INTELLIGENZA ARTIFICIALE IN AZIONE:
SCENARI E INNOVAZIONE SUL TERRITORIO

16 Ottobre 2024

LABORATORIO APERTO
NUOVO CIRCONDARIO IMOLESE
SPAZI DI CONDIVISIONE DIGITALE

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Cofinanziato dall'Unione europea
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RegioneEmilia-Romagna

Questo progetto è parte delle politiche territoriali dell'Emilia-Romagna per un'Europa più vicina ai cittadini

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SPAZI DI CONDIVISIONE DIGITALE

PIERANGELO RAFFINI

Assessore allo sviluppo economico del comune di Imola

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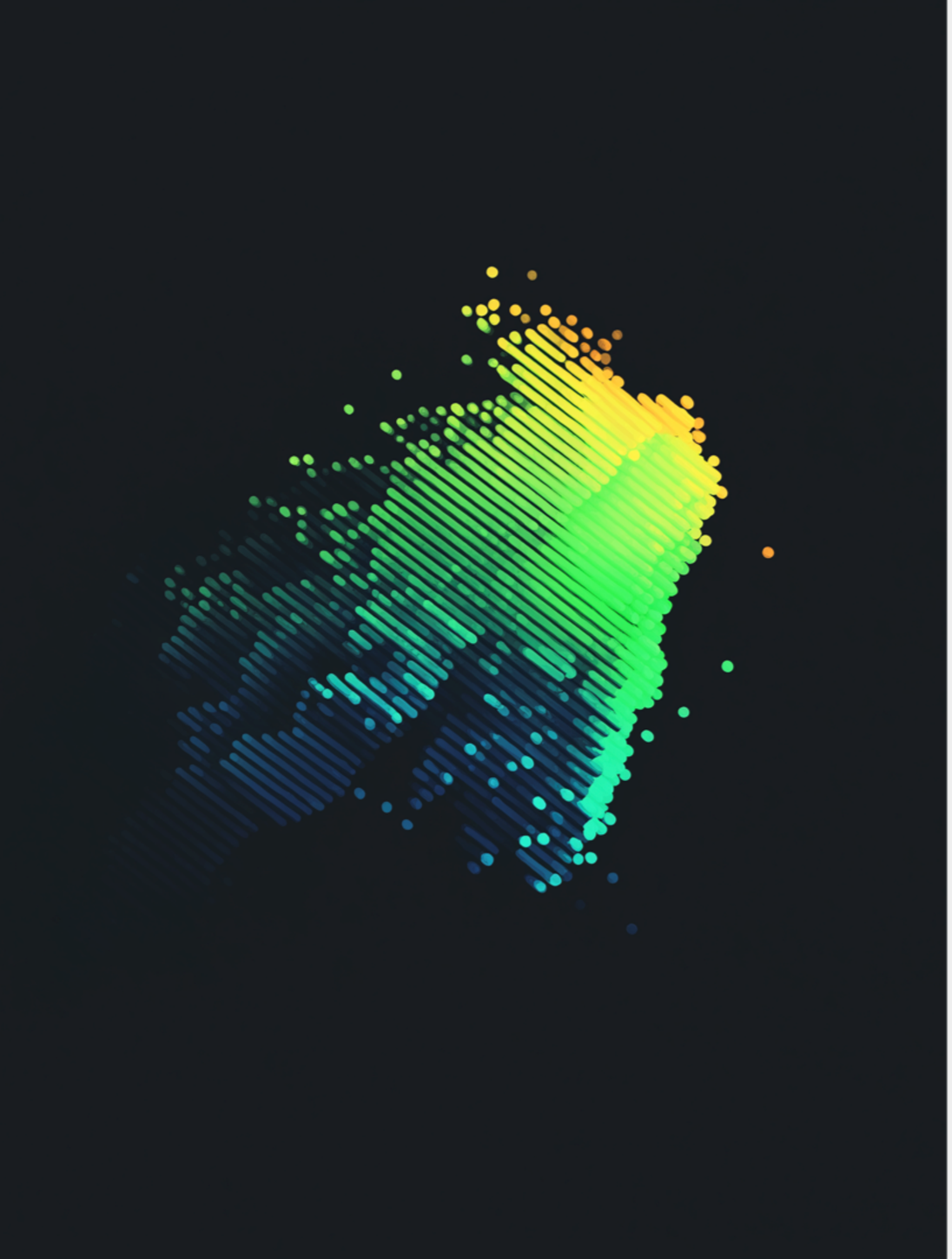
Che cos'è l'Intelligenza Artificiale Generativa e qual è il suo impatto nelle aziende e sul lavoro

INTELLIGENZA ARTIFICIALE IN AZIONE - 16 Ottobre 2024



01 | INTELLIGENZA ARTIFICIALE

02 | IMPATTO

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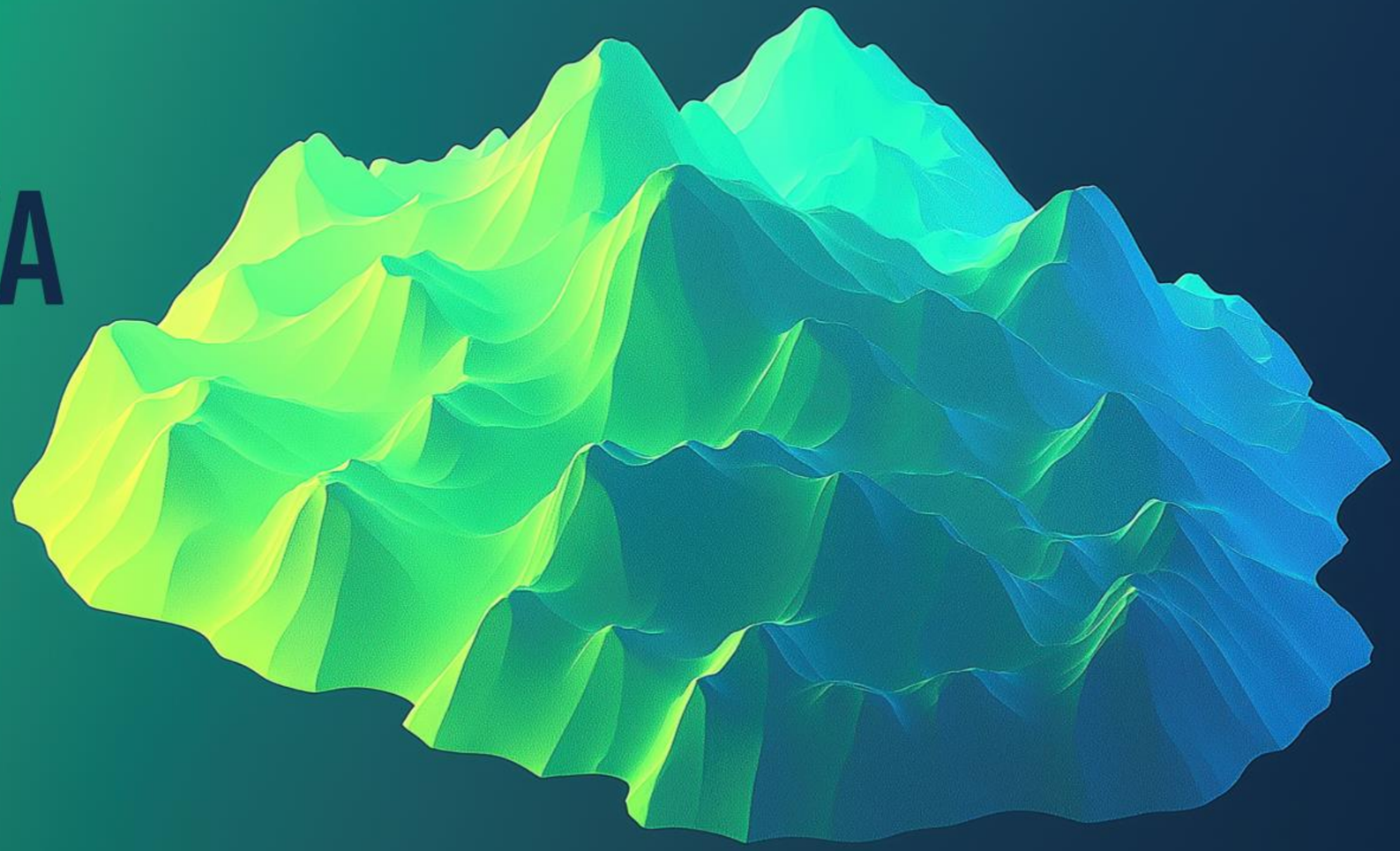
/ INTELLIGENZA ARTIFICIALE GENERATIVA



GENNAIO 2014

"Il 47% dei lavoratori americani aveva lavori ad alto rischio di automatizzazione, ovvero rischiavano di venir sostituiti da robot"

Carl Benedikt Frey e Michael Osborne (Oxford University)

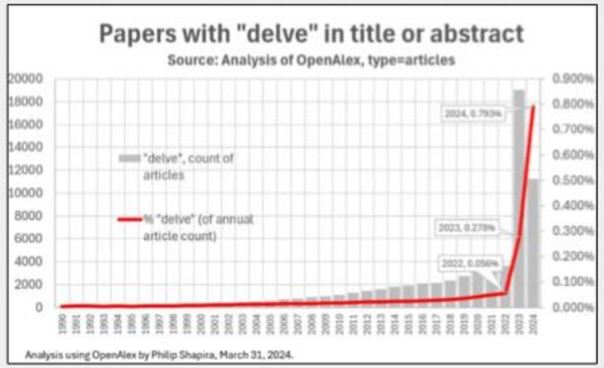

1980: COMPUTER
PROMPT DESIGN

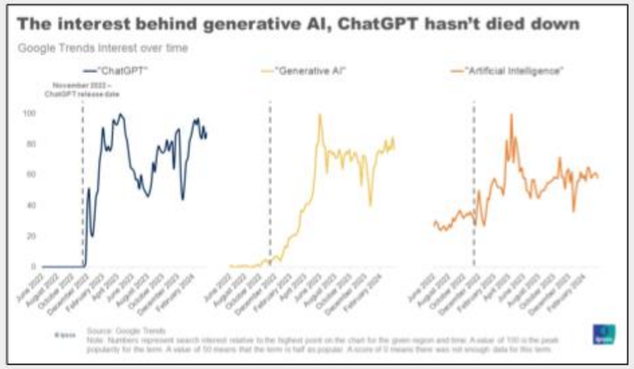

1990: INTERNET
PROMPT DESIGN

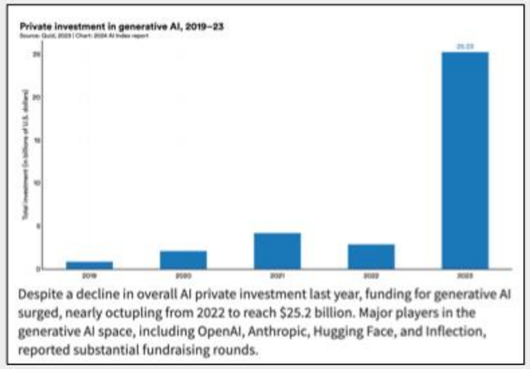

2000: SOCIAL MEDIA
PROMPT DESIGN

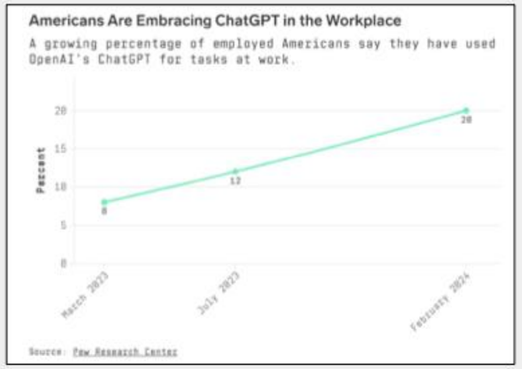

2010: SMARTPHONE
PROMPT DESIGN

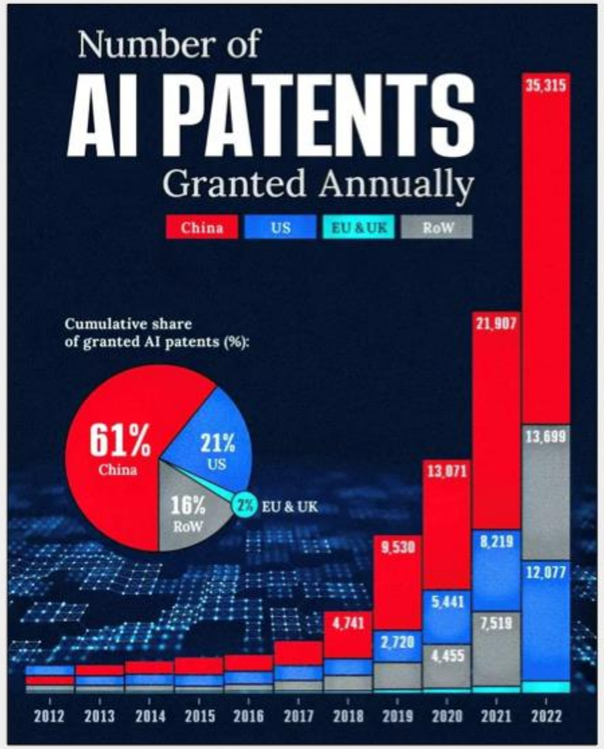

2020: AI
PROMPT DESIGN

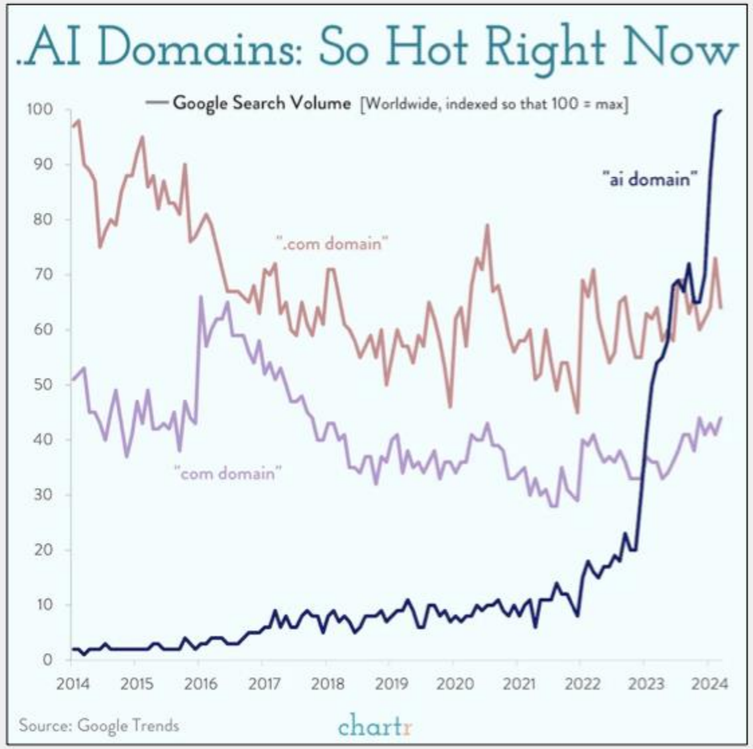

Papers with "delve" in title or abstract
Source: Analysis of OpenAlex, type=articles
"delve", count of articles
% "delve" (of annual article count)
2024, 0.793%
2023, 0.278%
2022, 0.056%
Analysis using OpenAlex by Philip Shapira, March 31, 2024.


The interest behind generative AI, ChatGPT hasn't died down
Google Trends Interest over time
"ChatGPT"
"Generative AI"
"Artificial Intelligence"
November 2022 – ChatGPT release date
Source: Google Trends


Private investment in generative AI, 2019–23
Despite a decline in overall AI private investment last year, funding for generative AI surged, nearly octupling from 2022 to reach $25.2 billion. Major players in the generative AI space, including OpenAI, Anthropic, Hugging Face, and Inflection, reported substantial fundraising rounds.


Americans Are Embracing ChatGPT in the Workplace
A growing percentage of employed Americans say they have used OpenAI's ChatGPT for tasks at work.
Percent
March 2023
July 2023
February 2024
Source: Pew Research Center


Number of
AI PATENTS
Granted Annually
China
US
EU & UK
RoW
Cumulative share of granted AI patents (%):
61% China
21% US
2% EU & UK
16% RoW
35,315
21,907
13,071
9,530
4,741
13,699
12,077
8,219
7,519
5,441
4,455
2,720
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022


.AI Domains: So Hot Right Now
Google Search Volume [Worldwide, indexed so that 100 = max]
"ai domain"
".com domain"
".com domain"
Source: Google Trends
chartr

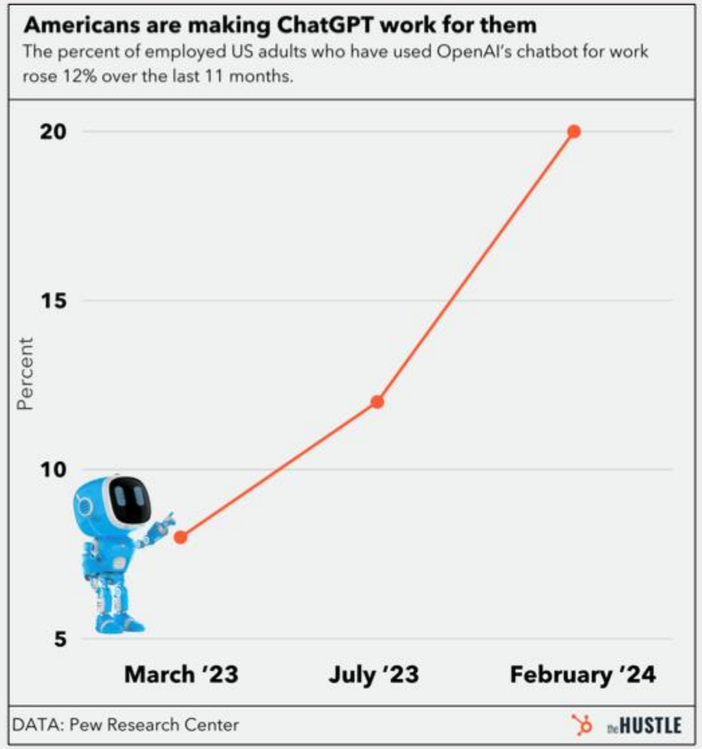
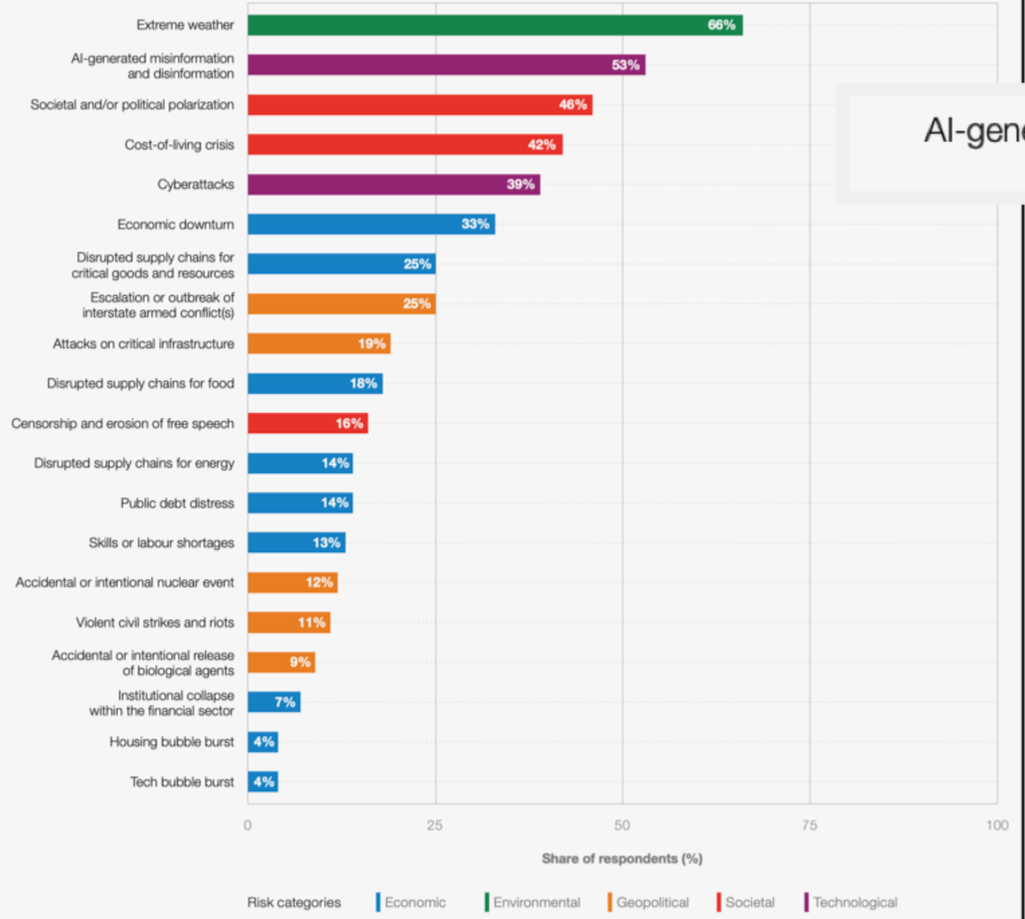

Americans are making ChatGPT work for them
The percent of employed US adults who have used OpenAI's chatbot for work rose 12% over the last 11 months.
Percent
March '23
July '23
February '24
DATA: Pew Research Center
The HUSTLE

FIGURE 1.2 **Current risk landscape**

"Please select up to five risks that you believe are most likely to present a material crisis on a global scale in 2024."



Source
World Economic Forum Global Risks Perception Survey 2023-2024.

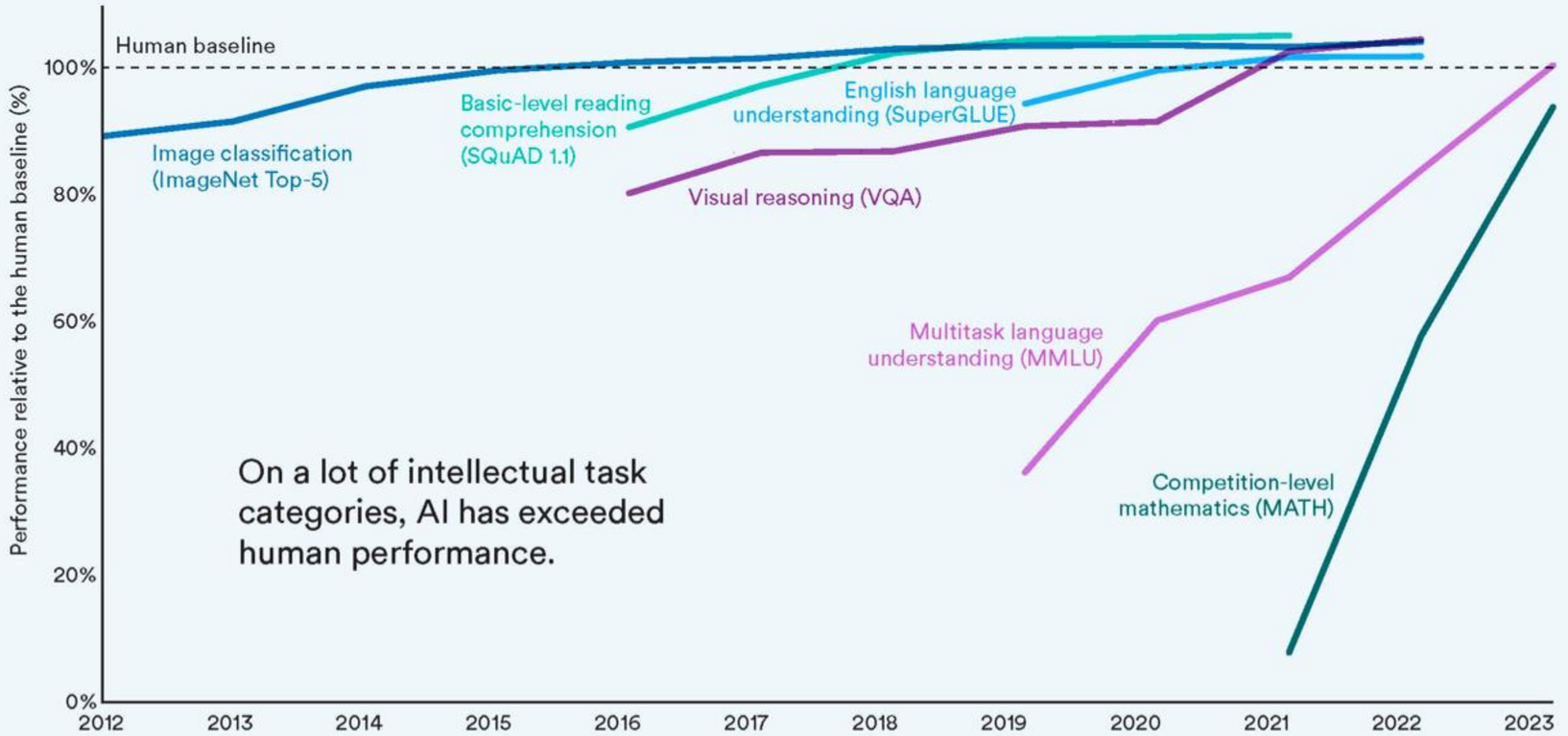
/ INTELLIGENZA ARTIFICIALE GENERATIVA

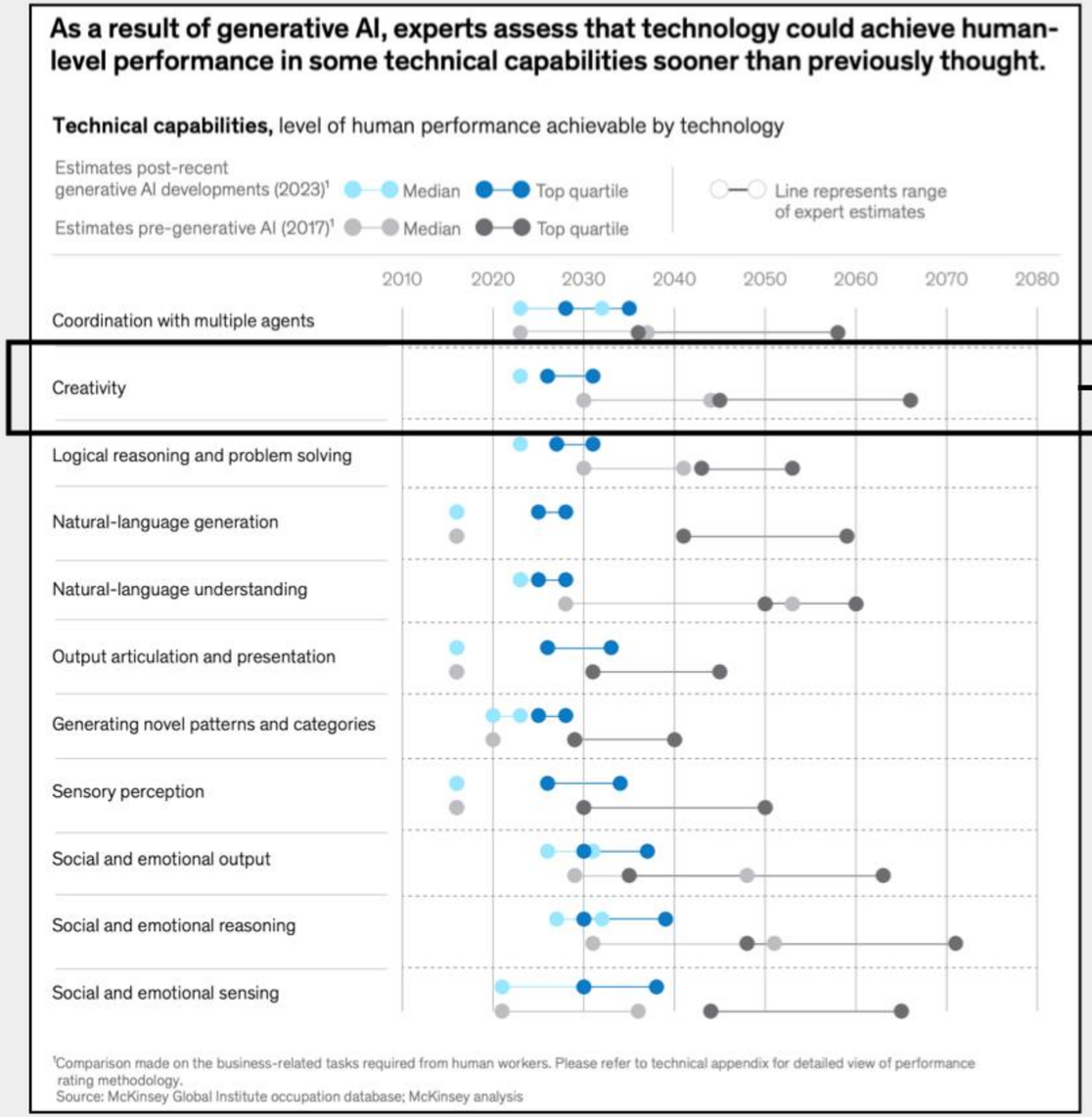
	PRE-2020	2020	2022	2023?	2025?	2030?
TEXT	Spam detection Translation Basic Q&A	Basic copy writing First drafts	Longer form Second drafts	Vertical fine tuning gets good (scientific papers, etc)	Final drafts better than the human average	Final drafts better than professional writers
CODE	1-line auto-complete	Multi-line generation	Longer form Better accuracy	More languages More verticals	Text to product (draft)	Text to product (final), better than full-time developers
IMAGES			Art Logos Photography	Mock-ups (product design, architecture, etc.)	Final drafts (product design, architecture, etc.)	Final drafts better than professional artists, designers, photographers)
VIDEO / 3D / GAMING			First attempts at 3D/video models	Basic / first draft videos and 3D files	Second drafts	AI Roblox Video games and movies are personalized dreams

Large model availability: First attempts · Almost there · Ready for prime time

Select AI Index technical performance benchmarks vs. human performance

Source: AI Index, 2024 | Chart: 2024 AI Index report





“Prima dell'avvento dell'Intelligenza Artificiale Generativa si prevedeva che l'IA avrebbe raggiunto un livello di creatività pari a quello del Quartile Superiore nel 2065. Oggi siamo scesi al 2031.”

/ INTELLIGENZA ARTIFICIALE GENERATIVA

01: Febbraio 2022

02: Aprile 2022

03: Luglio 2022

04: Novembre 2022

05: Marzo 2023

06: Dicembre 2023

/ IMPATTO

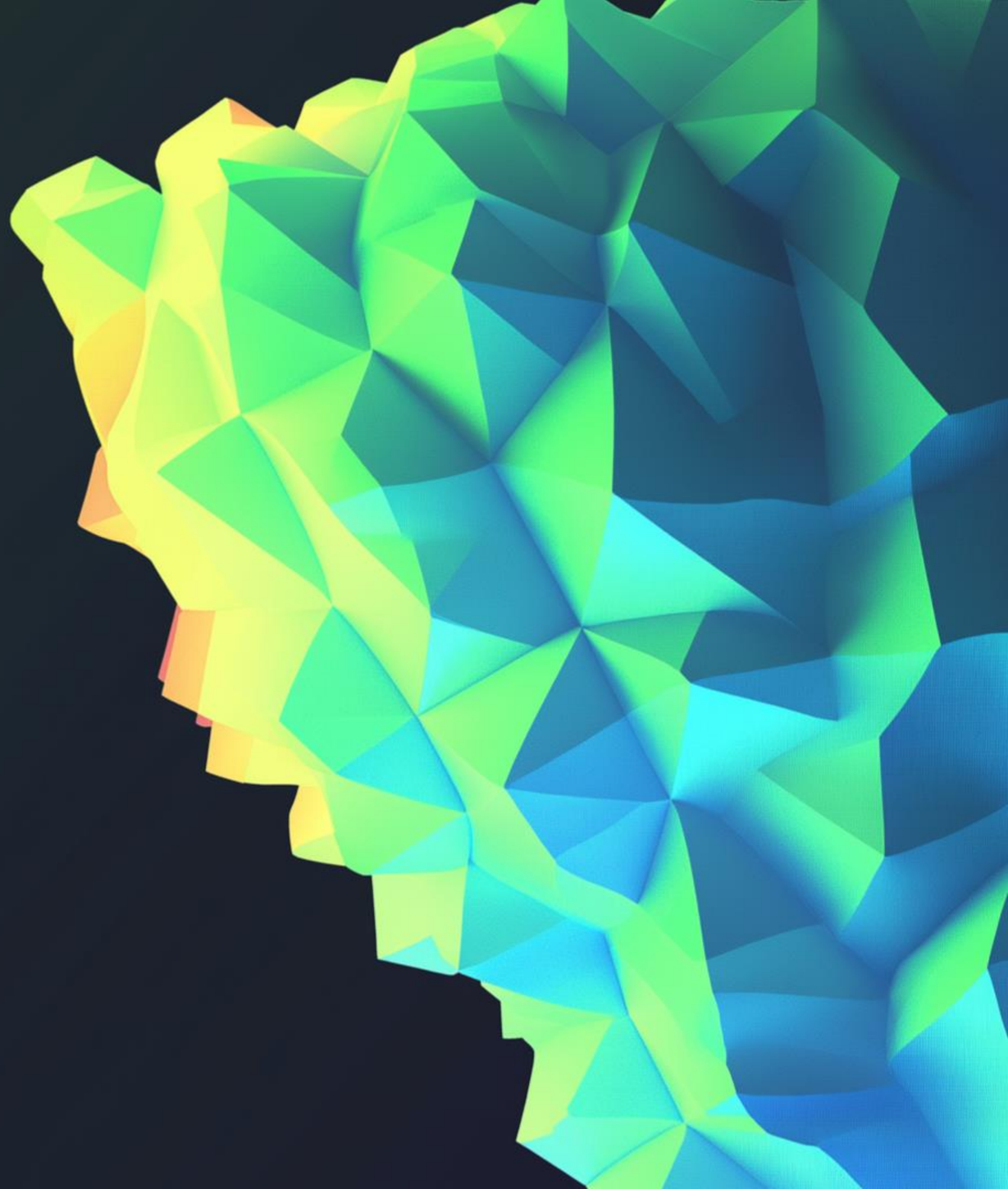
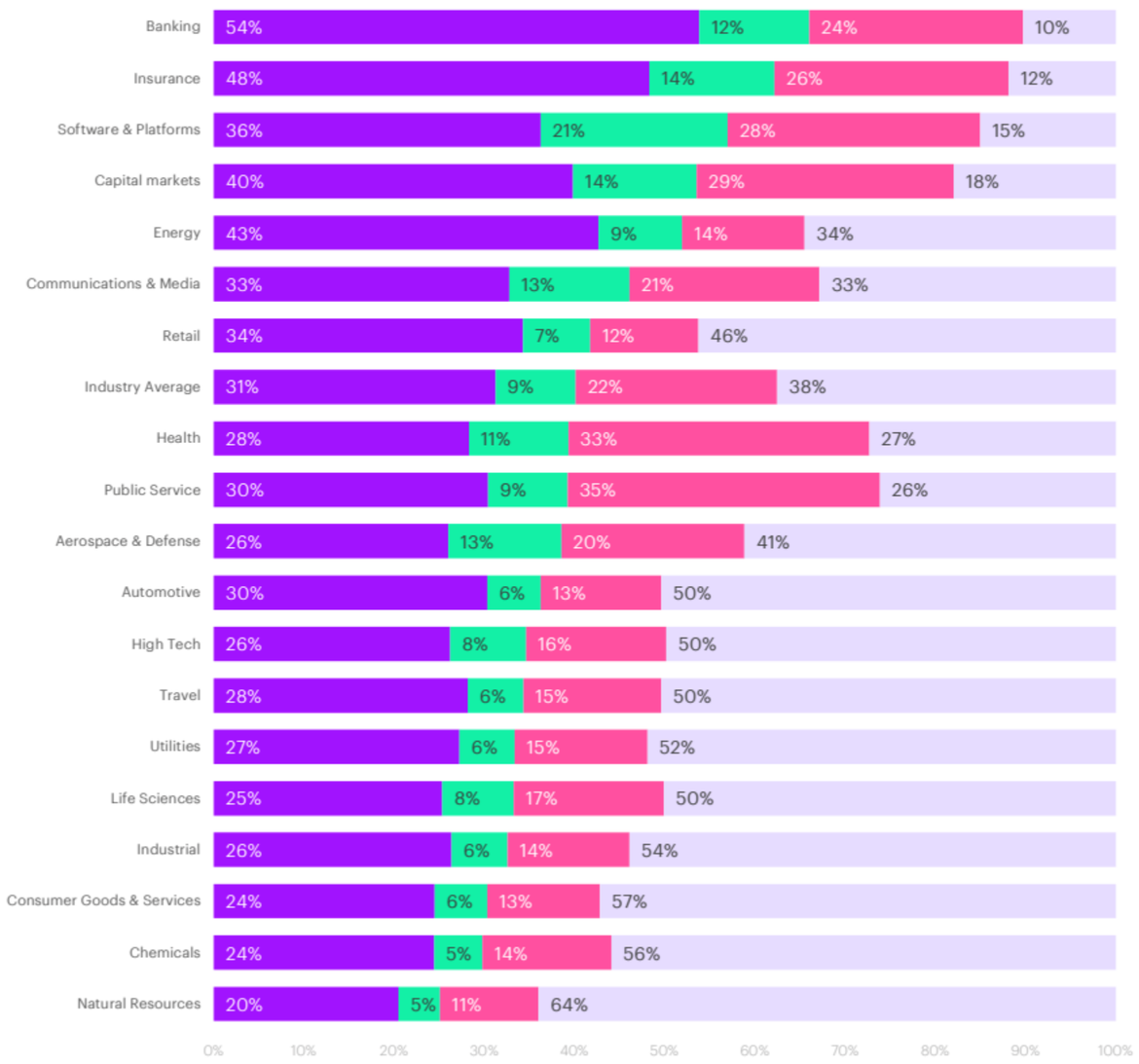
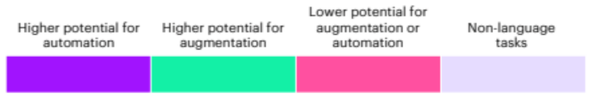


Figure 3: Generative AI will transform work across industries



Work time distribution by industry and potential AI impact

Based on their employment levels in the US in 2021



40% of working hours across industries can be impacted by Large Language Models (LLMs)

Why is this the case? Language tasks account for 62% of total worked time in the US. Of the overall share of language tasks, 65% have high potential to be automated or augmented by LLMs.

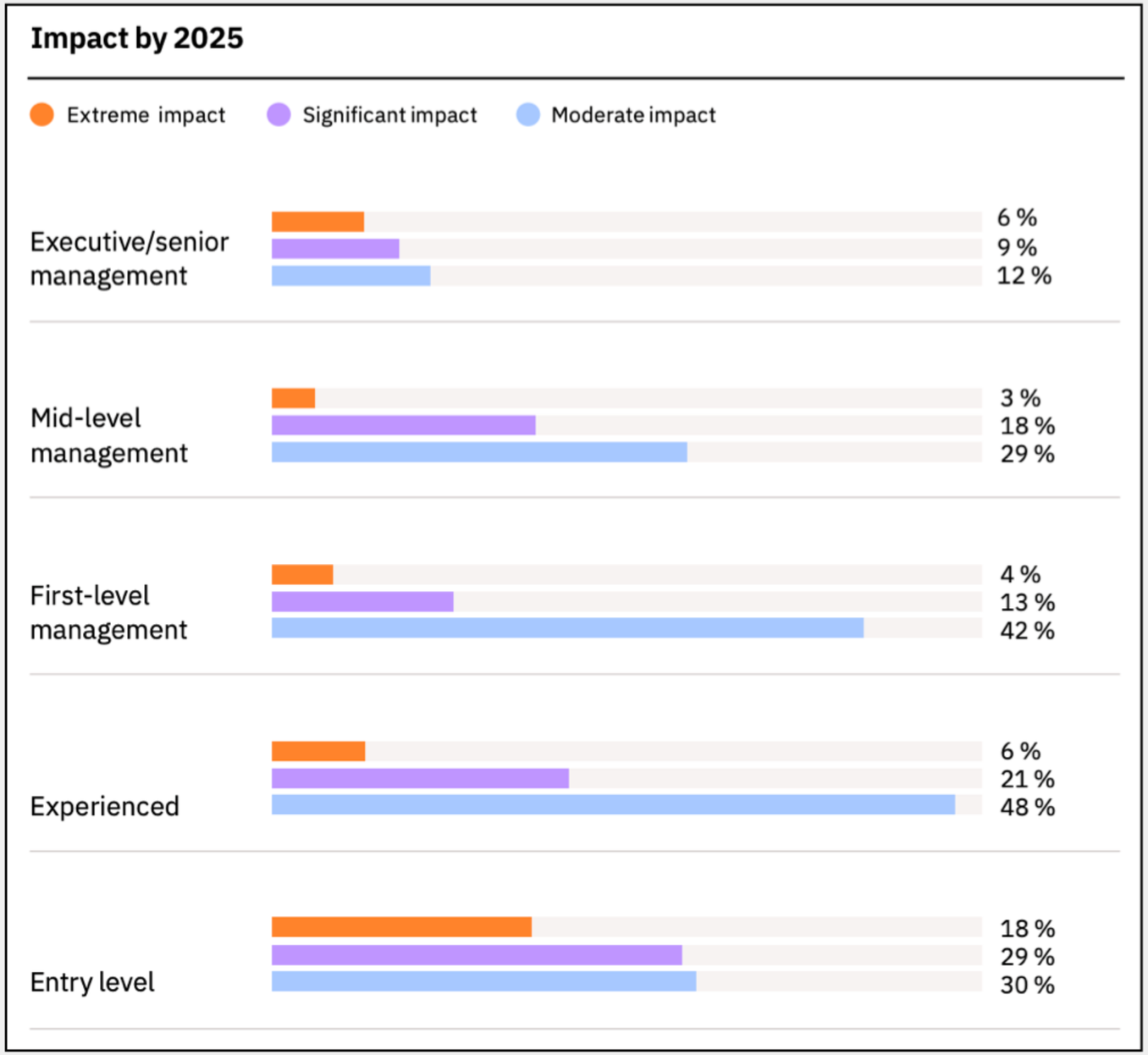
Source: Accenture Research based on analysis of Occupational Information Network (O*NET), US Dept. of Labor; US Bureau of Labor Statistics.

Notes: We manually identified 200 tasks related to language (out of 332 included in BLS), which were linked to industries using their share in each occupation and the occupations' employment level in each industry. Tasks with higher potential for automation can be transformed by LLMs with reduced involvement from a human worker. Tasks with higher potential for augmentation are those in which LLMs would need more involvement from human workers.

Fonte: https://www.weforum.org/agenda/2023/05/jobs-lost-created-ai-gpt/

- 100% Credit Analysts
- 79% Financial Analysts
- 100% Proofreaders & Copy Markers
- 100% Telemarketers
- 99% Administrative Assistants
- 92% Painting Workers
- 91% Models
- 78% Laboratory Technicians
- 62% Barbers
- 57% HR Specialists
- 56% Film and Video Editors
- 51% Economists
- 45% Musicians and Singers
- 42% Fine Artists
- 49% Writers and Authors
- 34% Graphic Designers

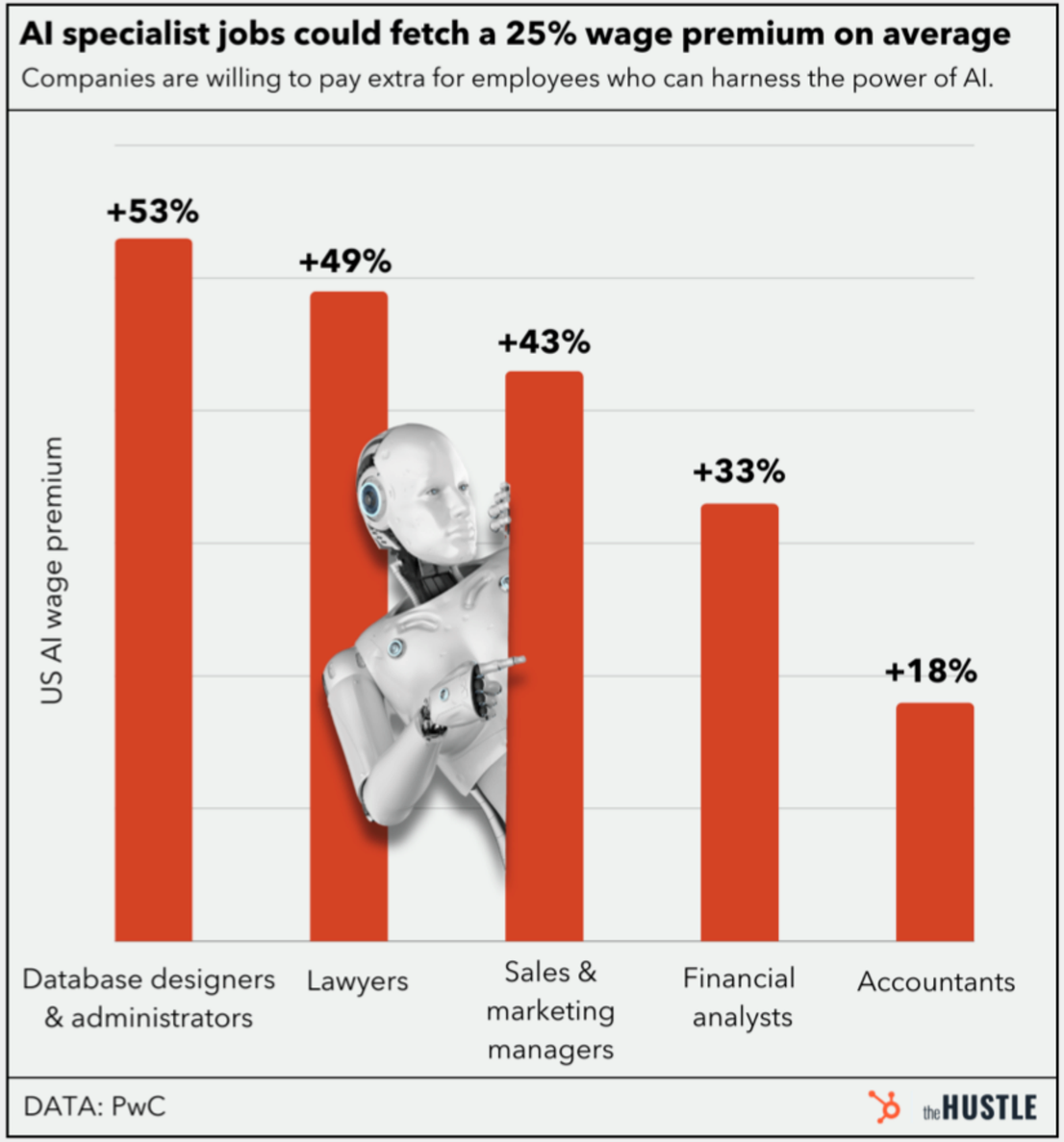
Fonte: https://willrobotstakemyjob.com/



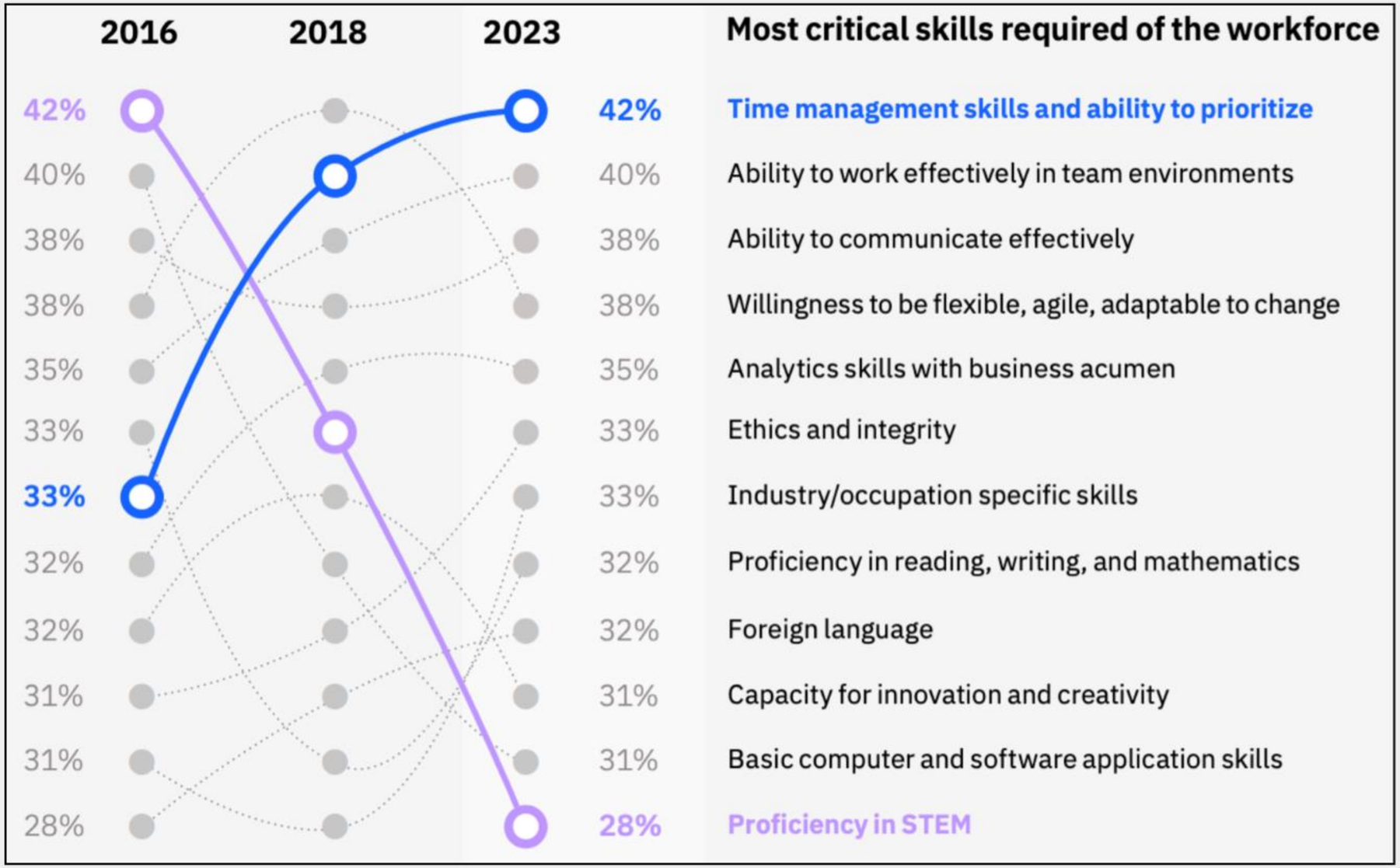
Fonte: IBM Institute for Business Value

- Il **91%** delle aziende ricerca persone che sappiano utilizzare ChatGPT.
- Il **29%** delle aziende ha in programma di assumere Prompt Designer.
- Secondo il Fondo Monetario Internazionale il **40%** dei posti di lavoro in tutto il mondo potrebbe essere automatizzato o esposto all'automatizzazione, con picchi del **60%** nelle economie avanzate.
- Nel 2024 il **61%** dei professionisti utilizzerà l'IA per il proprio lavoro.
- Nel 2024 il **44%** dei lavori verrà rivoluzionato dall'IA.
- Morgan Stanley ha stimato in **44%** la percentuale di lavori esposti all'avvento dell'IA con un «impatto economico di **4,1 trilioni di dollari**.

Fonte: The European House – Ambrosetti e Microsoft Italia | Gartner.com | bnnbreaking.com / Morgan Stanley, Ogilvy

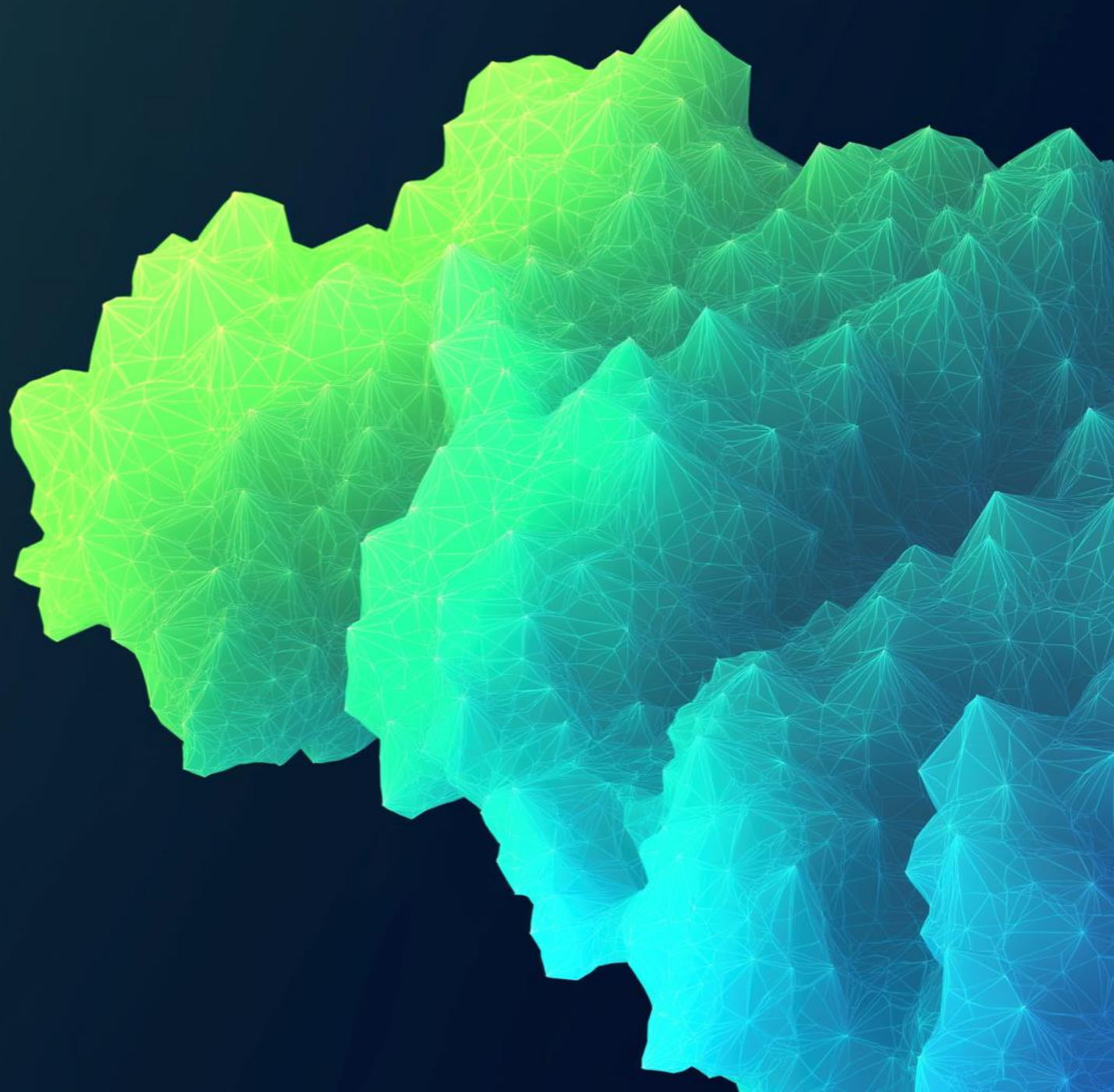


Aumenta il valore, aumenta il compenso.



Fonte: IBM Institute for Business Value

/ UTILIZZO



Utilizzo base:	Utilizzo Intermedio:	Utilizzo avanzato:
Content creation	Data Analysis	Predictions
Marketing Research	Chatbots	Custom AI apps
Administrative tasks	Data Visualisation	Automated processes
Social Media Management	Segmentation	Real time analysis
Communications	Team Management	
Brainstorming	Custom Advertise	
	A/B Testing	


PRODUTTIVITÀ


INNOVAZIONE

«Most jobs you can think of as a bundle of tasks. When you break them down into tasks, then analyzing individual tasks for potential for AI automation or augmentation often leads to interesting opportunities to use AI.»

- Andrew Ng

/ UTILIZZO


CHATGPT


MIDJOURNEY


ZAPIER

CHARACTER


CLIPDROP
(Stable Diffusion)

STABLE AUDIO


GEMINI


CLAUDE


IDEOGRAM


PERPLEXITY


COPILOT


POE


RUNWAY

CANVA

ELEVENLABS

VOICEFLOW

FIREFLY


RECRAFT


GAMMA


SUNO


HEY GEN

/ UTILIZZO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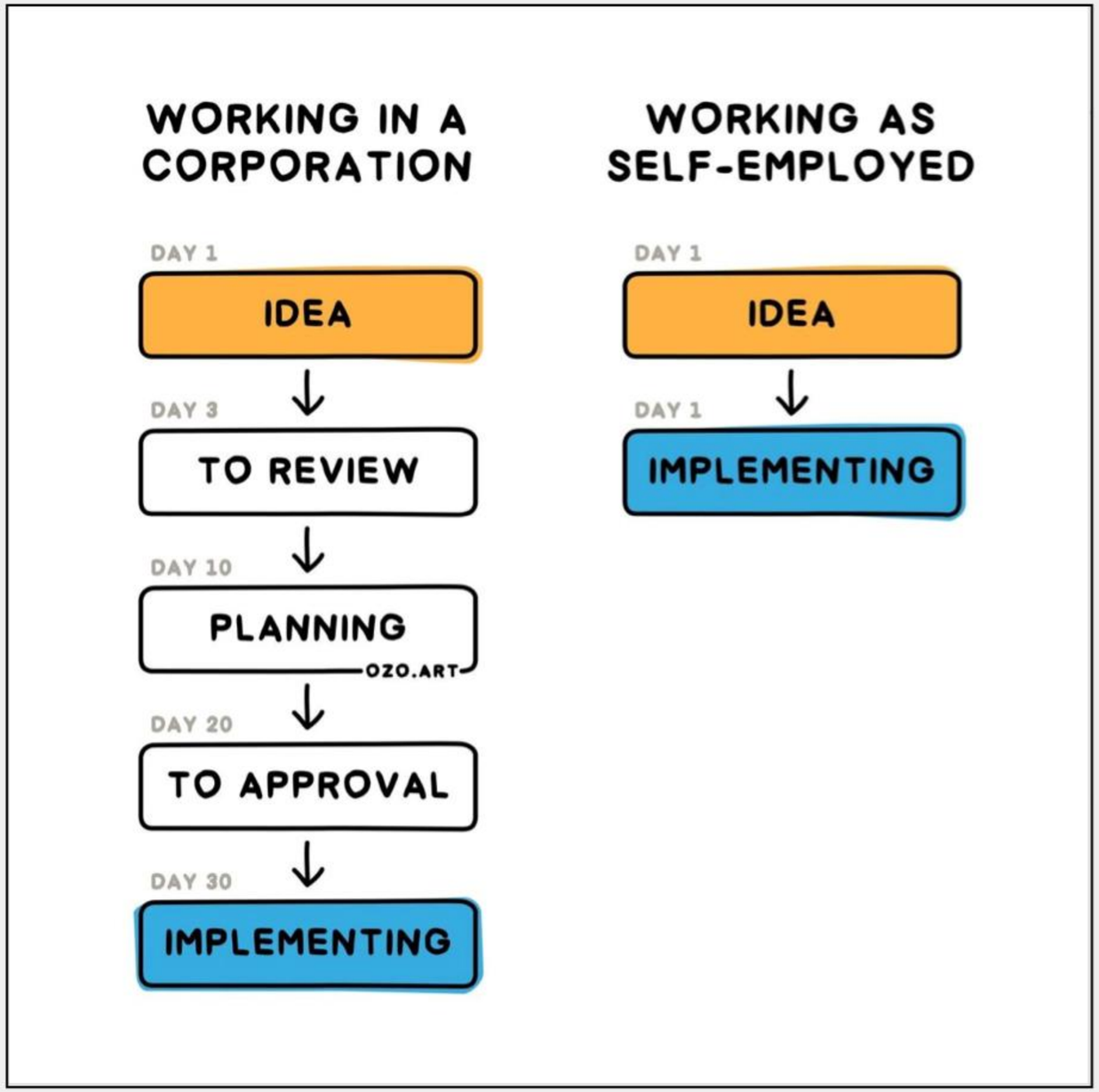

Le aziende saranno in grado di essere abbastanza veloci e “snelle” per integrare l’IA nei suoi processi?

01 **Formazione**
Formare chiunque in azienda su cosa sia l'Intelligenza Artificiale Generativa, quali siano i limiti e le opportunità e come si usano gli strumenti principali.

02 **Strumentazione**
Dare a tutti accesso a ChatGPT Plus versione Team (25€/mese per persona) così da essere sicuri che i dati non vengano usati per fare training.

03 **Sperimentazione**
Lasciare a tutti la libertà di fare esperimenti con ChatGPT Plus con buon senso (formazione).

04 **Condivisione**
Creare dei momenti o dei luoghi (fisici o virtuali) di condivisione degli esperimenti fatti, dei risultati raggiunti, o dei problemi riscontrati, scegliendo “Innovation Ambassador”.

/ GRAZIE

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FRANCESCO UBERTINI

Presidente centro di calcolo CINECA
e Professore ordinario presso
l'Università di Bologna

Supercalcolo e Intelligenza Artificiale: il ruolo del tecnopolo

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FRANCO CALLEGATI

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Dipartimento di Informatica Scienza
e Ingegneria - Università di Bologna

Integrare l'Intelligenza Artificiale valorizzando competenze logiche e professionali nell'era digitale

INTELLIGENZA ARTIFICIALE IN AZIONE - 16 Ottobre 2024

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

Credits

- This talk is mostly based on the talk “Teaching programming in the age of generative AI” given by Prof. Simone Martini at 29th annual ACM conference on Innovation and Technology in Computer Science Education (ITiCSE) held in Milano, July 8, 2024 and on his slides.

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Programming

- Programming **is the essence** of computing/informatics.
  - Indeed, computing is much more than programming, but programming [...] is essential to computing.

[Caspersen, Principles of Programming Education. In Computer Science Education, Bloomsbury. 2023]

- Programming was considered by many to be **a uniquely intellectual activity**, a black art that relied on individual ability and idiosyncratic style. [...]
  - By the early 1960s, the “problem of programming” had eclipsed all other aspects of commercial computer development.

[Ensmenger, The Computer Boys Take Over, MIT Press, 2010, p. 29]

Programming Languages

- Programming languages are the **metalanguage** in which we express informatics
- Programming languages are powerful tools to organize, make coherent, and model reality
  - data models; procedural, interaction, synchronization models, etc.

- **Teaching programming** implies teaching programming languages
- If we **stop teaching programming languages**, we are changing the way we understand and express our discipline

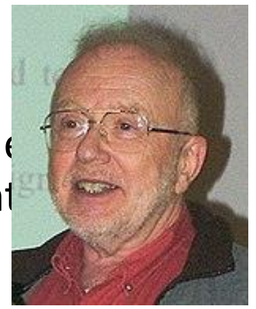
Automatic Programming

- **Automatic programming** has always been a very significant **research question**

BUT

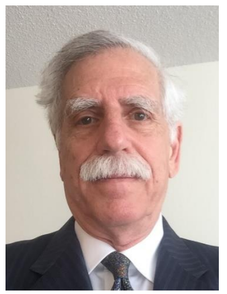
- **Automatic programming** always has been a **euphemism** for programming with a higher-level language than was then available to the programmer -> Research in automatic programming is simply research in the implementation of higher-level programming languages.

[Parnas, Sw aspects of strategic defence systems, CACM 28(12), 1985]



- Programs are not text; they are **hierarchical compositions of computational structures** and should be e executed, and debugged in an environment that consistently acknowledges and reinforces this viewpoint

[Teitelbaum, The Cornell Program Synthesizer. CACM. 24(9), 1981]



Generative Programming

- **Generative Programming** is an attempt to **manufacture software components** in an **automated way** by developing programs that synthesize other programs.

  [Cointe, Towards Generative Programming, Unconventional Programming Paradigms, 2005]

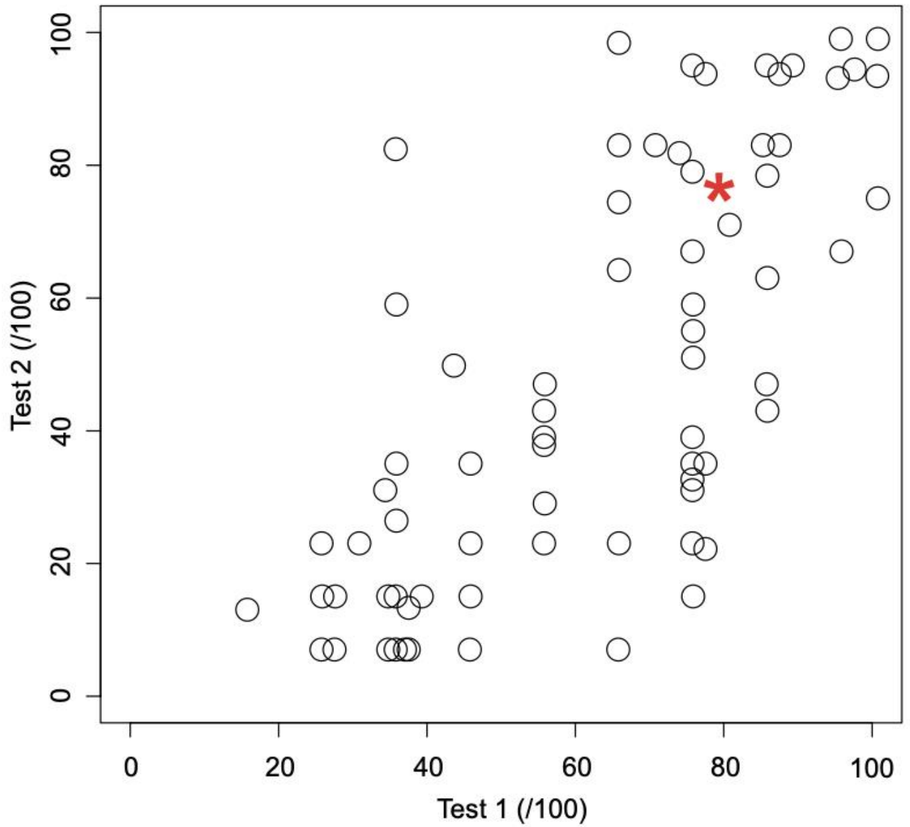
- August 2021 OpenAI **Codex** (originally based on GPT3)
  - OpenAI Codex is a descendant of GPT-3;
  - Is most capable in Python, but it is also proficient in over a dozen languages
  - Trained with both natural language and billions of lines of source code from publicly available sources

The 2 big questions with generative programming

Generative AI produces **reasonably good code**?

And if yes …

Should we **still teach programmming?**



Student vs GPT-4

In our replication, **GPT-4** would have been one of **the top students** in the class.

Prather et al. The Robots Are Here: .... ITiCSE-WGR 2023

Finnie-Ansley et al. The Robots Are Coming: Exploring.... ACE '22, 2022.

A change of perspective

- As the **level of abstraction** in computing education across educational levels steadily arose, the credo among computing cognoscenti became that one needs to be familiar with **at least one abstraction level below** that at which one is working.

  [Tedre et al., Teaching Machine Learning in K–12 Classroom, IEEE Access, vol. 9, 2021]

- When you use GPT as a programmer, you can spend **much less time writing code** (and tests), because GPT can do that for you. Instead, you spend your time writing prompts (aka specifications), and **creating an overall structure** for the code that GPT is writing.

  [Daniel Jackson, The End of Agile. on essenceofsoftware.com, 2023]

Is it really the first time?

- Translators are already extensively using computer-assisted translation

- Italo Calvino
  - Will we have a machine capable of replacing the poet and the author?
  - I am thinking of a writing machine that would bring to the page all those things that we are accustomed to consider as the most jealously guarded attributes of our psychological life, of our daily experience, our unpredictable changes of mood and inner elations, despairs and moments of illumination.

  - Once we have dismantled and reassembled the process of literary composition, **the decisive moment of literary life will be that of reading**.

Conclusion

- Code generator:
  - deep learning based: “**non-deterministic**” output
  - **opaque** for our understanding

- Automatically generated solutions may provide students with **models** that they can use for learning. Many benefits arise from looking at a **variety of solutions**, even when the code is flawed
- More emphasis on **code review**, or evaluation of code

  [Finnie-Ansley et al. The Robots Are Coming: Exploring.... ACE ’22, 2022.]

- Programs are meant **to be read by humans** and only incidentally for computers to execute.

  [Abelson & Sussman, Structure and Interpretation of Computer Programs, MIT Press, 1984]

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TITOLO SLIDE

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