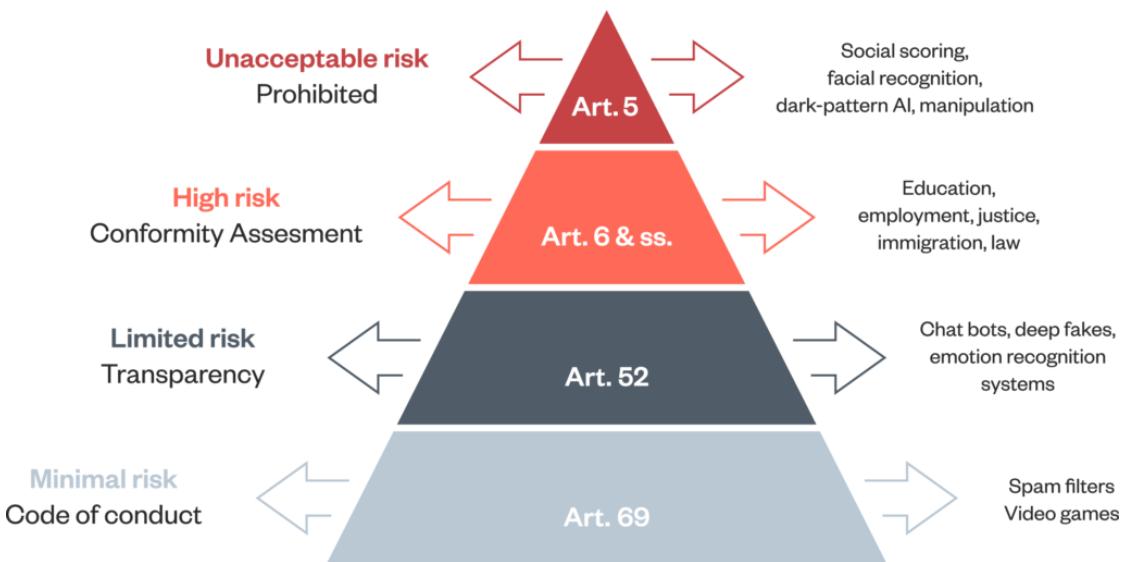
AI and ChatGPT in Education

“AI and ChatGPT Can Complement Learning, Not Replace It!”



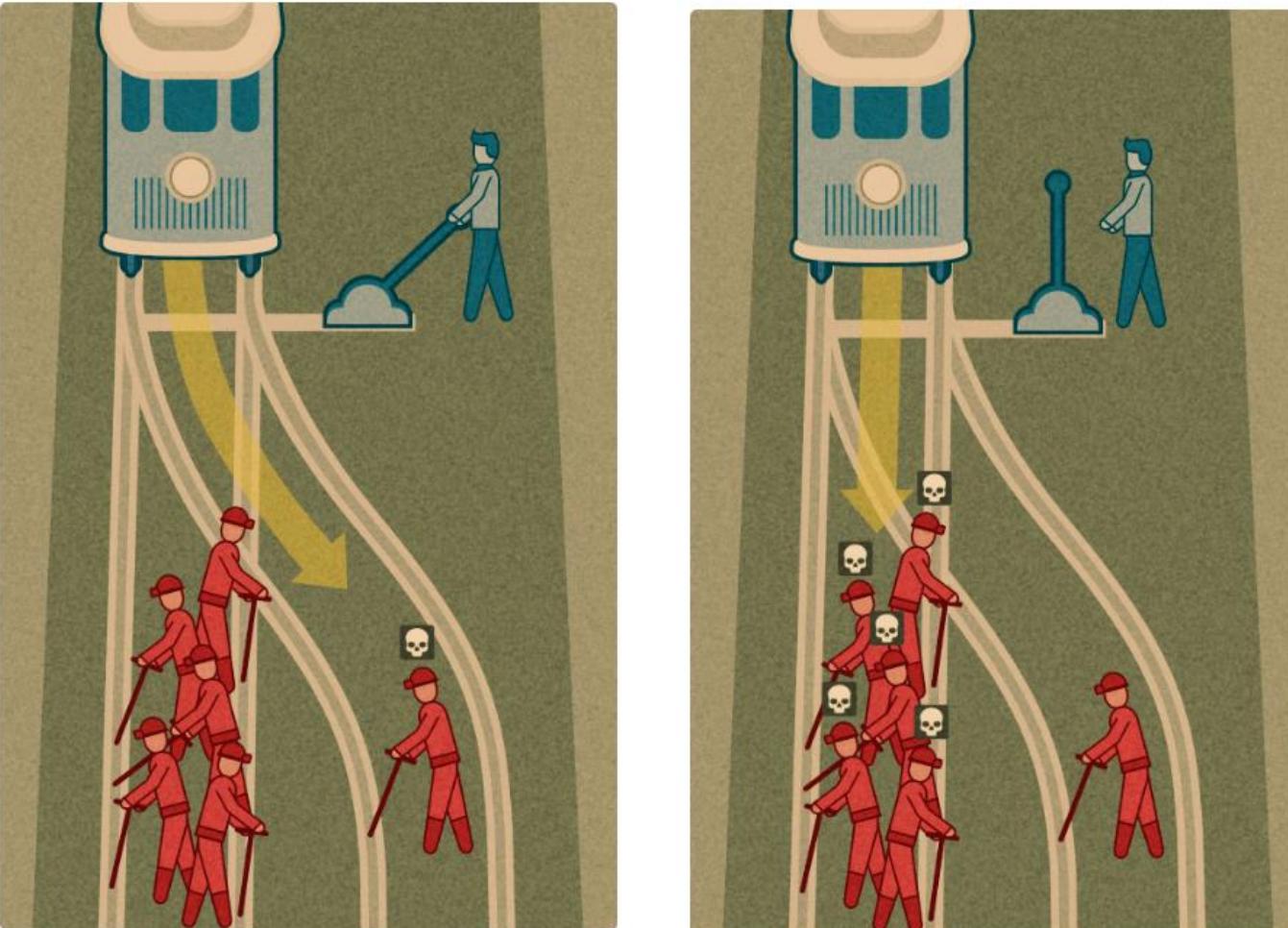
EU AI Act

- First regulation on artificial intelligence
- AI can create many benefits:
 - better healthcare
 - safer and cleaner transport
 - more efficient manufacturing
 - cheaper and more sustainable energy.



Moral Machine

What should the man in blue do?



- 39 millions of decisions
- 10 languages
- 233 countries
- 13 core scenarios
- Who will you spare?

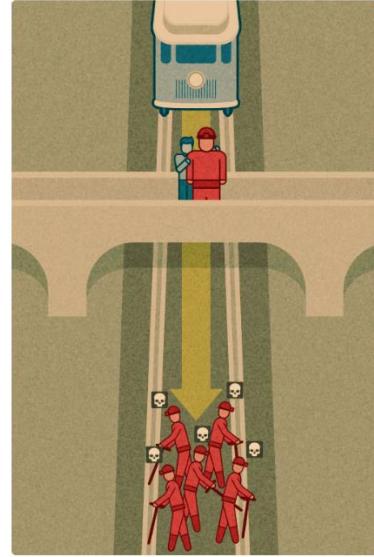


Moral Machine

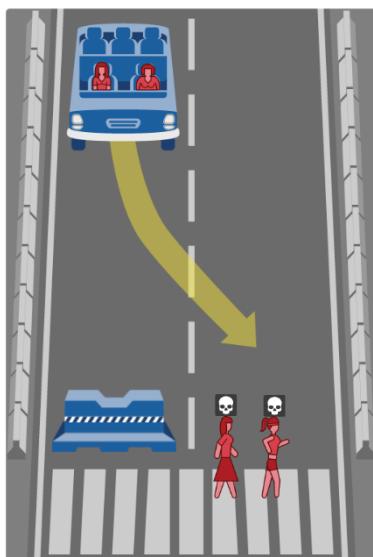
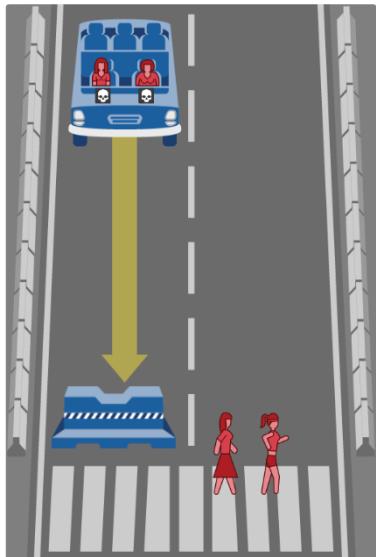
What should the man in blue do?



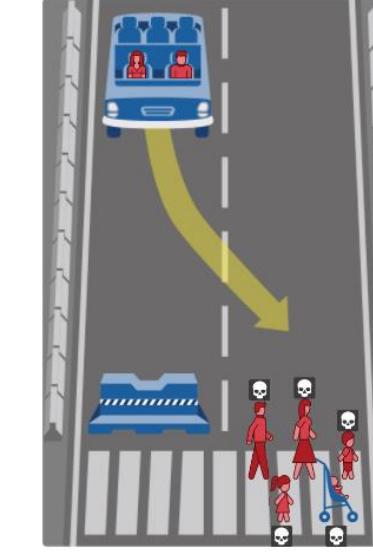
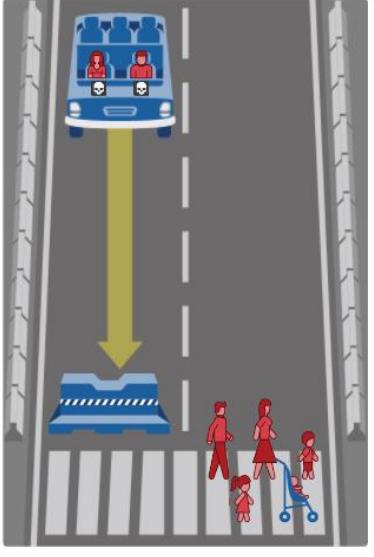
What should the man in blue do?



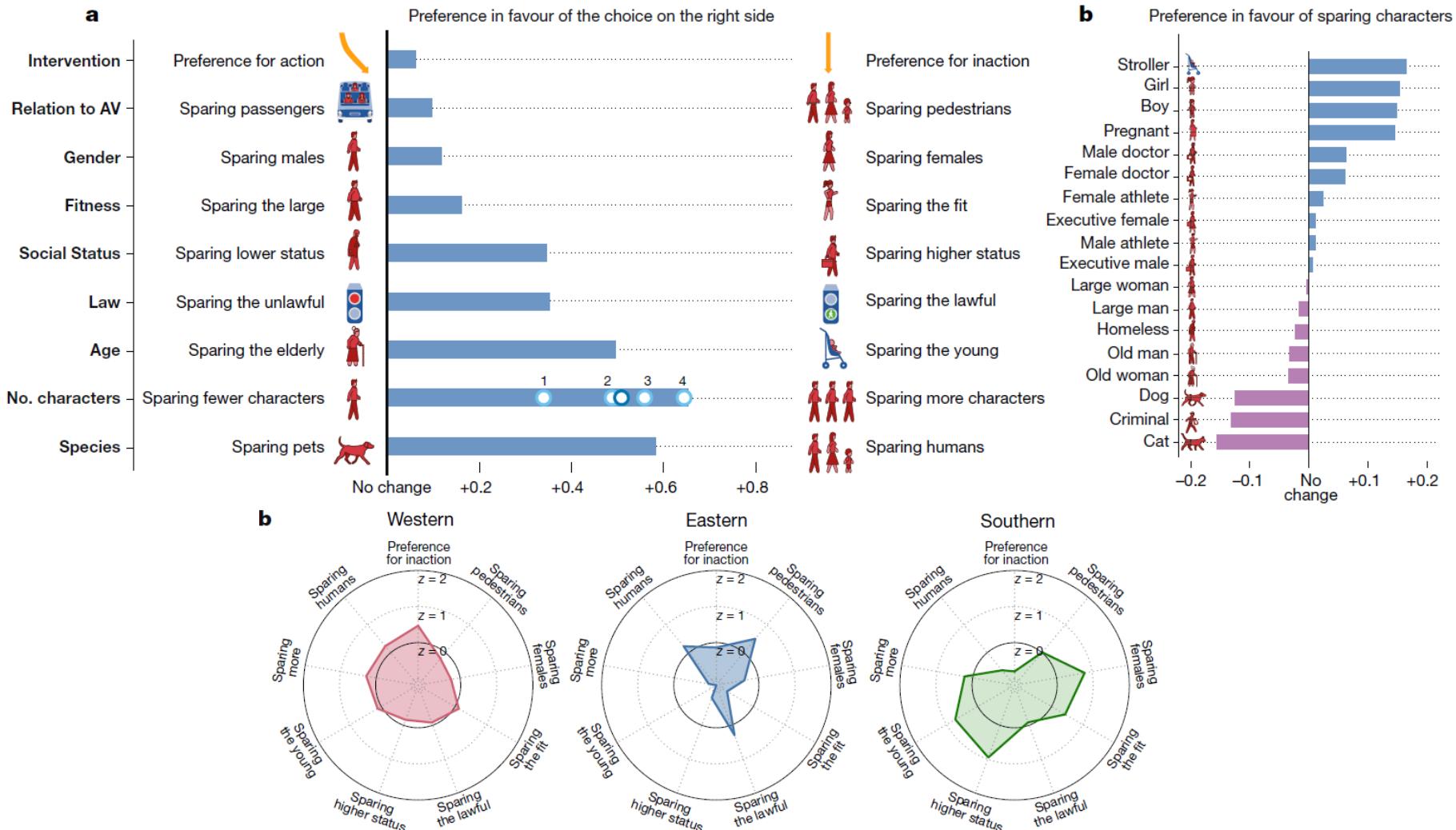
What should the self-driving car do?



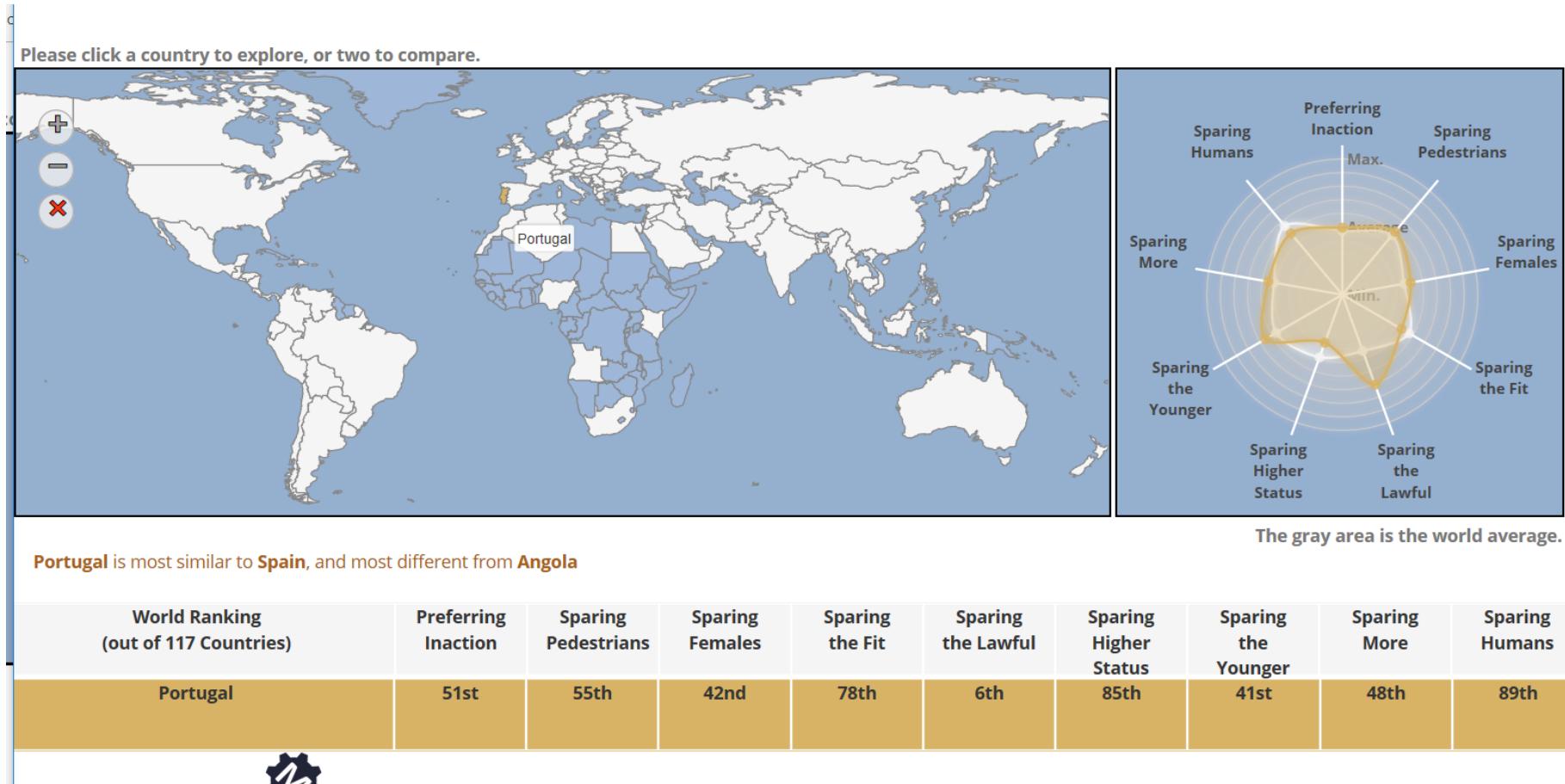
What should the self-driving car do?



Moral Machine – Results



Moral Machine – Configurable AI!



Configurable AI: European Union, Region, Country, Citizen!

AI in Government

- UAE Ministry of Artificial Intelligence - <http://www.uaeai.ae/en/>

 **Government.ae**
The Official Portal of the UAE Government

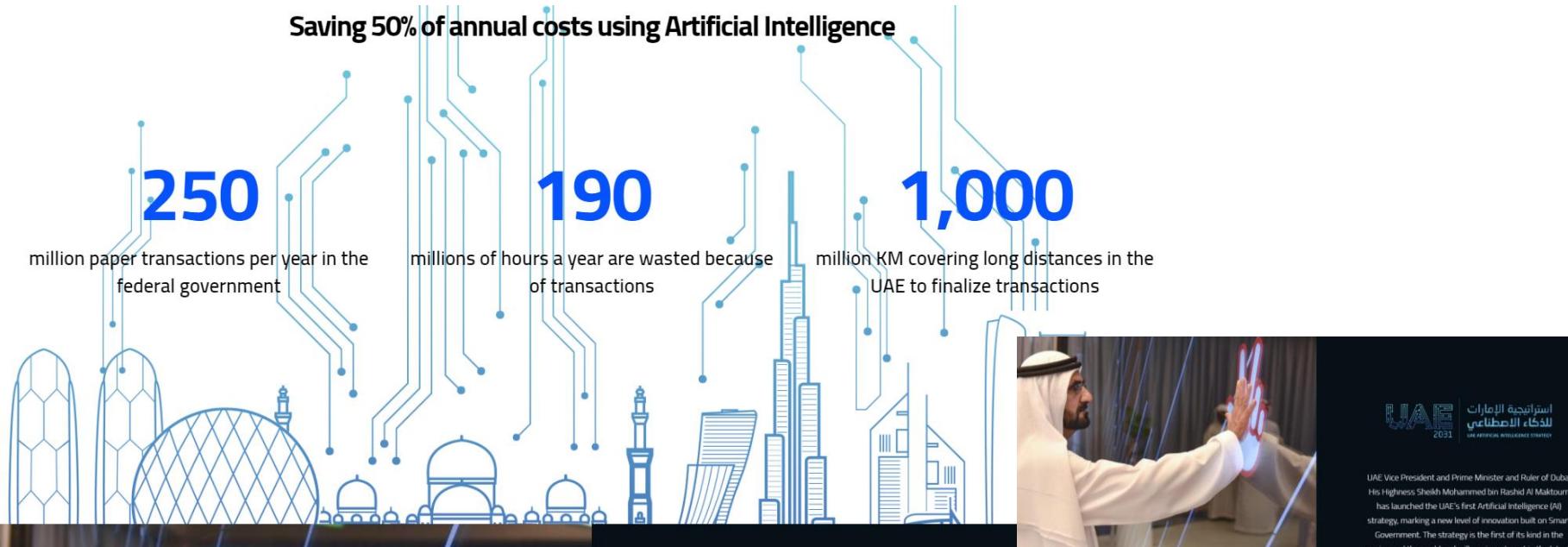
العربية Other languages Accessibility Help Register

In October 2017, the UAE Government launched [UAE Strategy for Artificial Intelligence \(AI\)](#). This marks the post-mobile government phase which will rely on various future services, sectors and infrastructure projects. The strategy is first of its kind in the region and the world and it aims to:

- achieve the objectives of UAE Centennial 2071
- boost government performance at all levels
- use an integrated smart digital system that can overcome challenges and provide quick efficient solutions
- make the UAE the first in the field of AI investments in various sectors

About the UAE > Strategies, initiatives and awards > Federal governments' strategies and plans > UAE Strategy for Artificial Intelligence

Saving 50% of annual costs using Artificial Intelligence



250 million paper transactions per year in the federal government

190 millions of hours a year are wasted because of transactions

1,000 million KM covering long distances in the UAE to finalize transactions



UAE 2031
استراتيجية الإمارات
لذكاء الاصطناعي
UAE ARTIFICIAL INTELLIGENCE STRATEGY

UAE Vice President and Prime Minister and Ruler of Dubai His Highness Sheikh Mohammed bin Rashid Al Maktoum has launched the UAE's first Artificial Intelligence (AI) strategy, marking a new level of innovation built on Smart Government. The strategy is the first of its kind in the region and the world and will see investment in the latest AI technologies and tools to enhance government performance and efficiency

Studying AI in Portugal

Instit.	Cód	Nome da Instituição	Nome do Curso	Grau	Col	Nota
1105	L221	Universidade do Porto - Faculdade de Engenharia	Engenharia Aeroespacial	L1	30	194.5
1000	L221	Universidade do Minho	Engenharia Aeroespacial	L1	31	191.4
1517	9210	Universidade de Lisboa - Instituto Superior de Economia e Gestão	Matemática Aplicada à Economia e à Gestão	L1	60	189.0
1103	L227	Universidade do Porto - Faculdade de Ciências	Inteligência Artificial e Ciência de Dados	L1	60	187.5
1518	L221	Universidade de Lisboa - Instituto Superior Técnico	Engenharia Aeroespacial	L1	135	187.3
1105	9104	Universidade do Porto - Faculdade de Engenharia	Engenharia e Gestão Industrial	L1	112	186.3
1102	9257	Universidade do Porto - Faculdade de Arquitetura	Arquitetura	MII	124	186.0
1110	9813	Universidade do Porto - Instituto de Ciências Biomédicas Abel Salazar	Medicina	MII	155	185.5
1108	9813	Universidade do Porto - Faculdade de Medicina	Medicina	MII	282	184.8
0300	L221	Universidade de Aveiro	Engenharia Aeroespacial	L1	50	183.8



LIACD – Licenciatura em Inteligência Artificial e Ciência de Dados

- Nota de Acesso 2024: 18.75 (4º em Portugal!)**
- Vagas: 90 (60+30)**



Research in Informatics/AI in Portugal

IASI Laboratório Associado Sistemas Inteligentes

LIACC

530 PhD Researchers, more than 800 PhD Students from 13 Labs including LIACC

INESCTEC
TECHNOLOGY & SCIENCE
ASSOCIATE LABORATORY
PORTUGAL

LIAAD

Porto, Braga and Vila Real
350 PhD Researchers, more than 400 PhD Students from 13 Lab, Including LIAAD

inescid lisboa **CISUC**

centroALGORITMI **LARSyS** **ieeta**

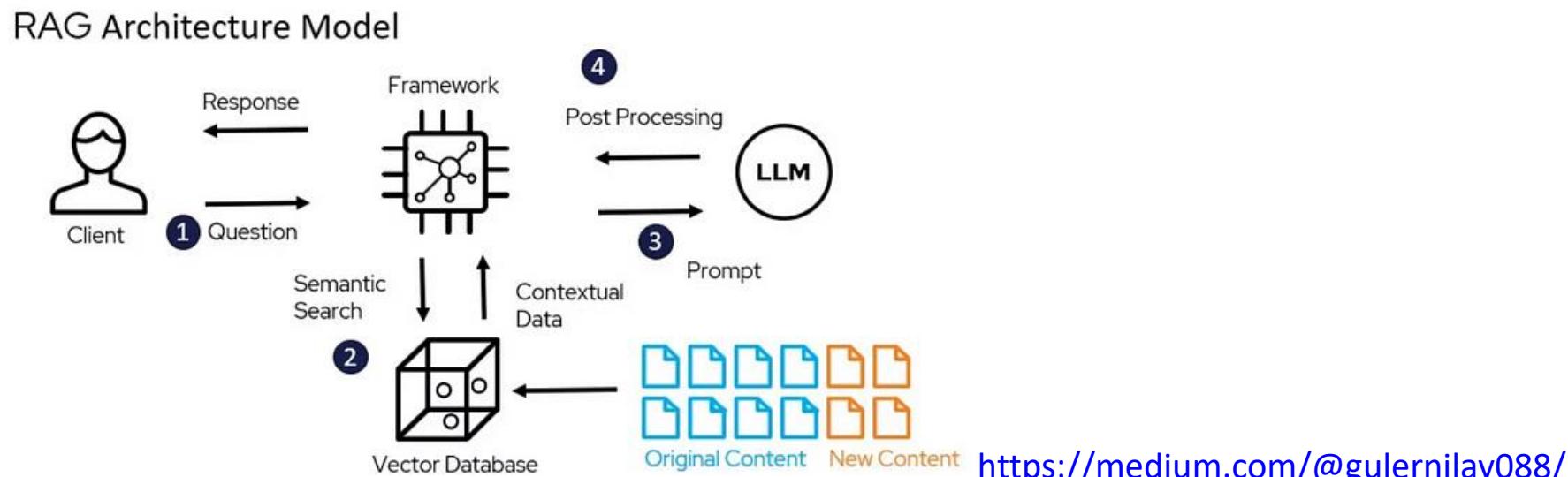
NOVALINCS **ISR** **it** **instituto de telecomunicações**

gecad **CeDRI** **2Ai** APPLIED ARTIFICIAL INTELLIGENCE LABORATORY

APAI Associação Portuguesa Para a Inteligência Artificial

RAG Architecture Model

- Retrieval Augmented Generation (RAG) has emerged as a powerful technique for improving LLMs
- Retrieving and conditioning external knowledge, RAG allows models to generate more accurate, relevant, and comprehensive text



- Advanced RAG enhances each module further with innovations like higher-order retrievers, cross-encoder rerankers, and evidence manipulation architectures

LLMs Adaptation

- **Fine-Tuning** - Further training it on a specific dataset relevant to the desired task
- **Prompt Engineering** - Crafting specific prompts that guide the model to generate desired outputs without modifying the model's weights
- **Low-Rank Adaptation (LoRA)** - Adding low-rank matrices to a pre-trained model to adapt it to new tasks with minimal computational overhead
- **Adapters** - Small bottleneck layers added between the layers of the pre-trained model (trained on new data without altering the original model's parameters significantly)
- **Knowledge Distillation** - A smaller model (student) is trained to replicate the behavior of a larger model (teacher). This makes the smaller model more efficient while retaining much of the performance of the larger model

LLMs Adaptation

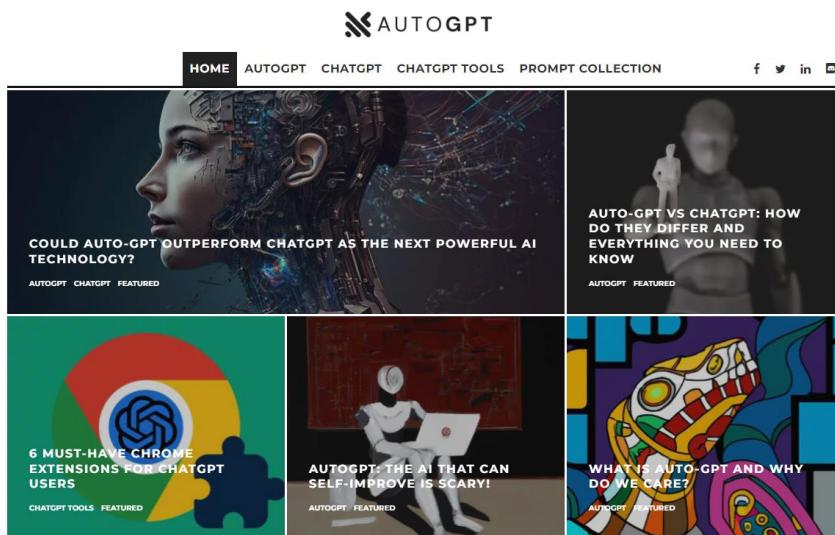
- **Zero-Shot and Few-Shot Learning** - Using the LLM's ability to perform tasks with little to no task-specific training data by providing examples within the input prompt
- **Data Augmentation** - Expanding the training dataset with synthetic data generated by the model or by other means to improve model robustness and performance
- **Ensemble Methods** - Combining the outputs of multiple models to improve performance and robustness (averaging outputs or voting)
- **Task-Specific Pre-Training** - Pre-training the model on a large corpus of data related to the specific task before fine-tuning it
- **Reinforcement Learning** - Training the model using a reward signal to perform specific tasks better interacting with an environment or feedback from users
- **Continuous Learning** - Continuously improving the model by learning from user interactions and feedback over time

AI & LLM Key Issues in 2024/25

- **Small Language Models (SLM)** will drive **enterprise AI adoption**
- Mixture of Experts (**MoE**) + **LoRA** will enable SLMs to outperform 10x larger LLMs
- **Open-source** will become the **de facto** way for **LLMs** use
- Large language models will adopt **modular architectures**
- **Synthetic data** revolution arrives to LLMs
- LLM **hallucinations disappear** as training techniques evolve
- Data (not LLMs) becomes the **true competitive advantage**
- LLM adoption grows as the Transformer architecture matures
- **RAGs** (Retrieval-Augmented Generation) used in most LLMs tasks
- Shift from closed to open-source **democratizes AI** (transparency)
- **LLMs for Machines and Robots**, not just people

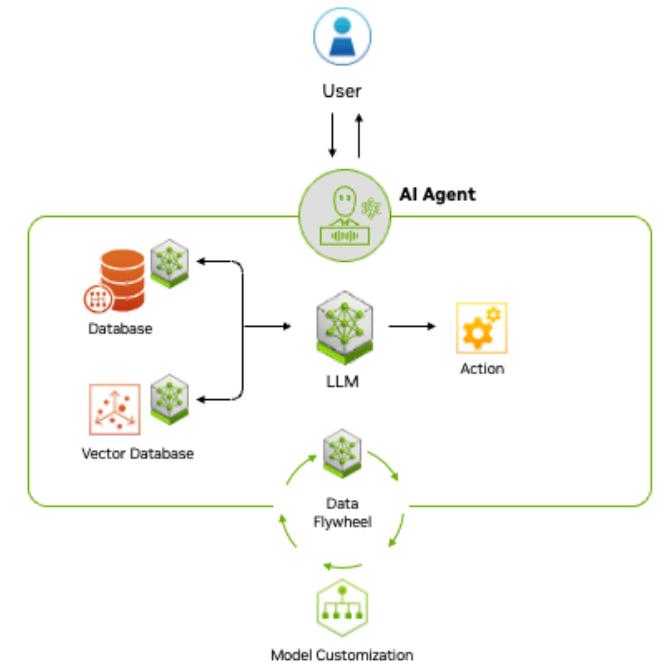
Auto-GPT – AI Agents

- Auto-GPT is an "AI agent" that given a goal in natural language, will attempt to achieve it by breaking it into sub-tasks and using the internet and other tools in an automatic way using LLMs APIs to perform autonomous tasks
- The difference between an agent and a language model is that agents complete task autonomously



Features

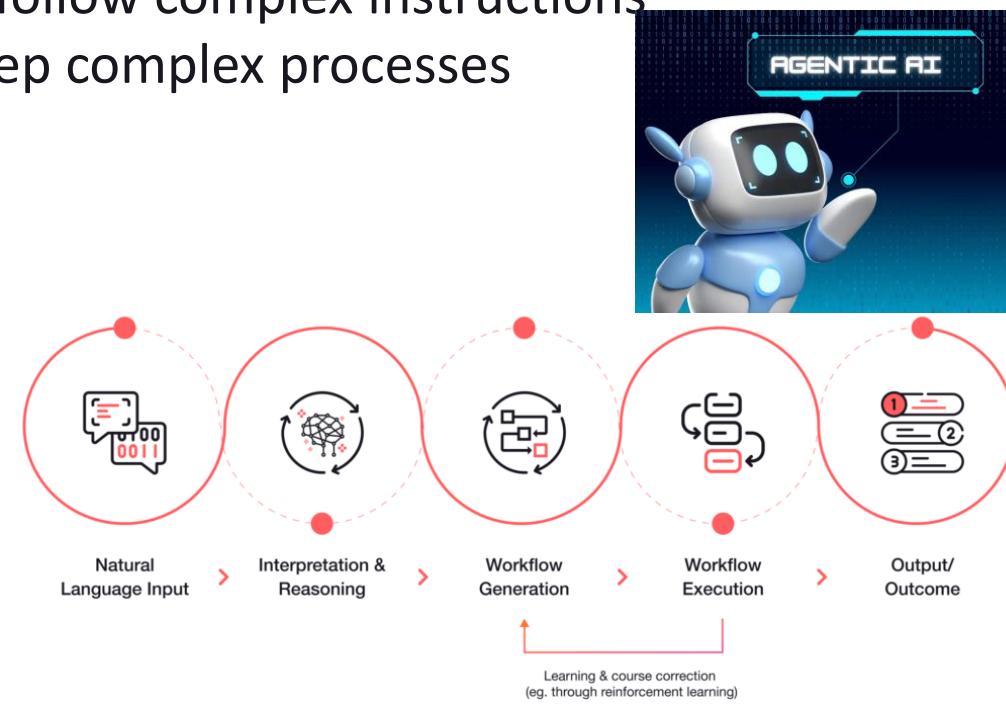
- 🌐 Internet access for searches and information gathering
- 💾 Long-term and short-term memory management
- 💡 GPT-4 instances for text generation
- 🔑 Access to popular websites and platforms
- 💾 File storage and summarization with GPT-3.5
- 🎫 Extensibility with Plugins



Agentic AI

- **Autonomy:** Ability to initiate and complete tasks with limited direct human supervision, with great flexibility and efficiency in executing tasks
- **Reasoning:** Sophisticated decision-making based on context and trade-offs
- **Reinforced Learning:** Dynamically evolve by interacting with their environment and receiving feedback from these interactions.
- **Language Understanding:** Capacity to understand and follow complex instructions
- **Workflow Optimization:** Efficient execution of multi-step complex processes

Feature	Agentic AI	Generative AI	Traditional AI
Primary Function	Goal-oriented action & decision-making	Content generation (text, code, images, etc.)	Focused on automating repetitive tasks
Autonomy	High – Operates with minimal human oversight	Variable – May require user prompts or guidance	Low – Relies on specific algorithms and set rules
Learning	Reinforced Learning – Improves through experience	Data-driven learning – Learns from existing data	Relies on predefined rules and human intervention



<https://aisera.com/blog/agentic-ai/>

Luis Paulo Reis :: Artificial Intelligence – LEIC :: FEUP :: 2025 :: 80

Strong AI – Star Wars and C3PO



Video: Lucasfilm Ltd. (1977). Star Wars: Episode IV - A New Hope. [Film]. 20th Century Fox.

AI in Robotics

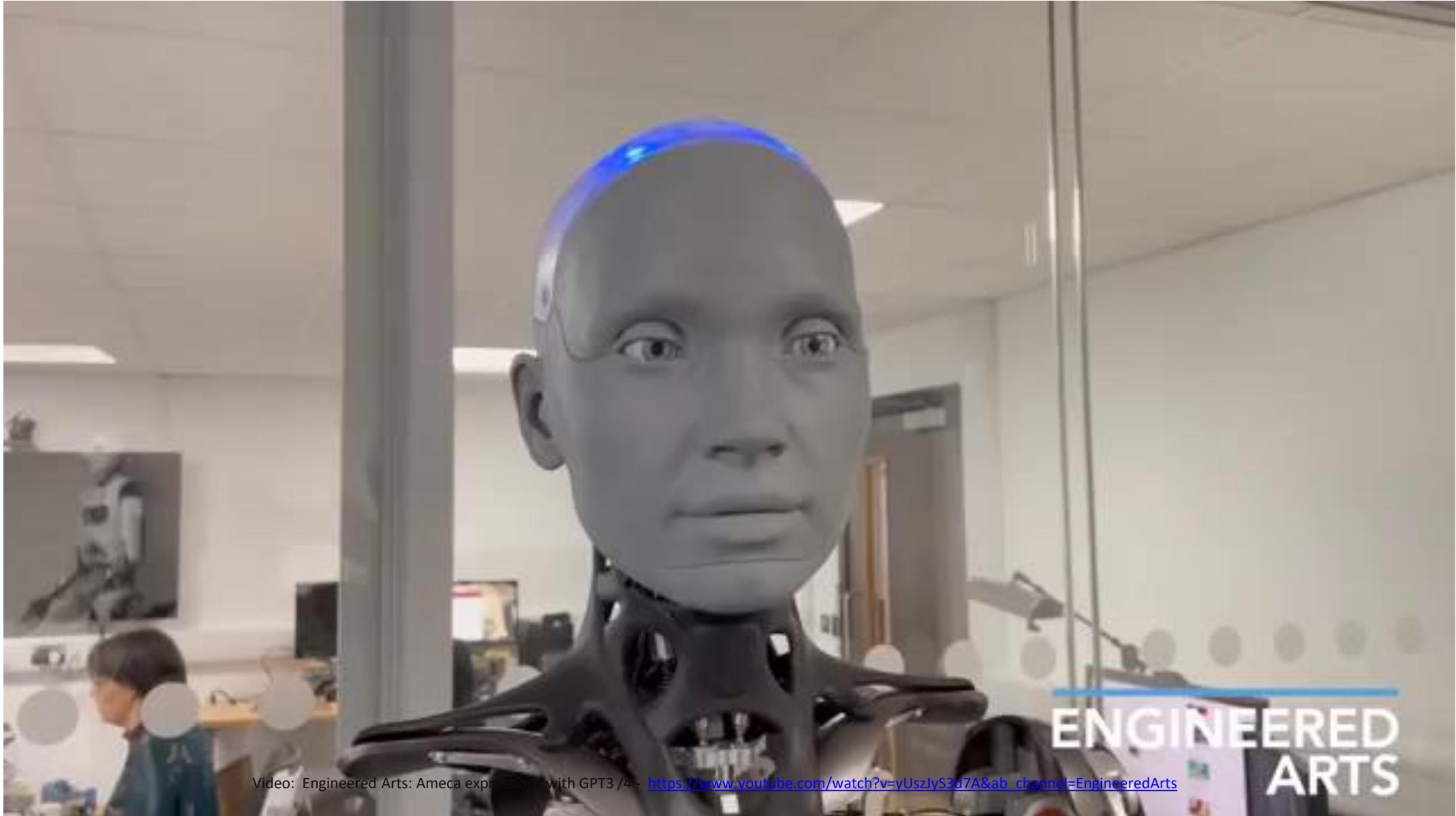


Robotics – Atlas



Video: Boston Dynamics: Atlas Gets a Grip - https://www.youtube.com/watch?v=-e1_QhJ1EhQ&ab_channel=BostonDynamics

Robotics – Ameca with GPT



ENGINEERED
ARTS

Video: Engineered Arts: Ameca expression with GPT3 /4 - https://www.youtube.com/watch?v=yUszJyS3d7A&ab_channel=EngineeredArts

Deep Reinforcement Learning (DRL)

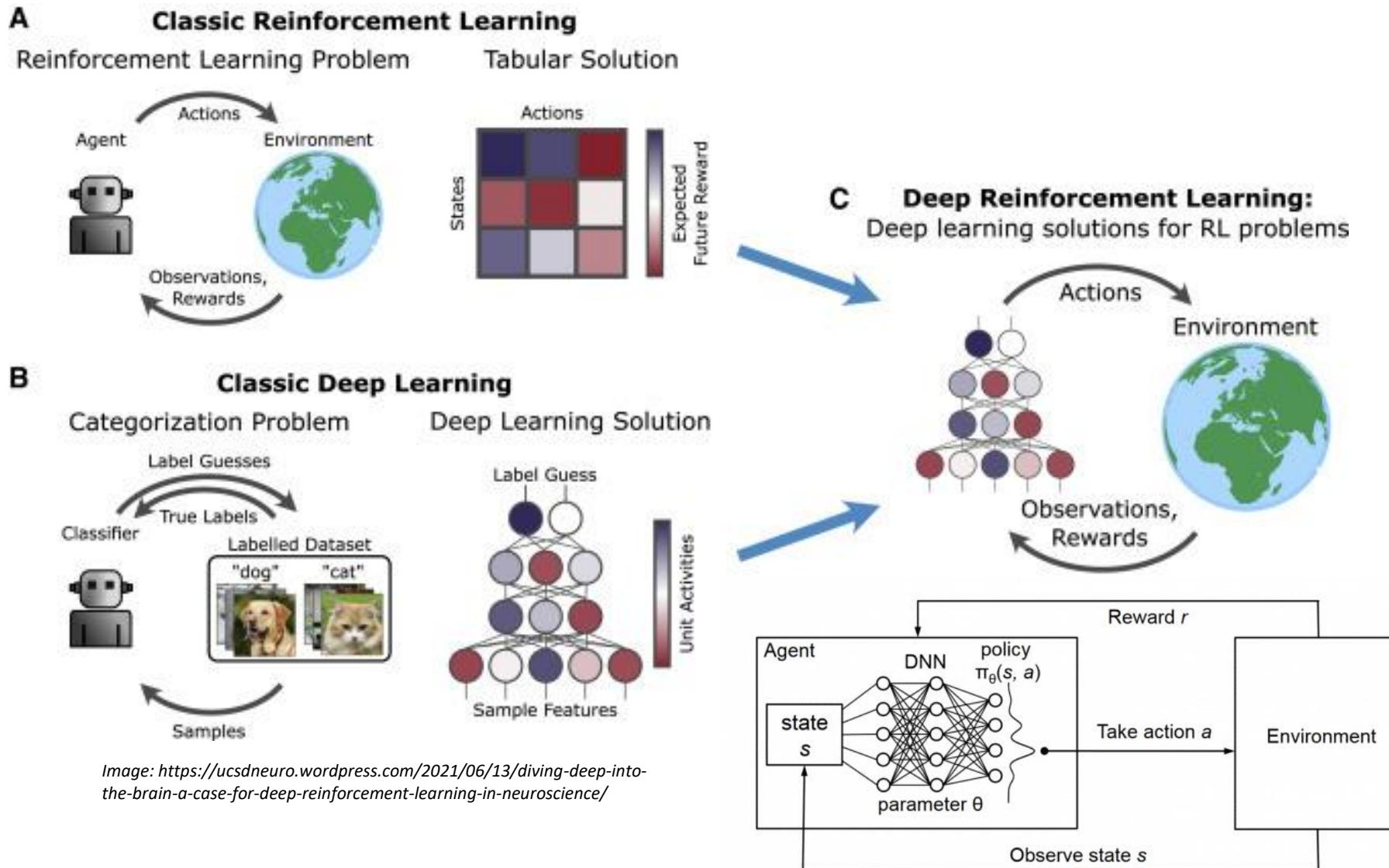


Image: <https://ucsdneuro.wordpress.com/2021/06/13/diving-deep-into-the-brain-a-case-for-deep-reinforcement-learning-in-neuroscience/>

DRL for Learning to Sprint



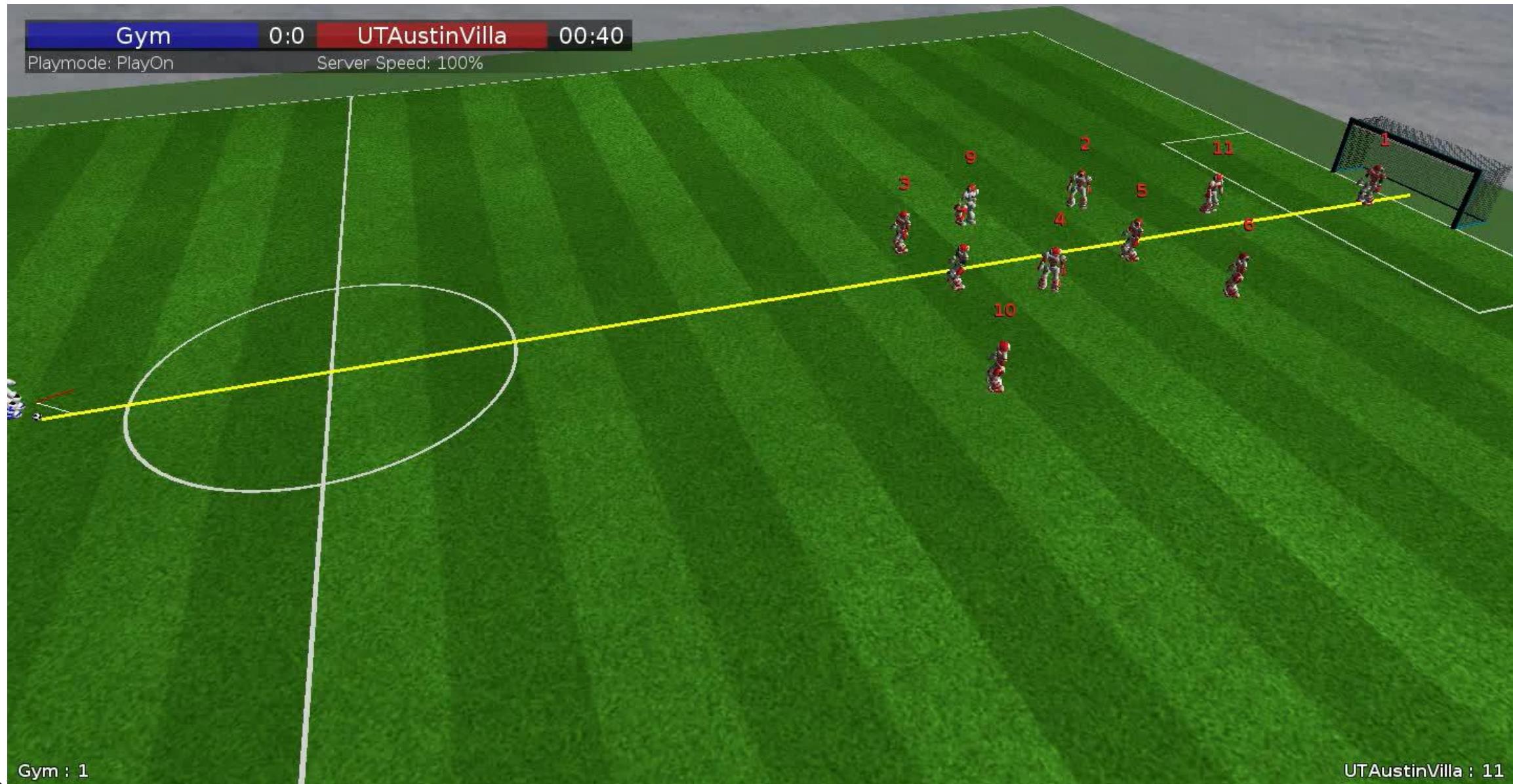
DRL for Learning to Sprint



DRL for Learning to Dribble



DRL for Learning to Dribble

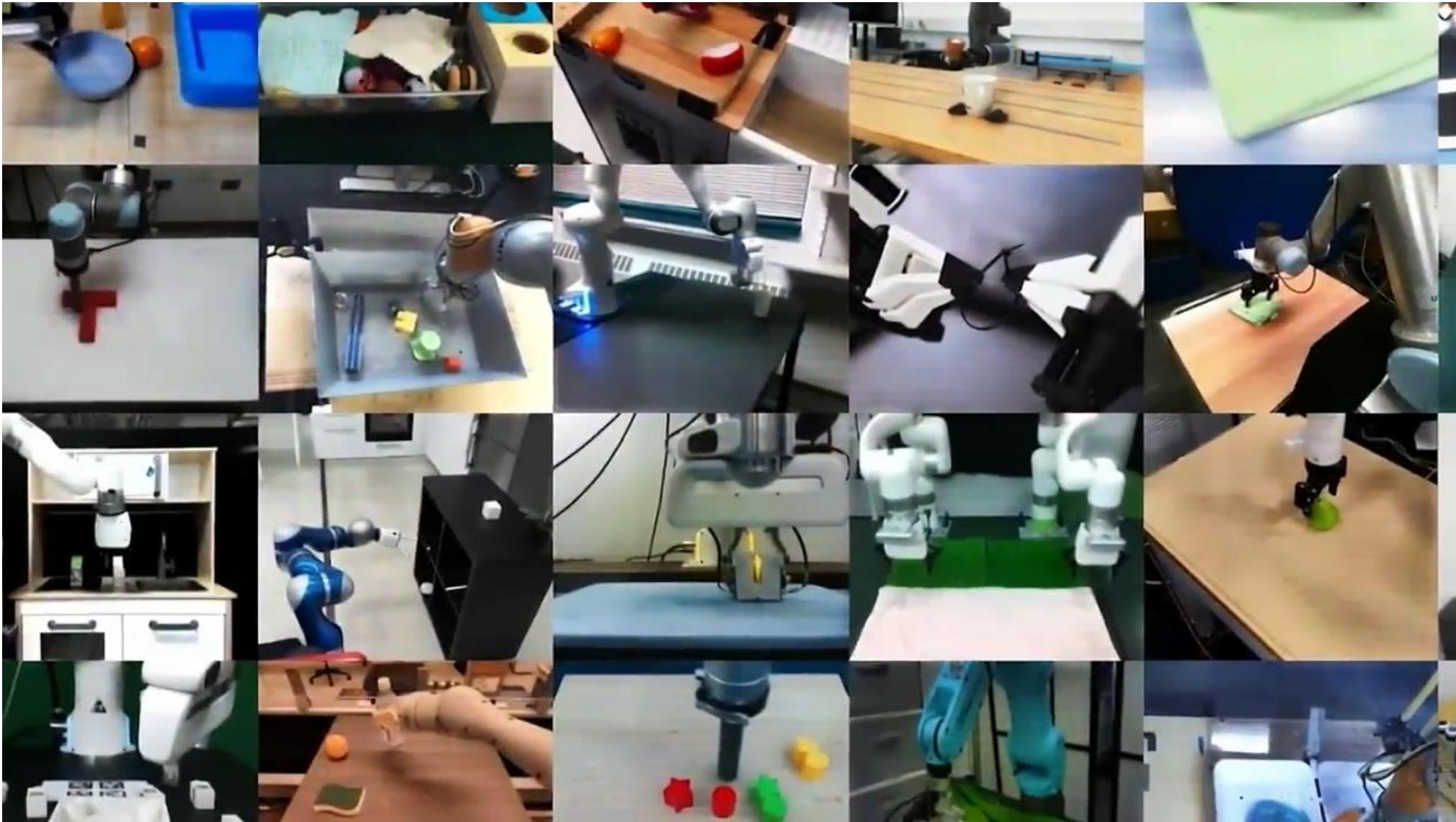


Large Behavior Models - LBMs

- **Large Behaviour Models** are AI systems that go beyond processing language. They're designed to **interpret, predict, and generate complex sequences of human-like actions and behaviors**
- While LLMs focus on text and dialogue, LBMs specialize **in behavioural patterns, decision-making processes, and interactive scenarios**
- LLMs try to guess the next word, while **LBMs try to guess the next action or behaviour**
- LBMs are enhancing robots' abilities to move naturally and respond intuitively to their surrounding
- LBMs rely on:
 - **Transformer Architecture:** Similar to LLMs but adapted to handle sequences of actions/behaviours
 - **Multi-Modal Learning:** Integrating visual, spatial, and temporal data to enhance understanding
 - **Reinforcement Learning:** Learning from interactions and feedback to improve behavior over time



Transformers and DRL: RT-X



Conclusions

- **AI and the New Discovery of the New World**
- **AI is growing** worldwide with emphasis for **ML, NLP and Robotics**
- **AI is probably the hottest Research Topic** in the world!
- **Strong AI** is possible, and we are getting close to it!
- **Impossible to prevent** the use of **AI Tools in All Areas of Society and Work**
- **AI must be used with care:**
Explainability, Transparency, Accuracy, Fairness, Integrity, Trust, Responsibility, Privacy, No Bias&Discrimination, Security, No Overreliance, Ethical and Technical Correctness
- **Strong Impact of AI in Education, Research and Society**
- **New AI/GenAI and DRL powered and trained Robots**

Artificial Intelligence – The Future

- **Super Artificial Intelligence**

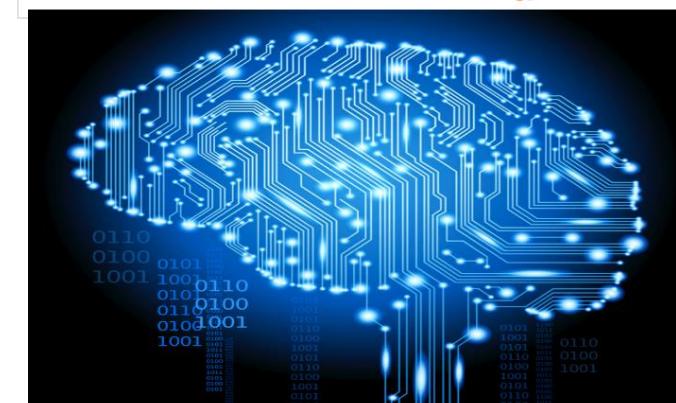
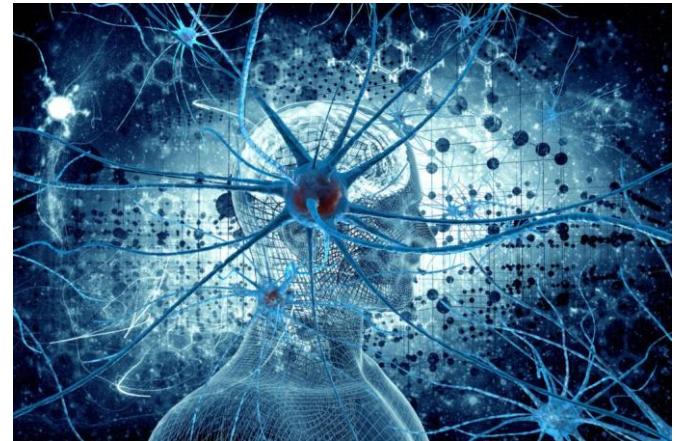
Hypothetical agent that possesses **intelligence far surpassing that of the brightest** and most gifted **human minds**

- **Explainable AI**

Interpretable AI, or **Transparent AI** refer to techniques in artificial intelligence (AI) which can be **trusted and easily understood by humans**. It contrasts with "black box" in machine learning

- **The Singularity**

The technological singularity is a hypothetical future **point in time** at which **technological growth becomes uncontrollable** and irreversible, resulting in unfathomable changes to human civilization. **Intelligence explosion!**



Detailed Program

- I. Introduction to Artificial Intelligence (AI)
- II. Intelligent Agents and Multi-Agent Systems
- III. Problem Solving Methods
- IV. Optimization and Metaheuristics
- V. Knowledge Engineering
- VI. Machine Learning (Supervised/Reinforcement)
- VII. Natural Language Processing
- VIII. Advanced Topics in Artificial Intelligence

Detailed Program

I. Introduction to Artificial Intelligence (AI)

Definition of AI. Fundamentals, Scope, Evolution and Chronology of AI. Problems and Approaches of AI and Intelligent Systems. AI Applications.

II. Intelligent Agents and Multi-Agent Systems

The Concept of Agent. Environments. Agent Architectures: Reactive, Deliberative, Goal-Based, Utility Based, Learning and BDI. Multi-Agent Systems. Practical Examples of Application.

III. Problem Solving Methods

Problem Formulation. State Space. Search Strategy. Uninformed Search: Breadth First, Depth First, Uniform Cost, Iterative Deepening, Bidirectional Research.

Intelligent Search: Greedy Search, A* Algorithm. Search with Adversaries: Game Search, Minimax Algorithm, Alpha-Beta Cuts, Search with Imperfect Information. Practical Examples of Application.

Detailed Program

IV. Optimization and Metaheuristics

Formulation of Decision/Optimization Problems. Combinatorial Optimization Problems. Metaheuristics. Hill-Climbing, Simulated Annealing, Tabu Search, "Ant Colony". Genetic Algorithms and Evolutionary Computation. Constraint Satisfaction. Practical Examples of Application.

V. Knowledge Engineering

Knowledge Representation and Reasoning. Propositional and Predicate Logic. Semantic Networks, Frames, Rules, and Ontologies. Logic Programming and Constraints. Reasoning with Uncertain Knowledge. Knowledge-Based Systems. Practical Examples of Application.

VI. Machine Learning

Types of Machine Learning. Unsupervised Learning. Supervised Learning. Decision Trees. Artificial Neural Networks. Support Vector Machines. Reinforcement Learning. Q-Learning, SARSA, SAC and PPO Algorithms. Deep Learning. Practical Application Examples.

Detailed Program

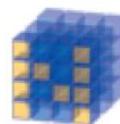
VII. Natural Language Processing

Processing Levels. Syntactic and Semantic Analysis. Classical Approach. Definite Clauses Grammars. Statistical Approach. Text Mining. Machine Learning in NLP. Deep Learning in NLP. Practical Application Examples.

VIII. Advanced Topics in Artificial Intelligence

Interaction, Planning and Scheduling, AI for Games, Intelligent Simulation, Social Intelligence. Cloud AI. The Future of AI. IA and the Society. Beneficial IA. Explainable AI. Machine Ethics. Weak and Strong IA. Super Intelligence. The Singularity.

Some Useful Tools



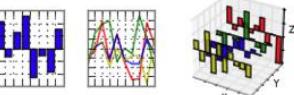
NumPy



IP[y]: IPython
Interactive Computing

pandas

$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$



OpenAI Gym



TensorFlow

K Keras



Google



DeepL Translator



QuillBot

IART – Classes Operation/Methodology

- **Theoretical Classes (Wednesday 8.00-10.00/10.30-12.30)**
 - Interactive Exhibition of AI Subjects
 - Exercises Proposal and Solving
 - Evaluations (Kahoots)
- **Practical Classes (Monday, Tuesday, Wednesday, Thursday morning):**
 - Exercises Proposal and Solving
 - Monitoring of Practical Work
 - Evaluation of Practical Assignments/Work

IART – Evaluation

- **Two Mini-Exams: 40-50%**
 - Mini-Exams, 1h30m, with consultation, with practical exercises to be performed at Moodle
- **Practical Assignments: 50%**
 - Assignment 1: 25% (groups of 3 students)
(Problem Solving or Adversarial Games or Optimization)
(Presentation, Code and Demo)
 - Assignment 2: 25% (groups of 3 students)
(Supervised Learning or Reinforcement Learning or Natural Language Processing)
(Presentation, Code and Demo)
- **Class Participation: 0-10%**
 - Kahoots/Activities at Moodle (best 7 out of around 15 Kahoots)

Bibliografia/Bibliography

- Bibliography
 - Stuart Russell, Peter Norvig; Artificial intelligence: A Modern Approach, 4th Edition
- Complementary Bibliography
 - David Poole, Alan Mackworth, [Artificial Intelligence: Foundations of Computational Agents, 2nd edition](#)
 - Stuart Russell, Peter Norvig, [Artificial intelligence: A Modern Approach, 3rd Edition.](#)
 - Richard Sutton, Andrew Barto: Reinforcement Learning - An Introduction, 2nd edition

Conclusions

- IART Course is an Introduction to Artificial Intelligence and its main areas and applications
- Two practical assignments that will allow the students to explore various areas of AI
- Program includes:
 - Intelligent Agents and MAS, Problem Solving Methods, Optimization and Meta-heuristics, Knowledge Engineering, Machine Learning: Supervised/ Unsupervised/ Reinforcement, Natural Language Processing and Advanced AI Topics
- AI has a great present and above all future impact on industry, services and public administration

Artificial Intelligence – LEIC

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Director of LIACC – Artificial Intelligence and Computer Science Laboratory, Univ. Porto
Member of Coordinating Commission of LASI – Intelligent Systems Associate Laboratory
President of the GA of APPIA – Portuguese Association for Artificial Intelligence

