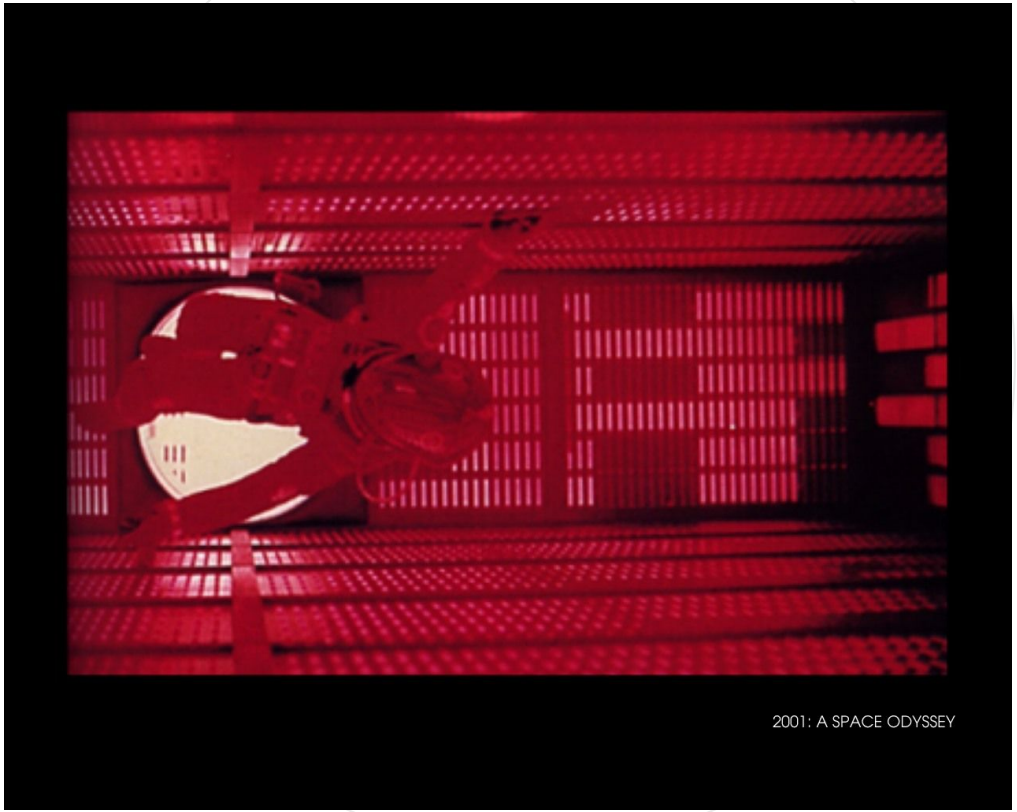

eman ta zabal zazu
Universidad del País Vasco
Euskal Herriko Unibertsitatea
HiTZ
Hizkuntza Teknologiako Zentroa
Basque Center for Language Technology
German Rigau Claramunt
hitz.eus

Artificial Intelligence

Artificial Intelligence

Artificial Intelligence

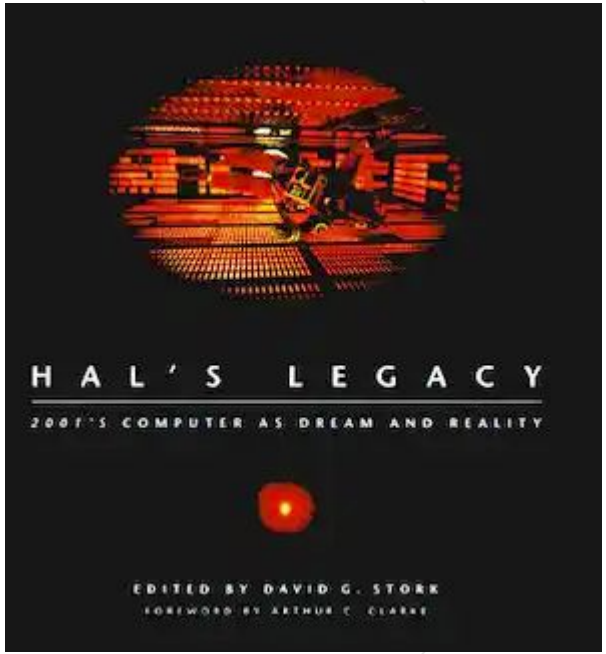


Artificial Intelligence

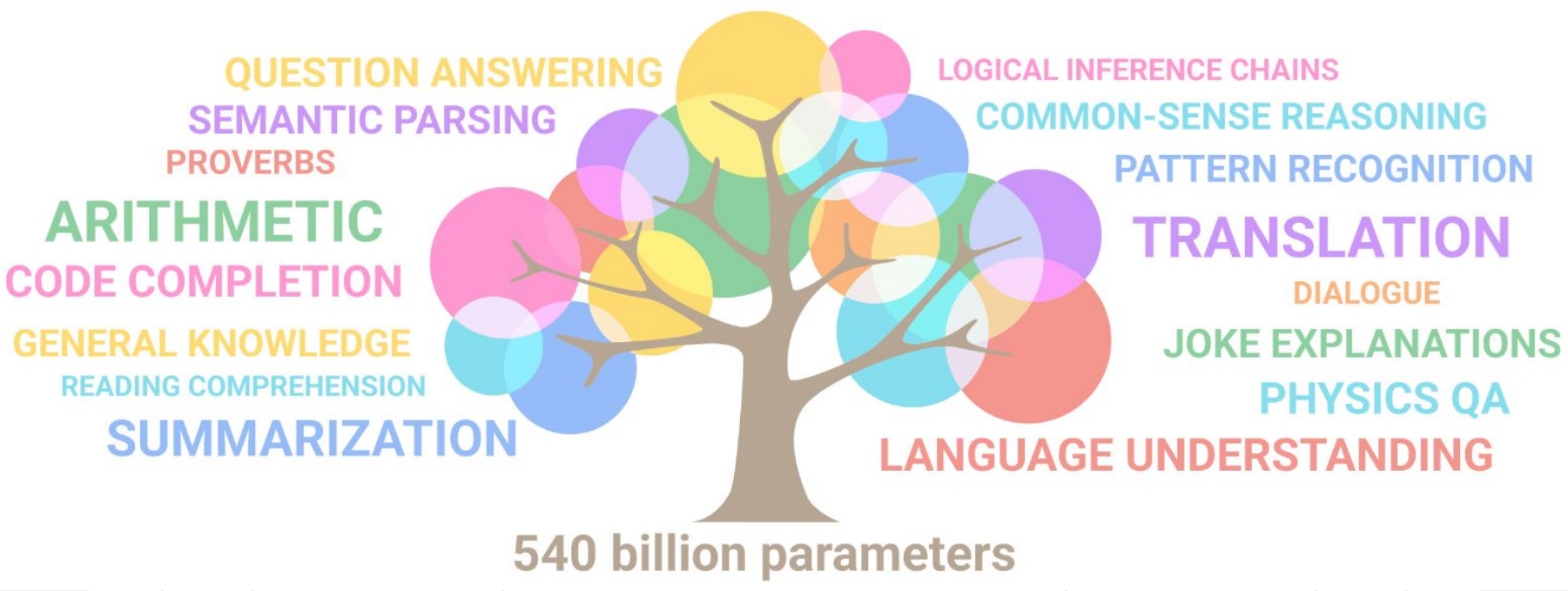
HAL's Legacy
2001's Computer as Dream and Reality

Edited by David G. Stork
Foreword by Arthur C. Clarke

384 pp., 8 x 9 in, Paperback
ISBN 9780262692113
Published: March 2, **1998**
Publisher: The MIT Press



Artificial Intelligence



PaLM: Scaling Language Modeling with Pathways (2022)
Aakanksha Chowdhery, + 67 authors

Preface

“Cuando creíamos que teníamos todas las respuestas, de pronto, cambiaron todas las preguntas.”

- Mario Benedetti

“Just when we thought we had all the answers, suddenly all the questions changed.”

1

(Brief) History of AI & NLP

History of IA & NLP

- 1950 Turing test

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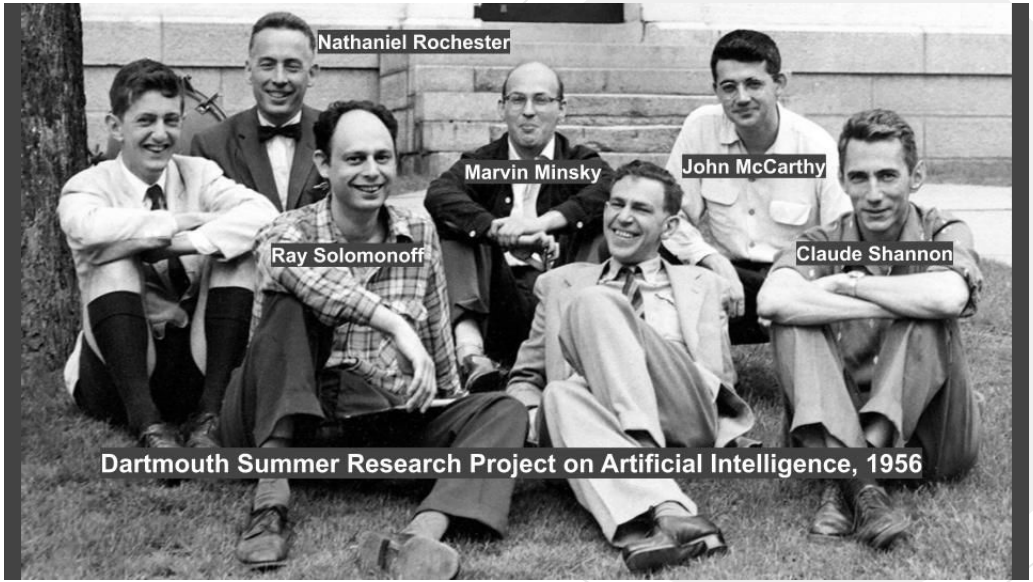
- 1956 DSRPAI



History of IA & NLP

- 1950 Turing test
- 1956 DSRPAI
- 1960s Rule-based AI & NLP
- 1966 ALPAC report

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- 1992 WordNet

History of IA & NLP

- 1950 Turing test
- 1956 DSRPAI
- 1960s Rule-based AI & NLP
- 1966 ALPAC report
- 1970s Noam Chomsky
- 1990s Statistical AI & NLP, Machine Learning
- 2010s Neural AI & NLP
  - 2013 Word Embeddings, 2017 **Transformers**, 2018 BERT, 2022 ChatGPT , ...
- 20XXs? AGI (singularity)

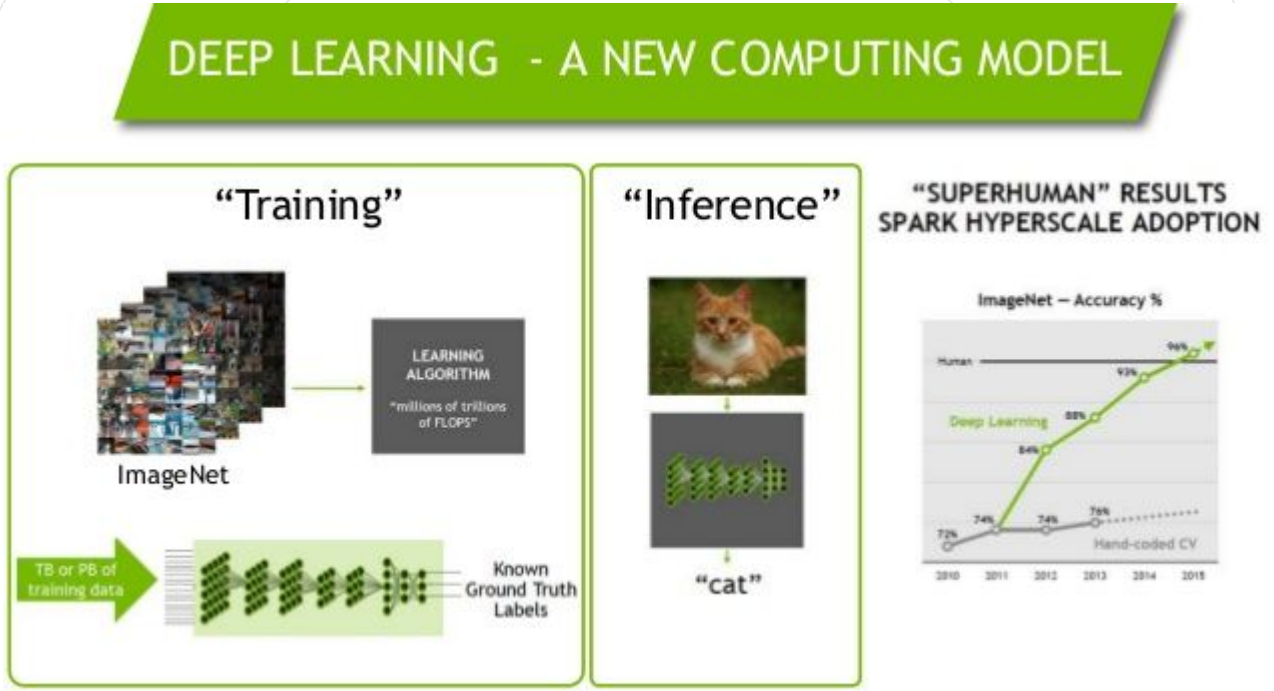
1

New AI paradigm

New AI paradigm

- **Accelerated** discovery cycle
- Impressive progress
  - **Superior** to humans in many tasks
- **Deep** and **reinforcement learning**
  - **Deep** neural networks
- Application in **Language**, Vision, Robotics
- Require
  - **Experts**, **Supercomputing**, **Data**
  - LLaMA-2 (70B) : 1.7M GPU hours A100-80Gb (~ 1000 A100 71 days)

Deep Learning: HPC

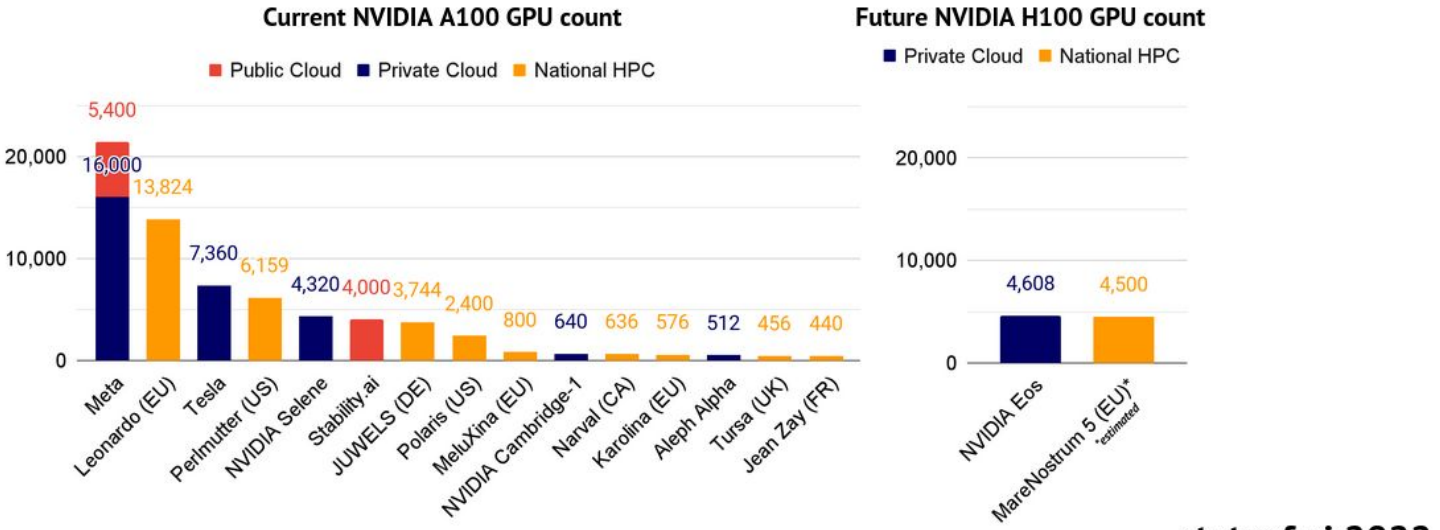


From Andy Steinbach (NVIDIA, 2016)

Deep Learning: HPC

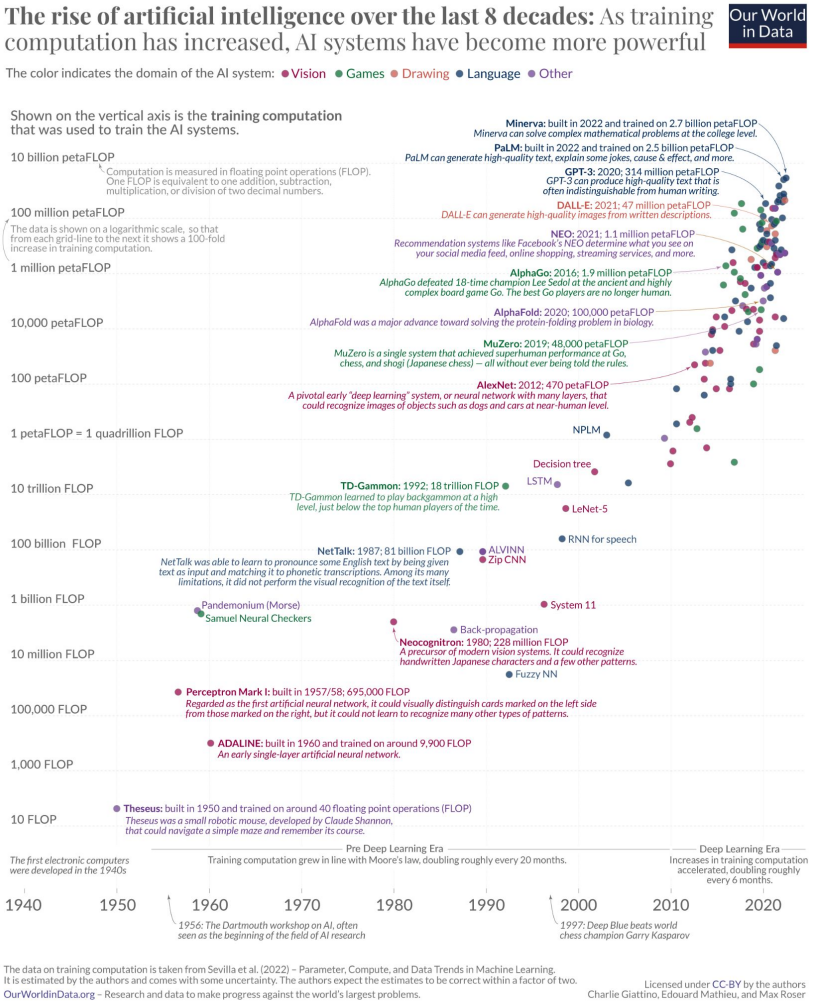
In a gold rush for compute, companies build bigger than national supercomputers

"We think the most benefits will go to whoever has the biggest computer" – Greg Brockman, OpenAI CTO



https://www.stateof.ai/
https://eurohpc-ju.europa.eu/about/our-supercomputers_en

Deep Learning: HPC

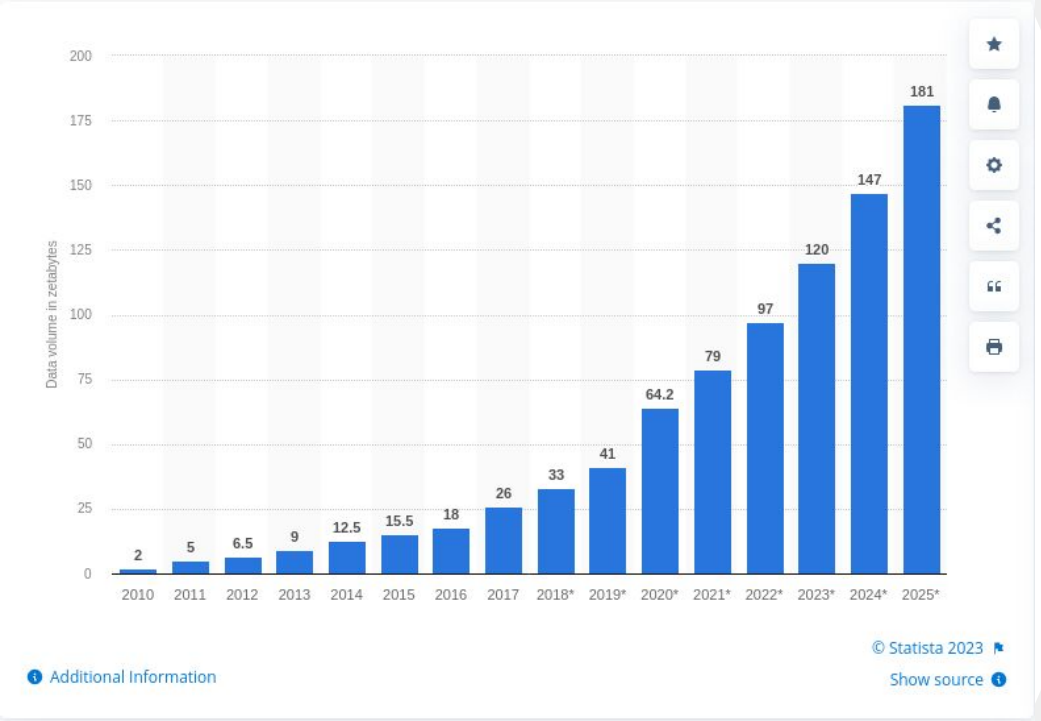


GPT-3

https://www.visualcapitalist.com/cp/charted-history-exponential-growth-in-ai-computation/

Deep Learning: Data

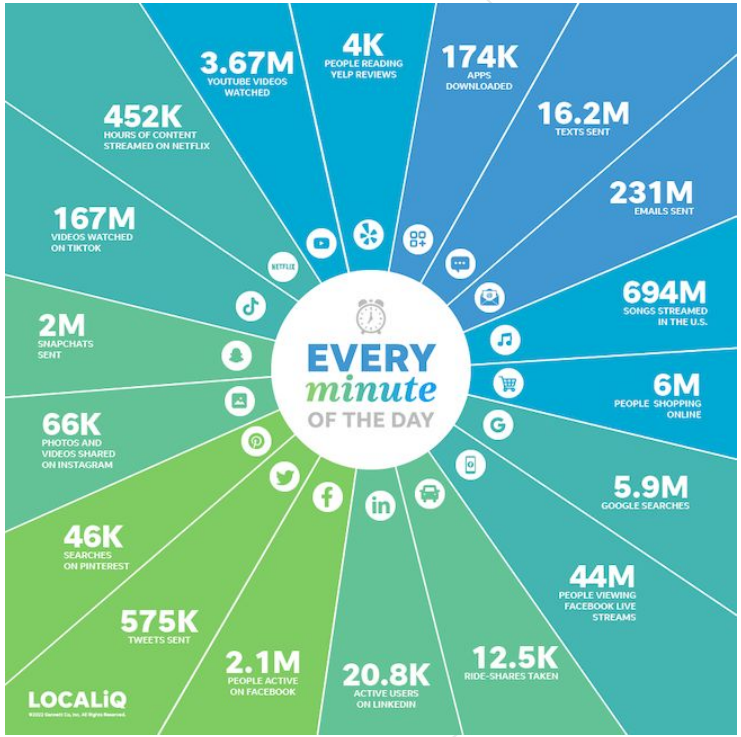
Volume of data/information created, captured, copied, and consumed worldwide from 2010 to 2020, with forecasts from 2021 to 2025 (in zettabytes)



https://www.statista.com/statistics/871513/worldwide-data-created/

Deep Learning: Data

Every minute of the day in Internet 2022 …



https://localiq.com/blog/what-happens-in-an-internet-minute/

Deep Learning: Data

- Information overload
- infobesity, infoxication!

Deep Learning: Data

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- by Bertram Gross, *The Managing of Organizations: The administrative struggle* (1964)

Deep Learning: Data

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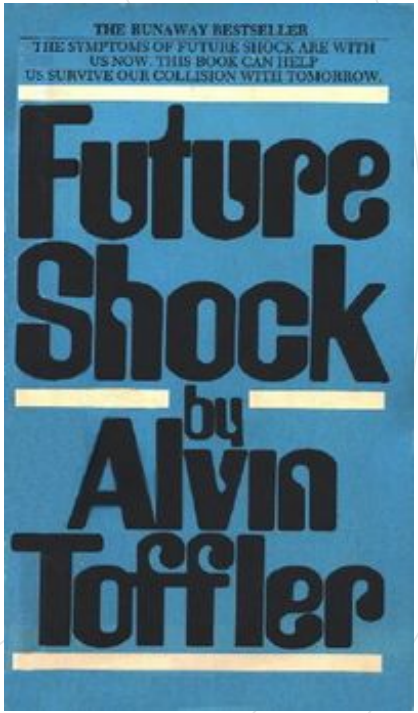
- by Alvin Toffler, *Future Shock* (1970)

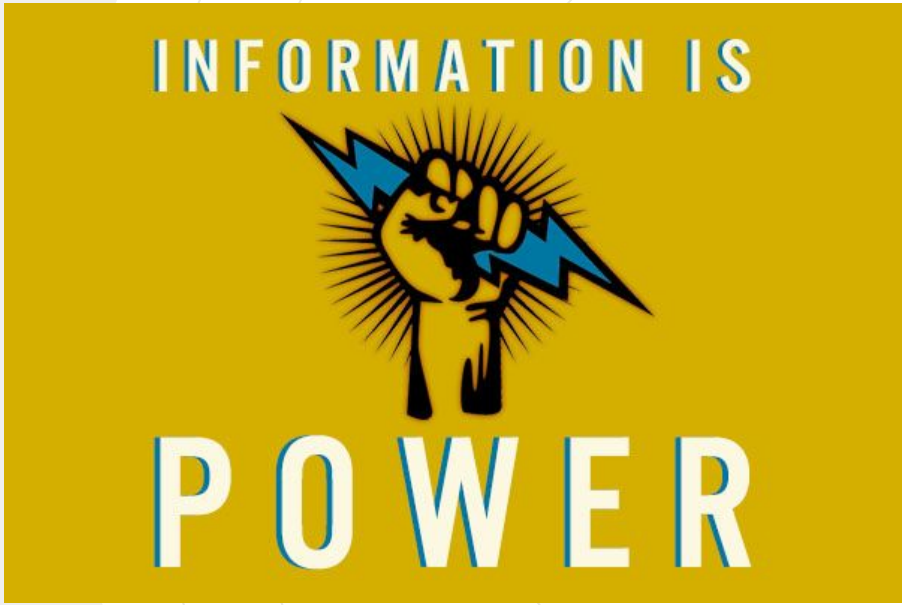


Deep Learning: Data

- Information overload
- infobesity, infoxication!
- by Bertram Gross, The Managing of Organizations: The administrative struggle (1964)
- by Alvin Toffler, Future Shock (1970)

- Seneca complained that
  “the abundance of books is distraction”
  in the 1st century AD!

Deep Learning: Data



KNOWLEDGE
IS
POWER

Deep Learning

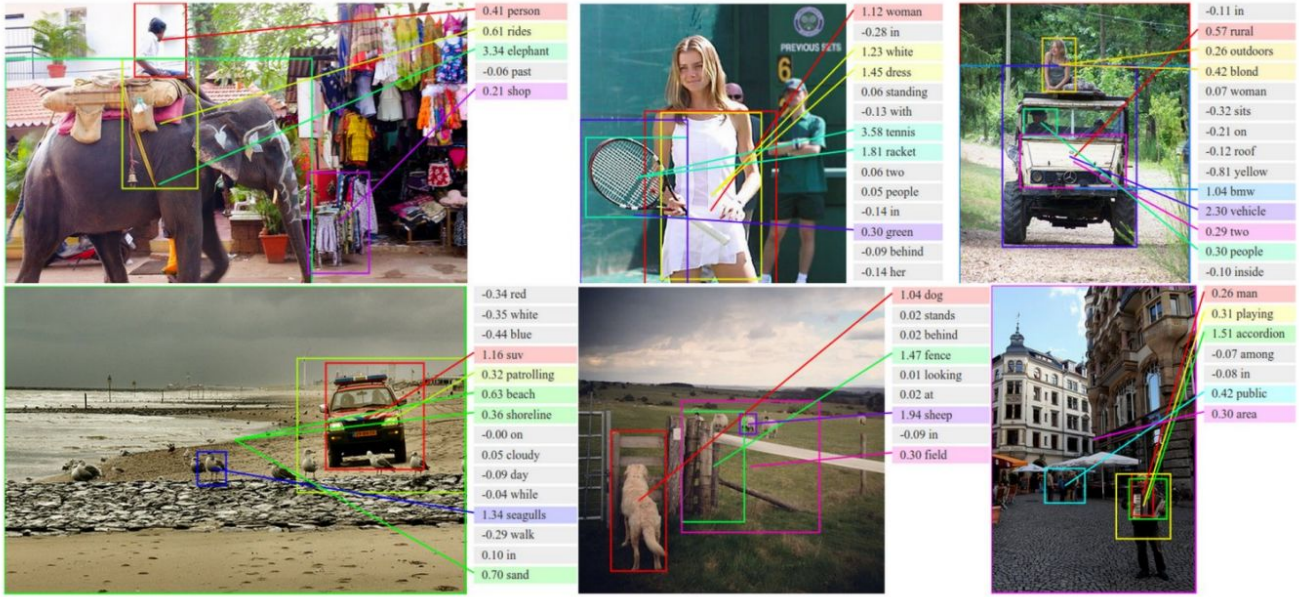


Figure 5. Example alignments predicted by our model. For every test image above, we retrieve the most compatible test sentence and visualize the highest-scoring region for each word (before MRF smoothing described in Section 3.1.4) and the associated scores ($v_i^T s_t$). We hide the alignments of low-scoring words to reduce clutter. We assign each region an arbitrary color.

Deep visual-semantic alignments for generating image descriptions (2014)
A Karpathy, L Fei-Fei

Deep Learning

LipNet: Sentence Level Lipreading (2016)
Yannis M. Assael, Brendan Shillingford, Shimon Whiteson, Nando de Freitas

Deep Learning

A Style-Based Generator Architecture for Generative Adversarial Networks (2018)
Tero Karras, Samuli Laine, Timo Aila
https://thispersondoesnotexist.com

Figure 2. Uncurated set of images produced by our style-based generator (config F) with the FFHQ dataset. Here we used a variation of the truncation trick [40, 5, 32] with $\psi = 0.7$ for resolutions $4^2 - 32^2$. Please see the accompanying video for more results.

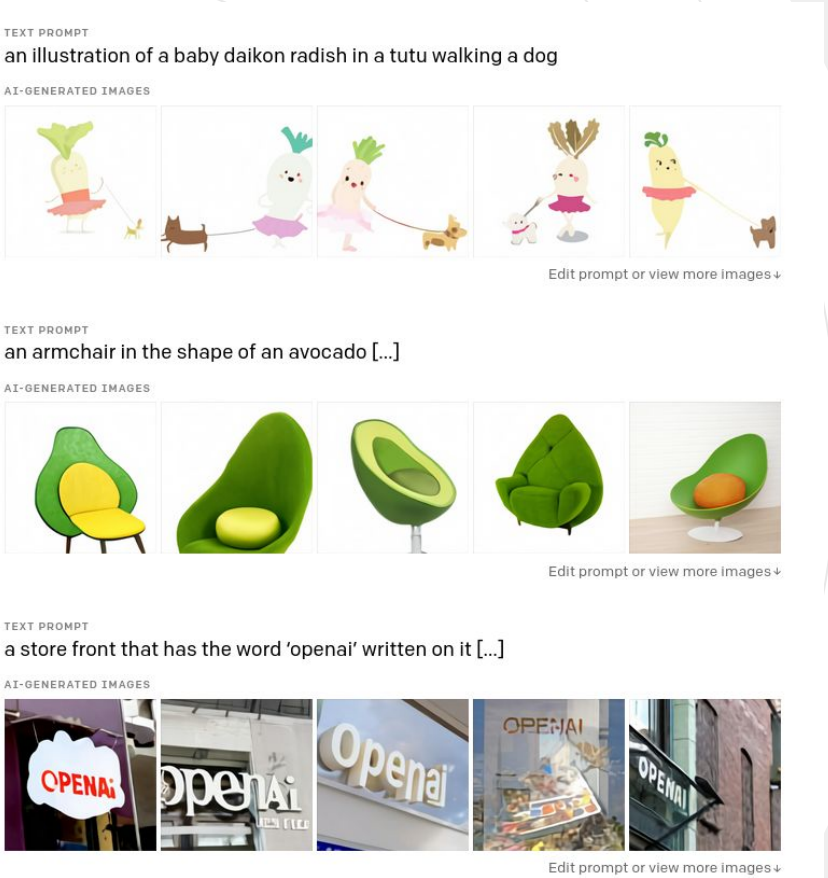
Deep Learning

Recursively Summarizing Books with Human Feedback (2021)
Jeff Wu, Long Ouyang, Daniel M. Ziegler, Nisan Stiennon, Ryan Lowe, Jan Leike, Paul Christiano

Deep Learning

Zero-Shot Text-to-Image Generation
(2021) Aditya Ramesh, Mikhail Pavlov, Gabriel Goh, Scott Gray, Chelsea Voss, Alec Radford, Mark Chen, Ilya Sutskever
https://openai.com/blog/dall-e/

DALL-E 2
Midjourney
Stable Diffusion
…



Deep Learning: pictures and video

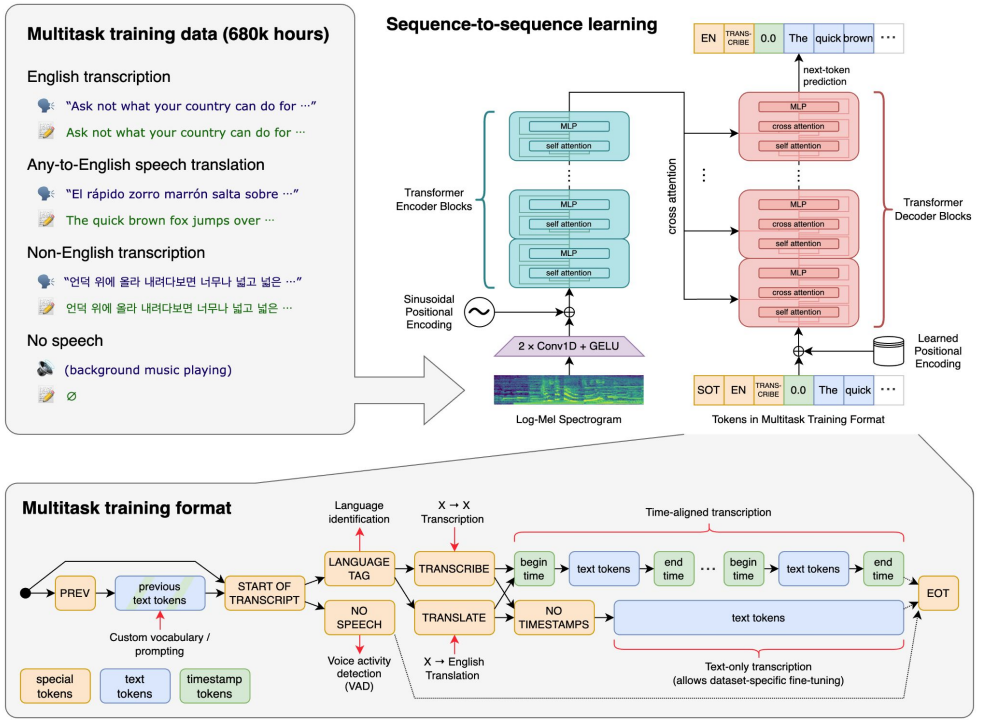
v3 August 22 **v4 November 22** **v5 Mach 23**

https://arstechnica.com/information-technology/2023/03/ai-imager-midjourney-v5-stuns-with-photorealistic-images-and-5-fingered-hands/

Deep Learning: music, speech

MusicLM: Generating Music From Text (2023)
13 authors

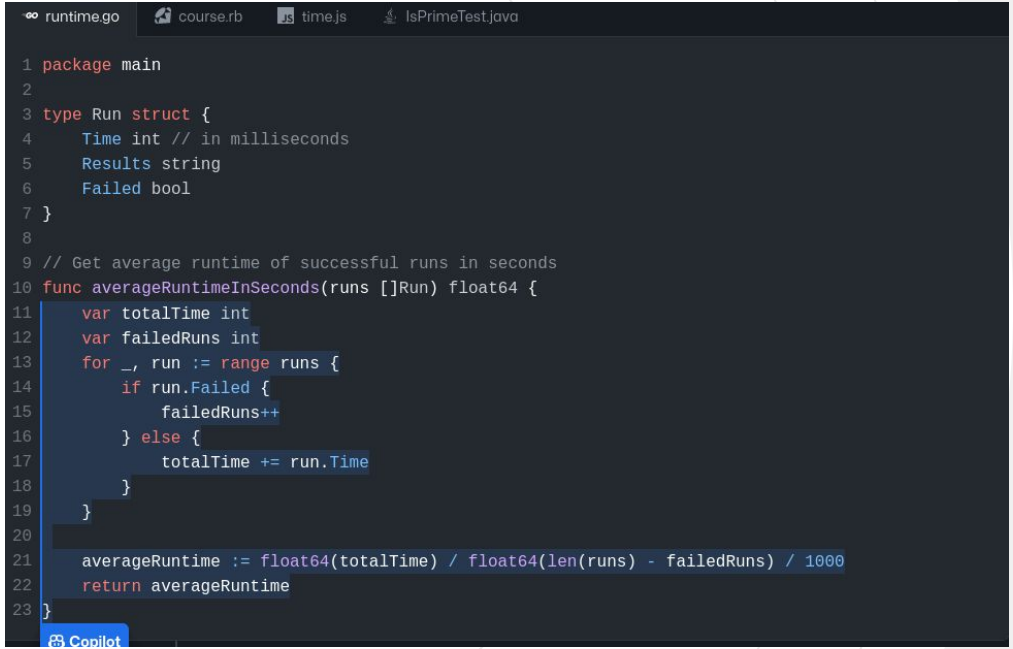
[MusicLM]
[Elevenlabs]
[Whisper]
[PromptTT2]
…



Deep Learning: coding, programming

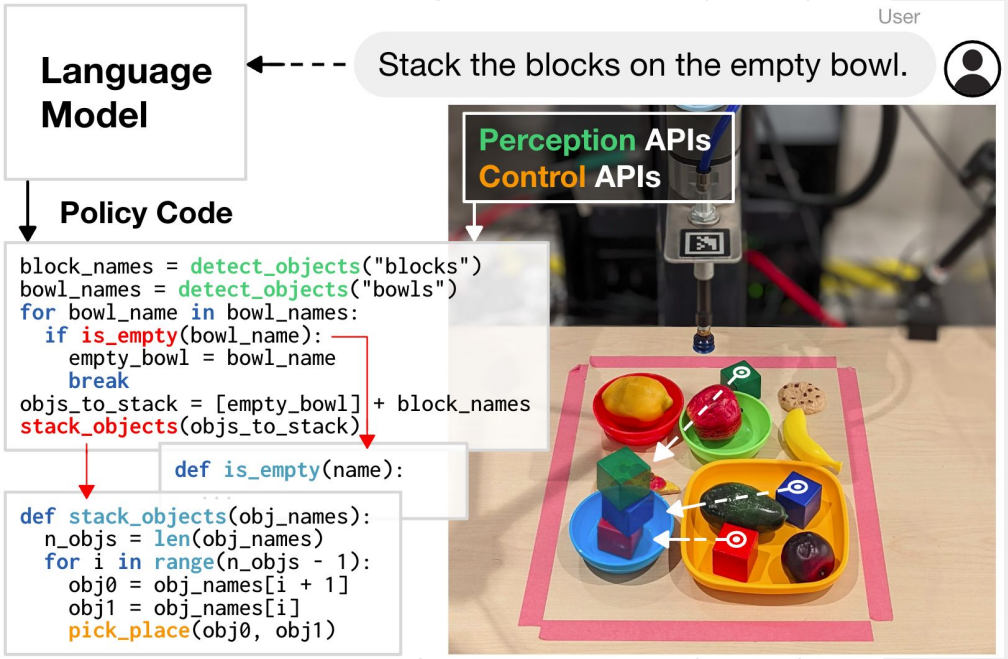
[Evaluating Large Language Models Trained on Code](#) **(2021)**
58 authors

[Codex](#)
[Copilot](#)
[Codewhisperer](#)
[ChatGPT](#)
…



Deep Learning: coding, programming

[Code as Policies: Language Model Programs for Embodied Control](#)
(2022)
8 authors



Deep Learning: 3D objects

DreamFusion: Text-to-3D using 2D Diffusion (2022)
4 authors

POINT-E
Magic3D
…

Deep Learning: videos

Make-A-Video: Text-to-Video Generation without Text-Video Data (2022)
Uriel Singer, Adam Polyak, Thomas Hayes, Xi Yin, Jie An, Songyang Zhang, Qiyuan Hu, Harry Yang, Oron Ashual, Oran Gafni, Devi Parikh, Sonal Gupta, Yaniv Taigman

Make-a-video
VEED.IO
GliaStudio
Sora (**video**)
…

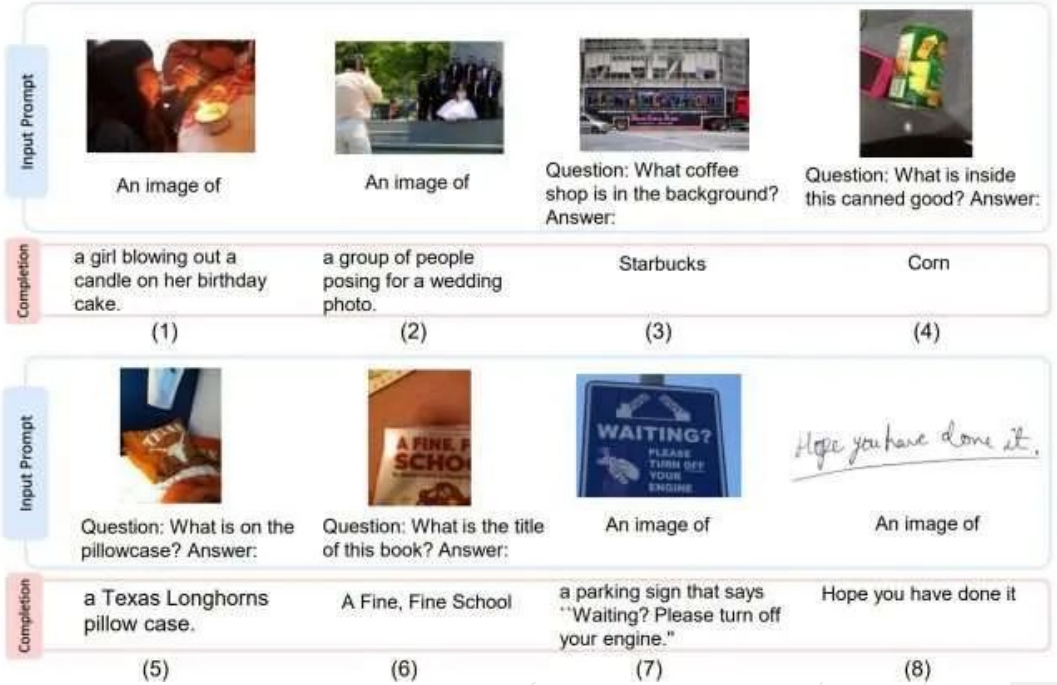
Deep Learning: language

Example of using ChatGPT, Synthesia and Descript.
https://slator.com/we-prompted-chatgpt-to-be-a-translation-manager/

Deep Learning: multimodal

[Language Is Not All You Need: Aligning Perception with Language Models](#) **(2023)**
14 authors

Kosmos-1
[Unified-IO 2](#)
…



Deep Learning: dubbing

[Example of translating, dubbing and changing facial expressions](#) by HeyGen

Deep Learning: robotics

[Atlas from Boston Dynamics]

2

Language-centered AI

AI overview

- AI techniques/methods: ML, DL, RL, etc.
- Functional applications:
  - Language Technology
  - vision
  - robotics
  - *Data Science*
- Fields of application:
  - Health, public administrations, tourism, internet, technological surveillance, security, etc.

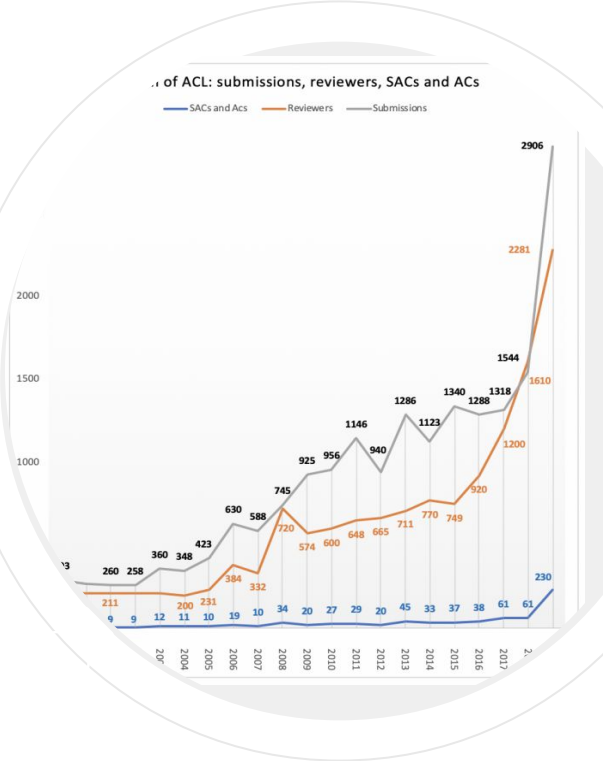
Language Technology

>80% unstructured digital information

Text (multilingual), audio, video

Natural Language Processing is the area of Artificial Intelligence that deals with written and spoken (or sign) language

- Automatic Translation
- Extraction and Recovery of information
- Speech Recognition and Synthesis
- Conversational systems (chatbots)
- …



Large Language Models

PaLM explains an original joke with two-shot prompts.

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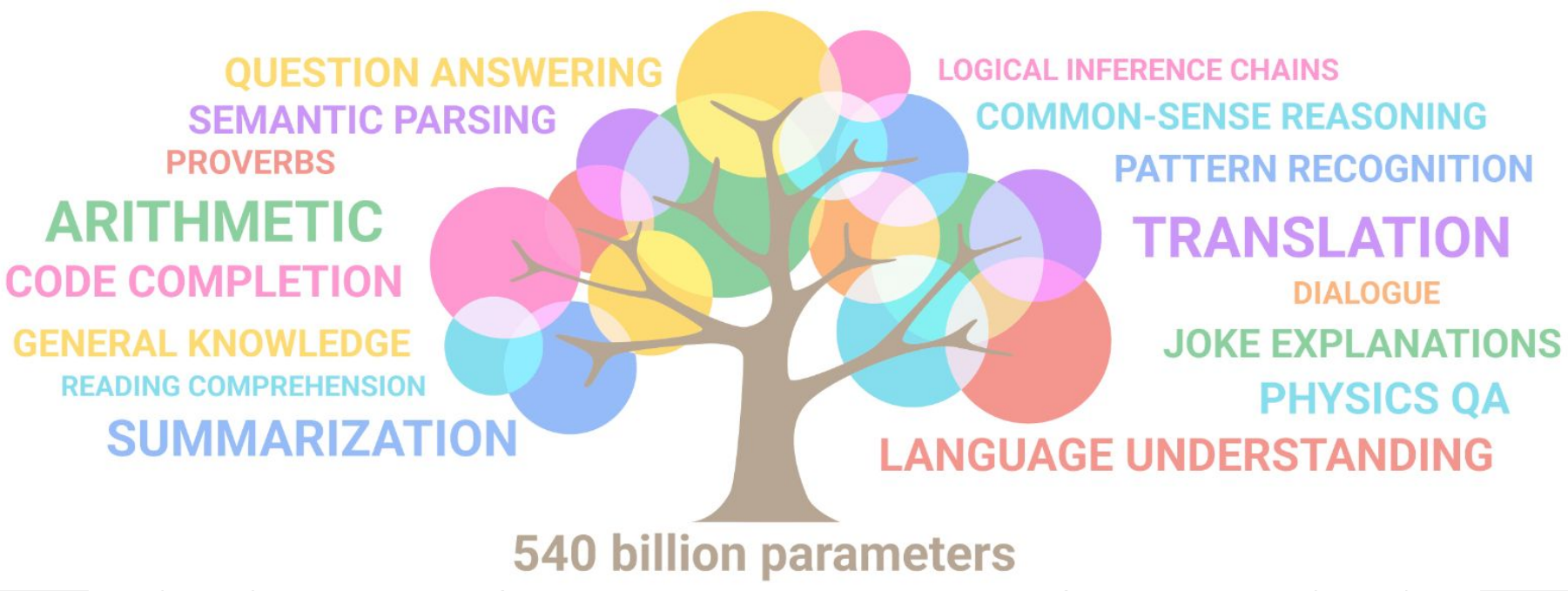
Aakanksha Chowdhery, + 67 authors

Experts, Data, HPC

Large Language Models



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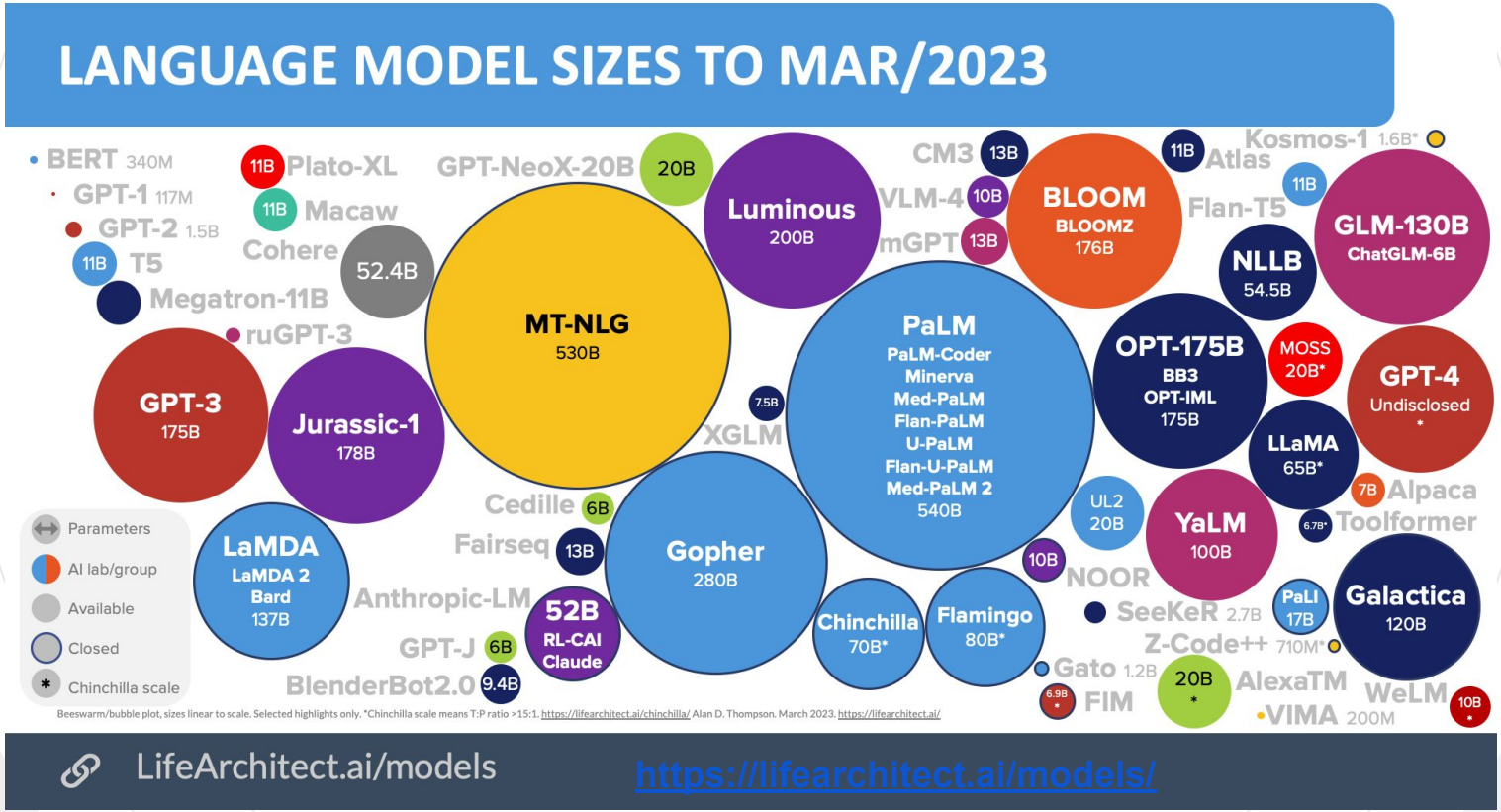
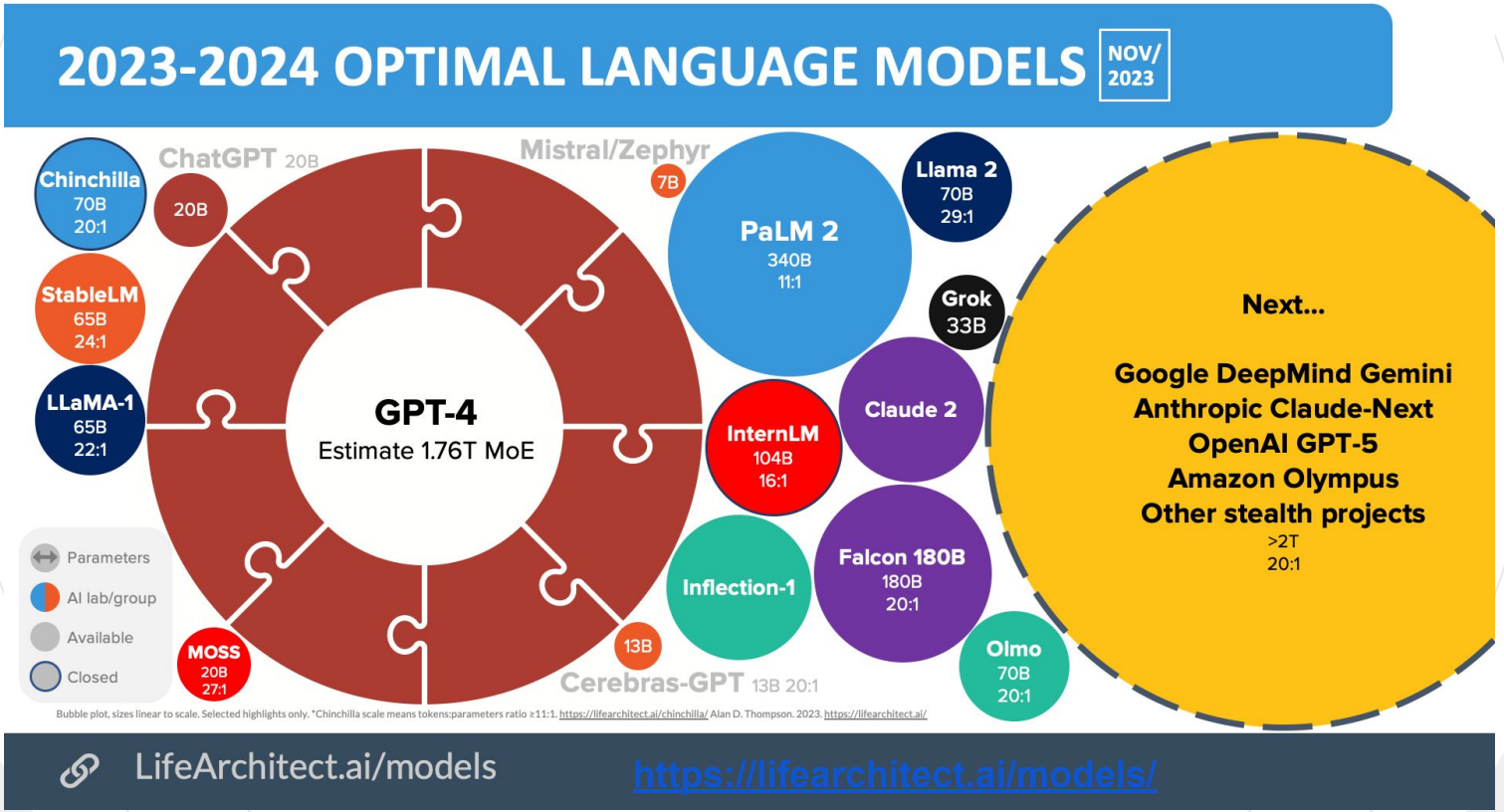
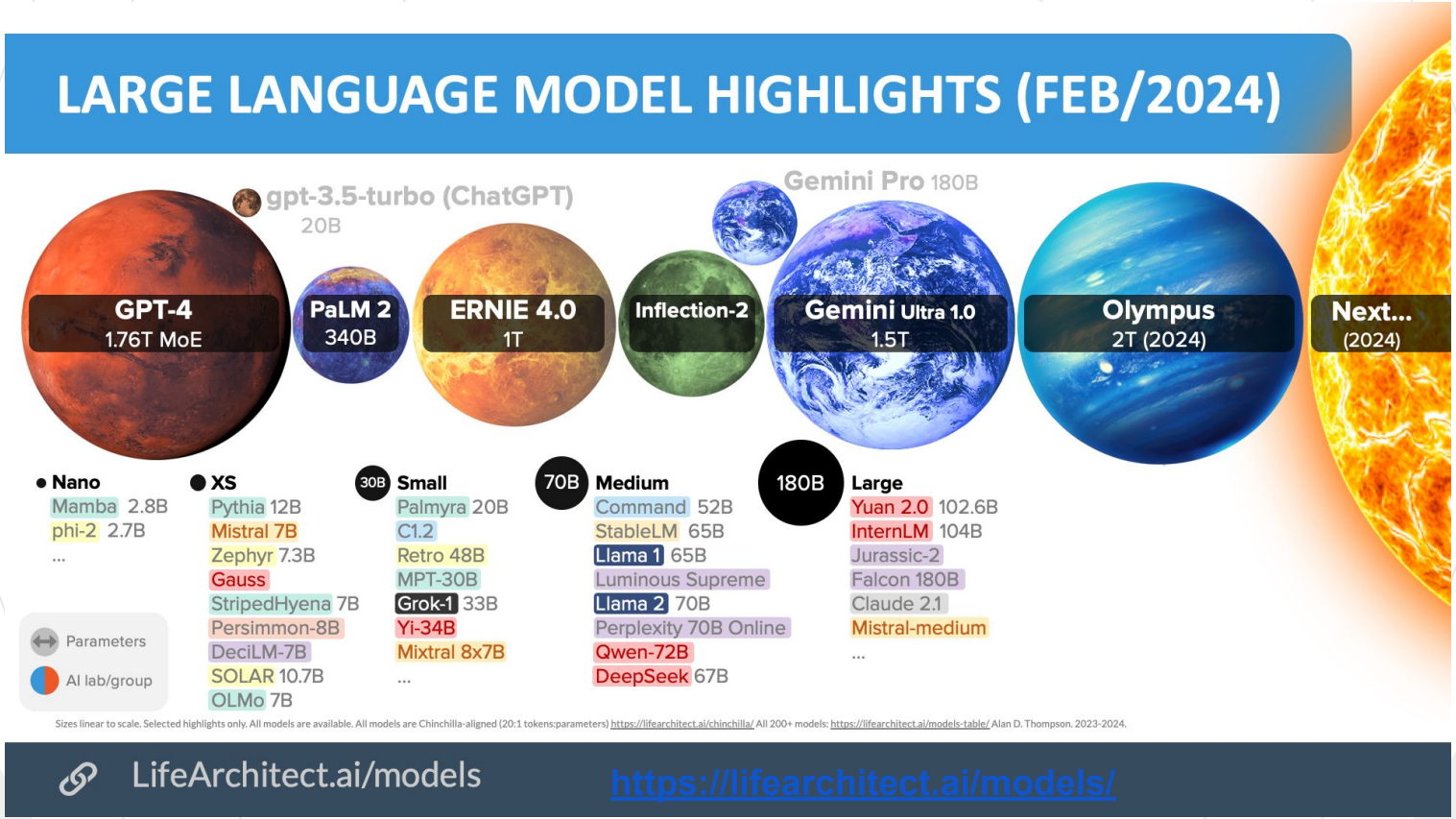


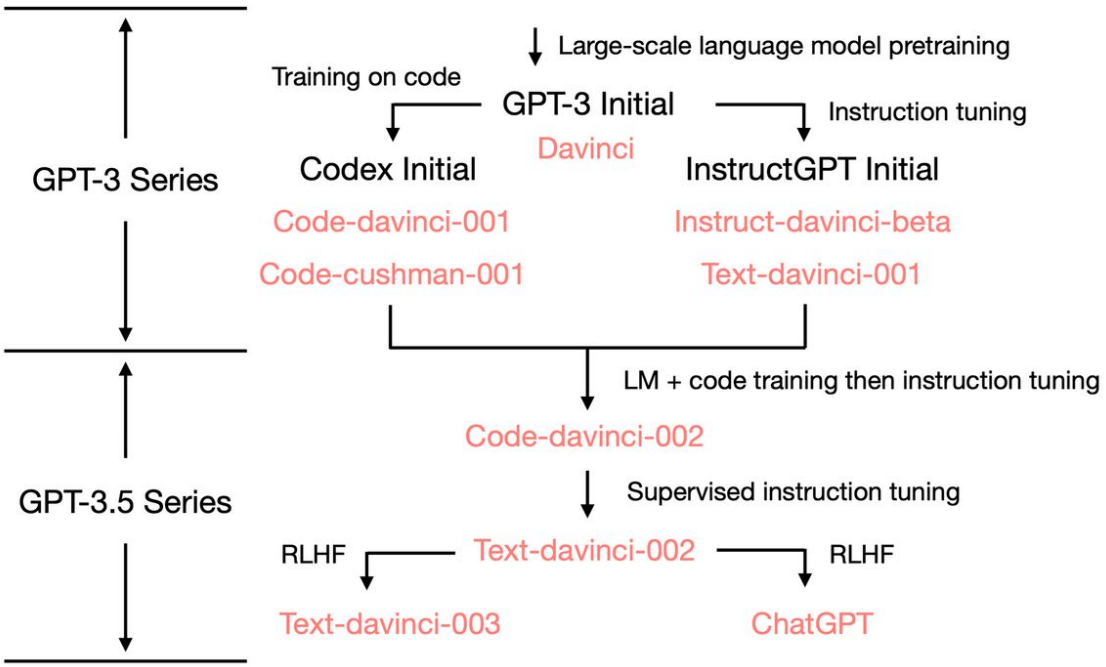
Large Language Models



Large Language Models

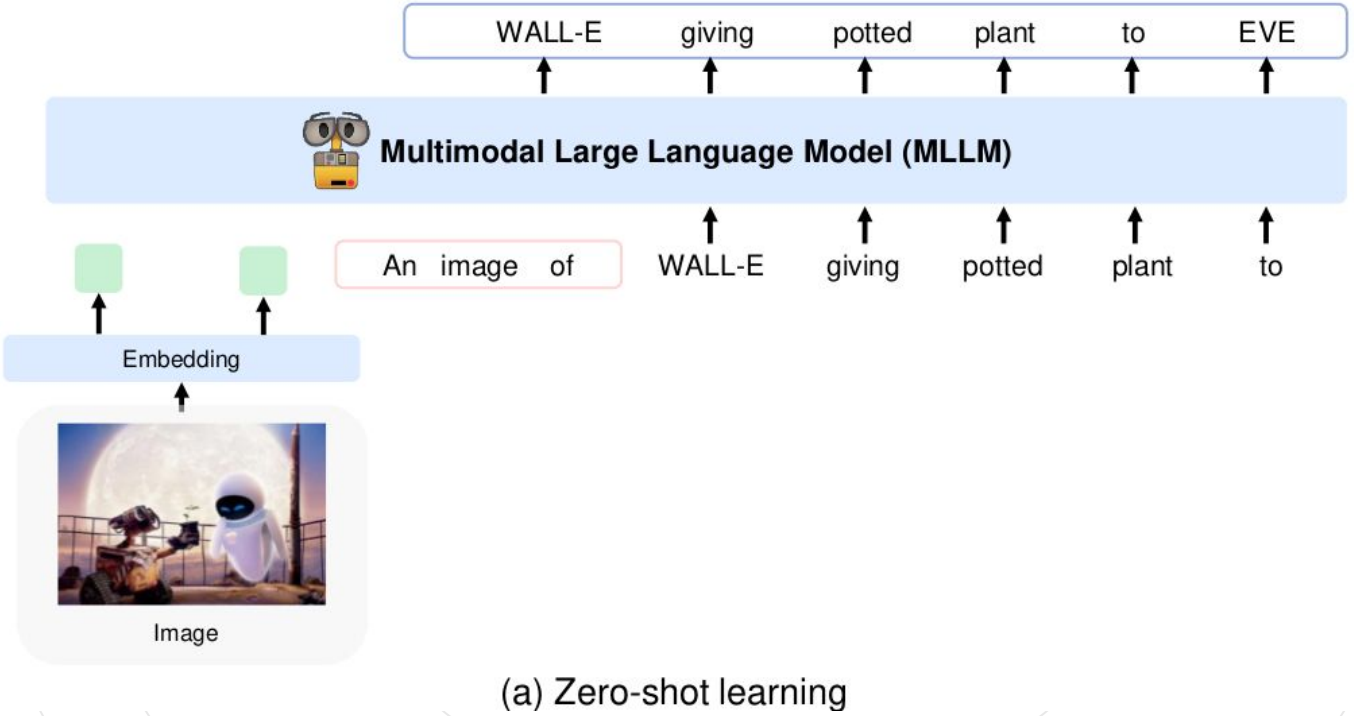


Large Language Models



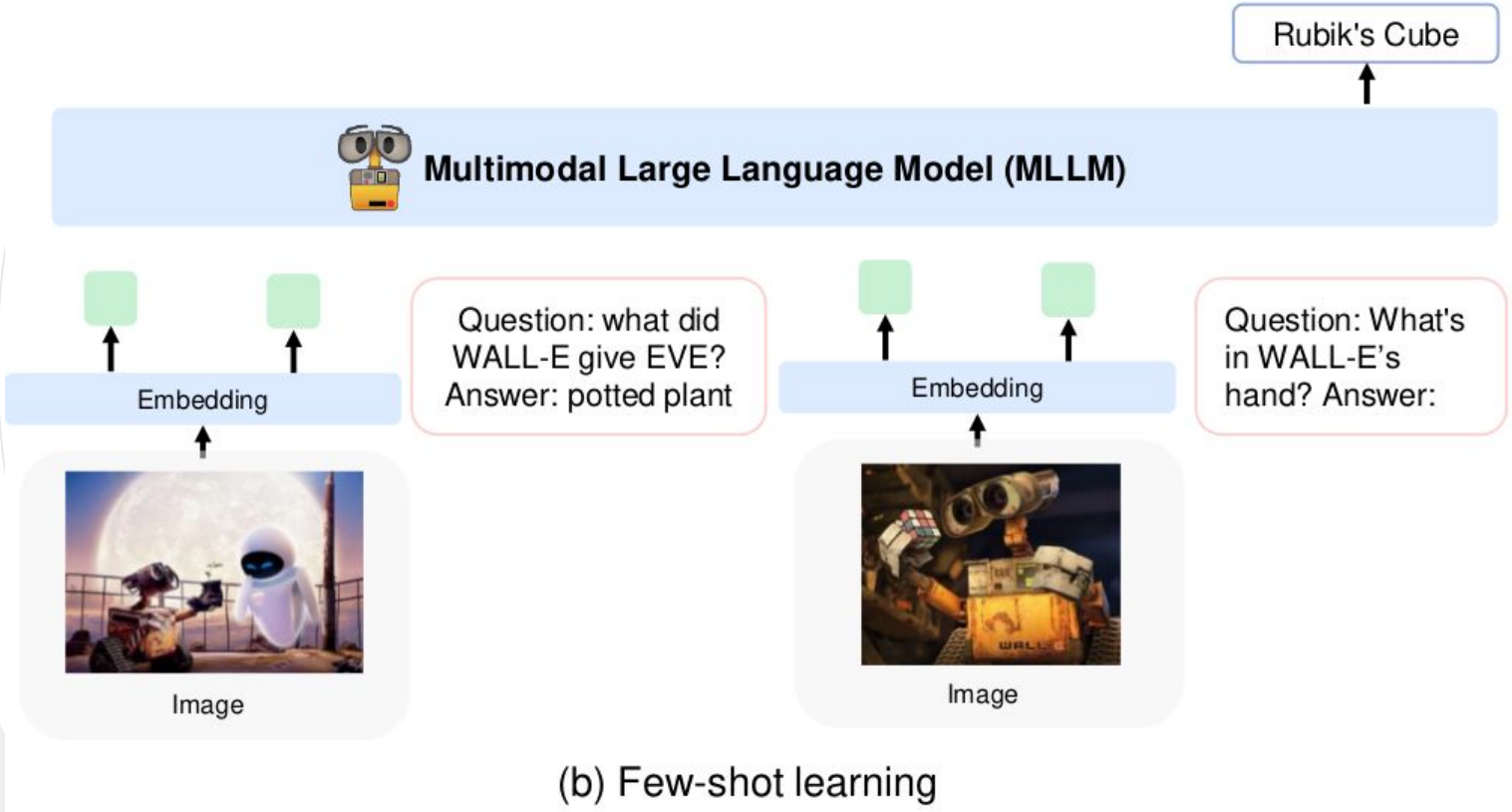
https://yaofu.notion.site/How-does-GPT-Obtain-its-Ability-Tracing-Emergent-Abilities-of-Language-Models-to-their-Sources-b9a57ac0fcf74f30a1ab9e3e36fa1dc1

LLMs: Zero-shot



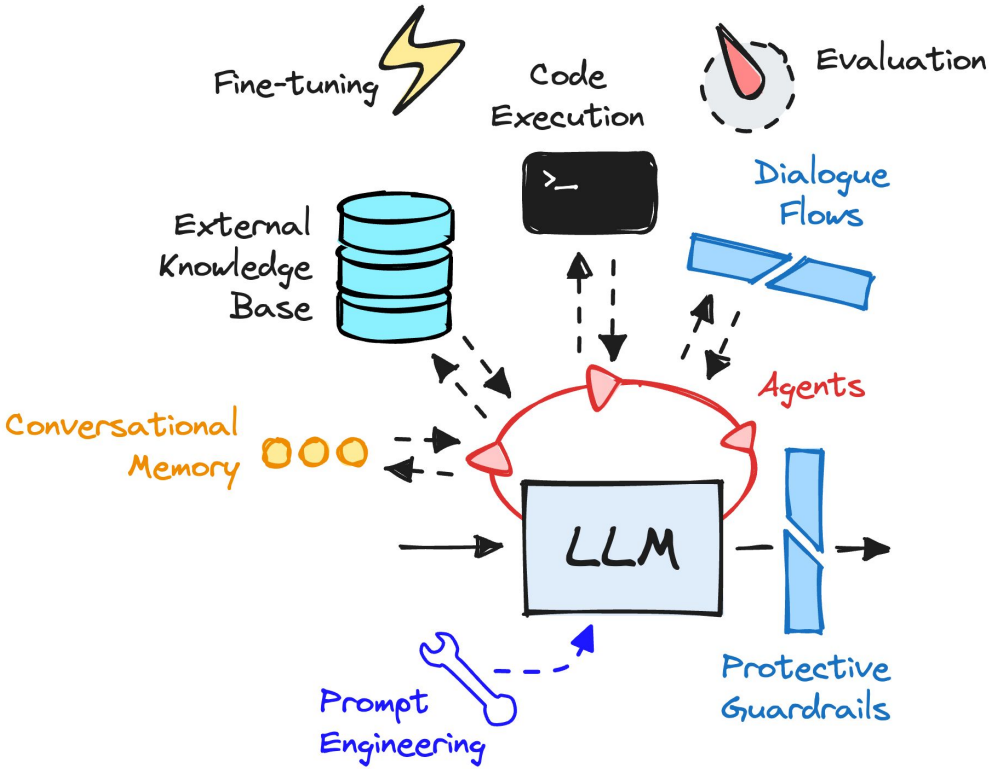
(a) Zero-shot learning

LLMs: few-shot



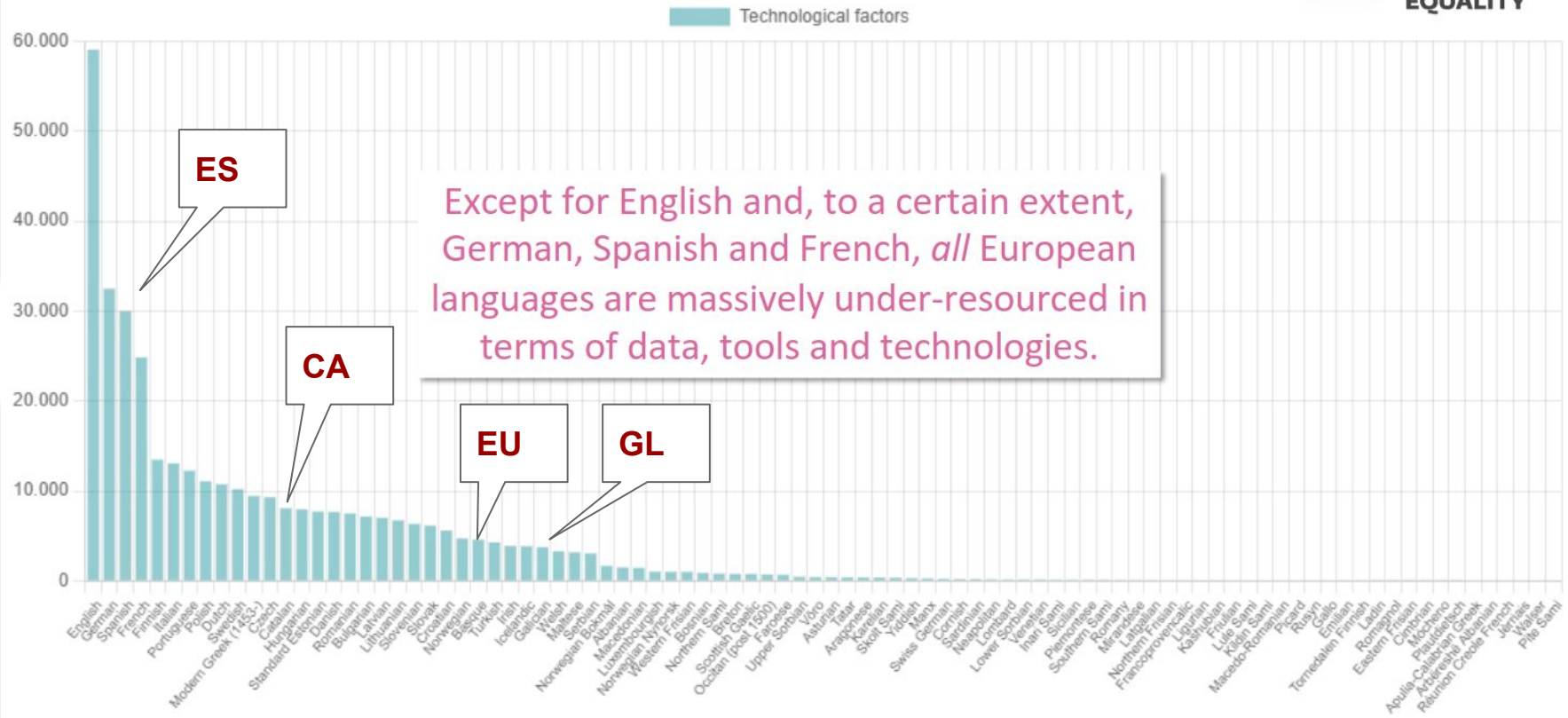
(b) Few-shot learning

Language Agents



LLM ecosystem components.

DLE Metric: Technological Scores



[European Language Equality]

3

Some reports

Reports AI & LT

- The AI index
- State of AI
- AI watch
- OECD.AI

- European Language Equality

4

Summary

Summary

- **Unthinkable** AI applications just a few years ago
- Even more **amazing** results in the near future (day by day)
- Experts, Supercomputing, Data …

- Resources (funding) Experts, Supercomputing, **Data** …
- **Coordination** and cooperation (EU, national, regional)
  - Administration, academia, technology centers, companies


eman ta zabal zazu
Universidad del País Vasco
Euskal Herriko Unibertsitatea
HiTZ
Hizkuntza Teknologiako Zentroa
Basque Center for Language Technology
German Rigau Claramunt
hitz.eus