DevFest

DevFest Cerrado

Vini Caridá

Usando Tecnologia, Dados e AI para alavancar negócios e impactar pessoas para um mundo mais justo e evoluido.

Google Developer Groups

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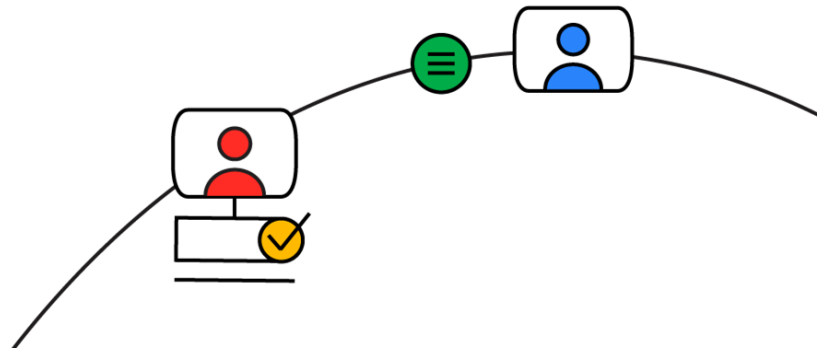
Desvendando a GenAI: Da Teoria à Aplicações com Gemini e Gemma



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Human-Centered Data & AI

Vinicius Caridá, Ph.D.

- Executive Specialist, Artificial Intelligence and Data - Itaú
- MBA Professor – FIAP and ESPM

@vinicius caridá @vfcarida @vinicius caridá @vfcarida @vinicius caridá @vfcarida

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01 GenAI, Hype ou Usual?

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Generative AI

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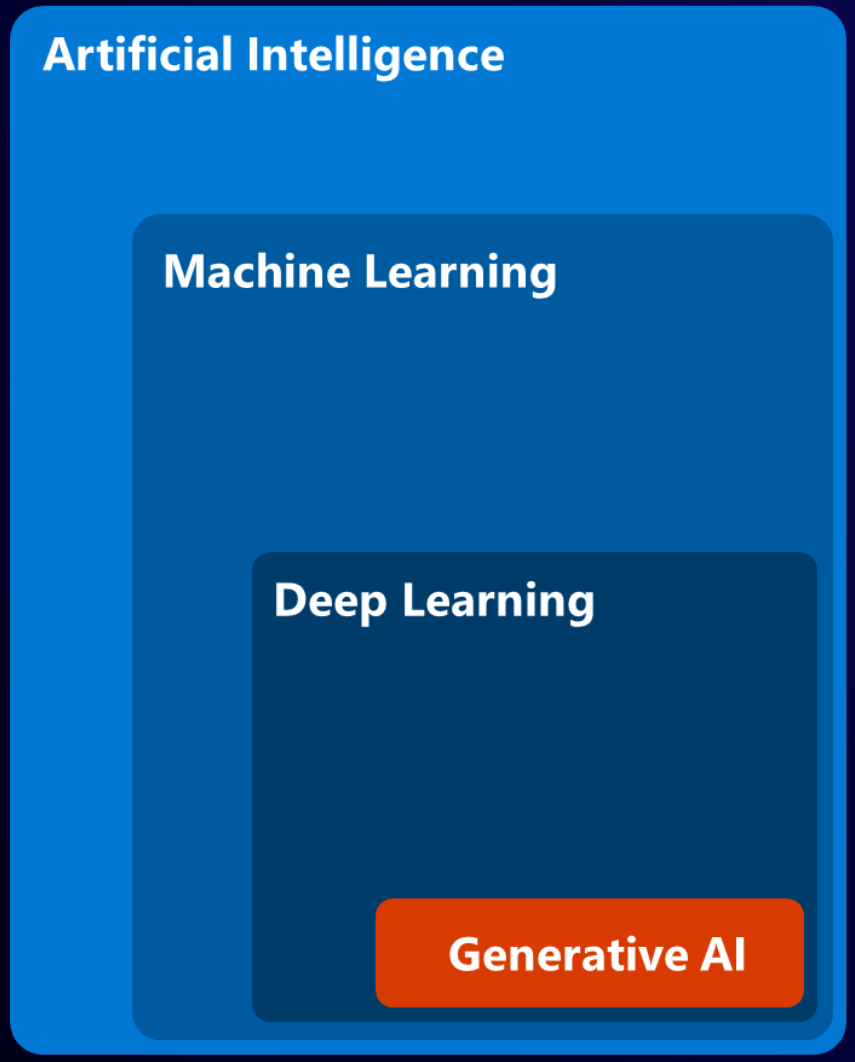

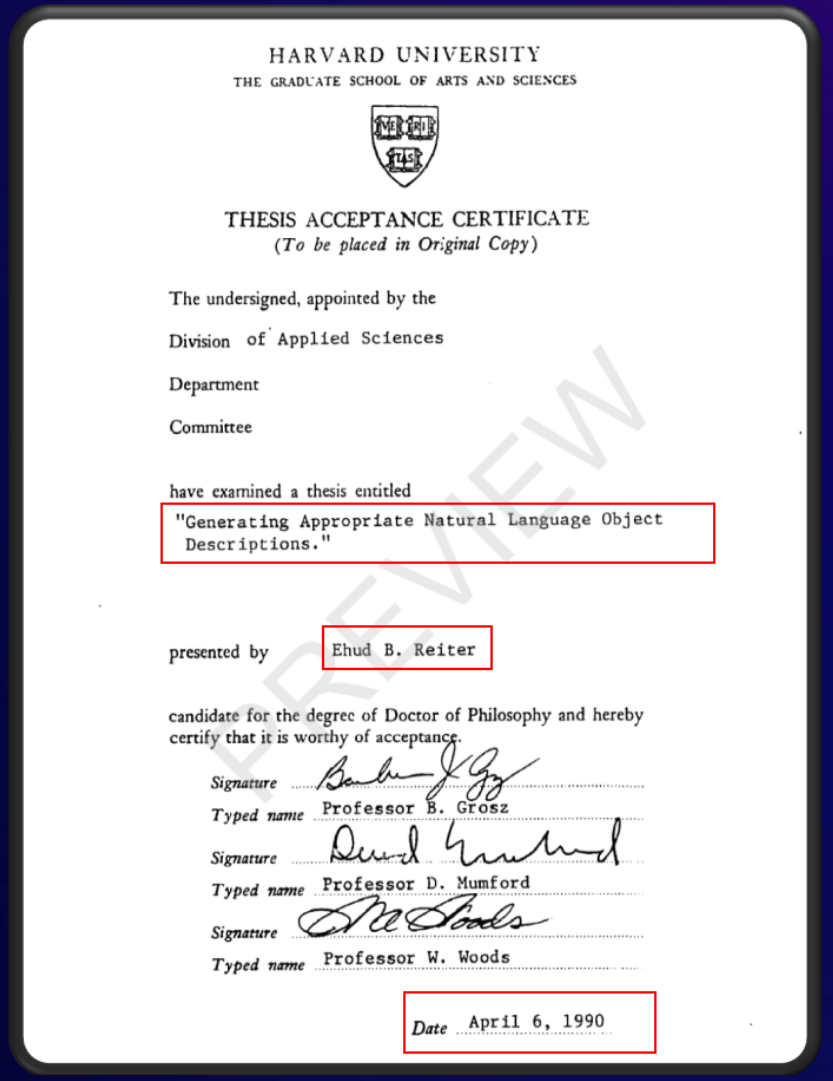

HARVARD UNIVERSITY
THE GRADUATE SCHOOL OF ARTS AND SCIENCES

THESIS ACCEPTANCE CERTIFICATE
(To be placed in Original Copy)

The undersigned, appointed by the

Division of Applied Sciences

Department

Committee

have examined a thesis entitled

"Generating Appropriate Natural Language Object Descriptions."

presented by Ehud B. Reiter

candidate for the degree of Doctor of Philosophy and hereby certify that it is worthy of acceptance.

Signature .....
Typed name Professor B. Grosz

Signature .....
Typed name Professor D. Mumford

Signature .....
Typed name Professor W. Woods

Date April 6, 1990

PREVIEW

https://www.proquest.com/openview/a17fb9188f537c2ab3df4091453547ba/

Generative AI | Hype cycle for AI

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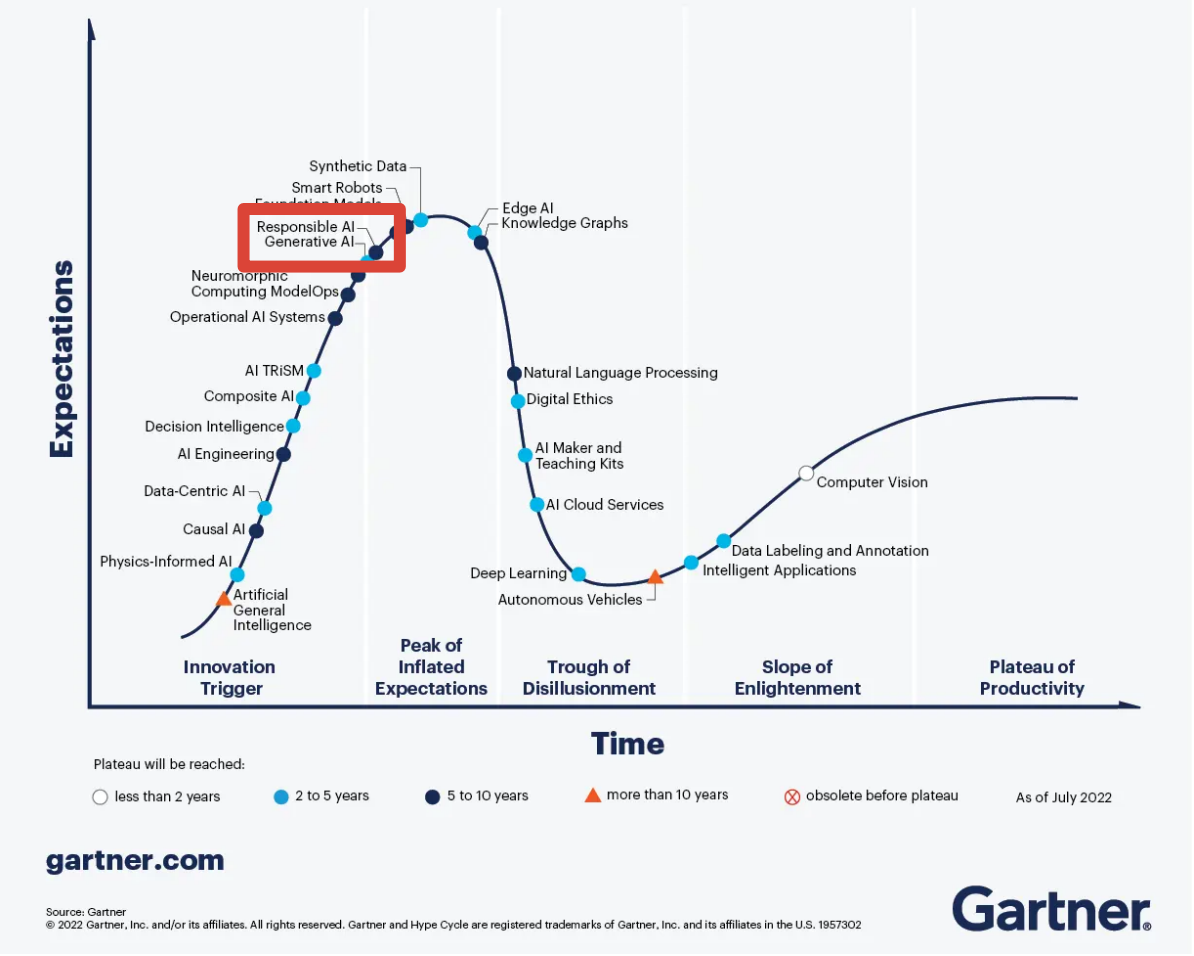
2022



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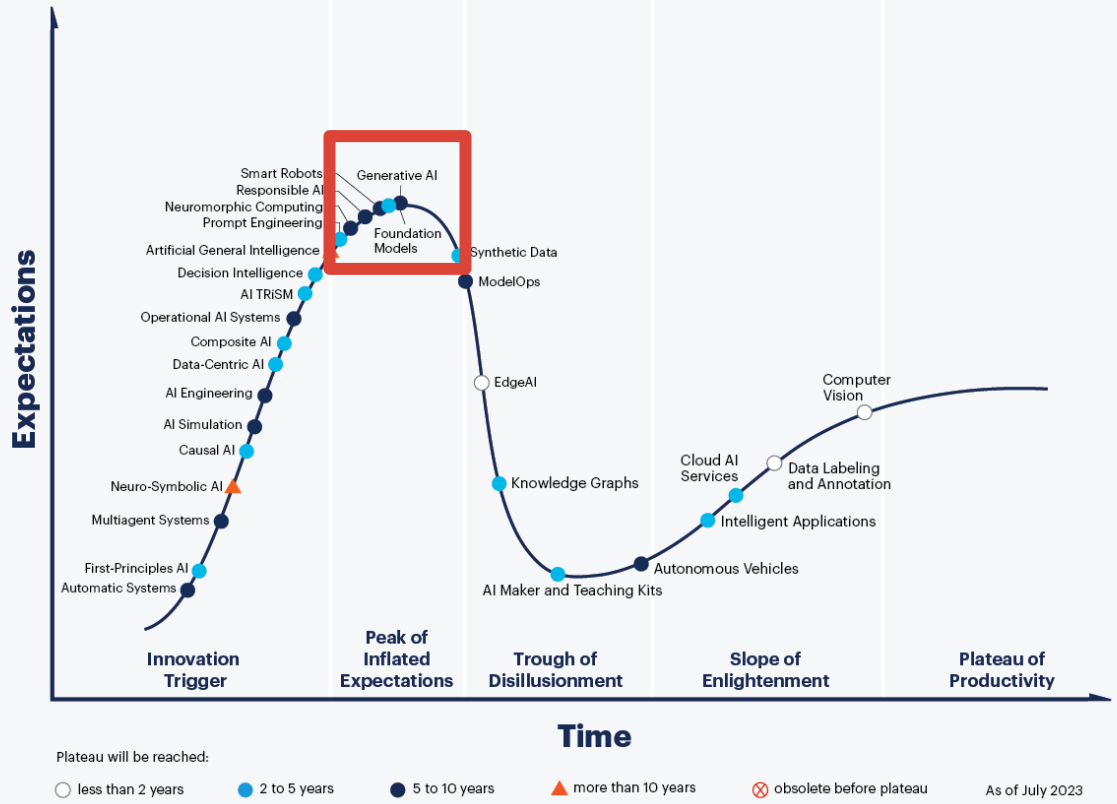

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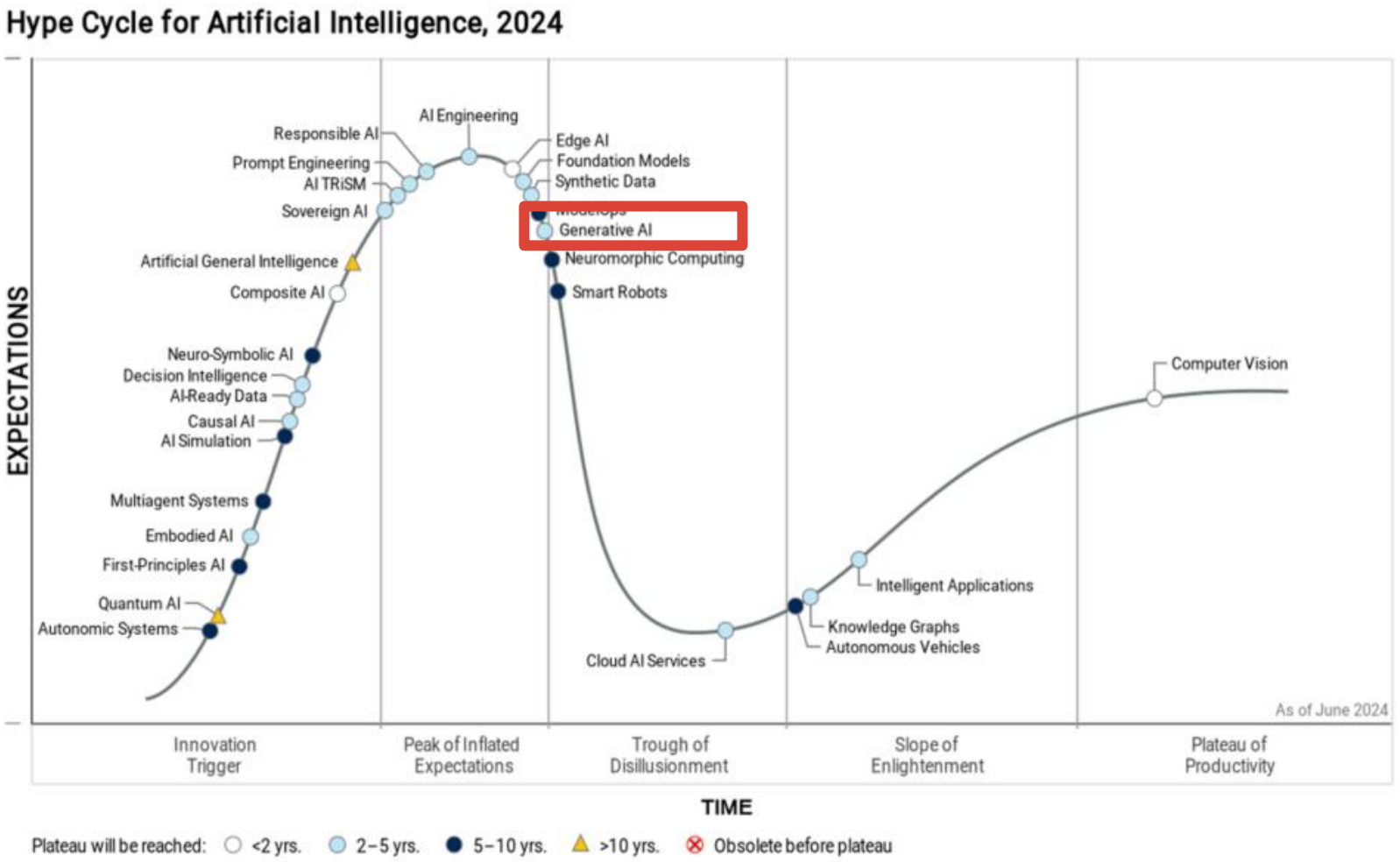
2024



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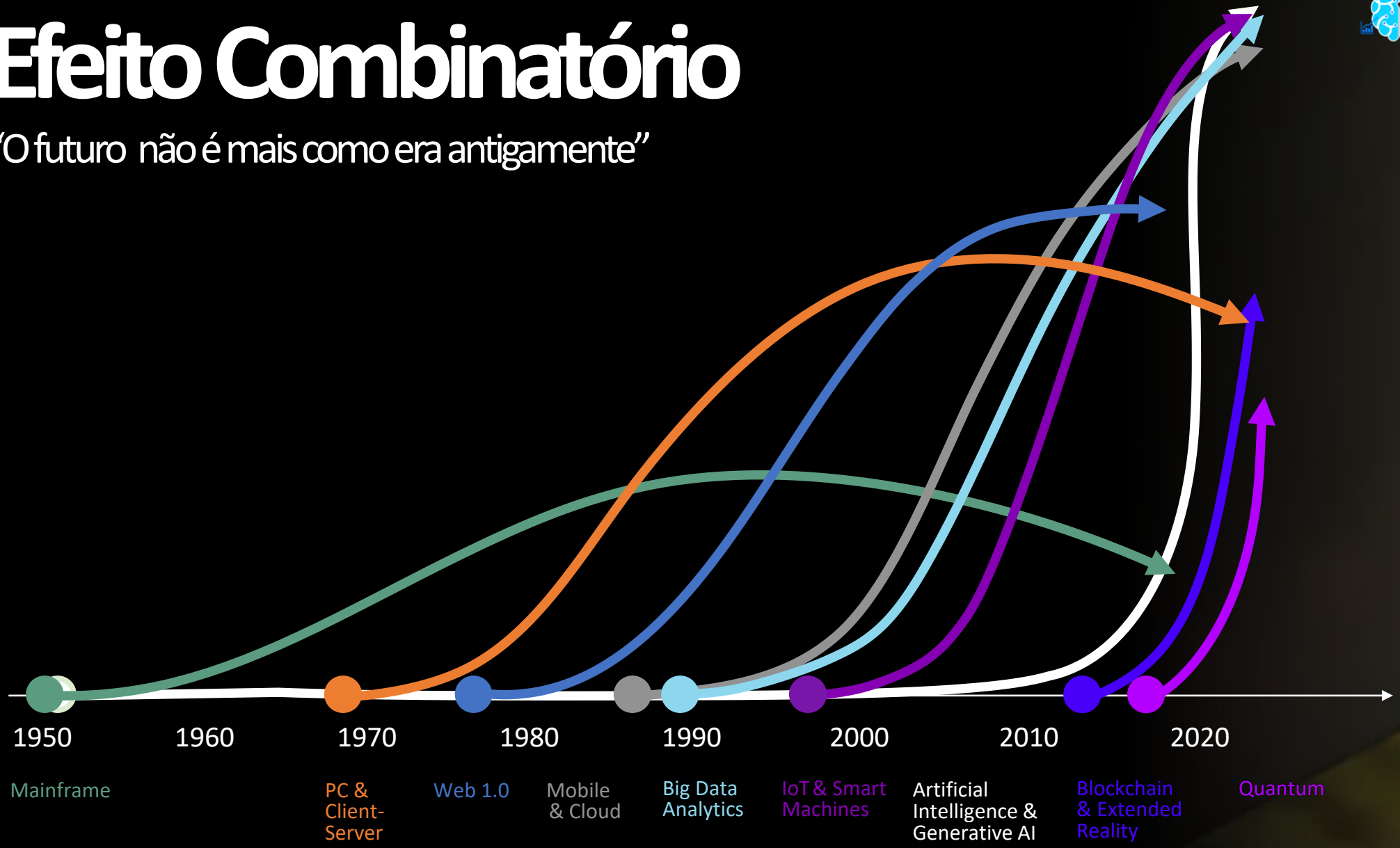
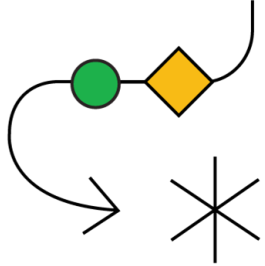
Tecnologias emergindo

Efeito Combinatório

"O futuro não é mais como era antigamente"



Fonte: Accenture Tech Vision 2022



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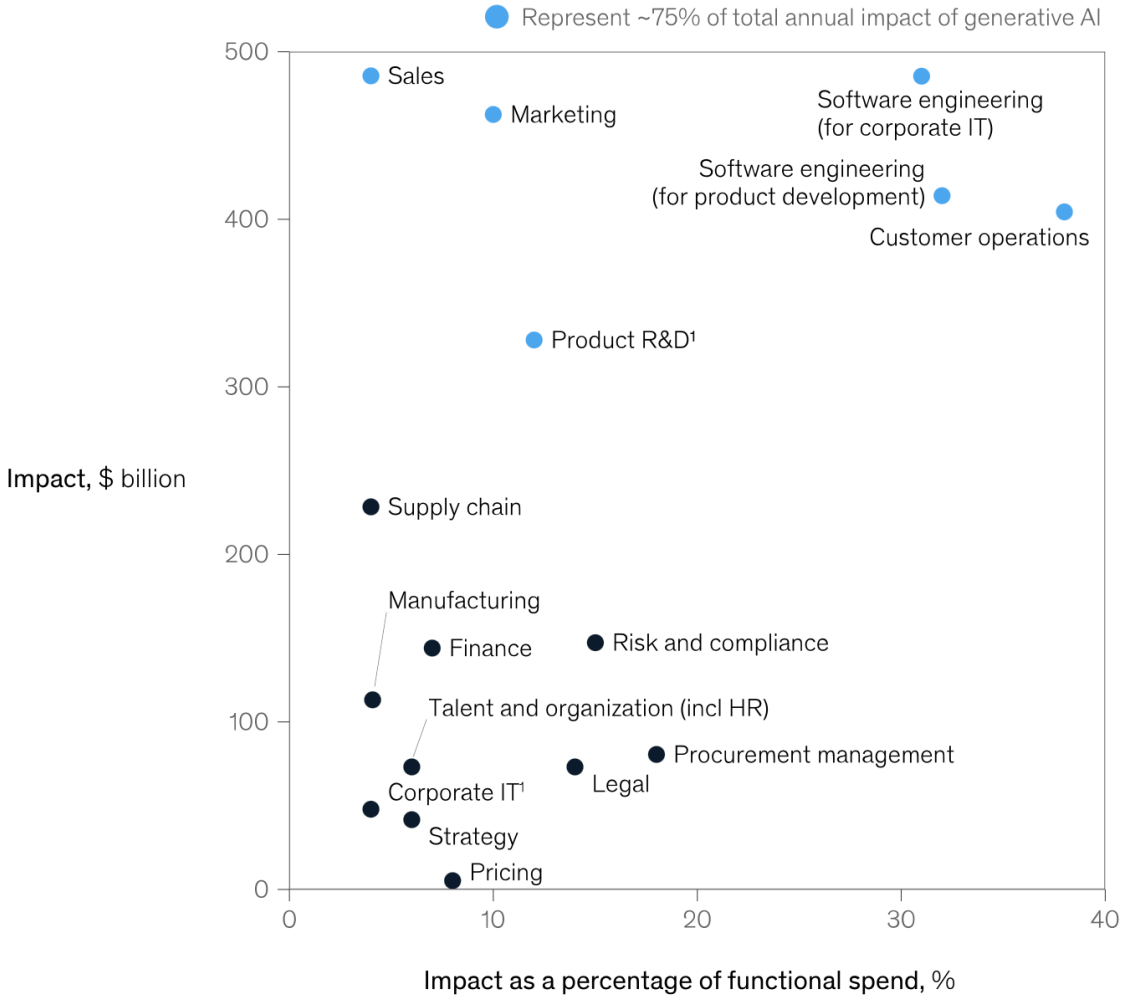
Using generative AI in just a few functions could drive most of the technology's impact across potential corporate use cases



https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/The-economic-potential-of-generative-AI-The-next-productivity-frontier

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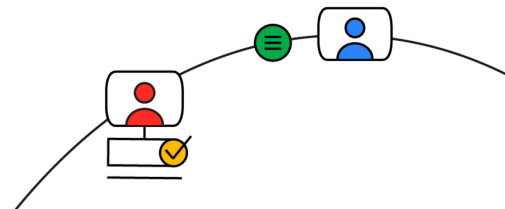

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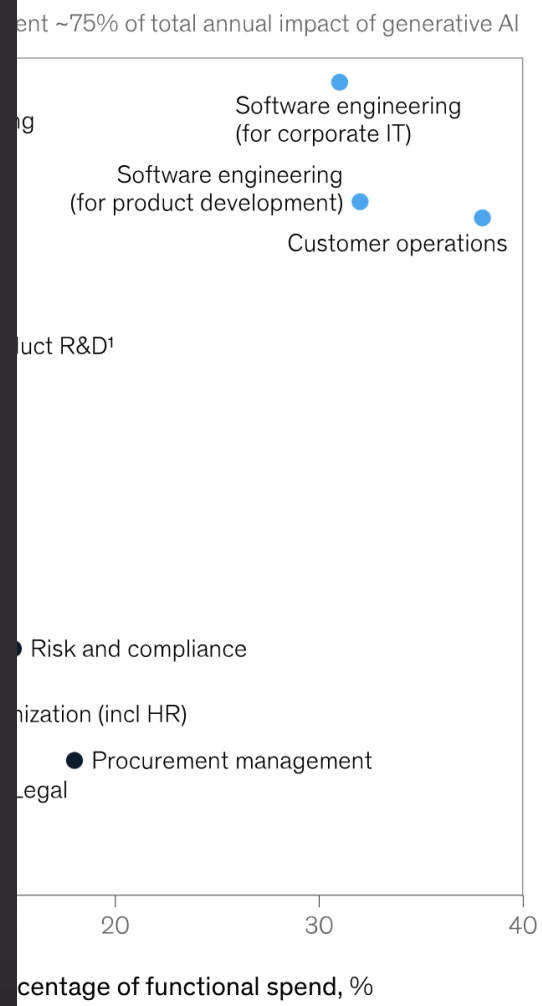
Using genera
just a few fur
could drive m
technology's
across poten
corporate us

https://www.mckinsey.com/capabilities/mc
economic-potential-of-generative-AI-The-ne



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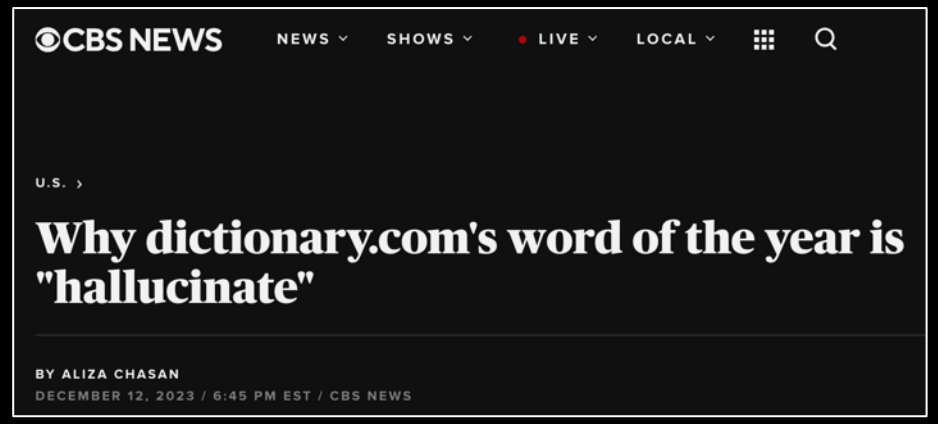
GenAI na nossa rotina


CBS NEWS NEWS SHOWS LIVE LOCAL

U.S. ›

Why dictionary.com's word of the year is "hallucinate"

BY ALIZA CHASAN
DECEMBER 12, 2023 / 6:45 PM EST / CBS NEWS

Um novo linguajar nos negócios. **&** Uma preocupação constante.

Sinais de ruptura

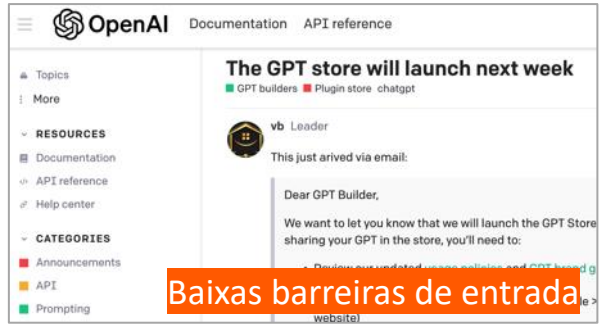

Big-name financial institutions are developing LLMs purpose-built for financial services

Bloomberg
Bloomberg is developing BloombergGPT – an LLM built for financial tasks like sentiment analysis and news classification.

JPMorgan Chase & Co.
JP Morgan Chase is developing IndexGPT, an AI chatbot for investment advice and selection.

INTUIT
Intuit partnered with OpenAI to develop GenOS – a genAI operating system that will power customer experiences across its product suite.

Investimentos do setor financeiro


OpenAI Documentation API reference

Topics
More
RESOURCES
Documentation
API reference
Help center
CATEGORIES
Announcements
API
Prompting

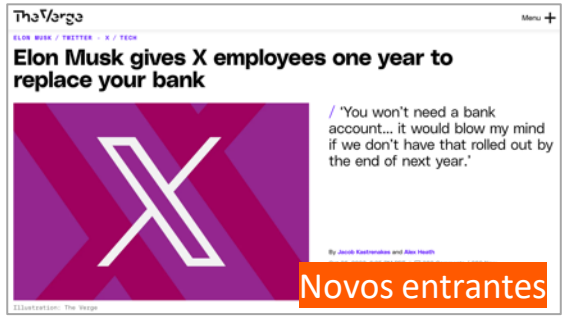
The GPT store will launch next week
GPT builders Plugin store chatgpt

vb Leader
This just arived via email:

Dear GPT Builder,

We want to let you know that we will launch the GPT Store sharing your GPT in the store, you'll need to:

Baixas barreiras de entrada


The Verge

Elon Musk gives X employees one year to replace your bank

'You won't need a bank account... it would blow my mind if we don't have that rolled out by the end of next year.'

Novos entrantes


THE FINANCIAL BRAND banking transforme

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In 2024, Gen Z Will Get Its Money Advice from TikTok. Should Banks Jump into the Conversation?

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Mudança de comportamento

O que é multimodal?

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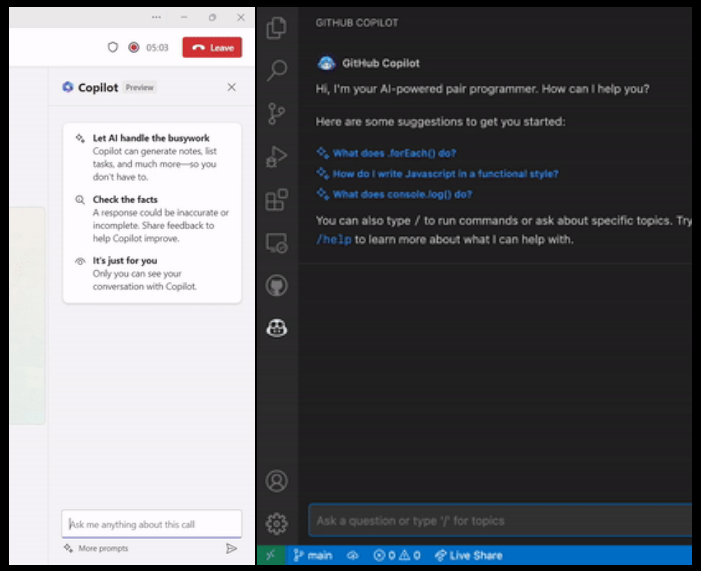
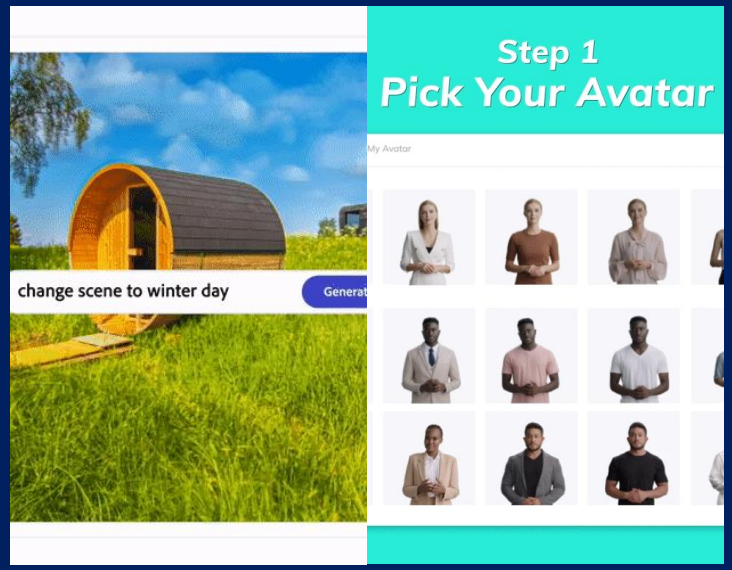
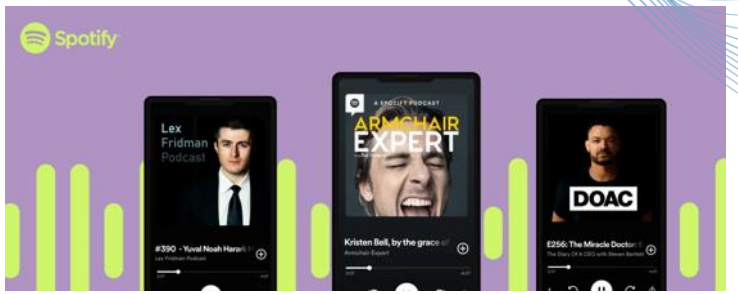
Textos & Código

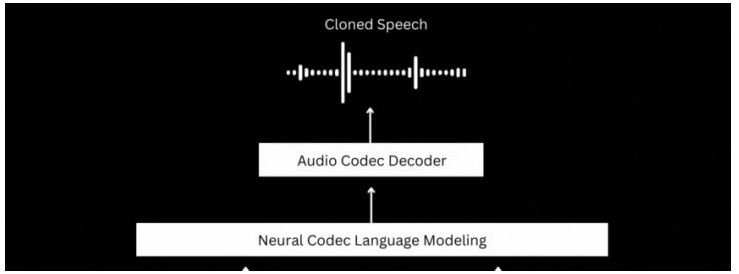


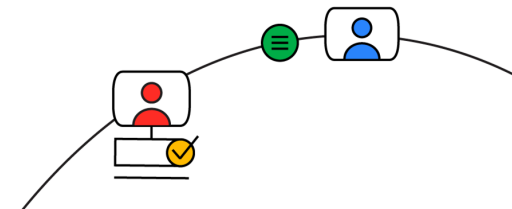
Imagens, Vídeos



Áudio







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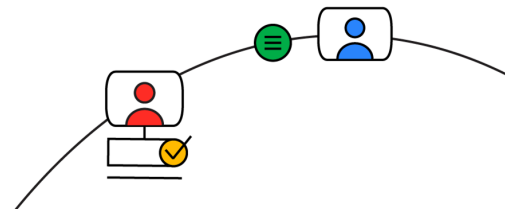

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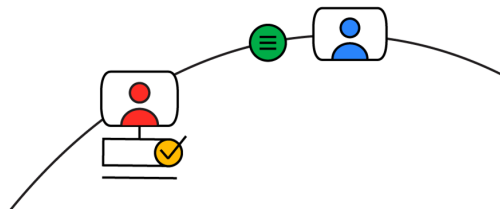

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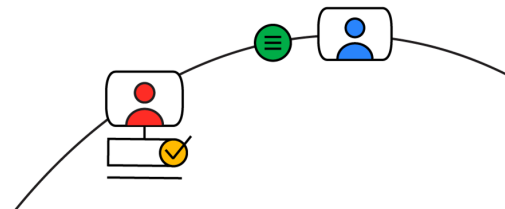
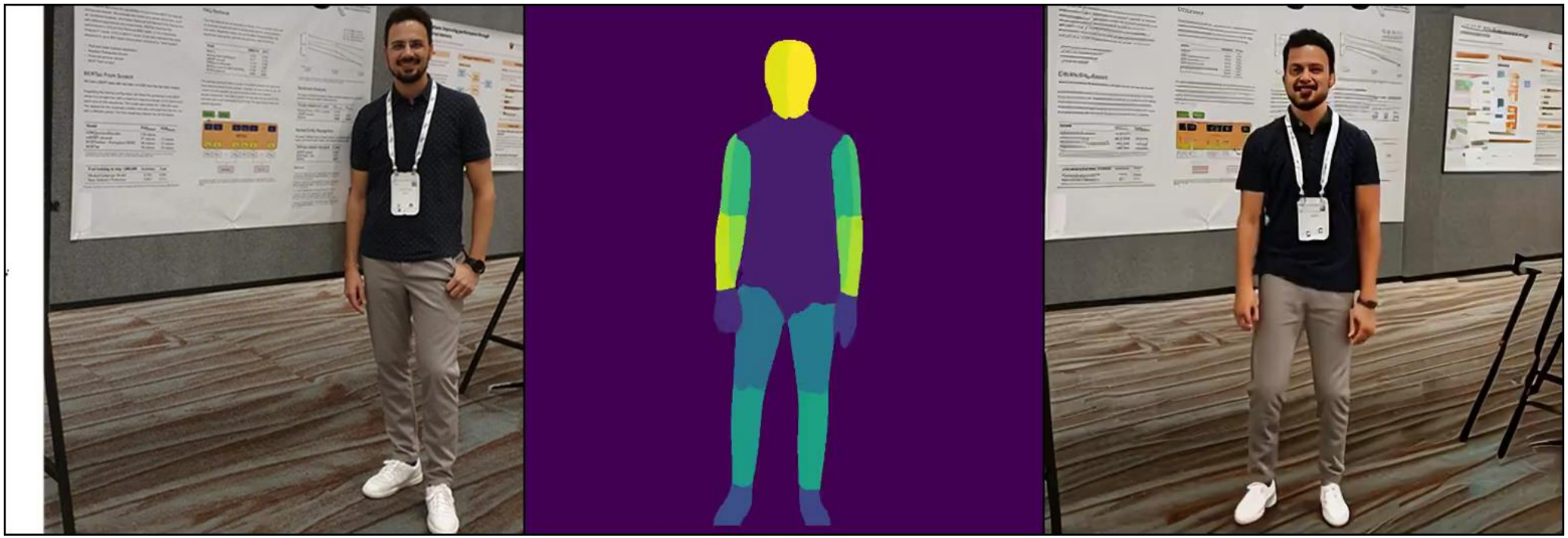
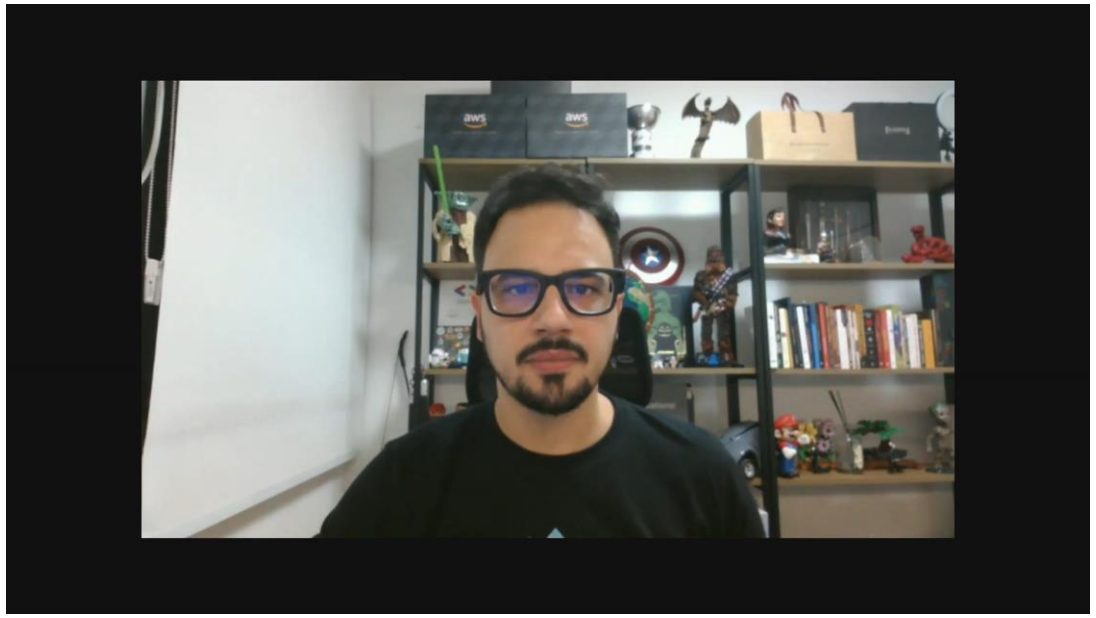
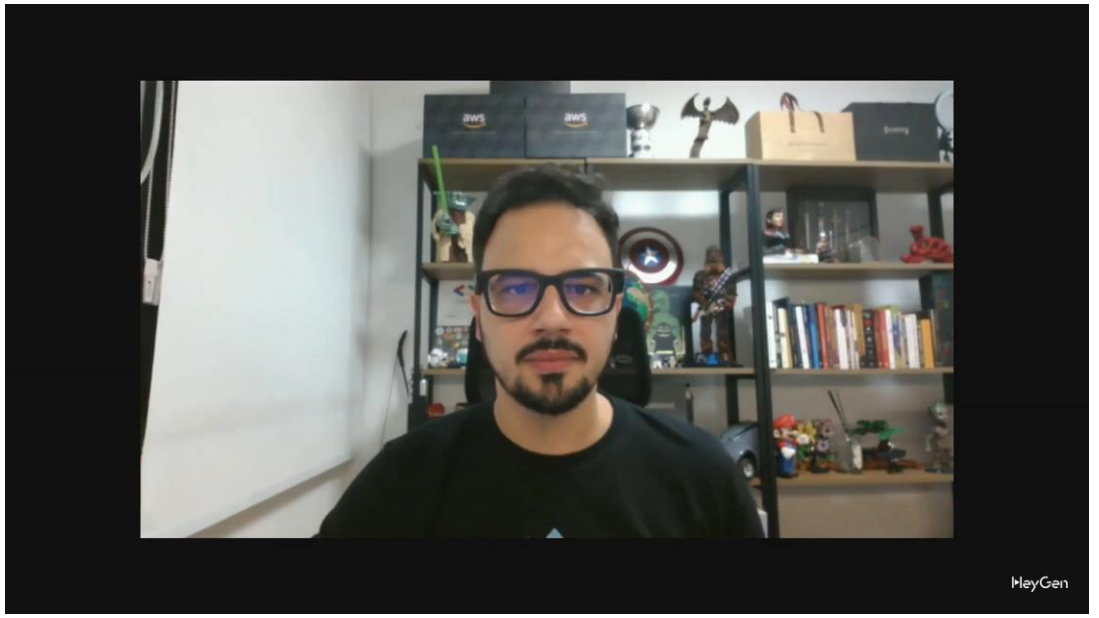
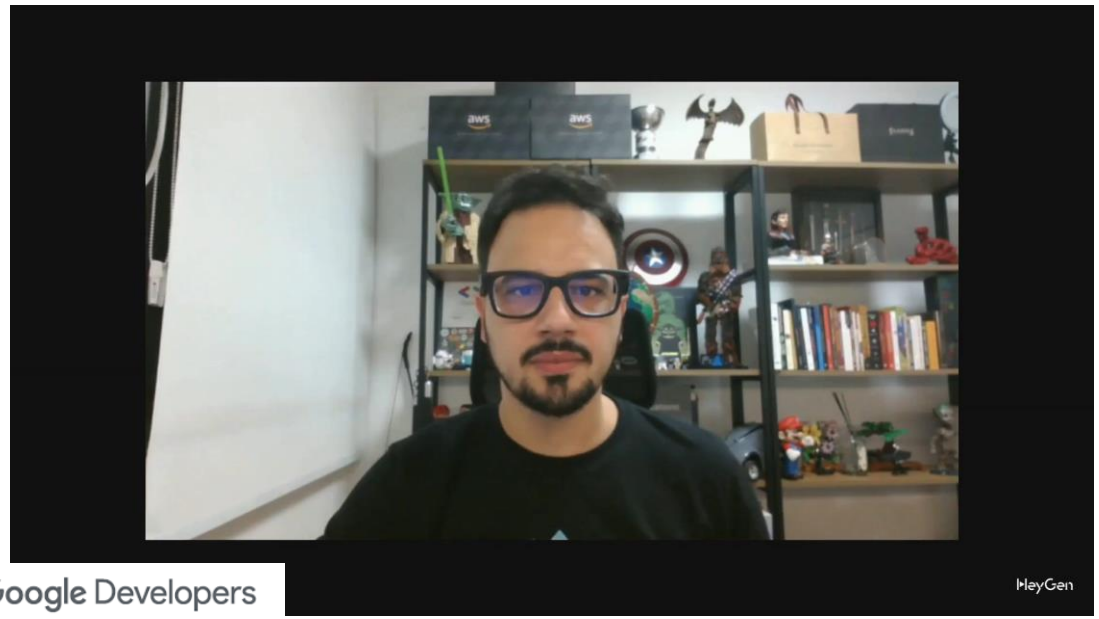
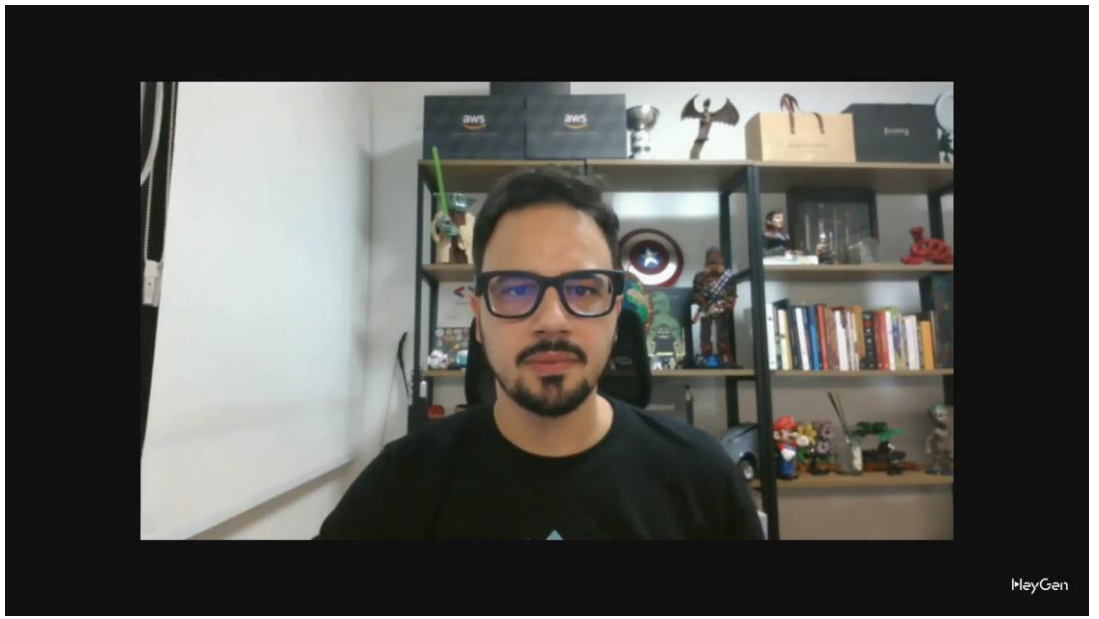







HeyGen


HeyGen


HeyGen


runway


runway


MASTER YARDA
YODDA
VIASTER YODDA
MASTER YODDA
runway


runway

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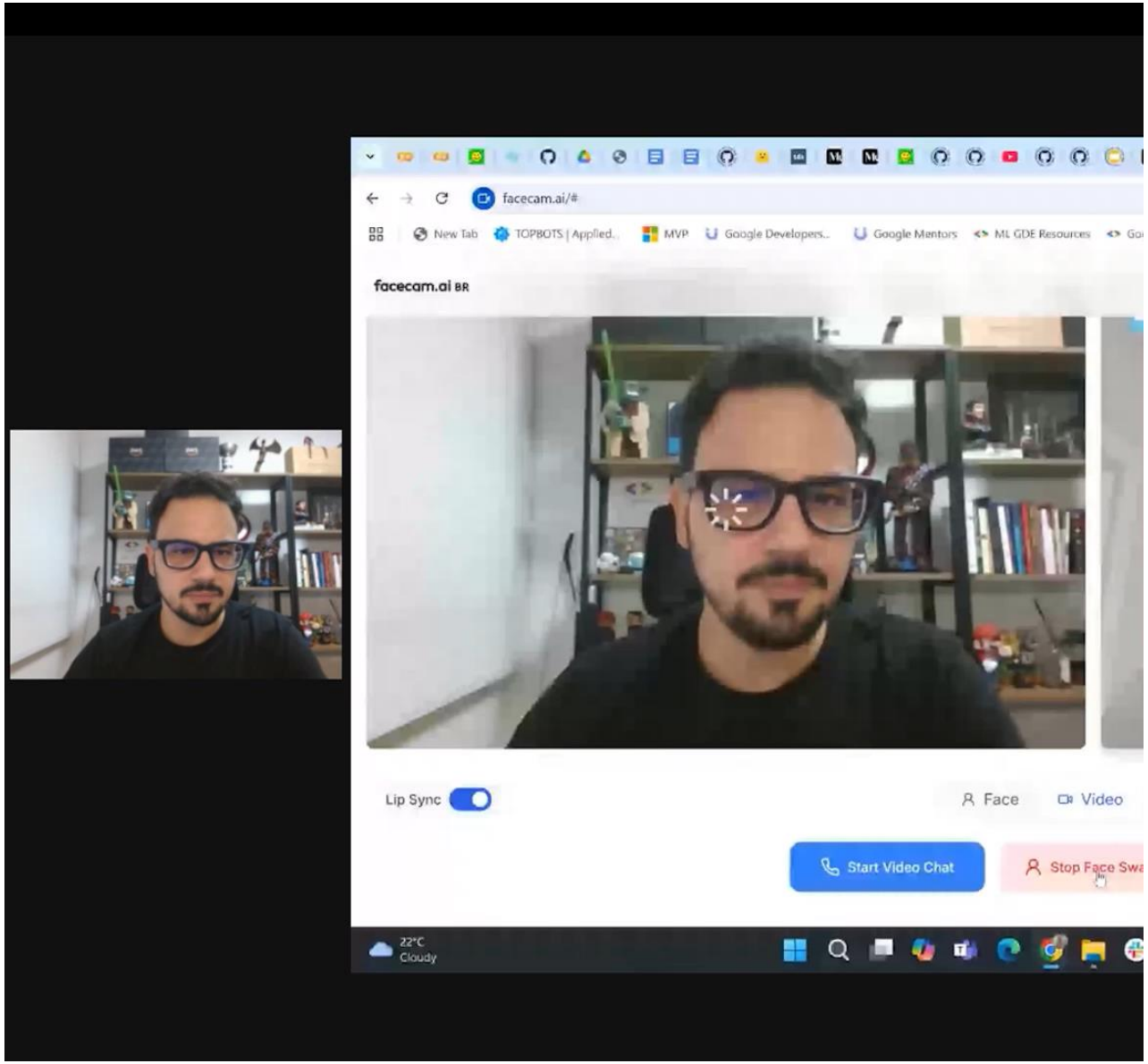

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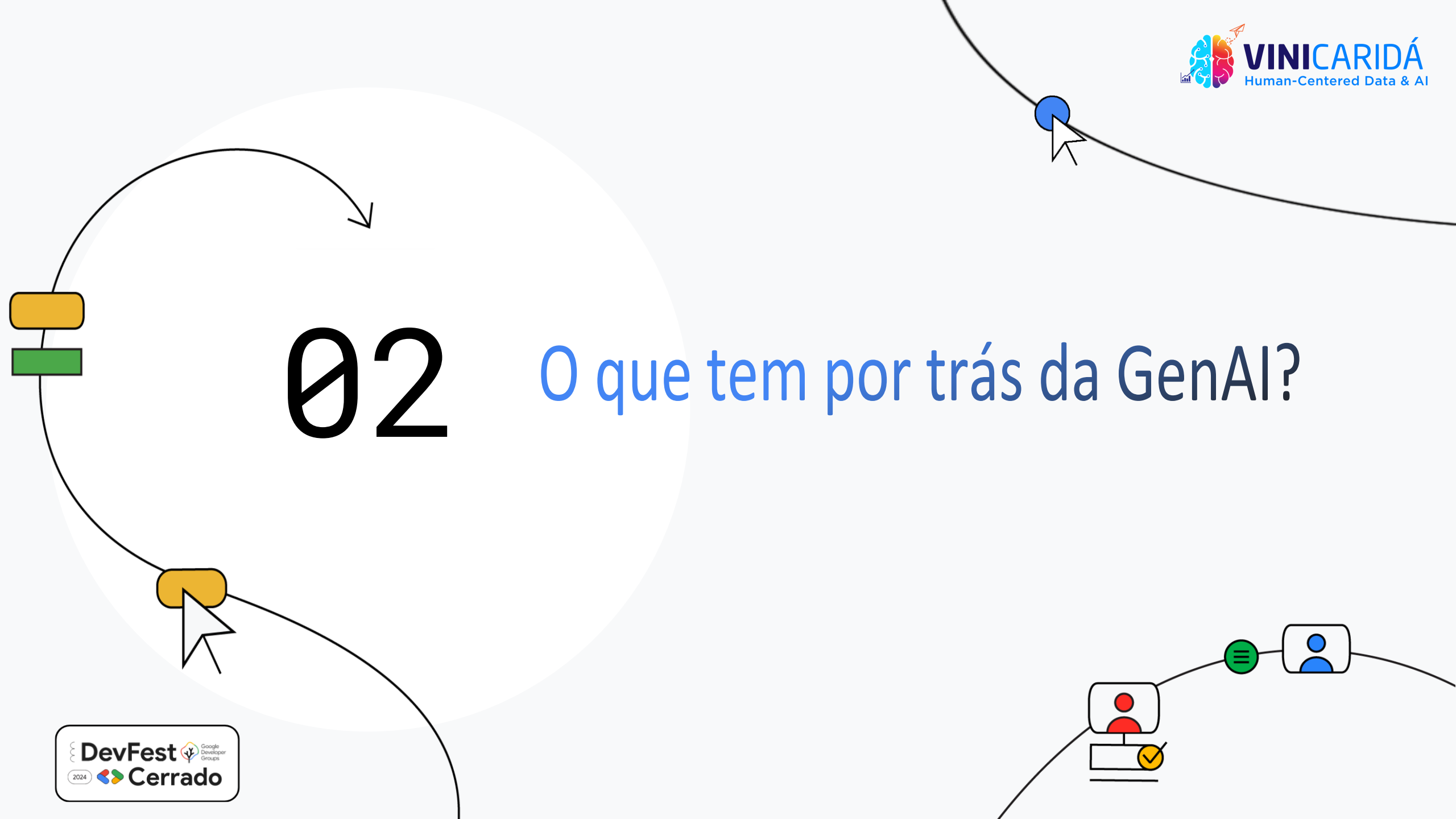
02 O que tem por trás da GenAI?



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Como representar contexto/significado das palavras

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Você sabe qual o significado da palavra **tezgüino**?

exemplo apresentado em: https://github.com/jacobeisenstein/gt-nlp-class/blob/master/notes/eisenstein-nlp-notes.pdf - cap 14

Como representar contexto/significado das palavras

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Observe a palavra **tezgüino** em diferentes contextos:

Como representar contexto/significado das palavras

VINICARIDÁ
Human-Centered Data & AI

Observe a palavra **tezgüino** em diferentes contextos:

- Uma garrafa de **tezgüino** está sobre a mesa.

Como representar contexto/significado das palavras

VINICARIDÁ
Human-Centered Data & AI

Observe a palavra **tezgüino** em diferentes contextos:

- Uma garrafa de **tezgüino** está sobre a mesa.
- Todo mundo gosta de beber **tezgüino**.

Como representar contexto/significado das palavras

VINICARIDÁ
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Observe a palavra **tezgüino** em diferentes contextos:

- Uma garrafa de **tezgüino** está sobre a mesa.
- Todo mundo gosta de beber **tezgüino**.
- Você pode ficar bêbado com **tezgüino**.

Como representar contexto/significado das palavras

VINICARIDÁ
Human-Centered Data & AI

Observe a palavra **tezgüino** em diferentes contextos:

- Uma garrafa de **tezgüino** está sobre a mesa.
- Todo mundo gosta de beber **tezgüino**.
- Você pode ficar bêbado com **tezgüino**.
- **Tezgüino** é feito de milho.

Como representar contexto/significado das palavras

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Observe a palavra **tezgüino** em diferentes contextos:

- Uma garrafa de **tezgüino** está sobre a mesa.
- Todo mundo gosta de beber **tezgüino**.
- Você pode ficar bêbado com **tezgüino**.
- **Tezgüino** é feito de milho.

Consegue entender o que é tezgüino?

Como representar contexto/significado das palavras

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Human-Centered Data & AI

Observe a palavra **tezgüino** em diferentes contextos:

- Uma garrafa de **tezgüino** está sobre a mesa.
- Todo mundo gosta de beber **tezgüino**.
- Você pode ficar bêbado com **tezgüino**.
- **Tezgüino** é feito de milho.

Com o contexto, conseguimos identificar do que se refere a palavra **tezgüino**.

Tezgüino:= é uma bebida alcoólica feita a base de milho.

Como representar contexto/significado das palavras

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Como o cérebro faz isso?

Como representar contexto/significado das palavras

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Quais outras palavras se “***encaixam***” nos slots das perguntas 1 até 4?

1. Uma garrafa de _____ está sobre a mesa.

Como representar contexto/significado das palavras

Quais outras palavras se “***encaixam***” nos slots das perguntas 1 até 4?

1. Uma garrafa de _____ está sobre a mesa.
2. Todo mundo gosta de beber _____.

Como representar contexto/significado das palavras

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Quais outras palavras se “***encaixam***” nos slots das perguntas 1 até 4?

1. Uma garrafa de _____ está sobre a mesa.
2. Todo mundo gosta de beber _____.
3. Você pode ficar bêbado com _____.

Como representar contexto/significado das palavras

VINICARIDÁ
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Quais outras palavras se “***encaixam***” nos slots das perguntas 1 até 4?

1. Uma garrafa de _____ está sobre a mesa.
2. Todo mundo gosta de beber _____.
3. Você pode ficar bêbado com _____.
4. _____ é feito de milho.

Como representar contexto/significado das palavras

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Inserindo contexto de forma manual...

1. Uma garrafa de _____ está sobre a mesa.
2. Todo mundo gosta de beber _____.
3. Você pode ficar bêbado com _____.
4. _____ é feito de milho.

	(1)	(2)	(3)	(4) ← contextos
tezgüino	1	1	1	1
som	0	0	0	0
suco de laranja	1	1	0	0
vinho	1	1	1	0

Como representar contexto/significado das palavras

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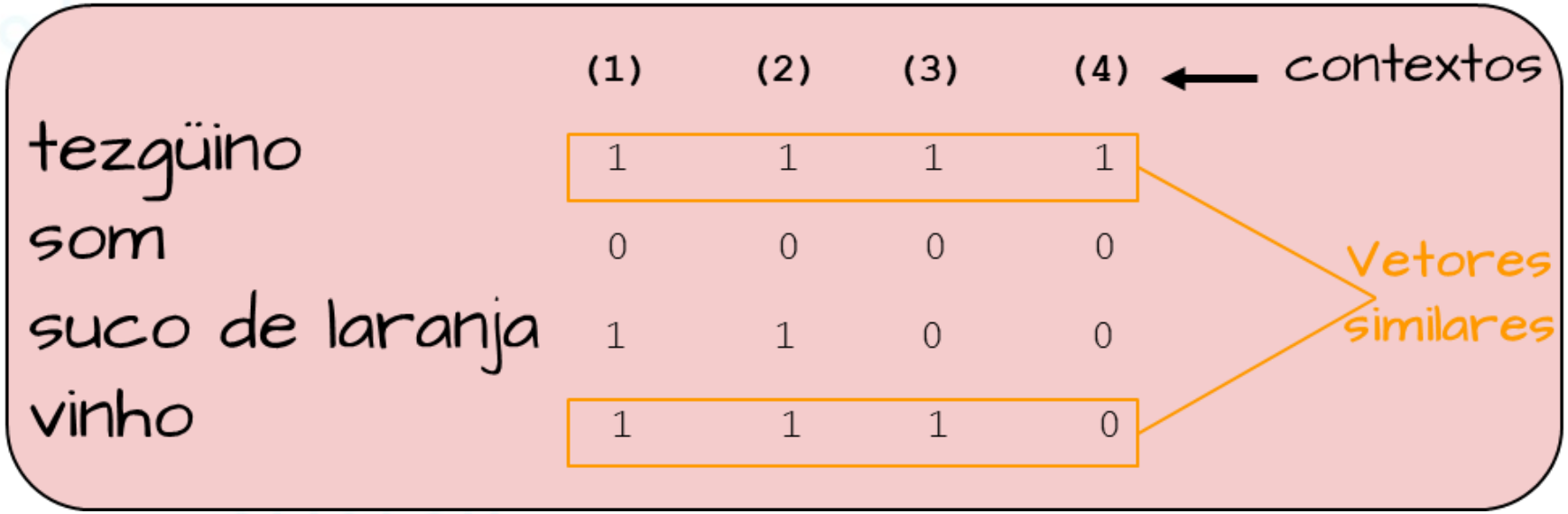
Inserindo contexto de forma manual...

1. Uma garrafa de _____ está sobre a mesa.
2. Todo mundo gosta de beber _____.
3. Você pode ficar bêbado com _____.
4. _____ é feito de milho.



Como representar contexto/significado das palavras

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Inserindo contexto de forma manual...

1. Uma garrafa de _____ está sobre a mesa.
2. Todo mundo gosta de beber _____.
3. Você pode ficar bêbado com _____.
4. _____ é feito de milho.

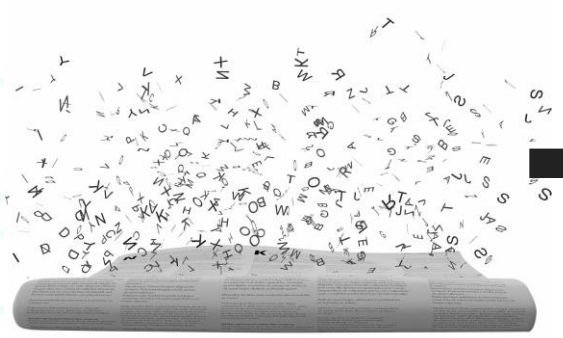
	(1)	(2)	(3)	(4)
tezgüino	1	1	1	1
som	0	0	0	0
suco de laranja	1	1	0	0
vinho	1	1	1	0

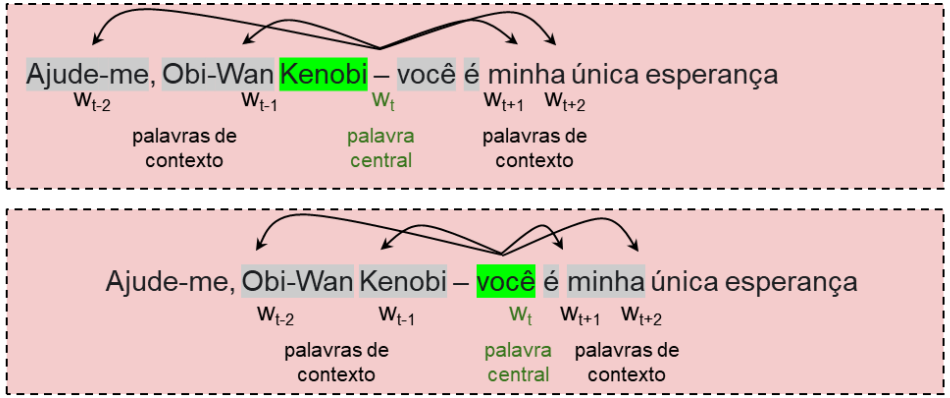
contextos

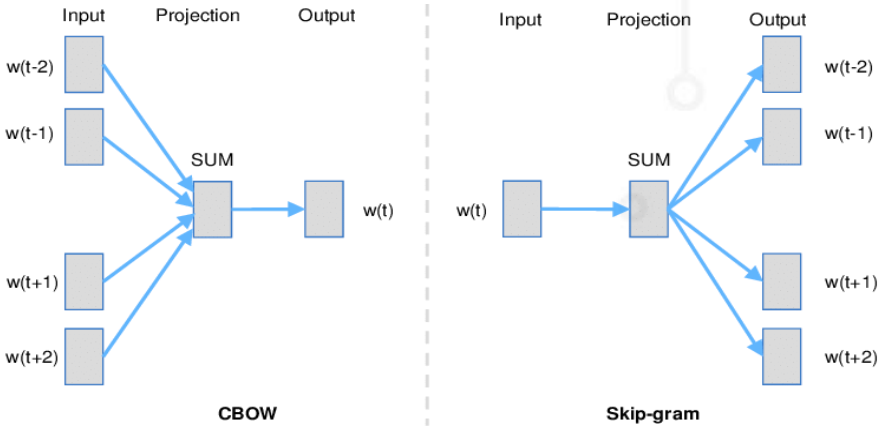
Vetores similares → contexto similar

Processamento de Linguagem Natural

Natural Language Processing (NLP)

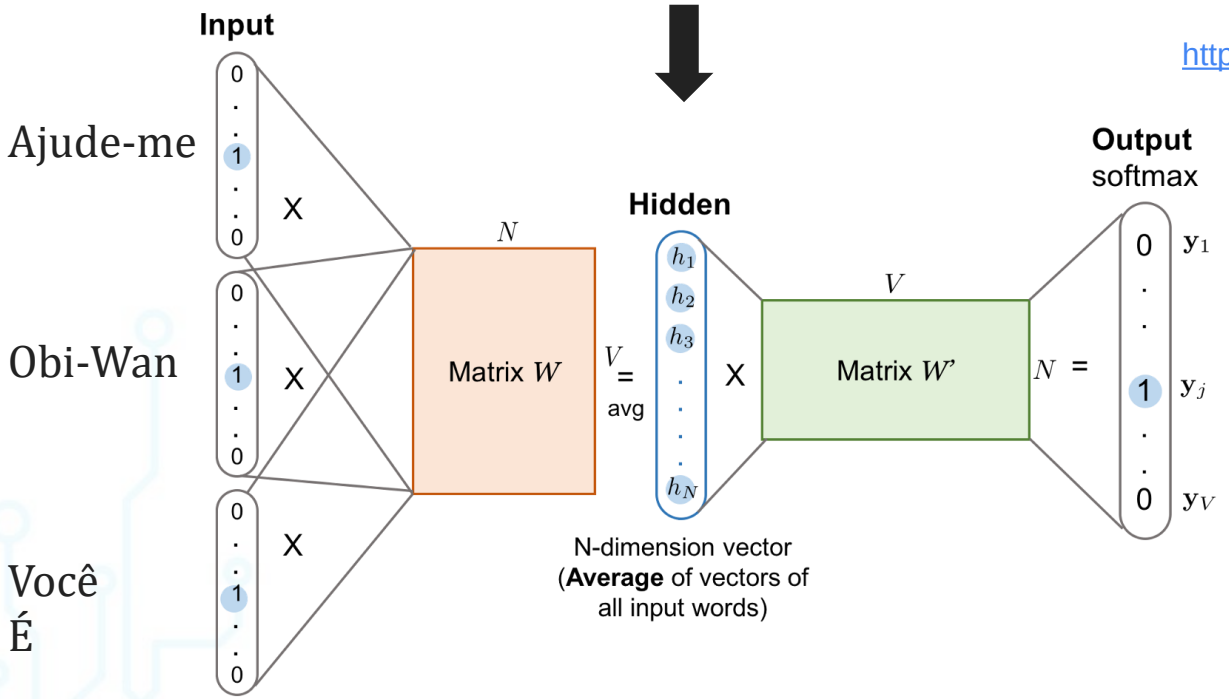






https://arxiv.org/abs/1301.3781

https://arxiv.org/pdf/1310.4546.pdf



MultiLayer Perceptron MLP

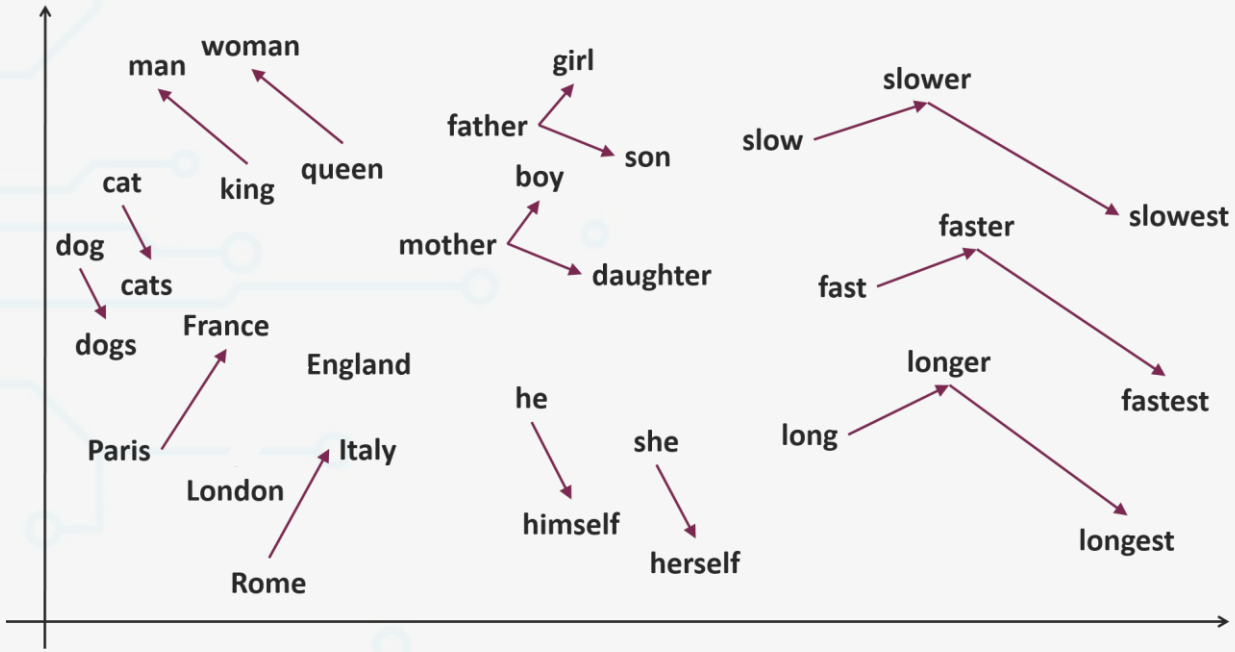
https://dl.acm.org/doi/10.5555/1639537.1639542

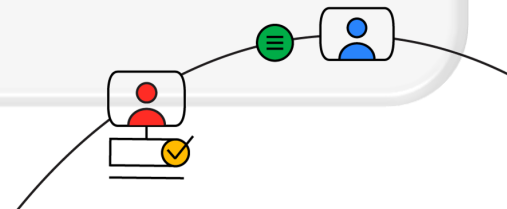
Self Supervised Learning (SSL)

https://arxiv.org/abs/2110.09327

Processamento de Linguagem Natural

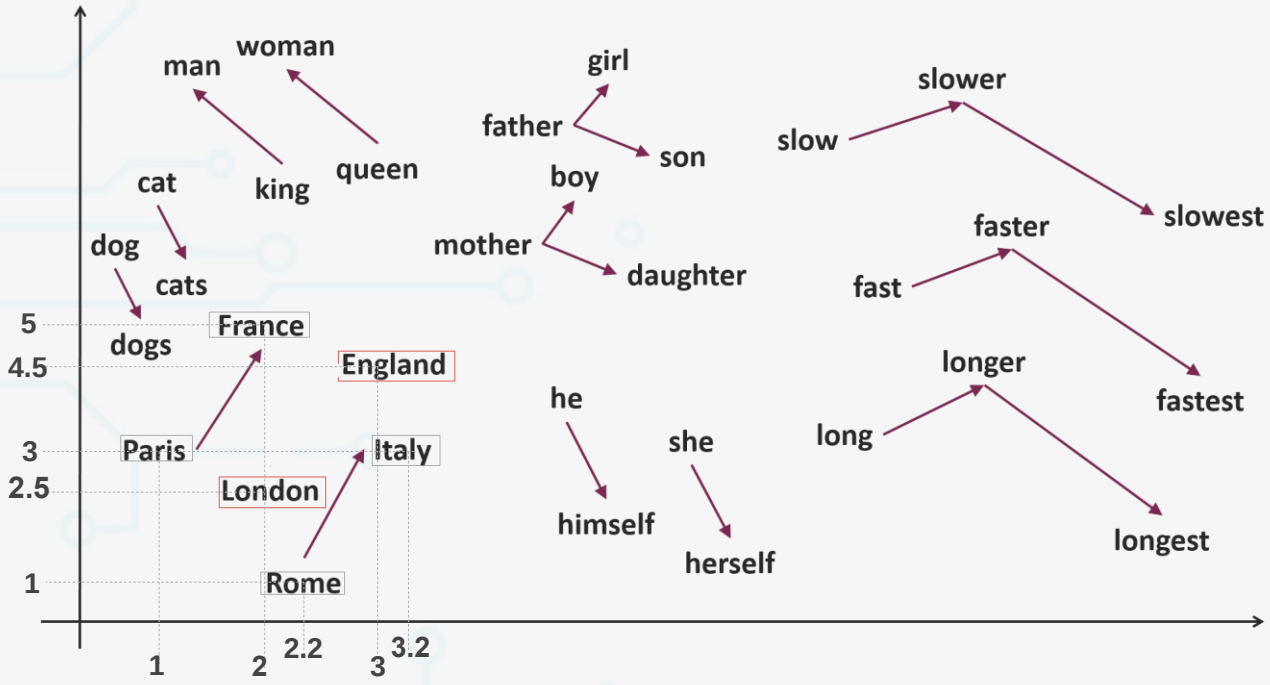
Natural Language Processing (NLP)





Processamento de Linguagem Natural

Natural Language Processing (NLP)



Paris [1, 3]

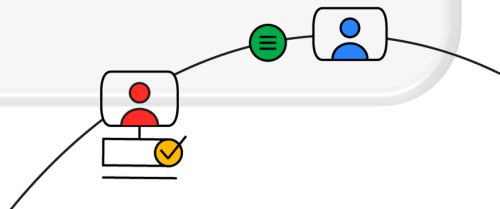
France [2, 5]

London [2, 2.5]

England [3, 4.5]

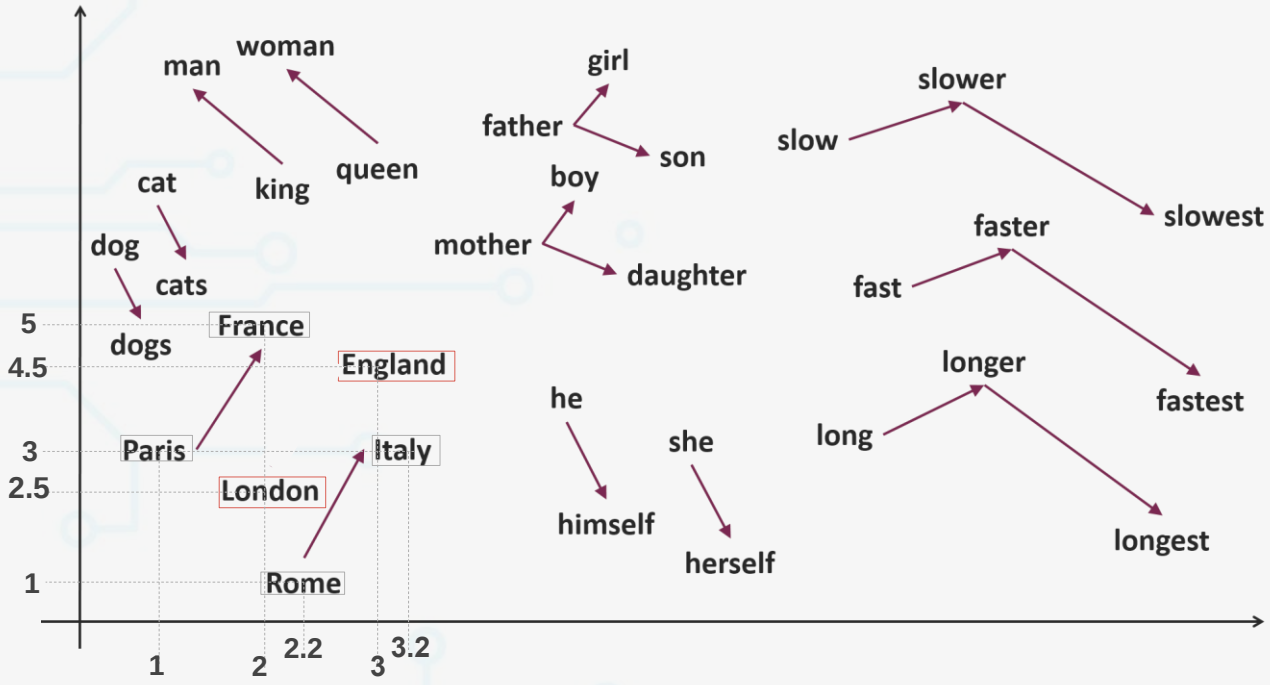
Rome [2.2, 1]

Italy [3.2, 3]

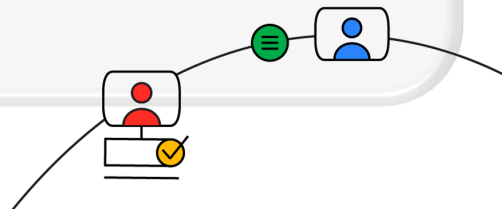


Processamento de Linguagem Natural

Natural Language Processing (NLP)

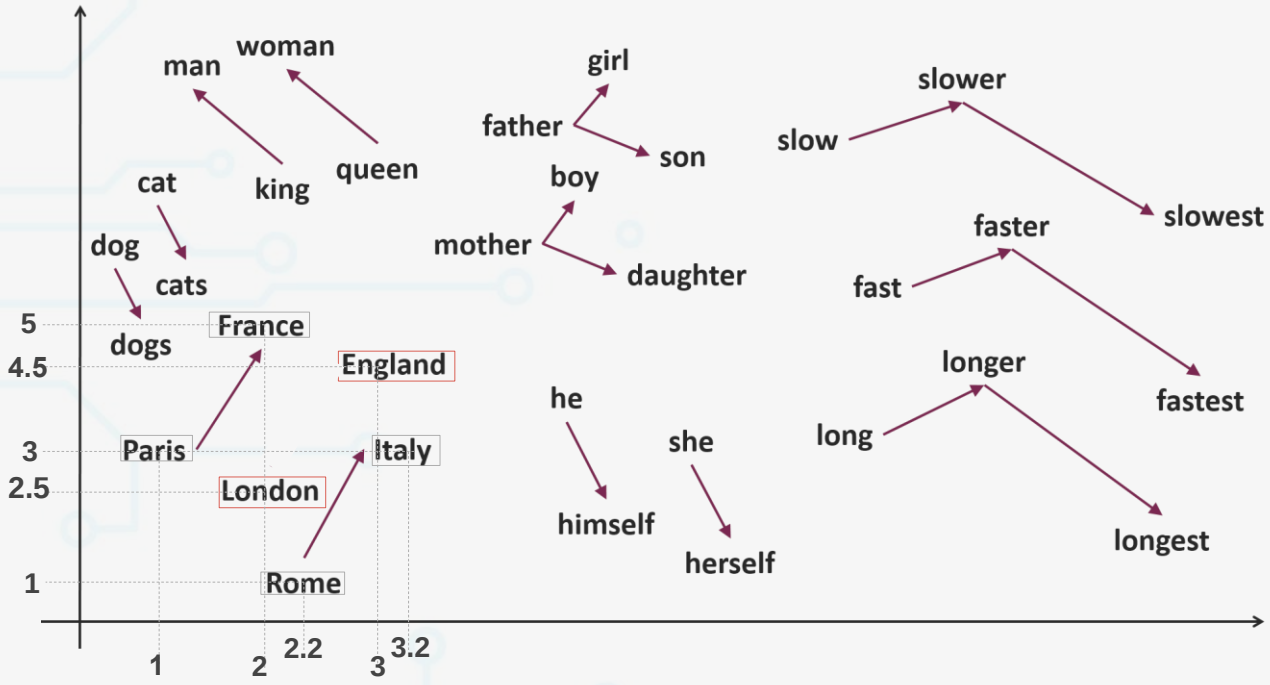


Qual a capital da Inglaterra?



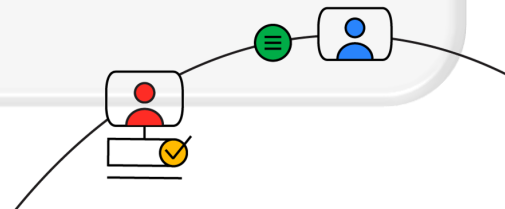
Processamento de Linguagem Natural

Natural Language Processing (NLP)



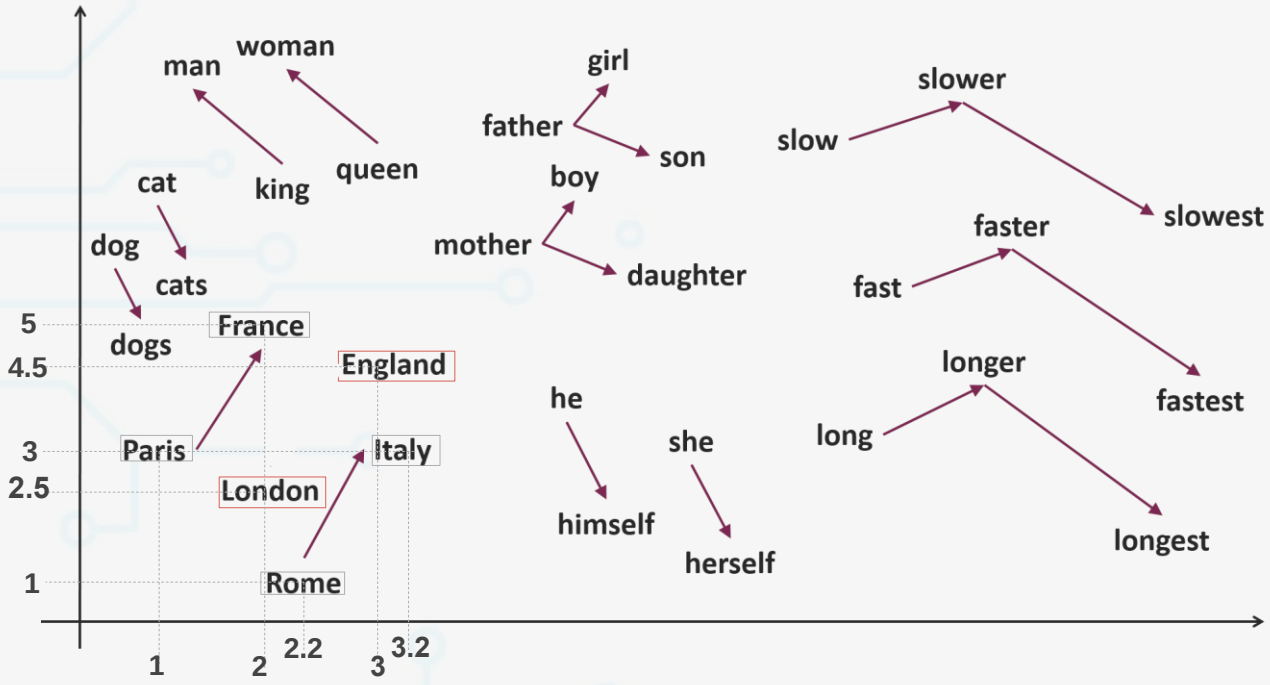
Qual a capital da Inglaterra?

Paris – France + England = ?



Processamento de Linguagem Natural

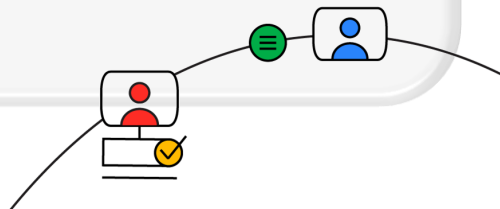
Natural Language Processing (NLP)



Qual a capital da Inglaterra?

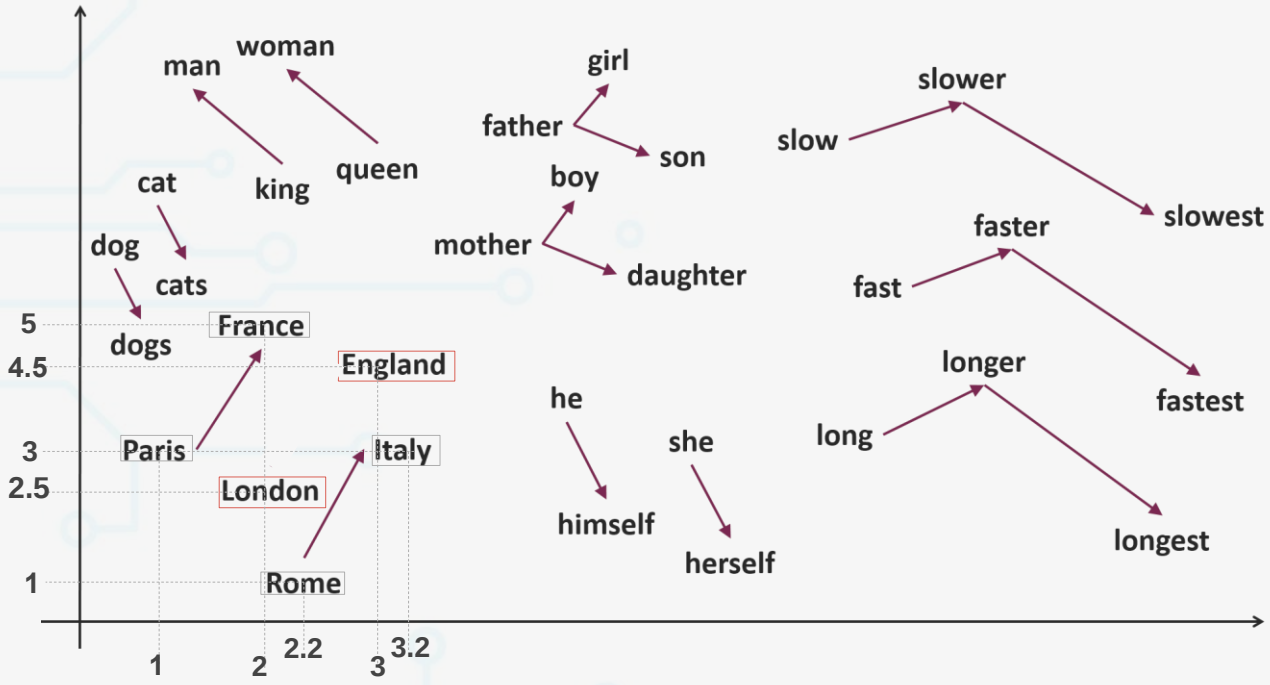
Paris – France + England = ?

Paris [1, 3]
France [2, 5]
=
Result. [-1, -2]
+
England [3, 4.5]
=
Result. [2, 2.5]
==
London [2, 2.5]



Processamento de Linguagem Natural

Natural Language Processing (NLP)



Qual a capital da Inglaterra?

Paris – France + England = ?

Paris [1, 3]
France [2, 5]
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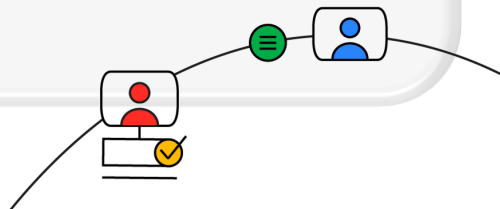
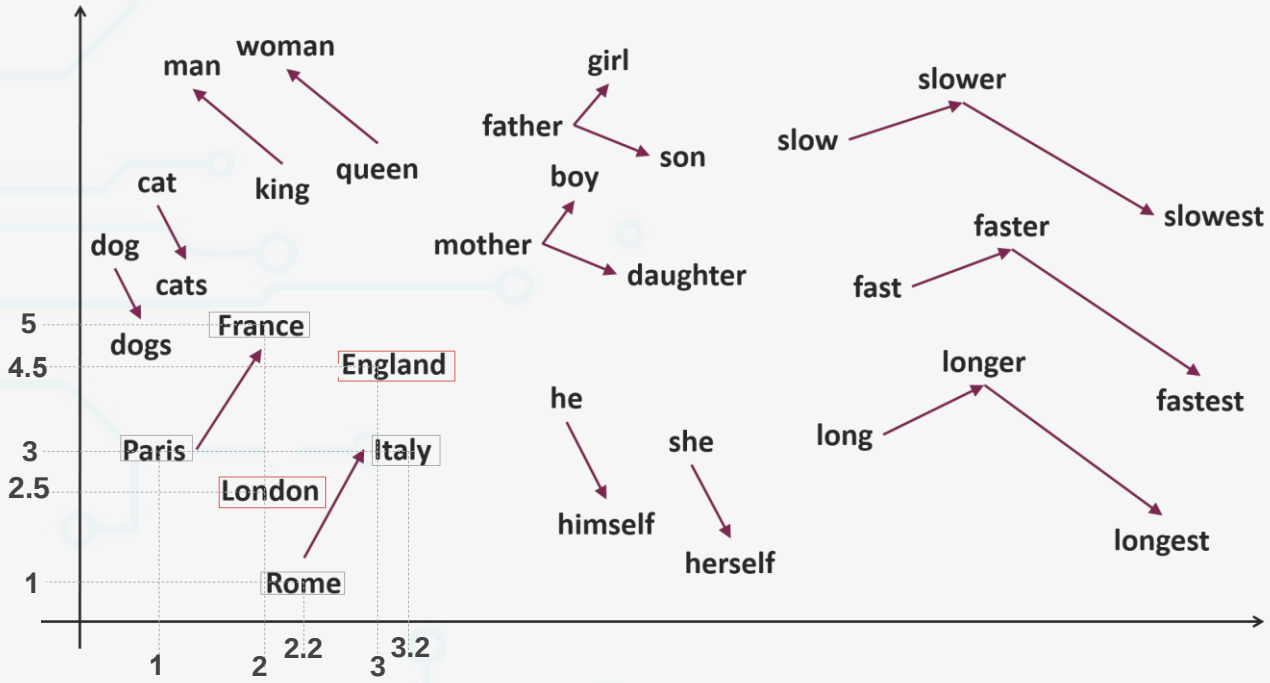
+
England [3, 4.5]
=
Result. [2, 2.5]
==
London [2, 2.5]

Paris – France + England = London



Processamento de Linguagem Natural

Natural Language Processing (NLP)



Qual a capital da Inglaterra?

Paris – France + England = ?

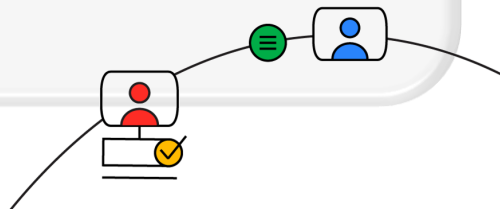
Paris [1, 3]
France [2, 5]
=
Result. [-1, -2]
+
England [3, 4.5]
=
Result. [2, 2.5]
==
London [2, 2.5]

Rome – Italy + England = ?

Rome [2.2, 1]
Italy [3.2, 3]
=
Result. [-1, -2]
+
England [3, 4.5]
=
Result. [2, 2.5]
==
London [2, 2.5]

Paris – France + England = London

Rome – Italy + England = London



Processamento de Linguagem Natural

Natural Language Processing (NLP)

Bag of Words

TF-IDF
Akiko Aizaka, 2003

Word2Vec
Mikolov et al, 2013
Google

Glove
Pennington et al., 2014

Seq2Seq
Sutskever et al, 2014
Google

CoVe
McCann et al., 2017

FastText
Bojanowski et al, 2017
Meta

ULMFiT
Howard et al.. 2018

ELMo
Peters et al, 2018
AI2

Attention Is All You Need

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Illia Polosukhin* ‡ illia.polosukhin@gmail.com
Google

https://arxiv.org/abs/1706.03762

DevFest 2024 Google Developer Groups Cerrado

VINICARIDÁ Human-Centered Data & AI

Attention Is All You Need

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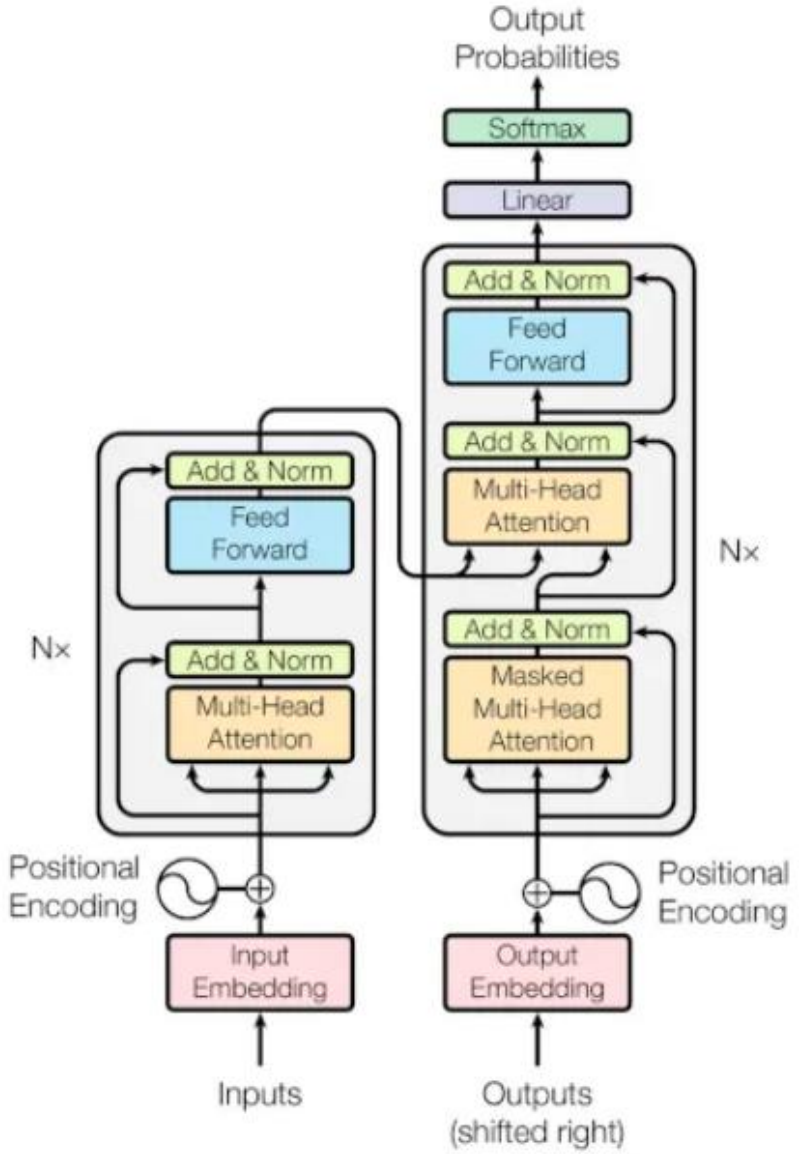
Abstract

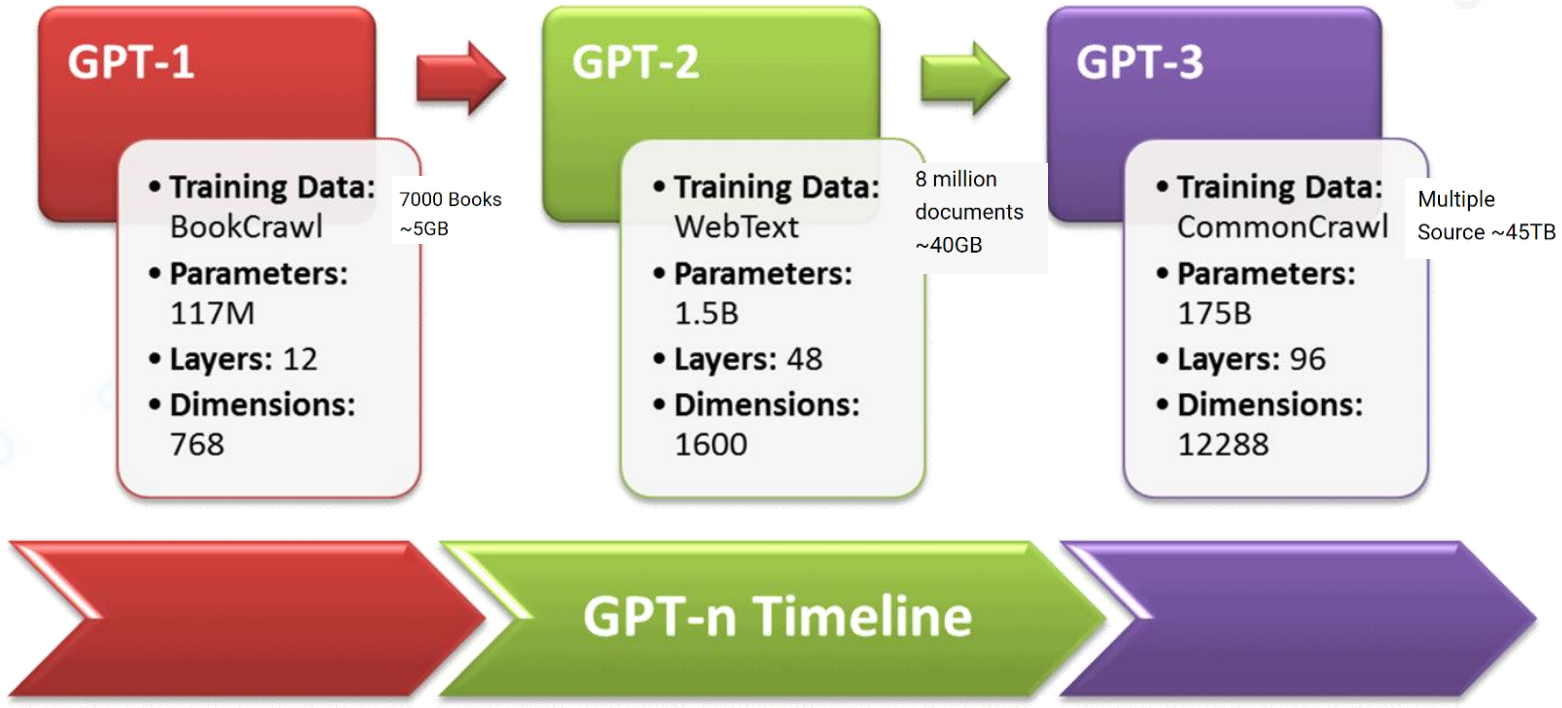
The dominant sequence transduction models are based on complex recurrent or convolutional neural networks that include an encoder and a decoder. The best performing models also connect the encoder and decoder through an attention mechanism. We propose a new simple network architecture, the Transformer, 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,

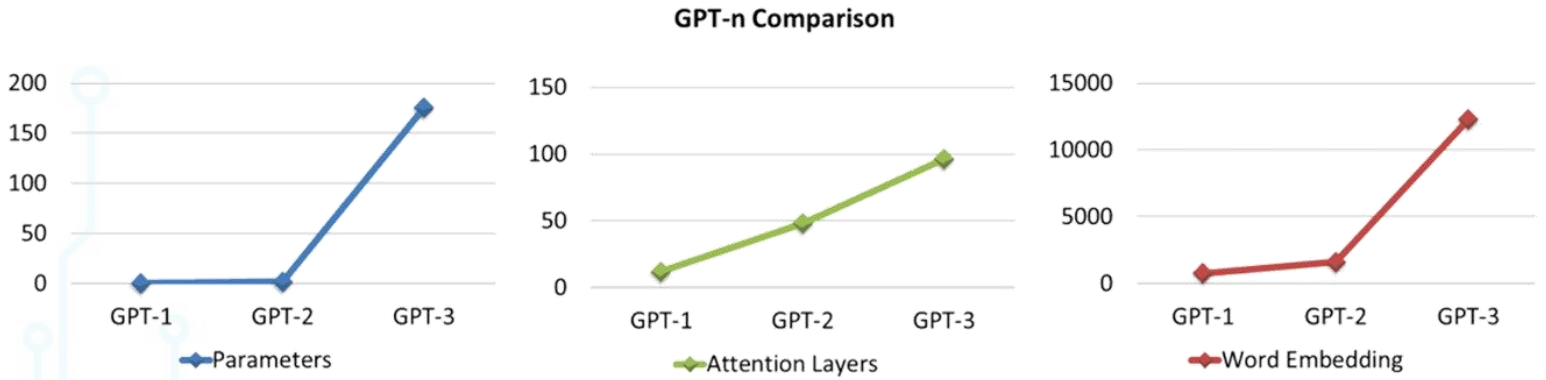
https://arxiv.org/abs/1706.03762



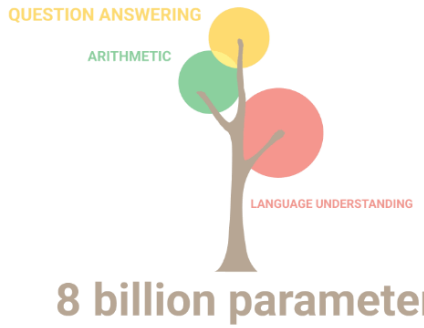
Experts Google Developers

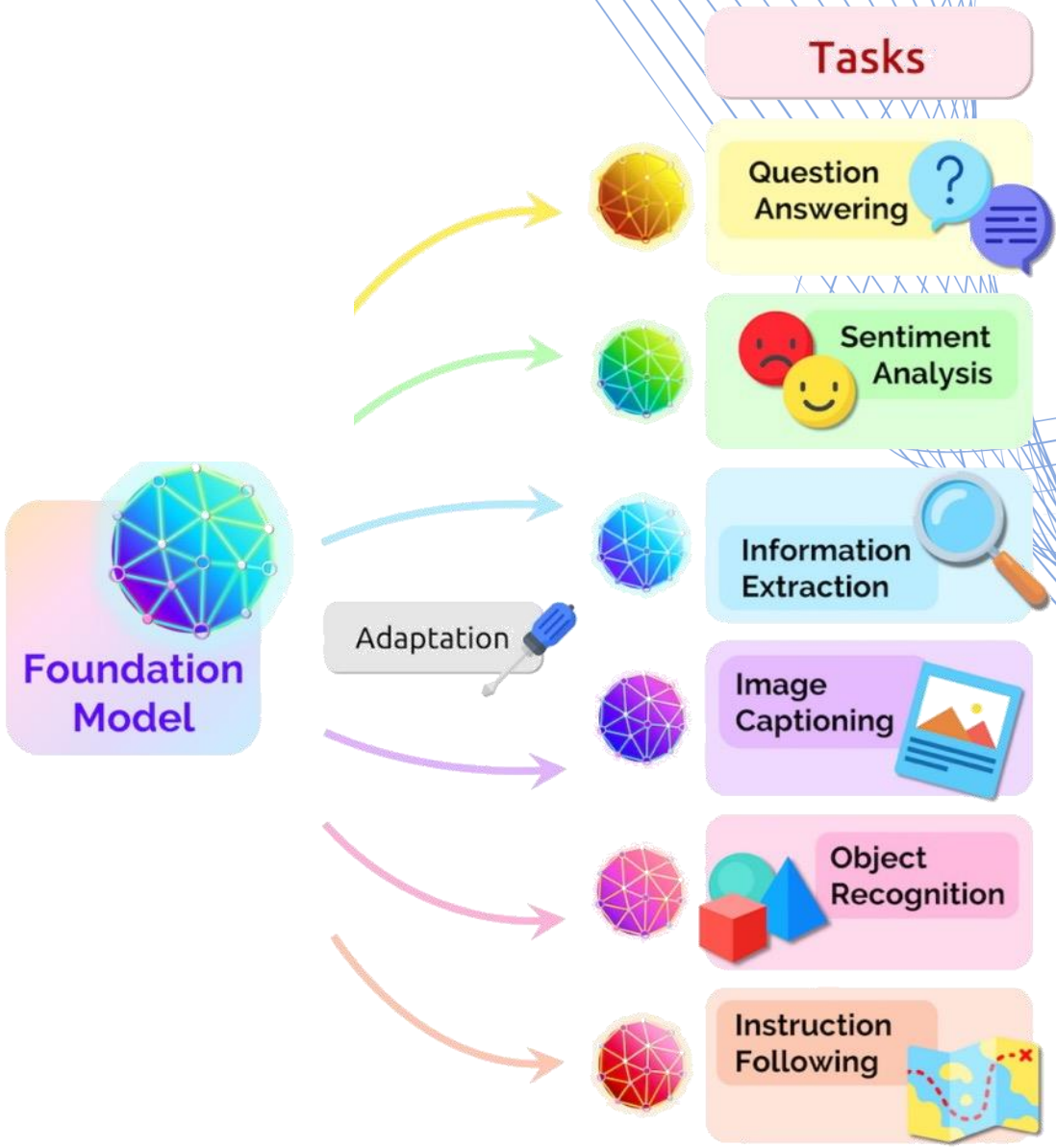
Família GPT





https://businessolution.org/gpt-3-statistics/





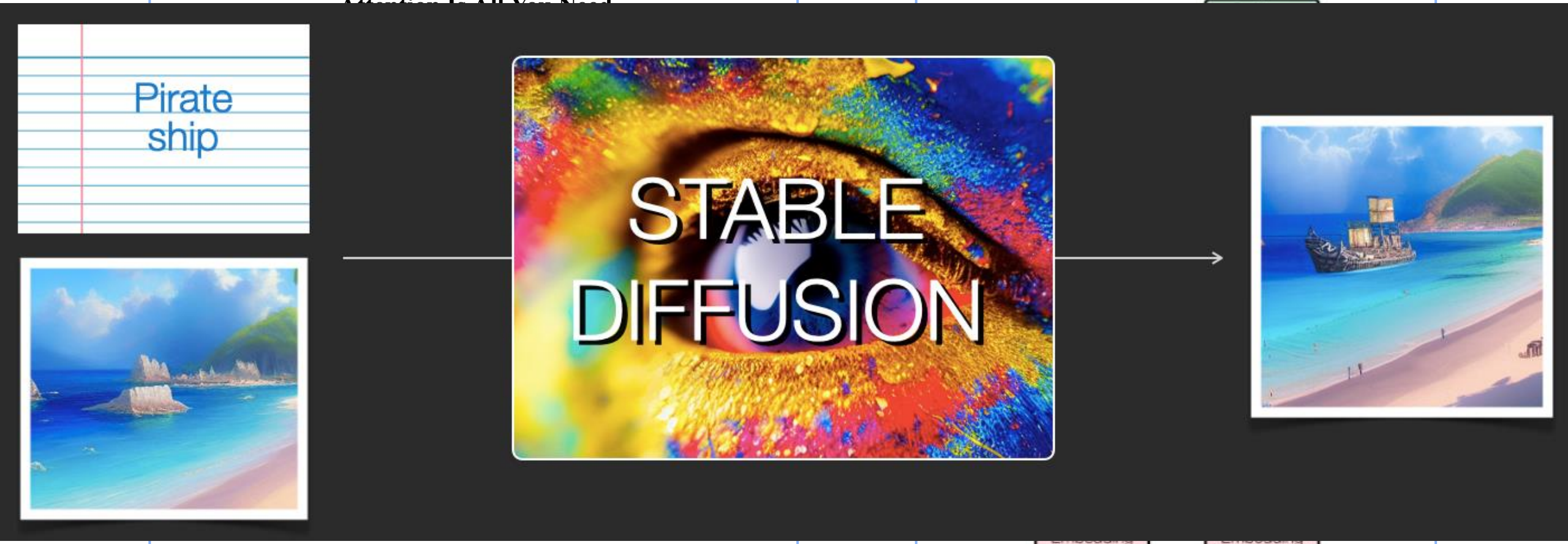
Zero-Shot Learning in Modern NLP
https://joeddav.github.io/blog/2020/05/29/ZSL.html

Few-Shot Learning
Não Corporativo https://arxiv.org/pdf/1904.05046.pdf

DevFest 2024 Cerrado

VINICARIDÁ
Human-Centered Data & AI

Output Probabilities



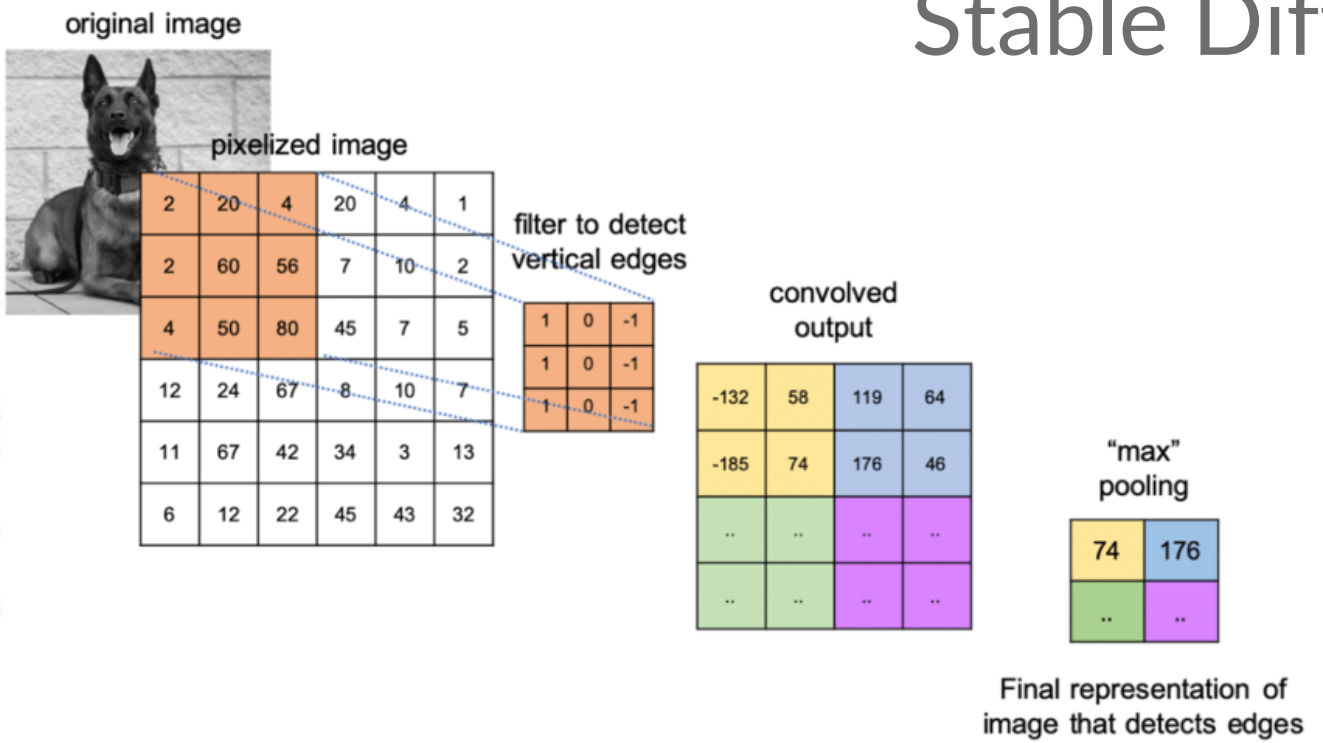
Inputs

Outputs (shifted right)

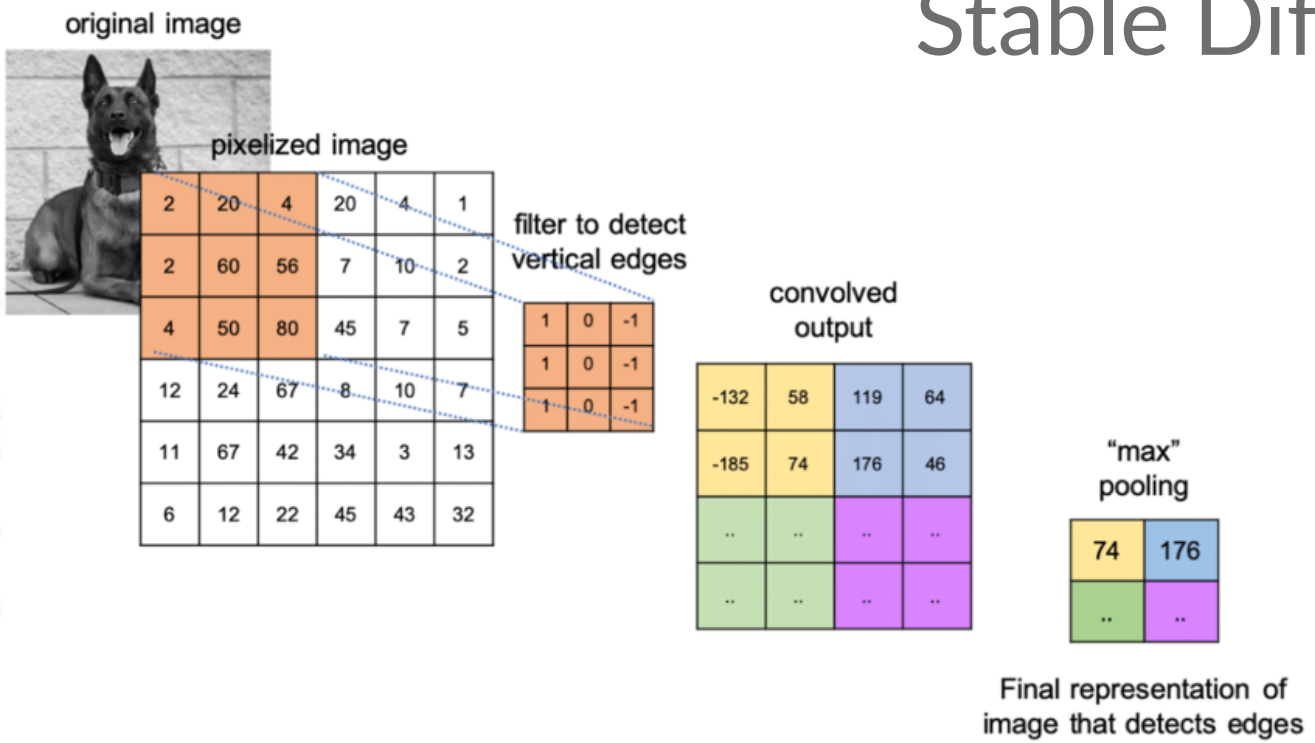
https://arxiv.org/abs/1706.03762

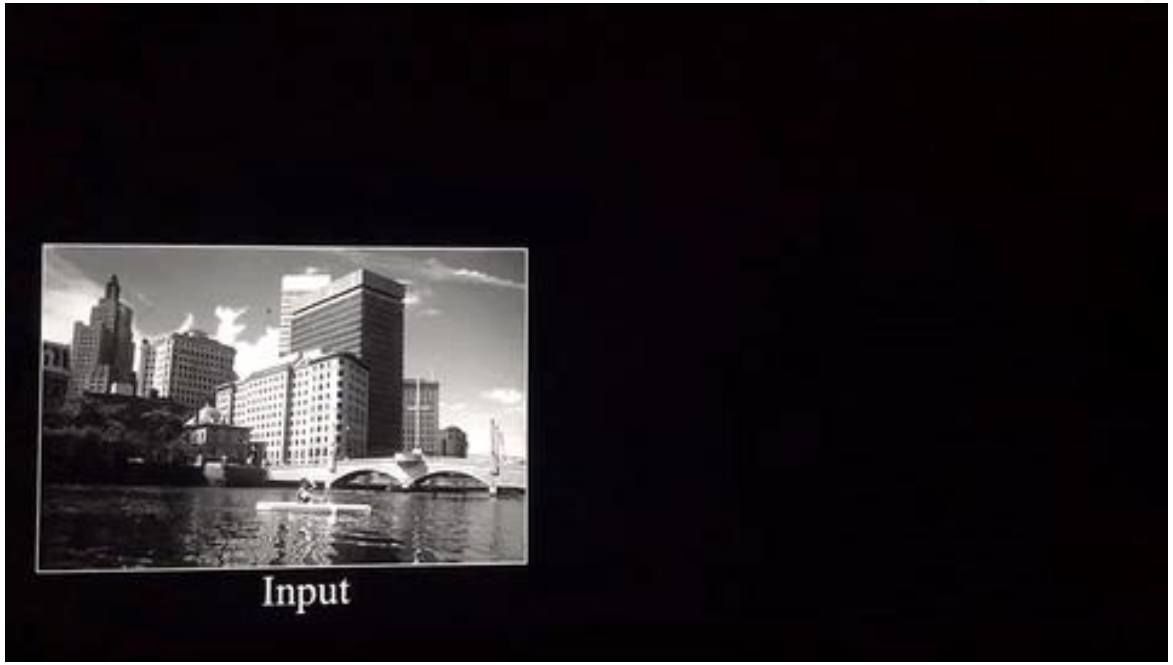
Experts
Google Developers

Stable Diffusion

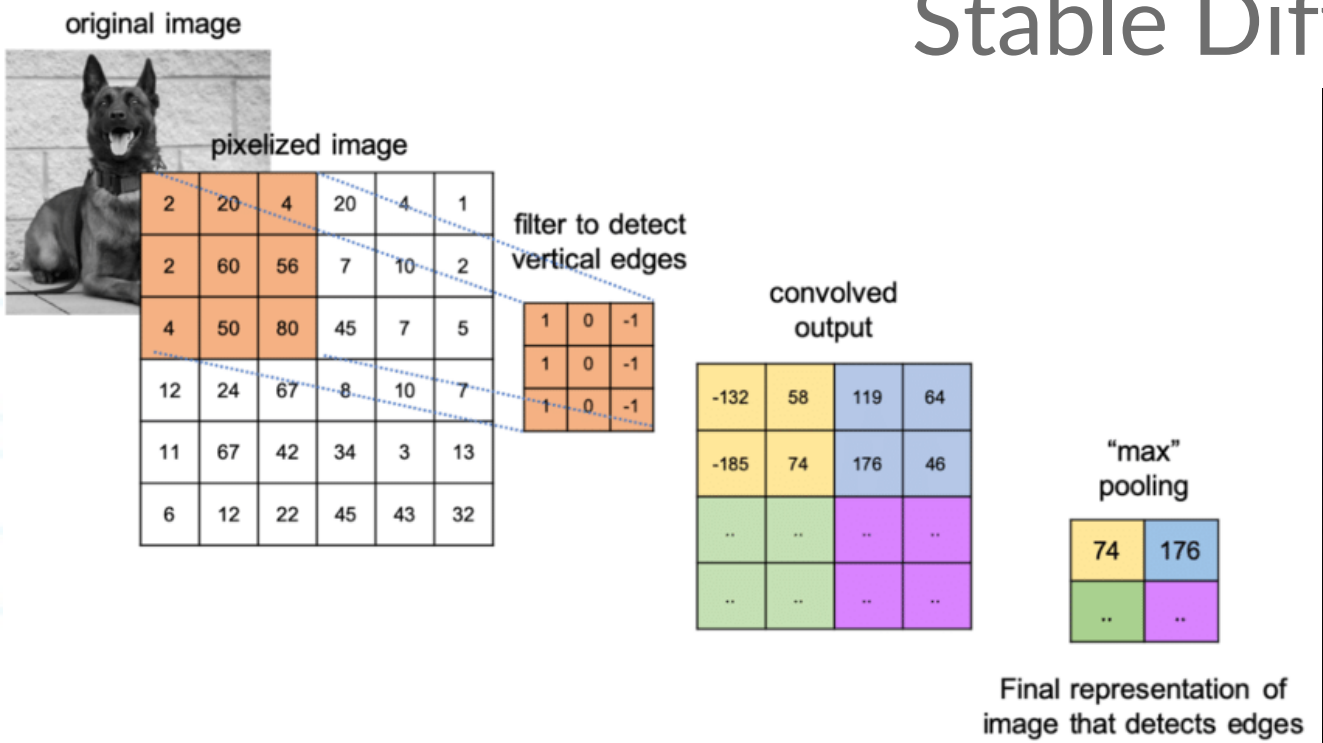


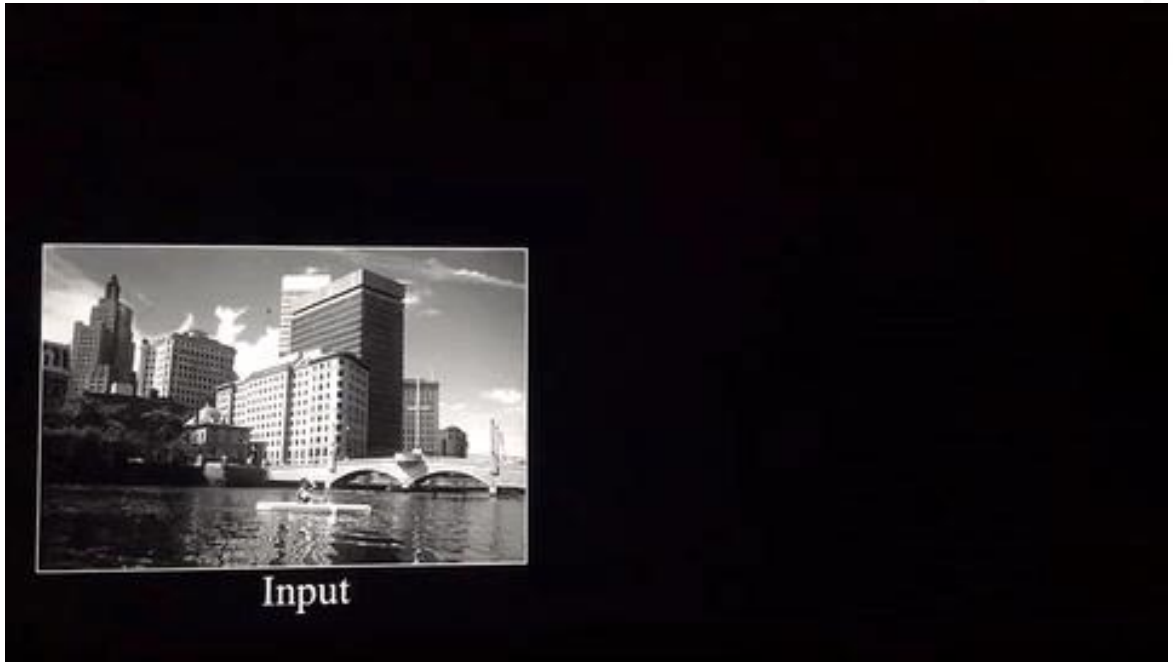
Stable Diffusion





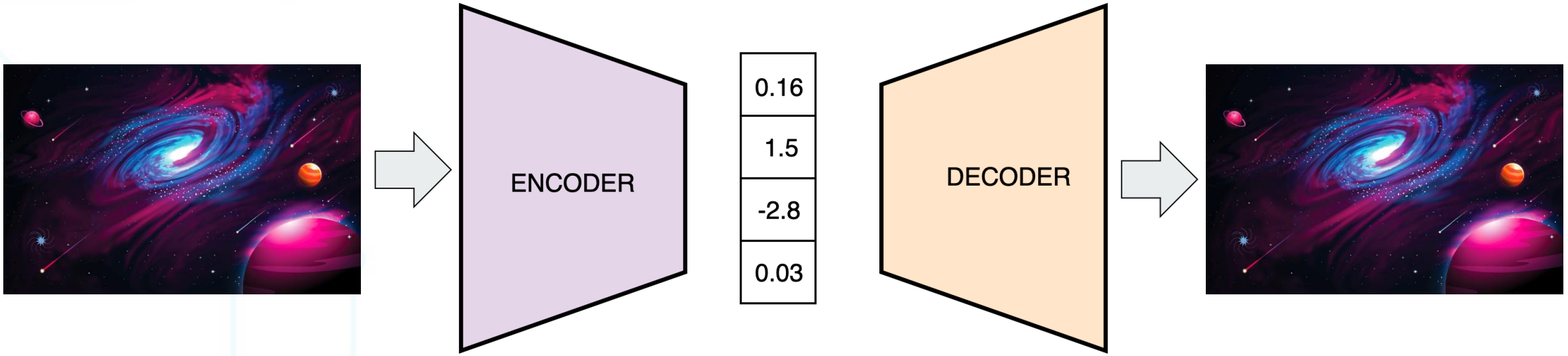
Stable Diffusion





Stable Diffusion

Espaço latente



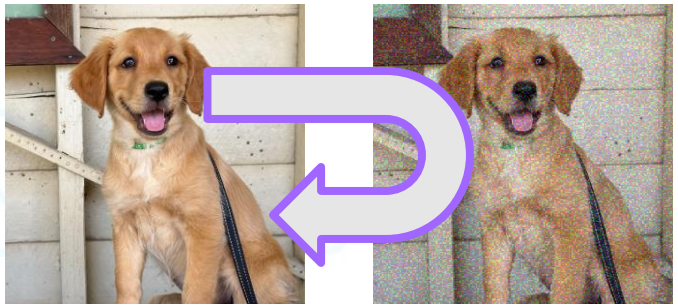
Modelos de difusão

Diffusion model

Adds noise and learns how to work backwards to the original image.

Modelos de difusão

Diffusion model



Adds noise and learns how to work backwards to the original image.

Modelos de difusão

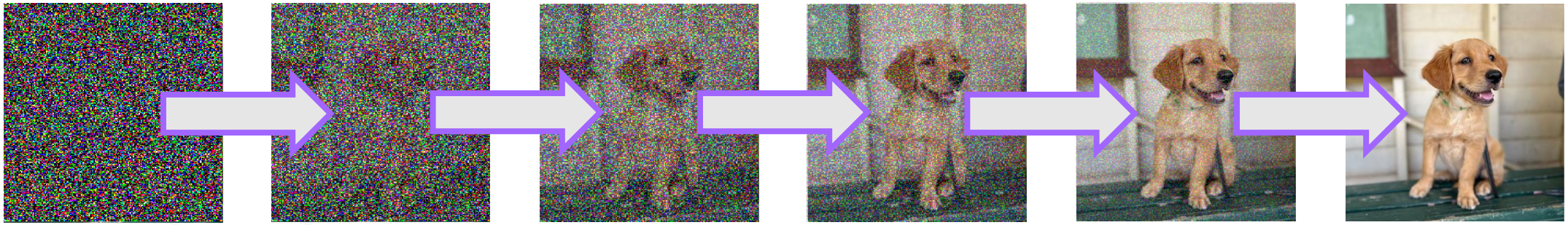
Diffusion model

Adds noise and learns how to work backwards to the original image.

Modelos de difusão

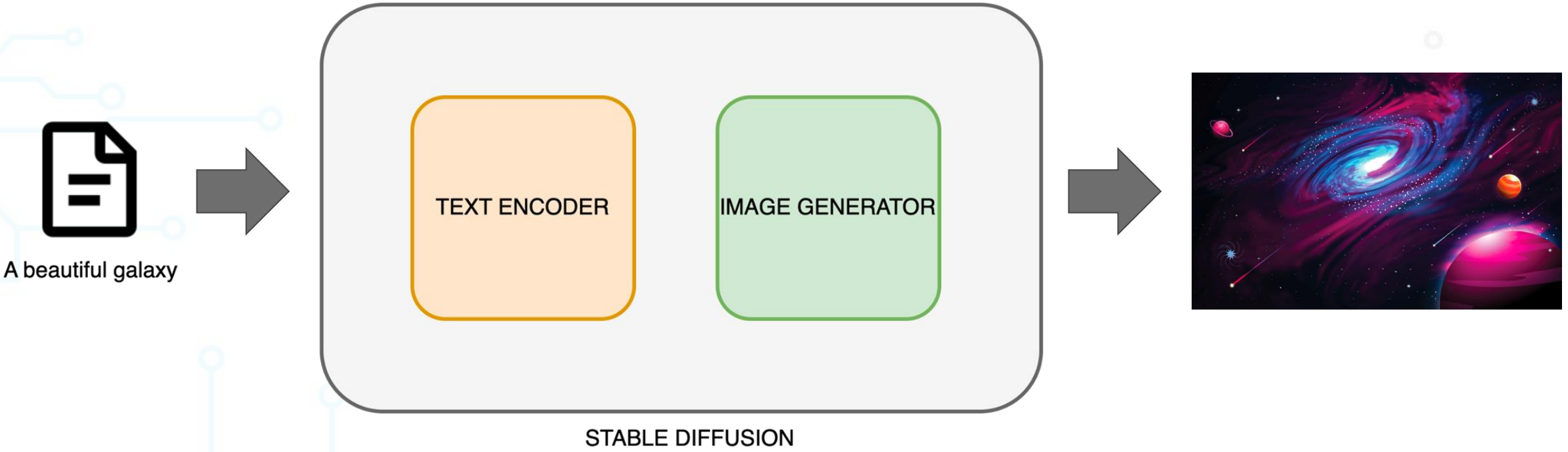
Diffusion model

Adds noise and learns how to work backwards to the original image.



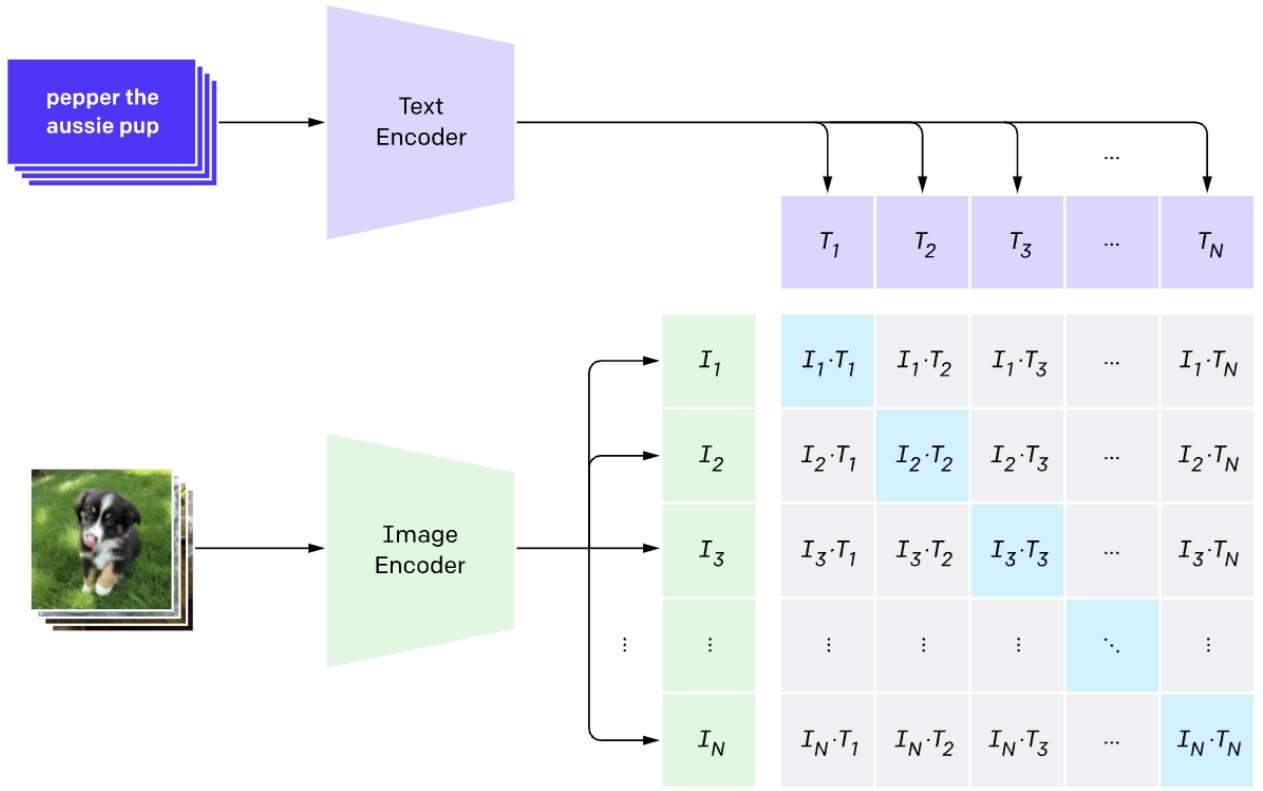
Trained model works from random noise to generated an image.

Stable Diffusion



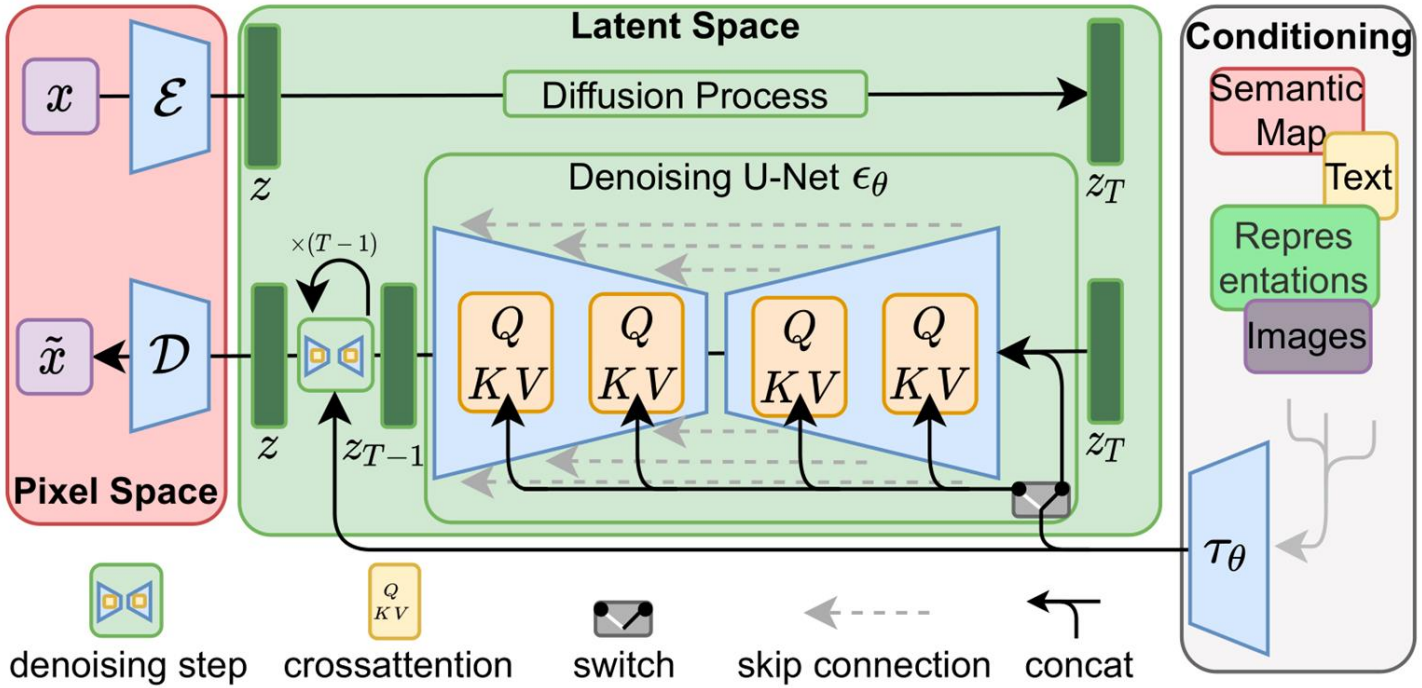
Stable Diffusion

Text Encoder - CLIP



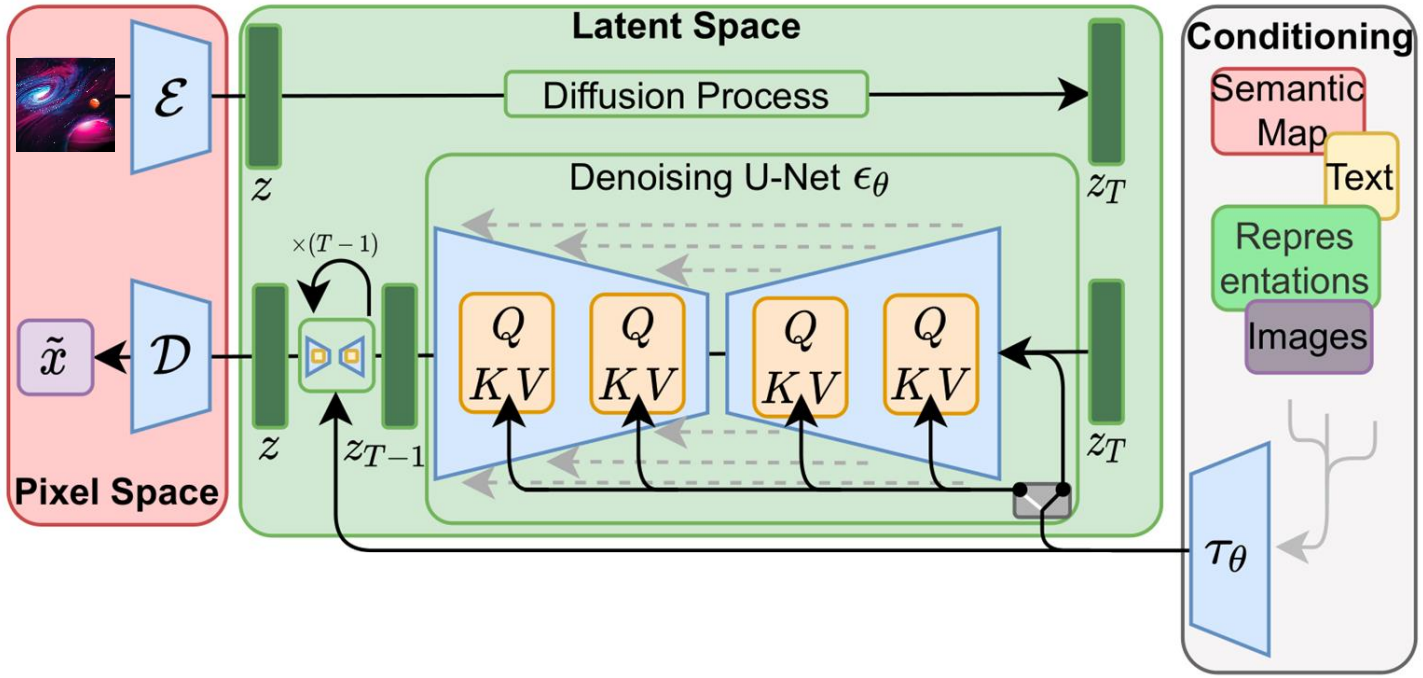
Stable Diffusion

Treinamento



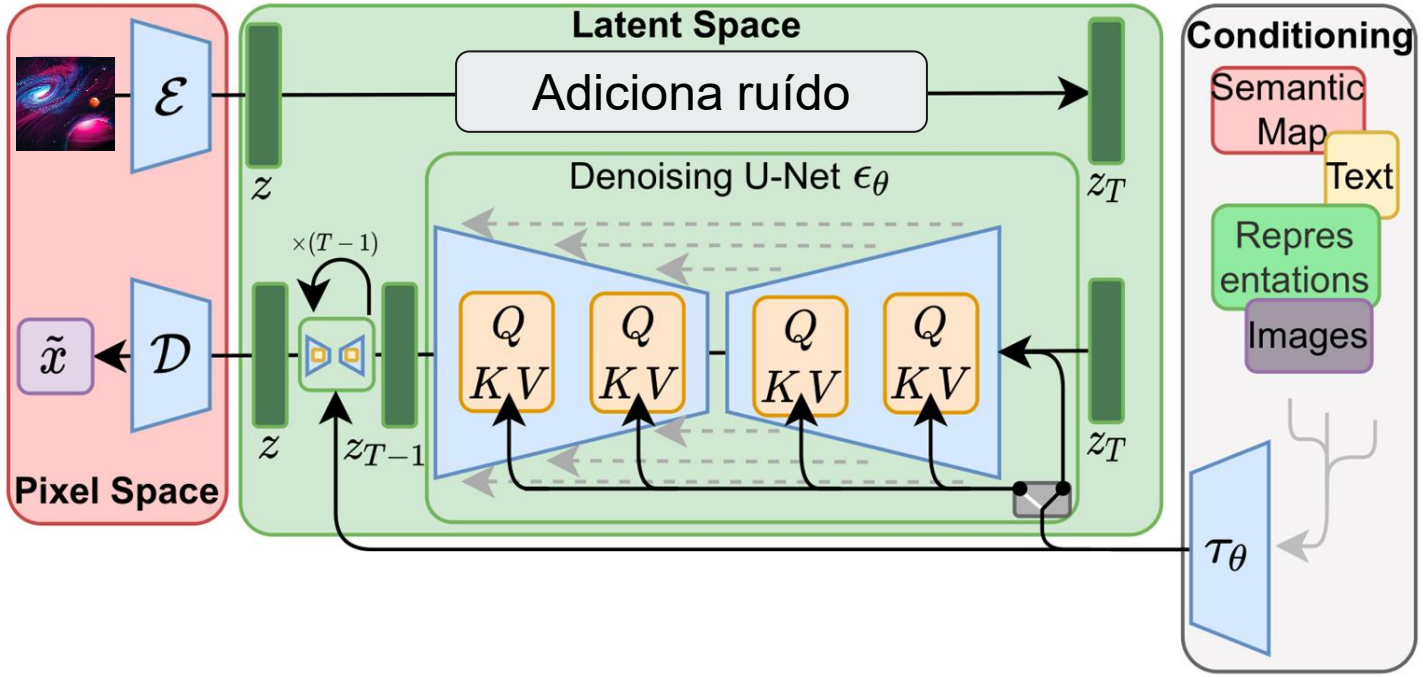
Stable Diffusion

Treinamento



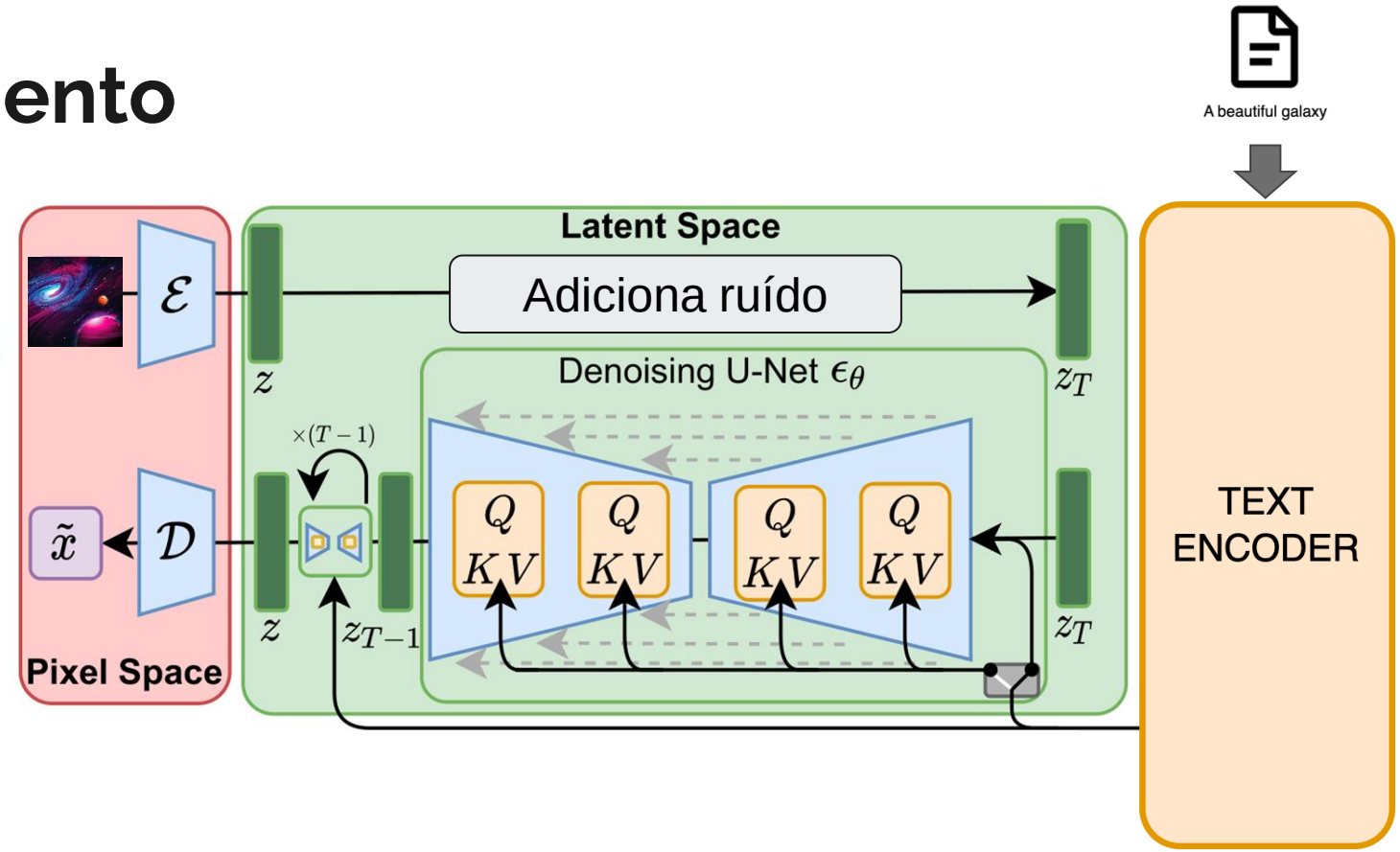
Stable Diffusion

Treinamento



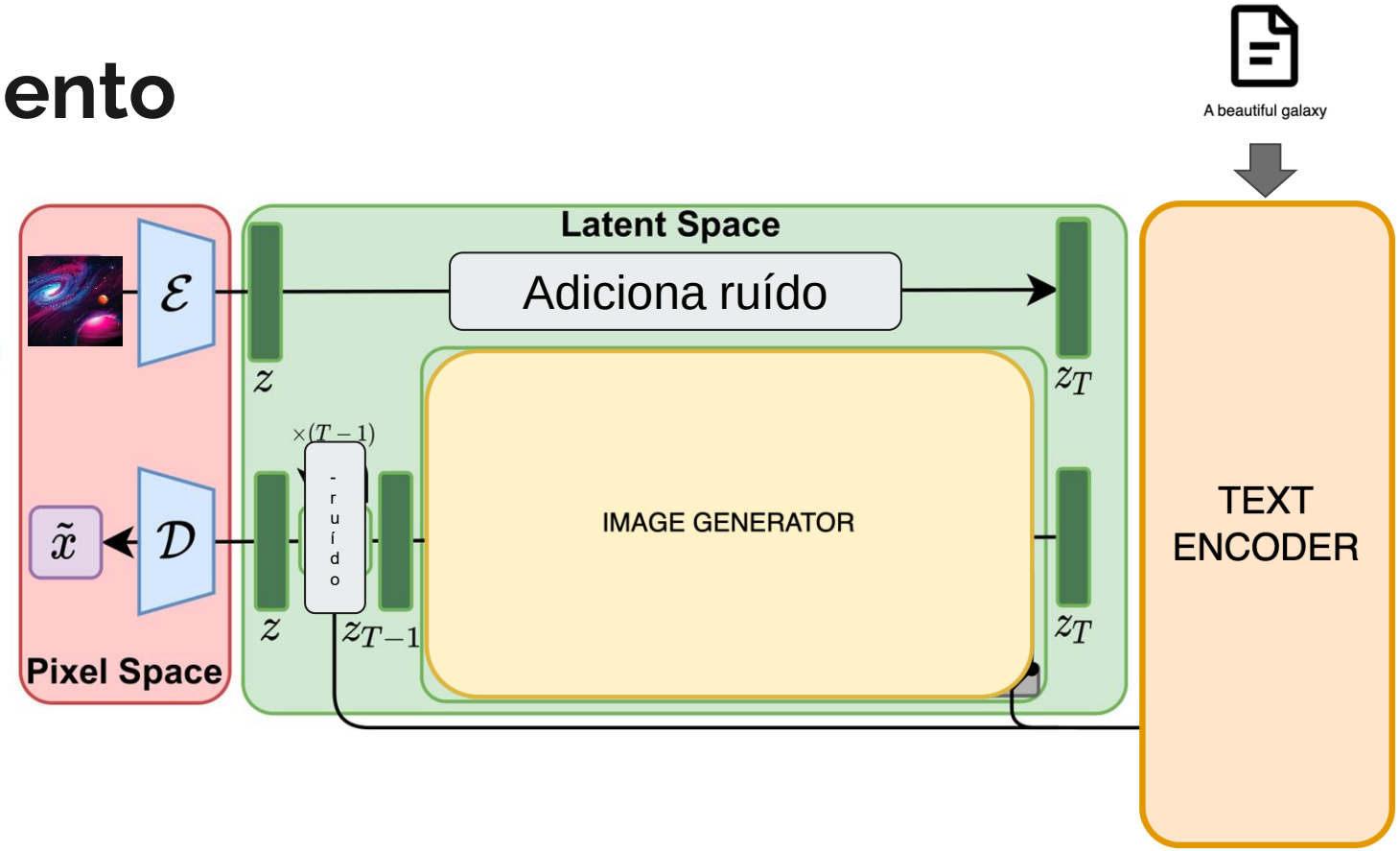
Stable Diffusion

Treinamento



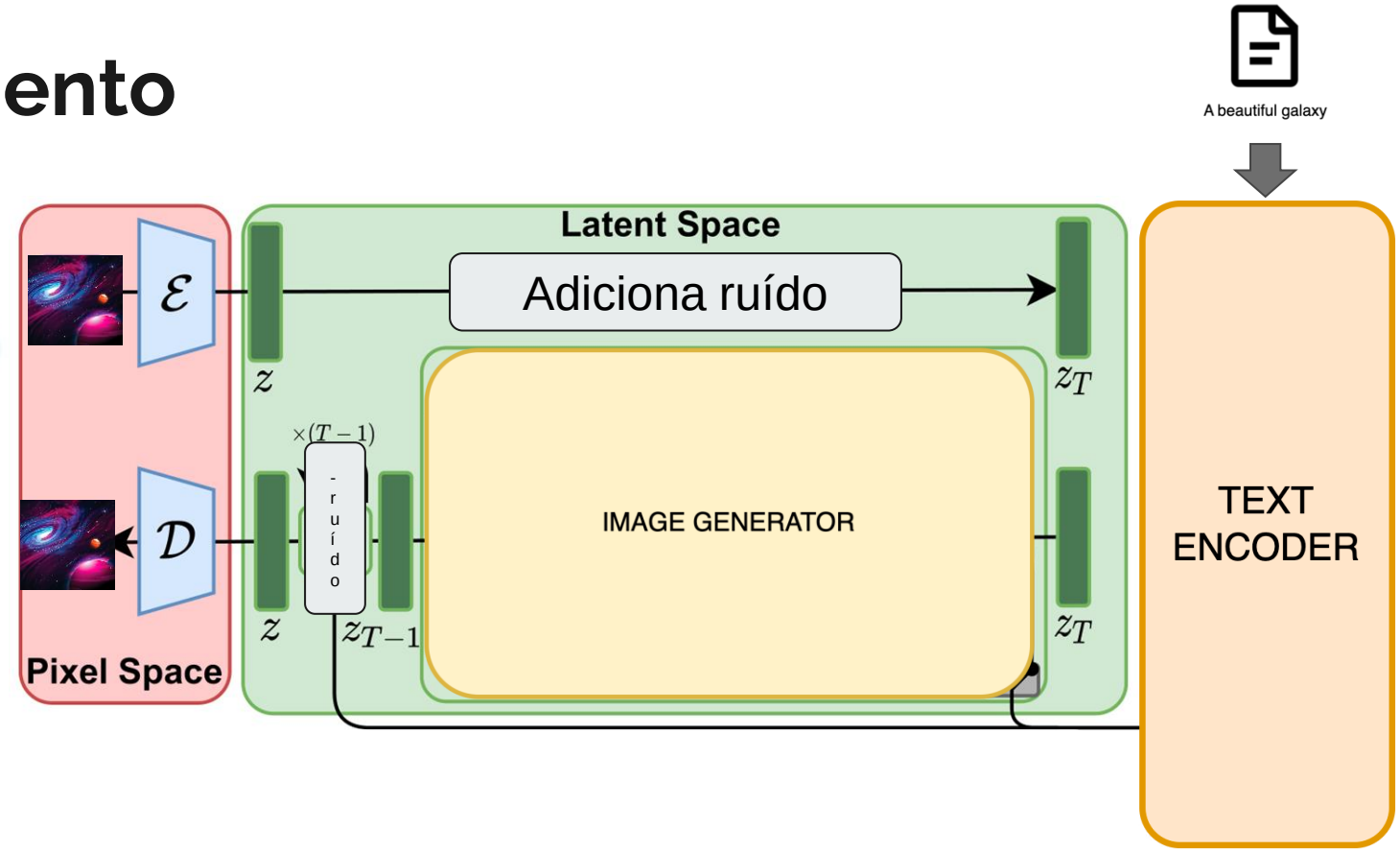
Stable Diffusion

Treinamento

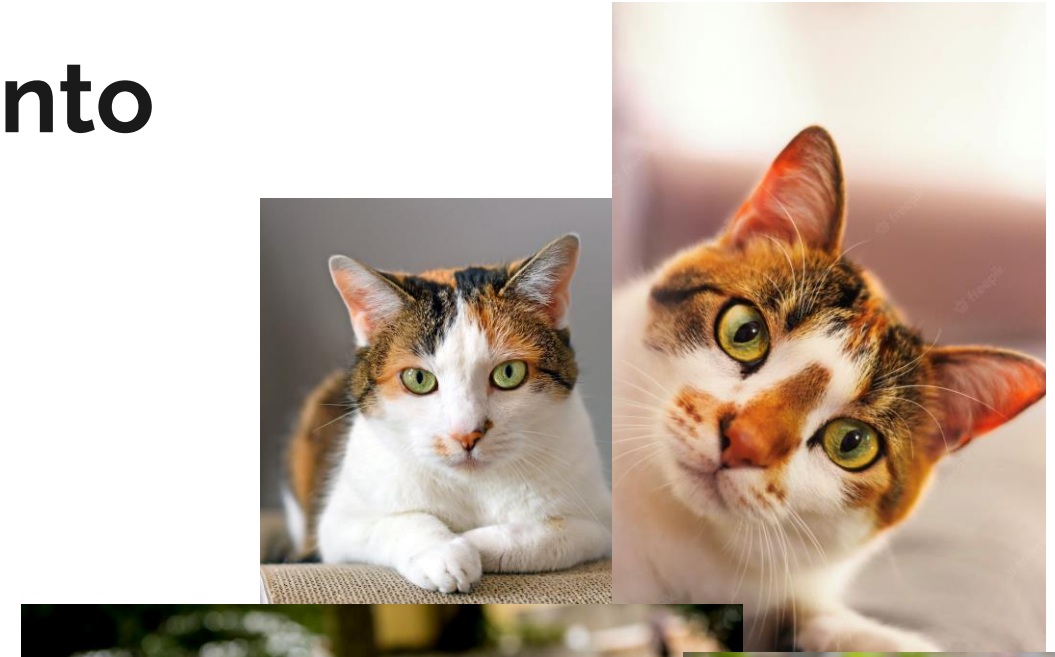


Stable Diffusion

Treinamento



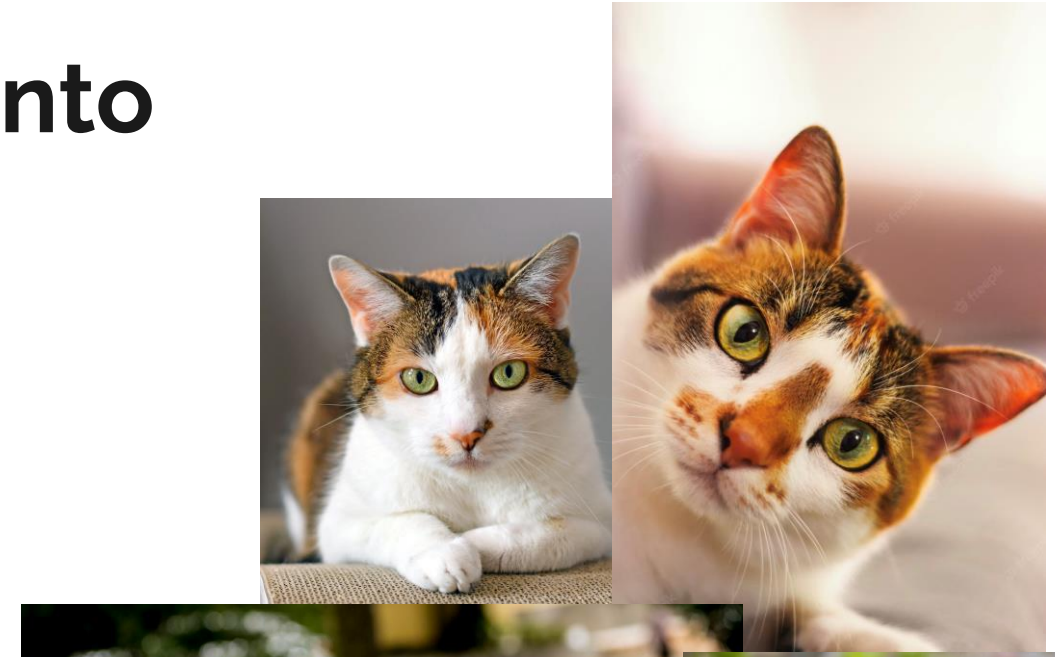
Dados fora do treinamento



Textual Inversion

Dados fora do treinamento

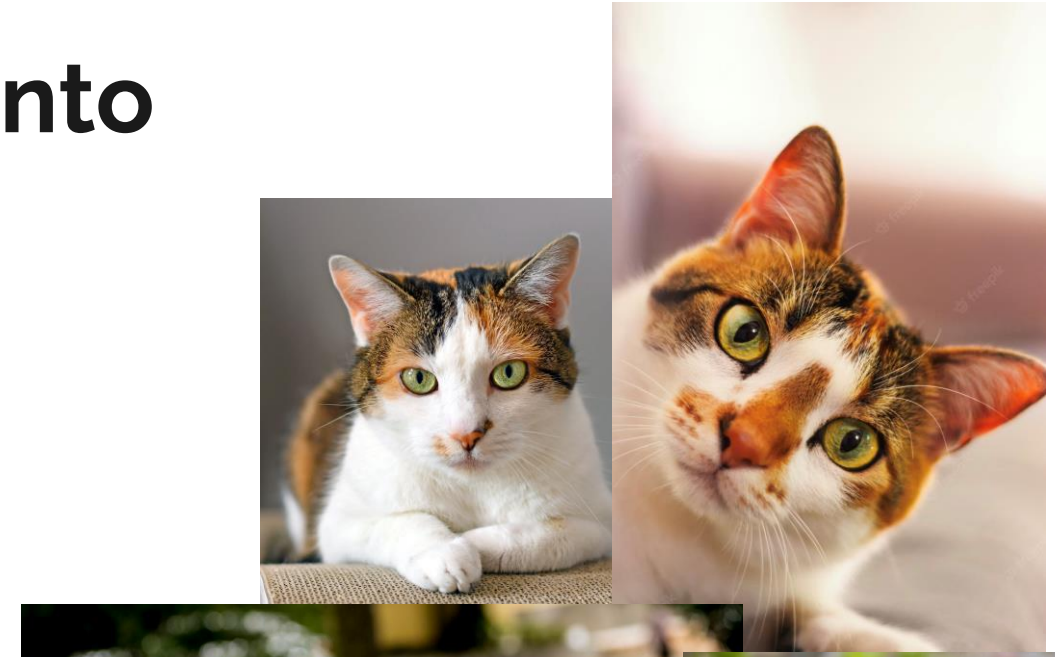
- Um gato em uma praça ✅



Textual Inversion

Dados fora do treinamento

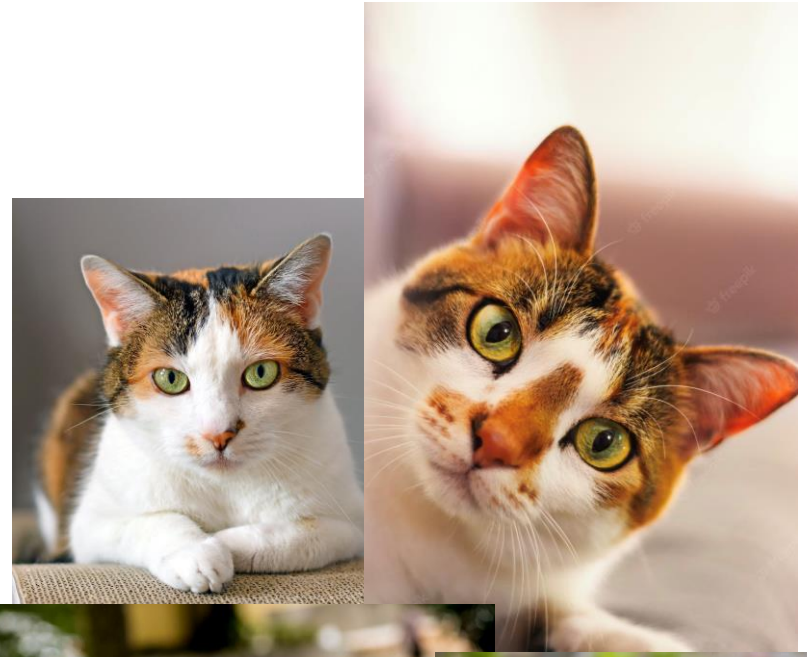
- Um gato em uma praça ✅
- Um cachorro na grama ✅



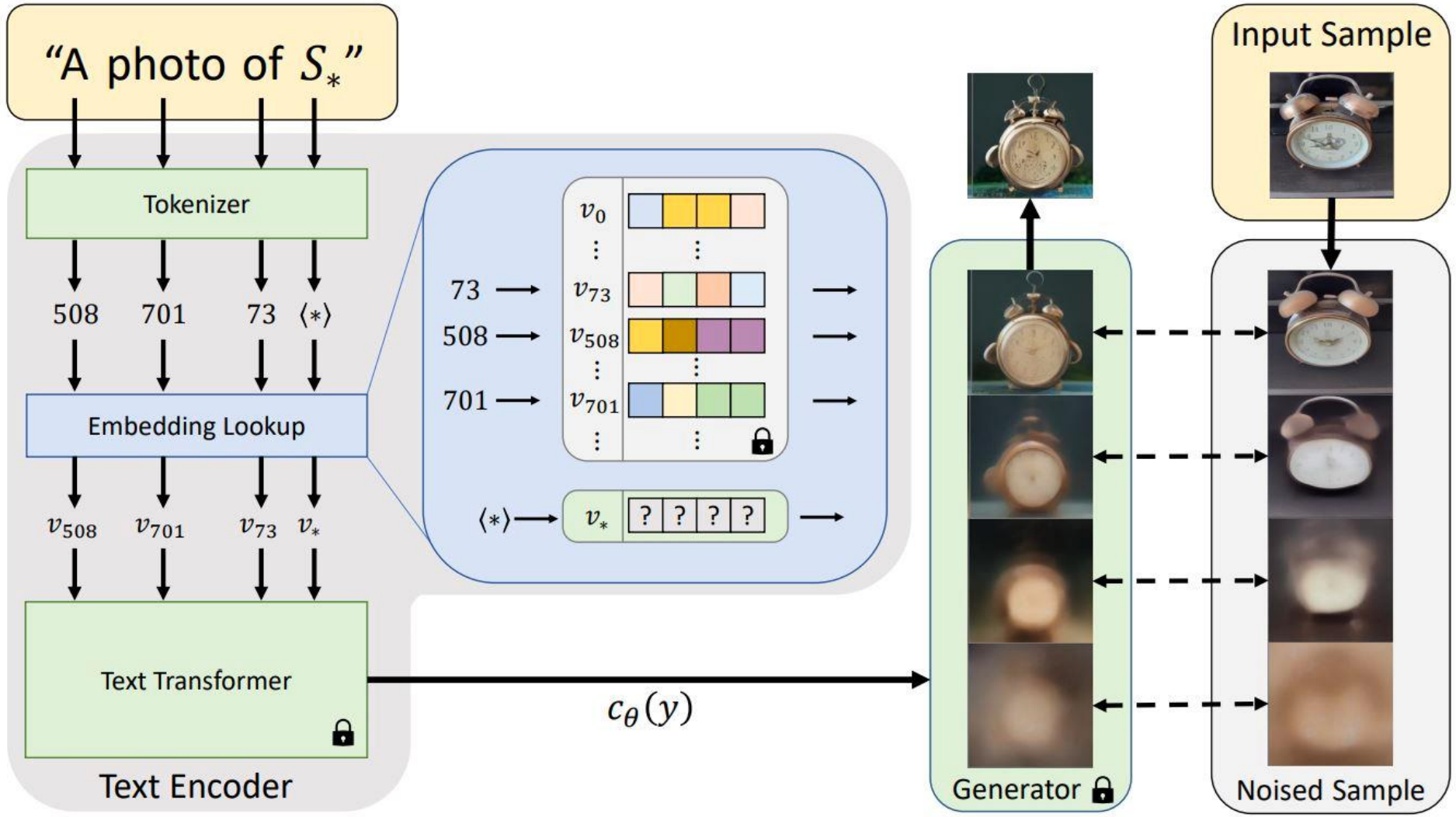
Textual Inversion

Dados fora do treinamento

- Um gato em uma praça ✅
- Um cachorro na grama ✅
- Um coelho no mato ✖



Textual Inversion



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03 Onde o Google entra nisso?

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Google has pioneered AI advances for a decade

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2015

Google DeepMind AlphaGo defeats Go champion

2016

Google's DeepMind helps detect eye disease

2017

Google invents Transformer kickstarting LLM revolution

2018

Google's groundbreaking large language model, BERT

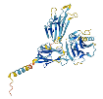
T5

2019

Text-to-Text Transfer Transformer LLM 10B P Model Open Sourced

2020

Google LaMDA Model Trained to converse



2022

AlphaFold predicts structures of all known proteins

2023

A conversational AI Service powered by PaLM2

2024

Family of multimodal LLMs & products

3,000
Researchers

7,000
Publications

Responsible AI

- Built & Tested for Safety
- Upholds high scientific standards
- Socially Beneficial
- Privacy in design
- Accountable to People
- Avoid creating unfair bias

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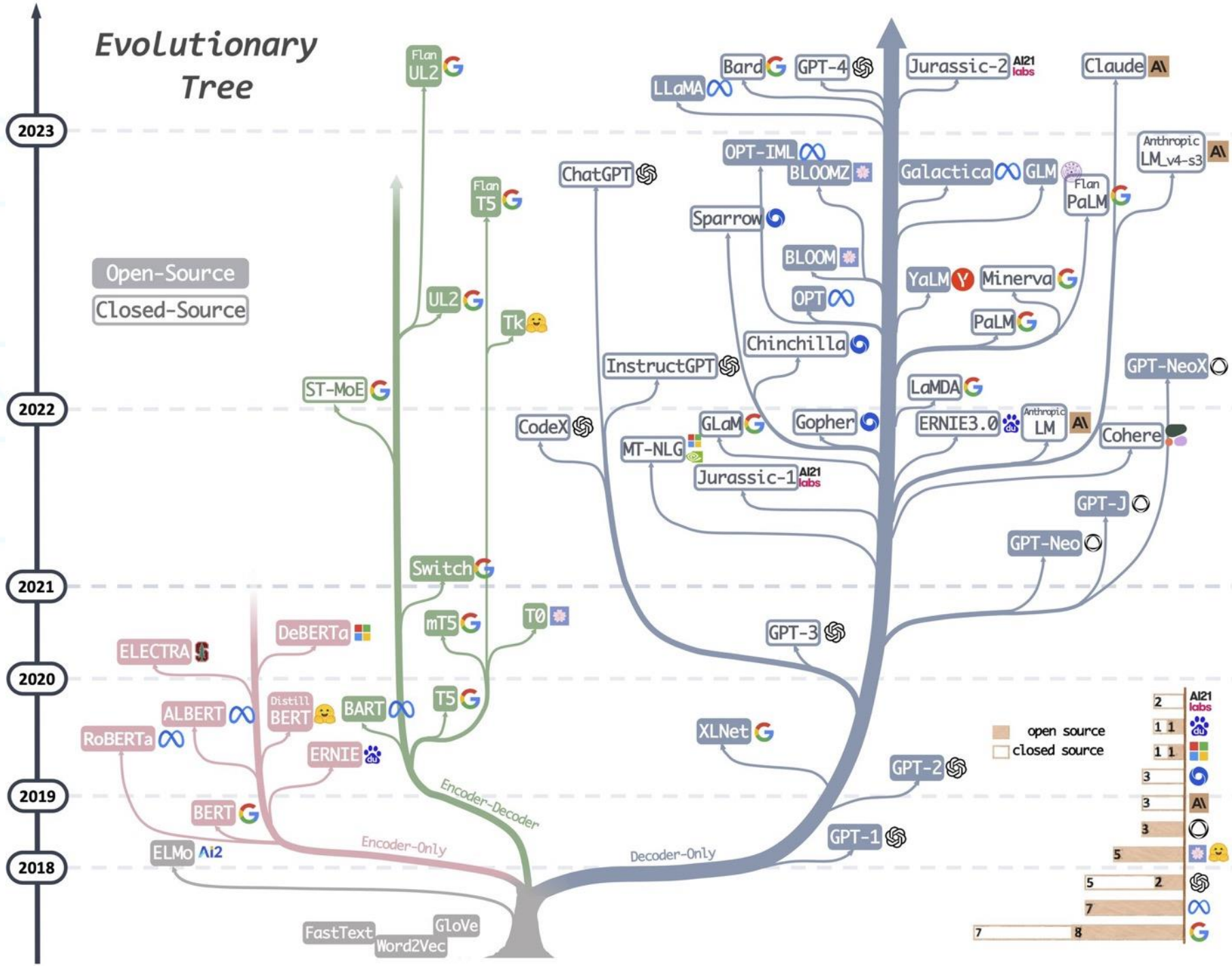
Evolutionary Tree
2023
2022
2021
2020
2019
2018
Open-Source
Closed-Source
Flan UL2
Flan T5
UL2
Tk
ST-MoE
Switch
mT5
T0
T5
BART
ELECTRA
DeBERTa
ALBERT
Distill BERT
RoBERTa
ERNIE
BERT
ELMo
Ai2
FastText
GloVe
Word2Vec
Encoder-Only
Encoder-Decoder
Decoder-Only
LLaMA
Bard
GPT-4
Jurassic-2
Claude
OPT-IML
BLOOMZ
ChatGPT
Galactica
GLM
Flan PaLM
Anthropic LM_v4-s3
Sparrow
BLOOM
YaLM
Minerva
OPT
PaLM
Chinchilla
InstructGPT
GPT-NeoX
LaMDA
CodeX
GLaM
Gopher
ERNIE3.0
Anthropic LM
Cohere
MT-NLG
Jurassic-1
GPT-J
GPT-Neo
GPT-3
XLNet
GPT-2
GPT-1
open source
closed source
2
1 1
1 1
3
3
3
5
5 2
7
7 8

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Linha do tempo até o chat Generative Pre-Training chatGPT

OpenAI

2017 — Deep RL from human preferences (link)

2018 — GPT1

2019 — GPT2

2019 — GPT2 treino RLHF (link)

2020 — GPT3

2021 — WebGPT GPT3 fine-tuned

2022 — GPT3.5 GPT3 com RLHF instructGPT

2023 — chatGPT InstructGPT

Deep Reinforcement Learning from Human Preferences

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Abstract

For sophisticated reinforcement learning (RL) systems to interact usefully with real-world environments, we need to communicate complex goals to these systems. In this work, we explore goals defined in terms of (non-expert) human preferences between pairs of trajectory segments. We show that this approach can effectively solve complex RL tasks without access to the reward function, including Atari games and simulated robot locomotion, while providing feedback on less than

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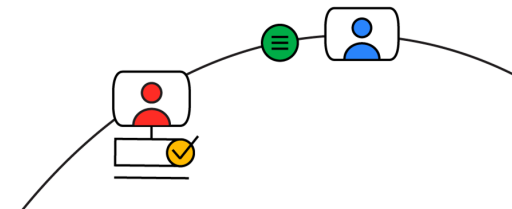
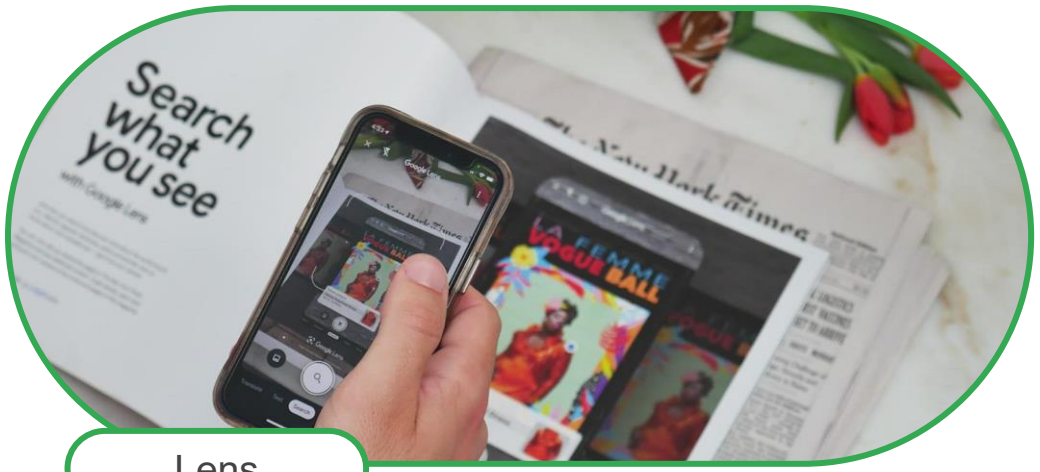
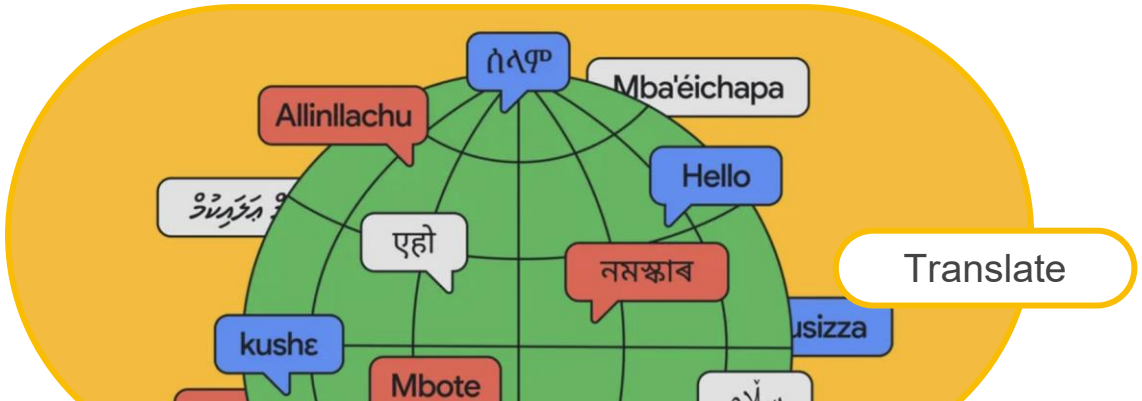


LaMDA

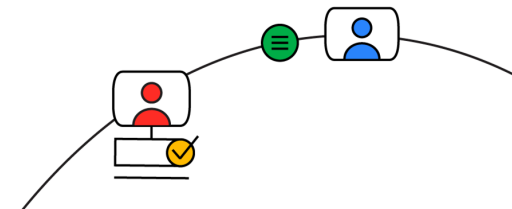


Lens



Translate

Ultimately helping people achieve their potential.



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Google’s AI Principles

1. Be socially beneficial.

2. Avoid creating or reinforcing unfair bias.

3. Be built and tested for safety.

4. Be accountable to people.

5. Incorporate privacy design principles.

6. Uphold high standards of scientific excellence.

7. Be made available for uses that accord with these principles.

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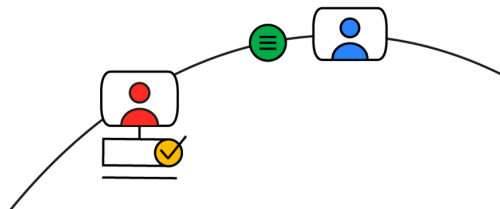

The Layer Cake of GenAI

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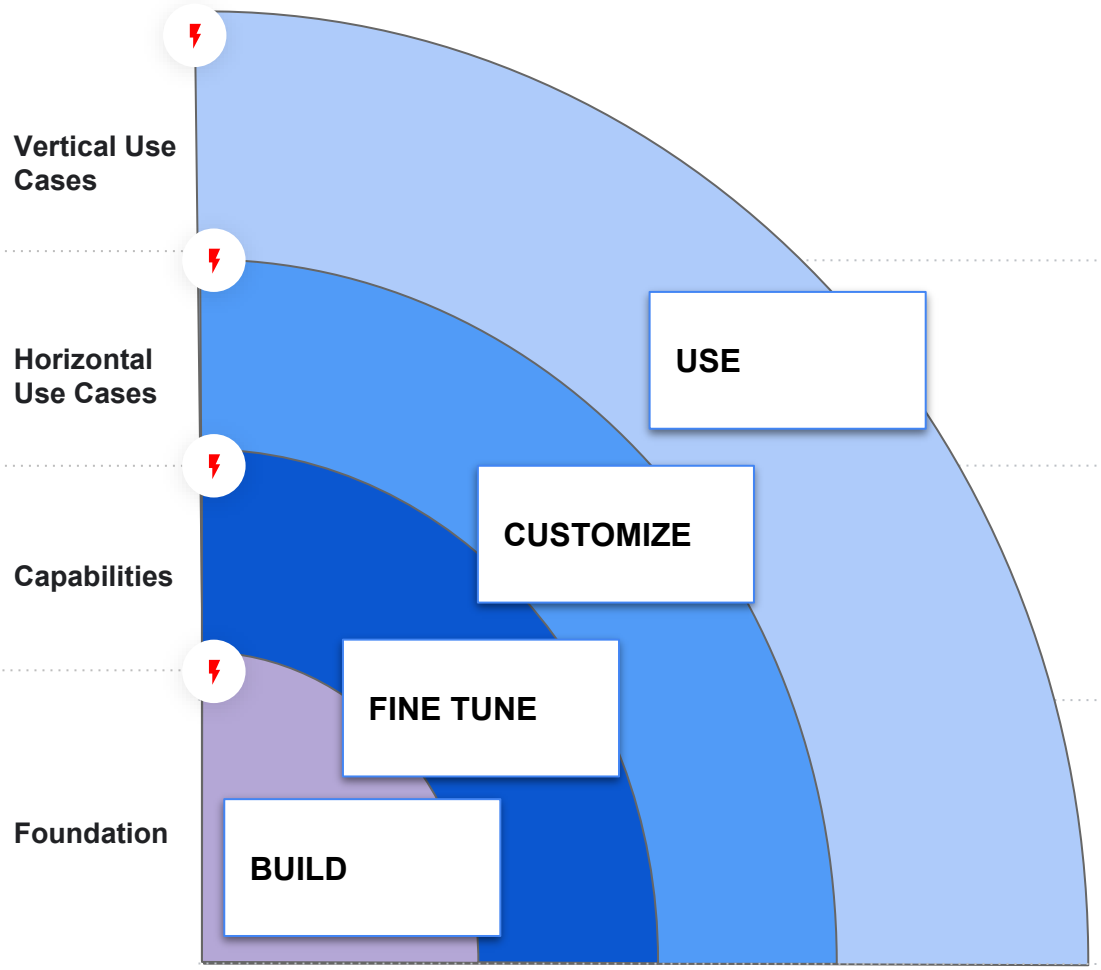

USE CASE	PERSONAS
COMPLIANCE ASSISTANT PERSONAL FINANCE ASSISTANT PERSONALIZED MKTG CONTENT KNOW YOUR CUSTOMER PROFILES FLEET MANAGEMENT	HR & FINANCE END USERS CUSTOMER RELATIONSHIP MANAGERS STRATEGIC OPERATIONS MARKETERS
SEARCH CONVERSATION PRODUCTIVITY ASK YOUR DATA	DATA ANALYSTS SOFTWARE ENGINEERS IT ANALYSTS
GENERATION SUMMARIZATION EXTRACTION DOCUMENT UNDERSTANDING MODAL TRANSITIONS	AI ENGINEERS PROMPT ENGINEERS SOFTWARE ENGINEERS
MODEL-OPS TRAINING PREDICTIVE/ANALYTICAL AI INFRASTRUCTURE DATASETS	MODEL ENGINEERS DATA ENGINEERS DATA SCIENTISTS INFRA ENGINEERS

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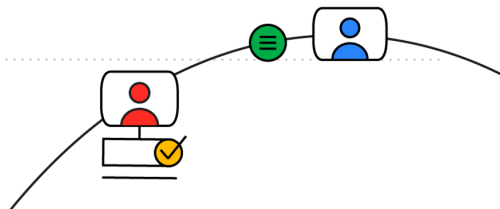
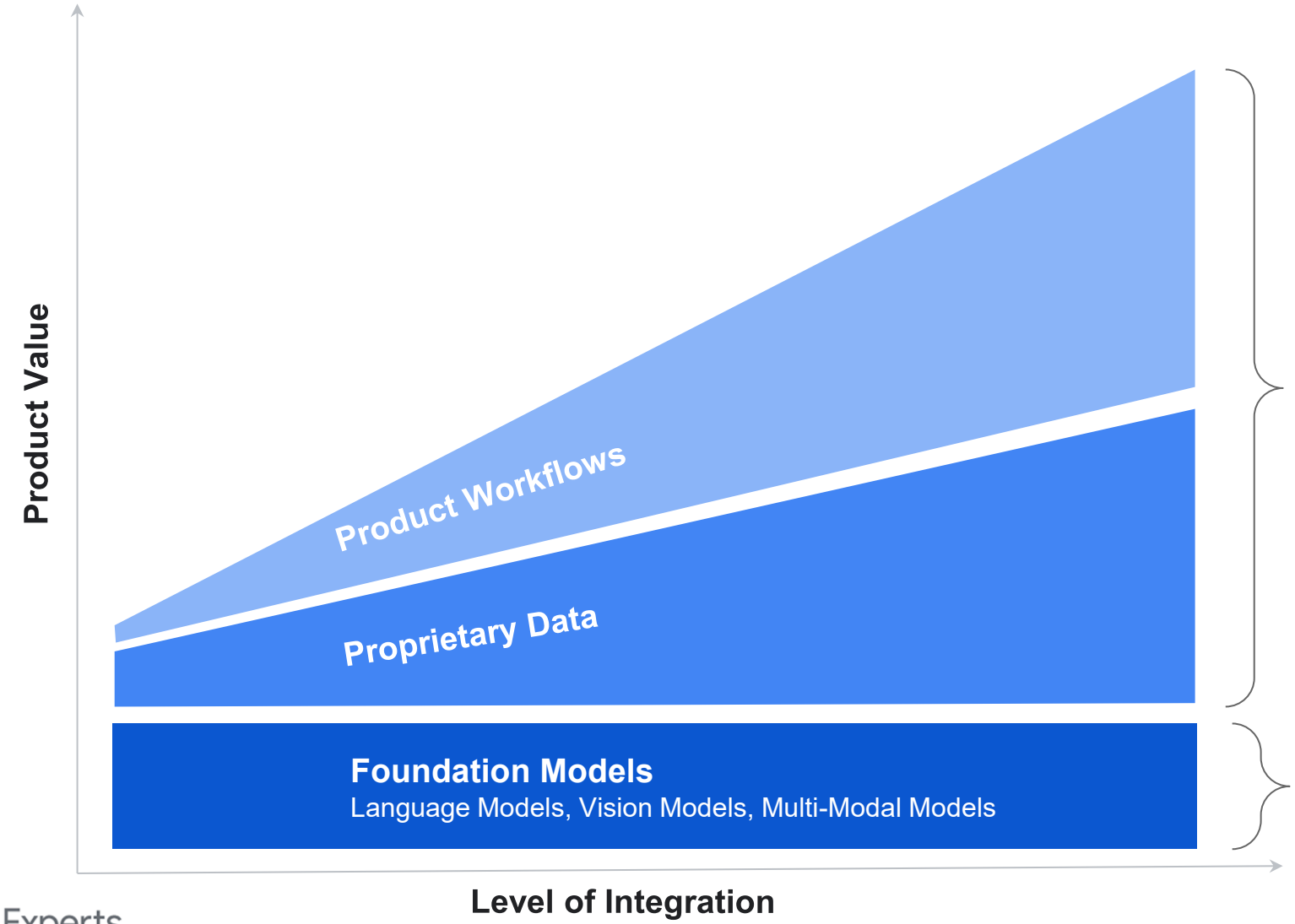
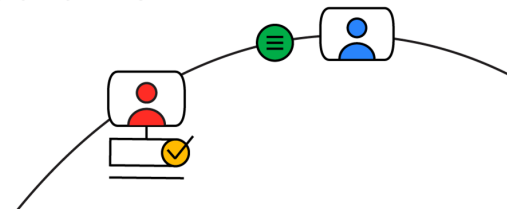


Where Value Accrues with GenAI



Your Competitive Advantage

Everyone has access to this



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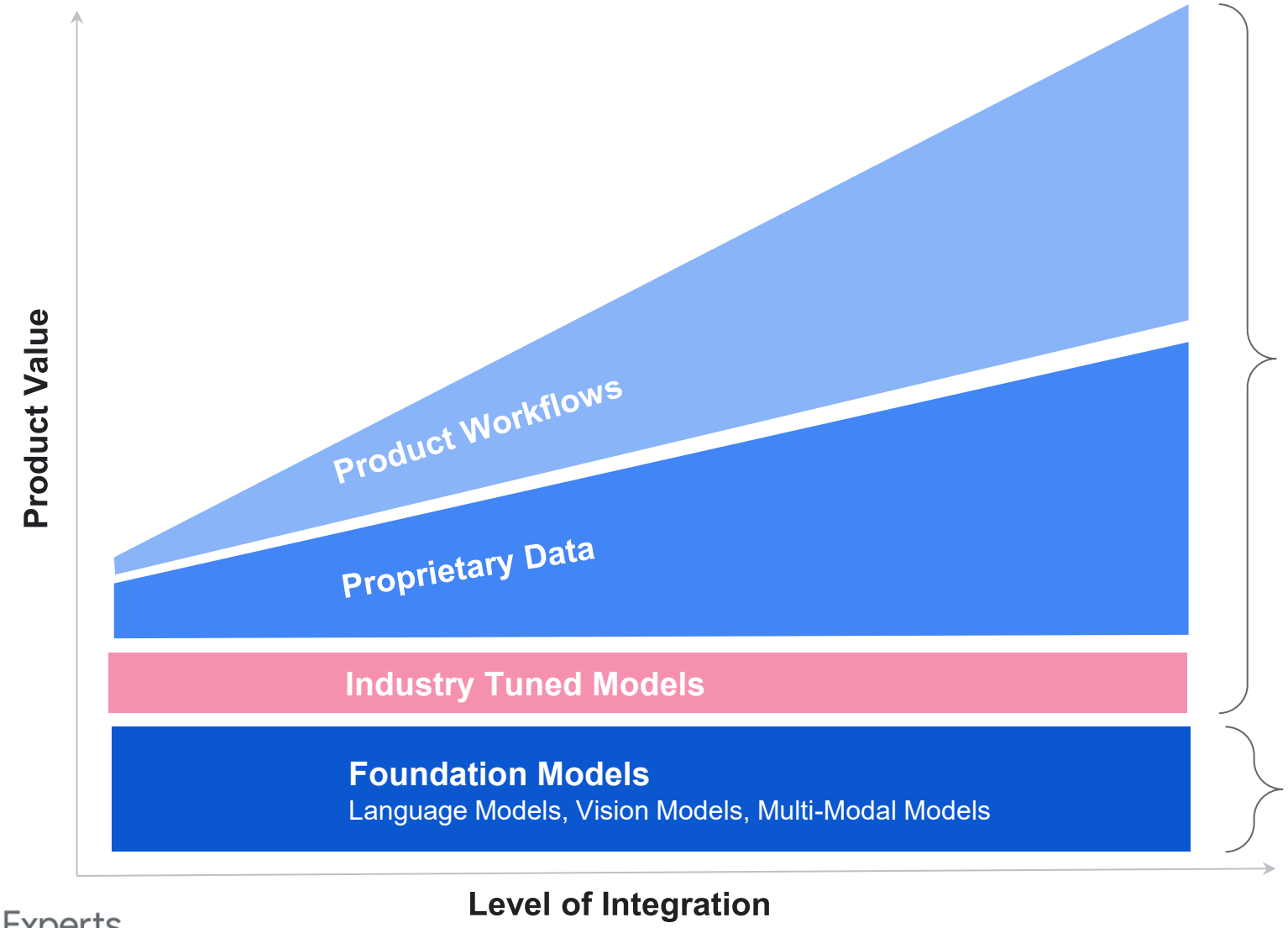
Where Value Accrues with GenAI



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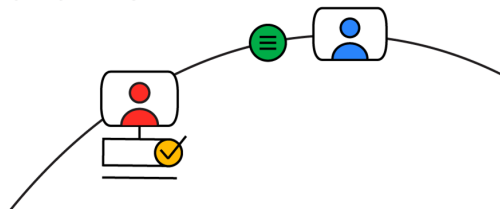

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04 The Gemini and Gemma Era

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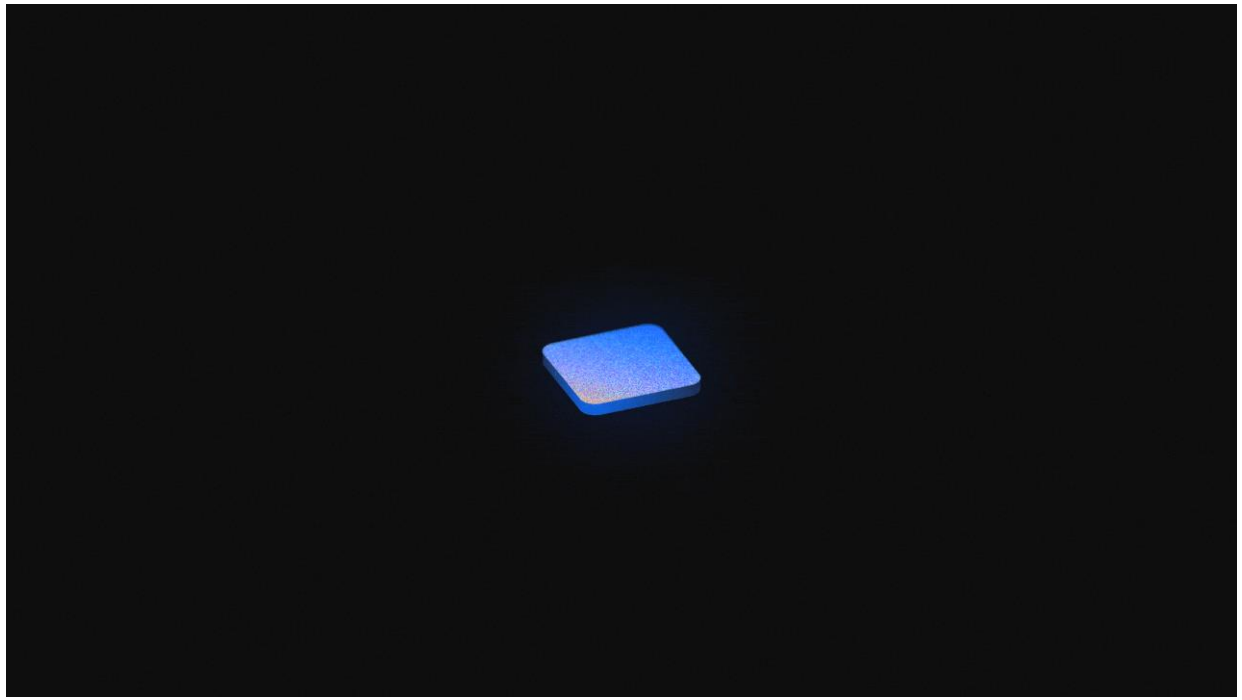
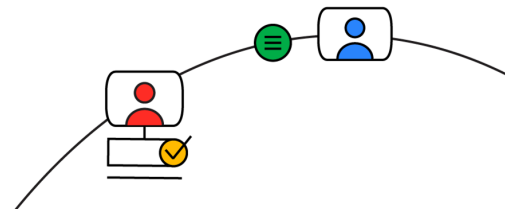
The next chapter of Generative AI innovation

Gemini

Gemini is the most capable and general model we've ever built, and is the result of a large-scale collaborative effort by teams across Google, including Google DeepMind and Google Research.





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Gemini marks the next phase on our journey to making AI more helpful for everyone

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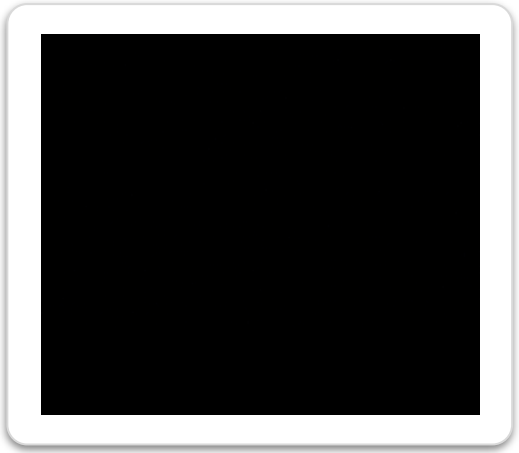
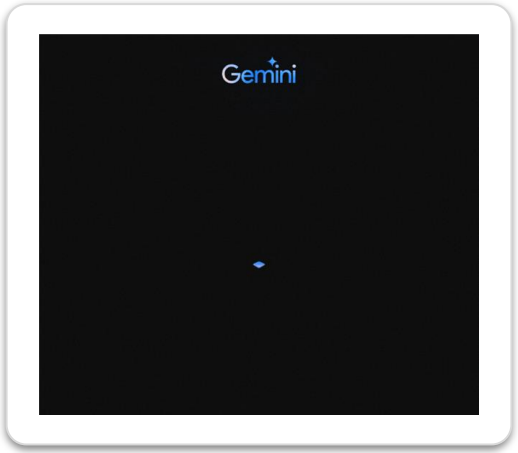
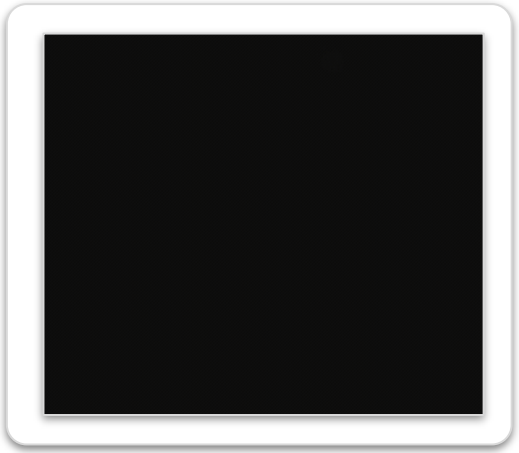


State-of-the-art, natively multimodal reasoning capabilities

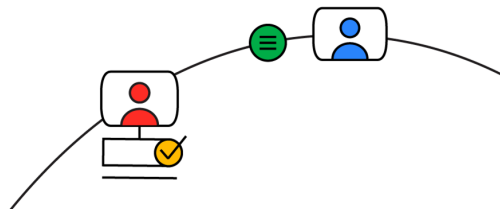


Highly optimized while preserving choice



Built with responsibility and safety at the core

Experts
Google Developers



The Gemini Ecosystem

The most advanced AI from Google

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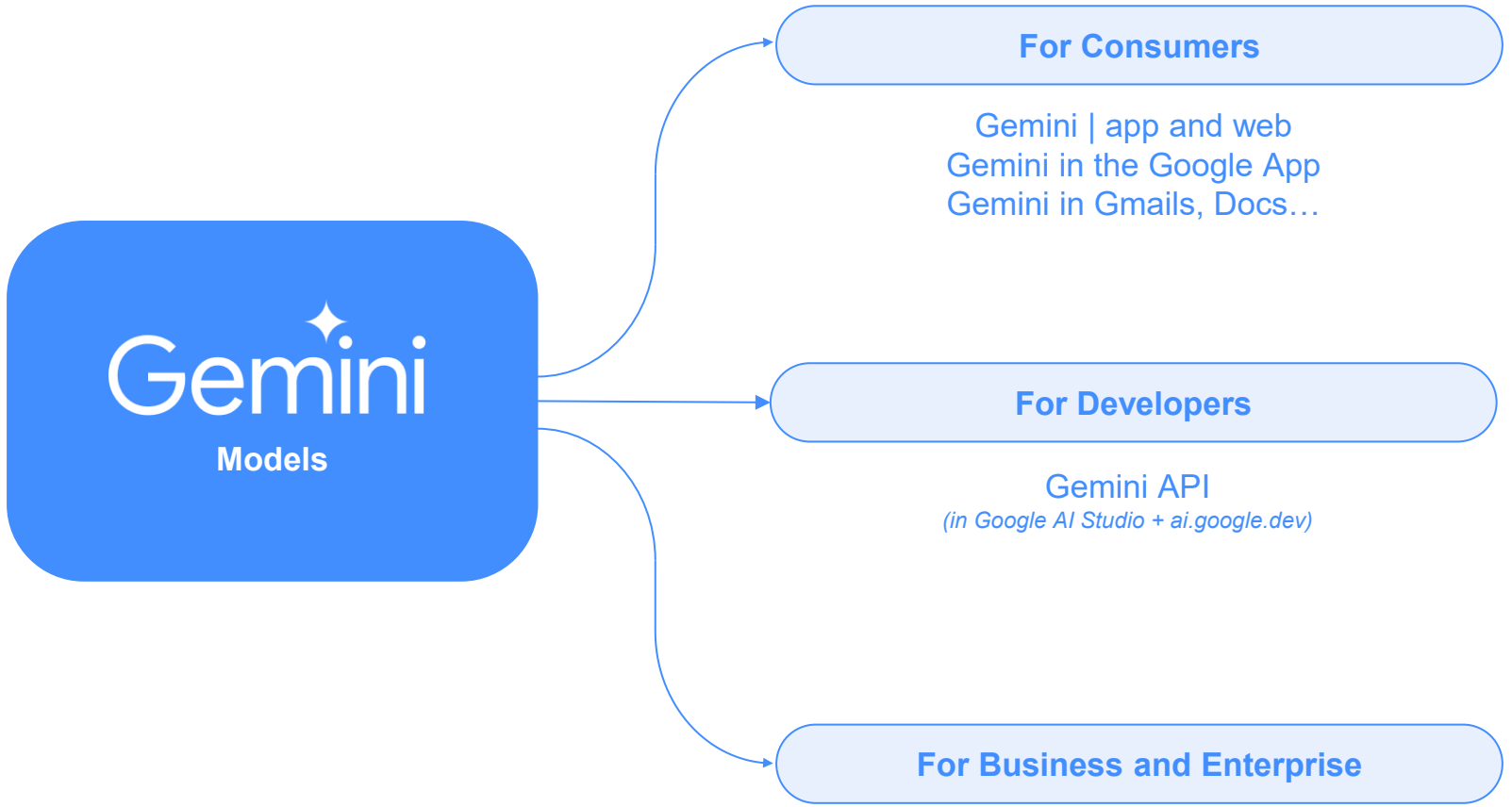
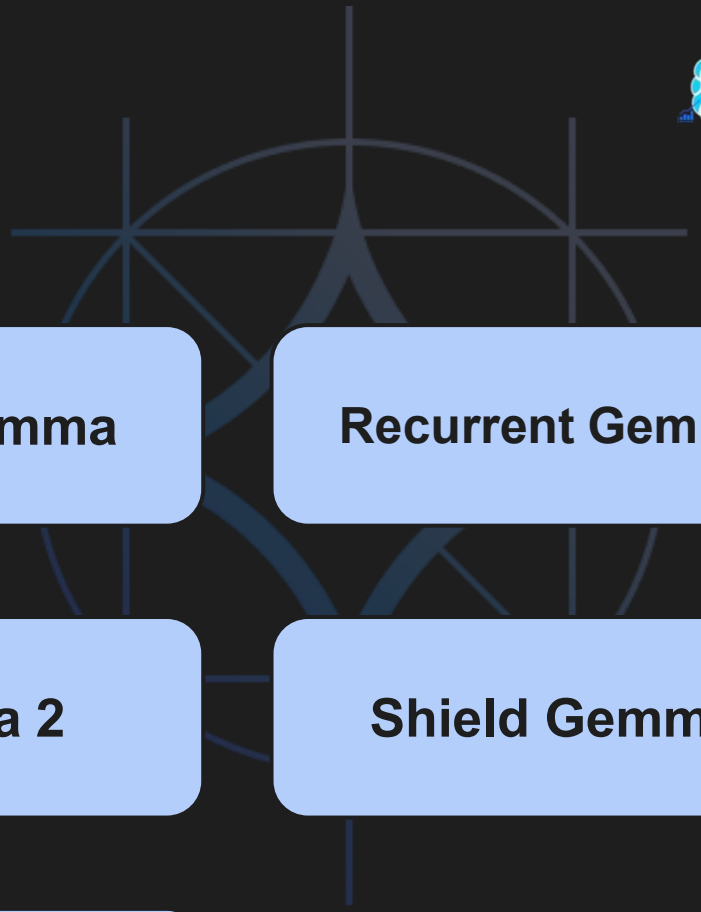
Human-Centered Data & AI



Gemma Family



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- Gemma
- Code Gemma
- Recurrent Gemma
- Pali Gemma
- Gemma 2
- Shield Gemma
- Gemma Scope

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kaggle

Gemma

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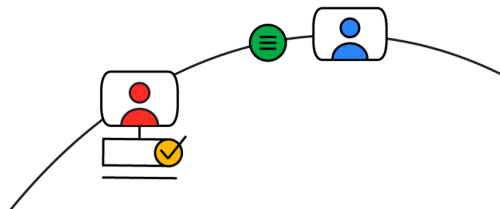

kaggle Competitions Datasets Models Code Discussions Courses ... Search Sign In Register

Level up with the largest AI & ML community

Join over 17M+ machine learners to share, stress test, and stay up-to-date on all the latest ML techniques and technologies. Discover a huge repository of community-published models, data & code for your next project.

Register with Google Register with Email

Who's on Kaggle?

Learners
Dive into Kaggle courses, competitions & forums.

KEY FEATURES

- Beginner competitions
- Practical courses
- Public datasets

Developers
Leverage Kaggle's models, notebooks & datasets.

KEY FEATURES

- Open-sourced models
- Competition solution write-ups
- Public notebooks

Researchers
Advance ML with our pre-trained model hub & competitions.

KEY FEATURES

- ML competition hosting
- Model training datasets
- Open-sourced models

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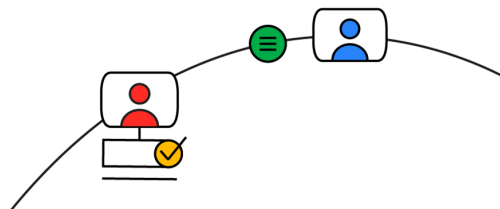
Keras

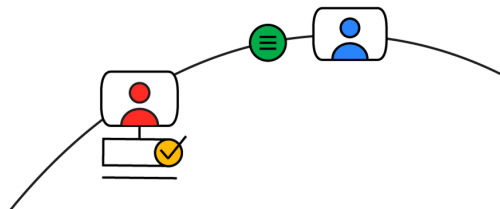
Gemma

Experts
Google Developers



Why Keras?

Simple	Flexible	Powerful
simplifies development, empowering focused problem-solving.	offers scalable complexity for evolving needs.	industry-strength performance and scalability



Vertex AI

Build your own generative AI-powered agents

AI Solutions
Contact Center AI | Document AI | Risk AI | …

Search

Conversation

AI Platform
Extensions | Connectors | Grounding
Prompt | Serve | Tune | Distill | Eval

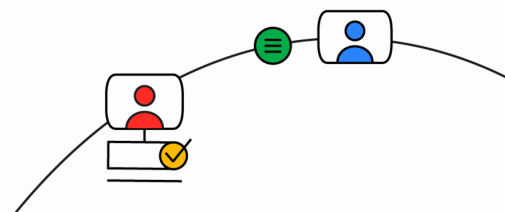
Gemini and 130+ models

Model Garden
Google | OSS | Partner Models

Gemma

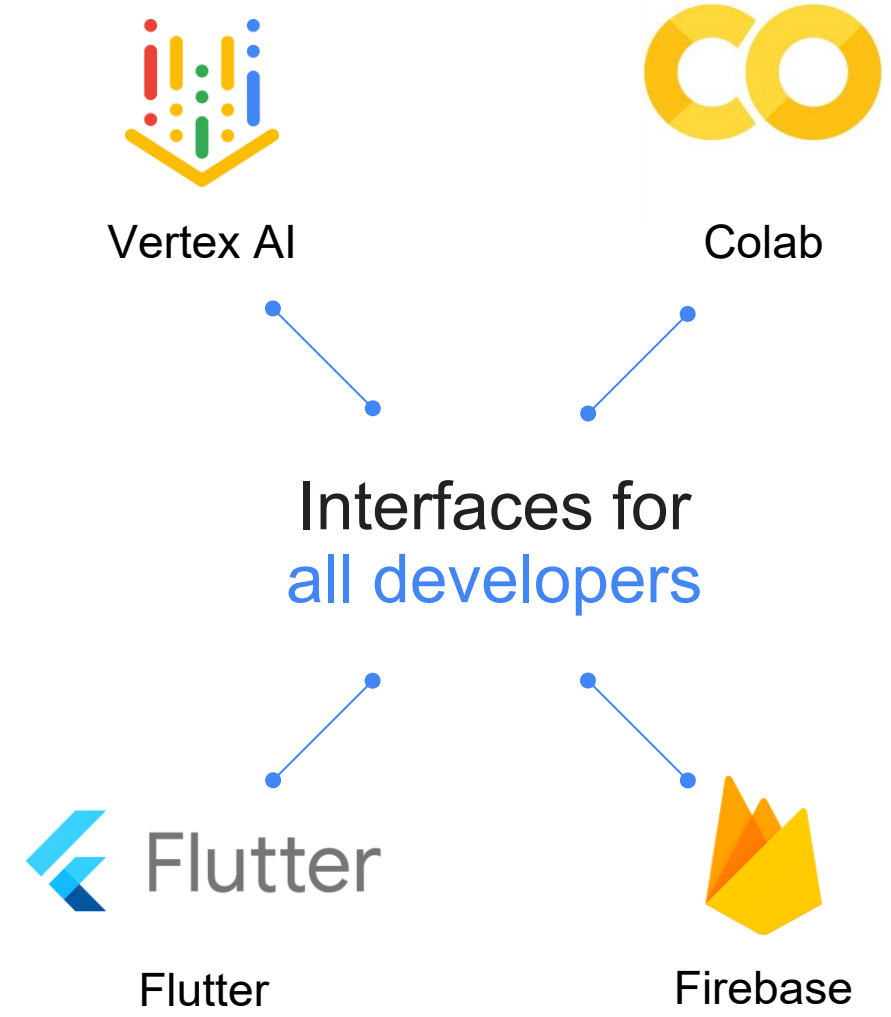
Google Cloud Infrastructure (GPU/TPU) | Google Data Cloud

- Business Users
- Developers
- AI Practitioners



Vertex AI is built for developers

- Extensive **quick start library** with code samples and jumpstarts for **developers of all levels** and ecosystems
- **Free developer labs** and training resources across Vertex products at Cloud Skills Boost
- **Robust integrations** with popular third party developer tools like **Lang Chain, LlamaIndex, Pinecone, and Weaviate.**
- **Packages and extensions** to natively support Google Cloud foundation models in Google app developer frameworks like **Firebase and Flutter**.



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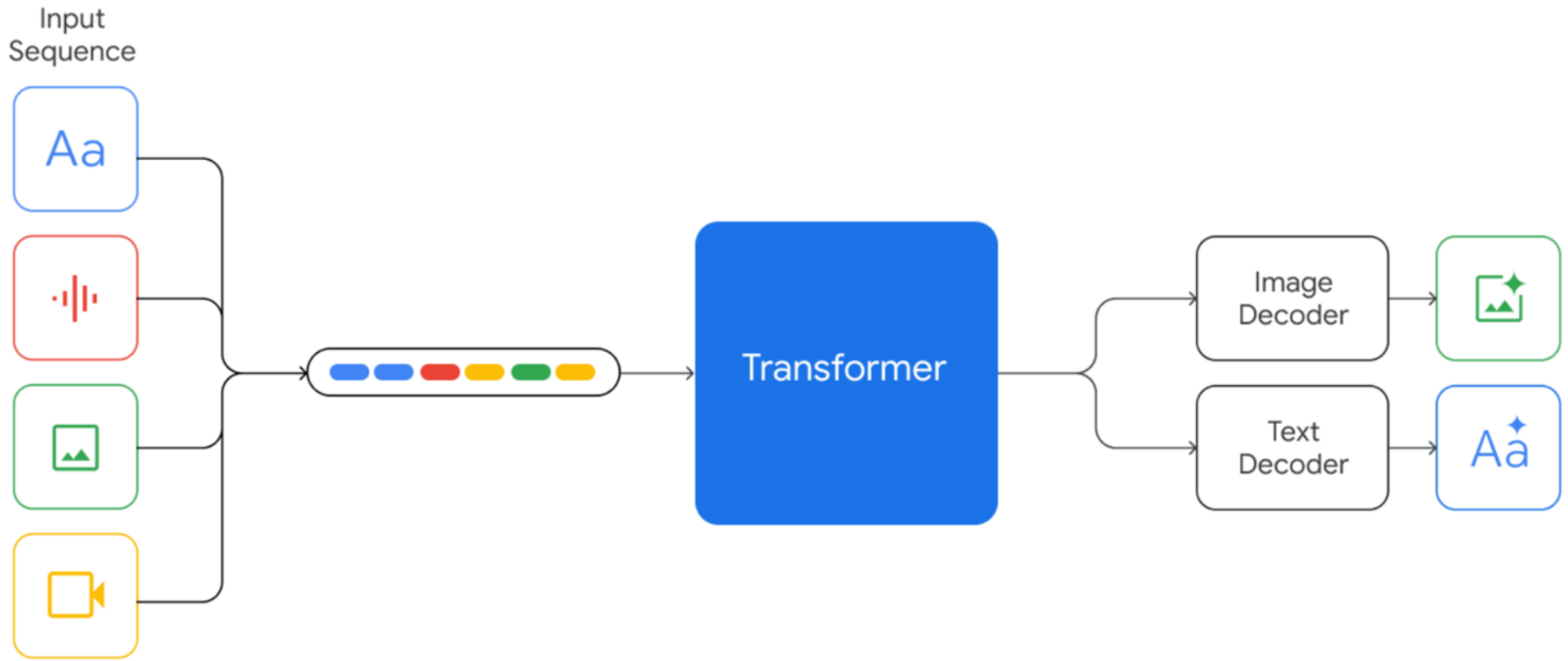
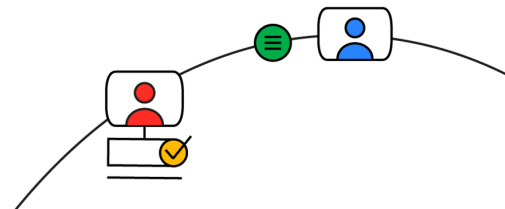
Multimodality



Experts
Google Developers



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Gemini VS Gemma

Experts
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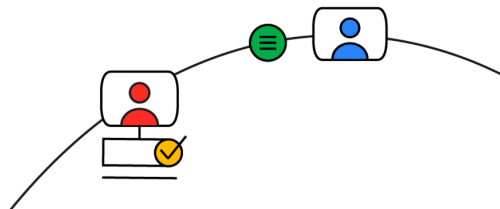

Gemini

Gemma

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Purpose

Gemini is Google's next-generation large language model (LLM). It's a more advanced model designed to compete with other state-of-the-art models in natural language understanding and generation, such as GPT-4. Gemini is built to excel in tasks that require deep understanding, reasoning, and creativity, specifically in conversational AI and content generation.

Gemma is designed to be a highly versatile AI model, mainly focused on general-purpose machine learning tasks like natural language processing (NLP), computer vision, and other structured or unstructured data tasks.

Experts
Google Developers

Gemini

Gemma

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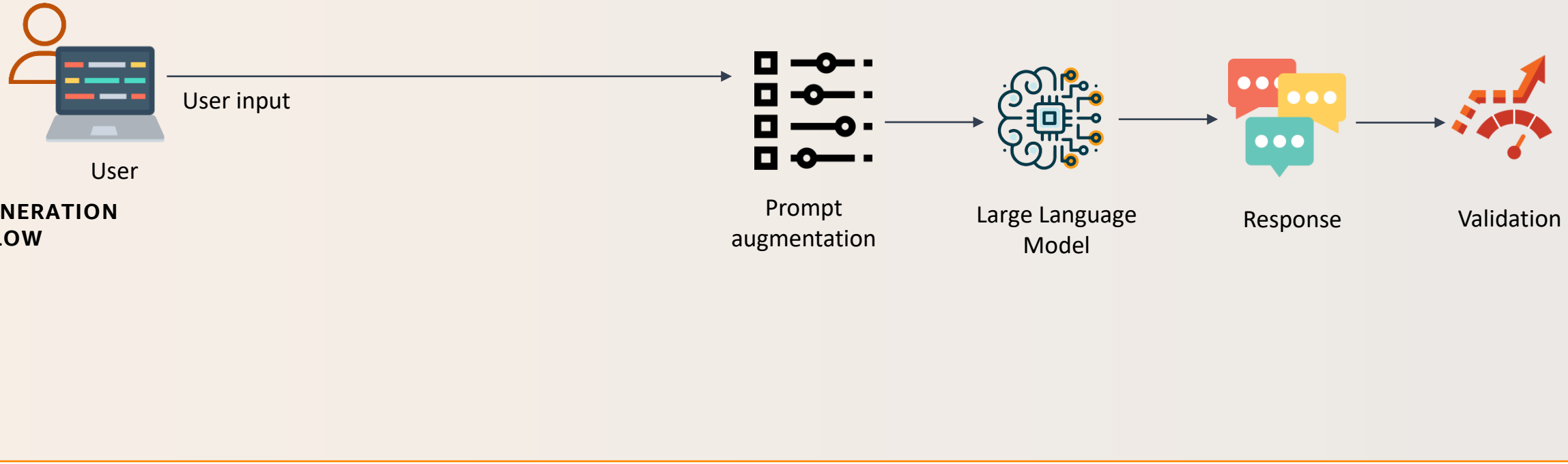
Integration

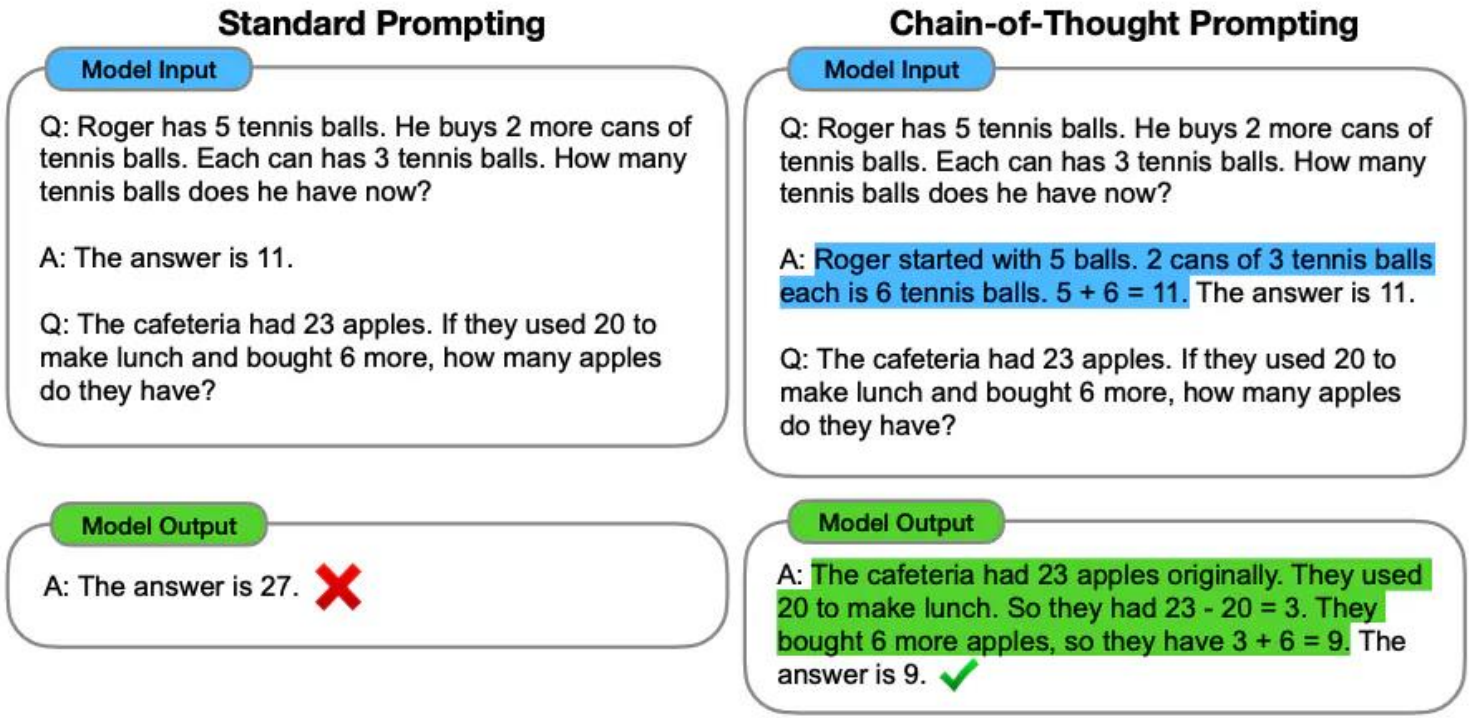
Gemini is integrated into Google services like Bard and Search, and can be used via Google Cloud for NLP-heavy applications.

It's also deeply integrated into Google Cloud's Vertex AI ecosystem, making it easy to use for developers and data scientists who are already working within the Google Cloud environment.

Experts
Google Developers

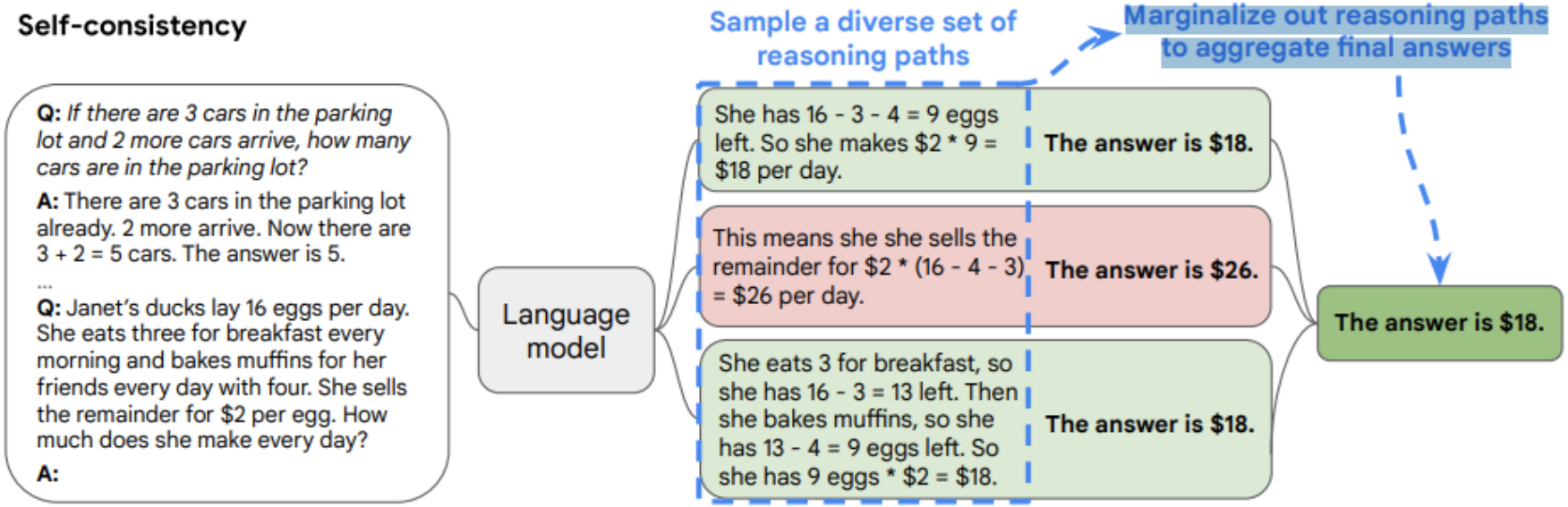


Chain-of-Thought Prompting (CoT)

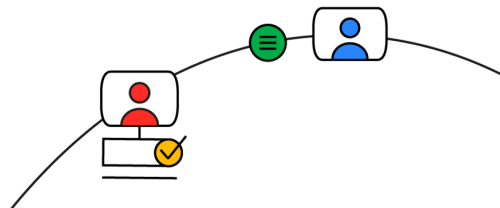


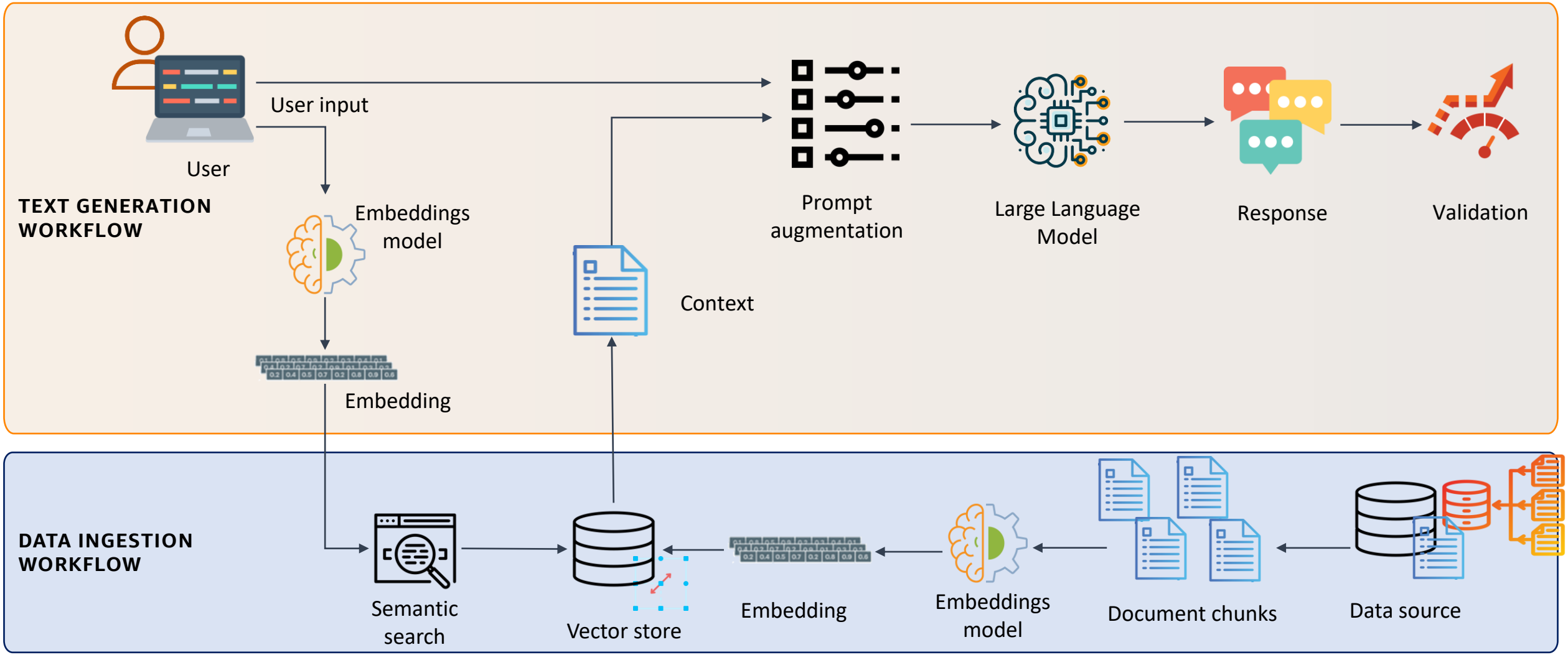
Ref: https://arxiv.org/abs/2201.11903

Self Consistency



Ref: https://arxiv.org/pdf/2203.11171





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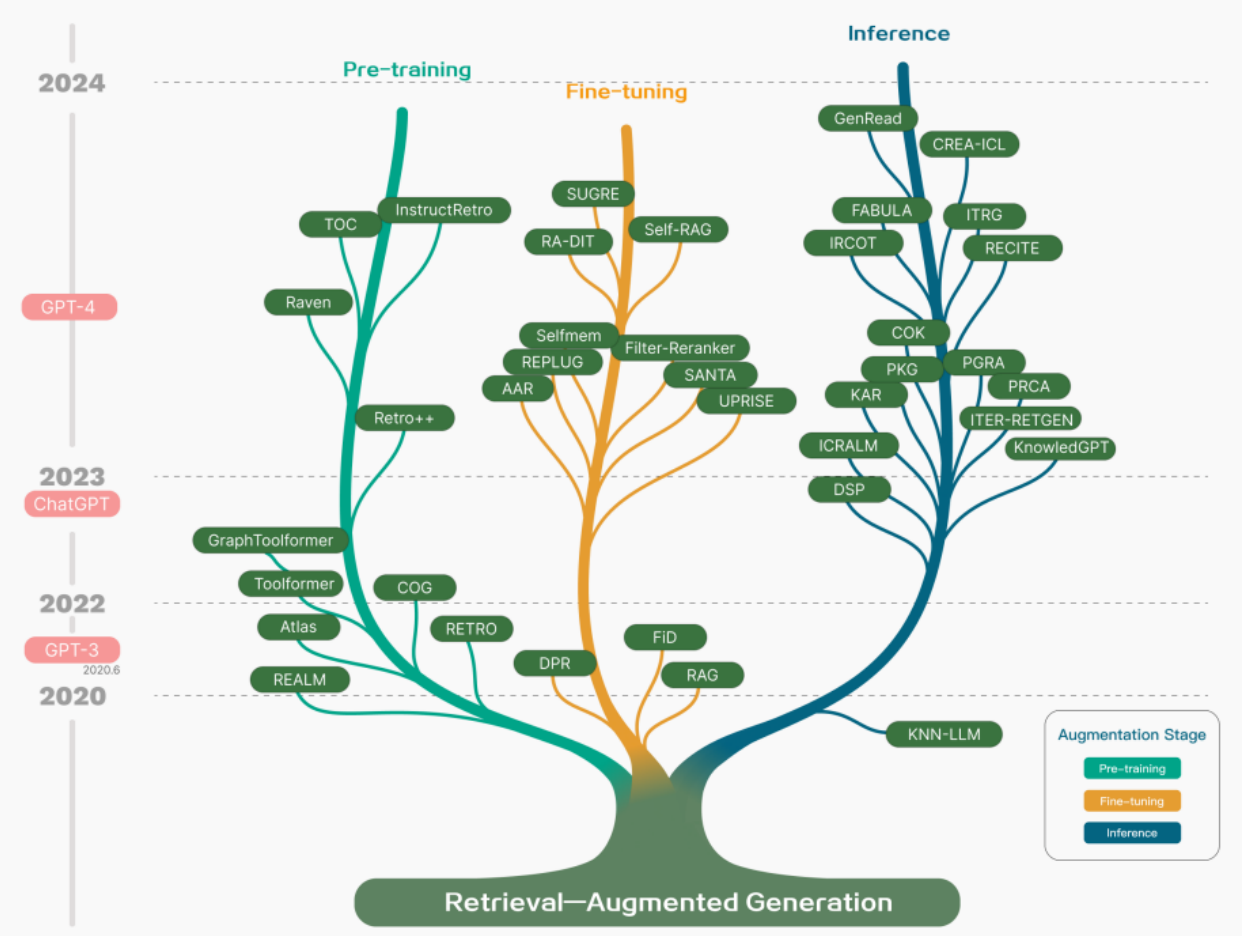
Retrieval-Augmented Generation for Large Language Models: A Survey

Yunfan Gao [1], **Yun Xiong** [2], **Xinyu Gao** [2], **Kangxiang Jia** [2], **Jinliu Pan** [2], **Yuxi Bi** [3], **Yi Dai** [1], **Jiawei Sun** [1], **Qianyu Guo** [4], **Meng Wang** [3] and **Haofen Wang** [1,3] *

[1] Shanghai Research Institute for Intelligent Autonomous Systems, Tongji University
[2] Shanghai Key Laboratory of Data Science, School of Computer Science, Fudan University
[3] College of Design and Innovation, Tongji University
[4] School of Computer Science, Fudan University



https://arxiv.org/pdf/2312.10997.pdf

THE CHRONICLES OF RAG: THE RETRIEVER, THE CHUNK AND THE GENERATOR

PREPRINT

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* Both authors contributed equally to this research.

ABSTRACT

Retrieval Augmented Generation (RAG) has become one of the most popular paradigms for enabling LLMs to access external data, and also as a mechanism for grounding to mitigate against hallucinations. When implementing RAG you can face several challenges like effective integration of retrieval models, efficient representation learning, data diversity, computational efficiency optimization, evaluation, and quality of text generation. Given all these challenges, every day a new technique to improve RAG appears, making it unfeasible to experiment with all combinations for your problem. In this context, this paper presents good practices to implement, optimize, and evaluate RAG for the Brazilian Portuguese language, focusing on the establishment of a simple pipeline for inference and experiments. We explored a diverse set of methods to answer questions about the first Harry Potter book. To generate the answers we used the OpenAI's `gpt-4`, `gpt-4-1106-preview`, `gpt-3.5-turbo-1106`, and Google's `Gemini Pro`. Focusing on the quality of the retriever, our approach achieved an improvement of MRR@10 by 35.4% compared to the baseline. When optimizing the input size in the application, we observed that it is possible to further enhance it by 2.4%. Finally, we present the complete architecture of the RAG with our recommendations. As result, we moved from a baseline of 57.88% to a maximum relative score of 98.61%.

https://arxiv.org/abs/2401.07883

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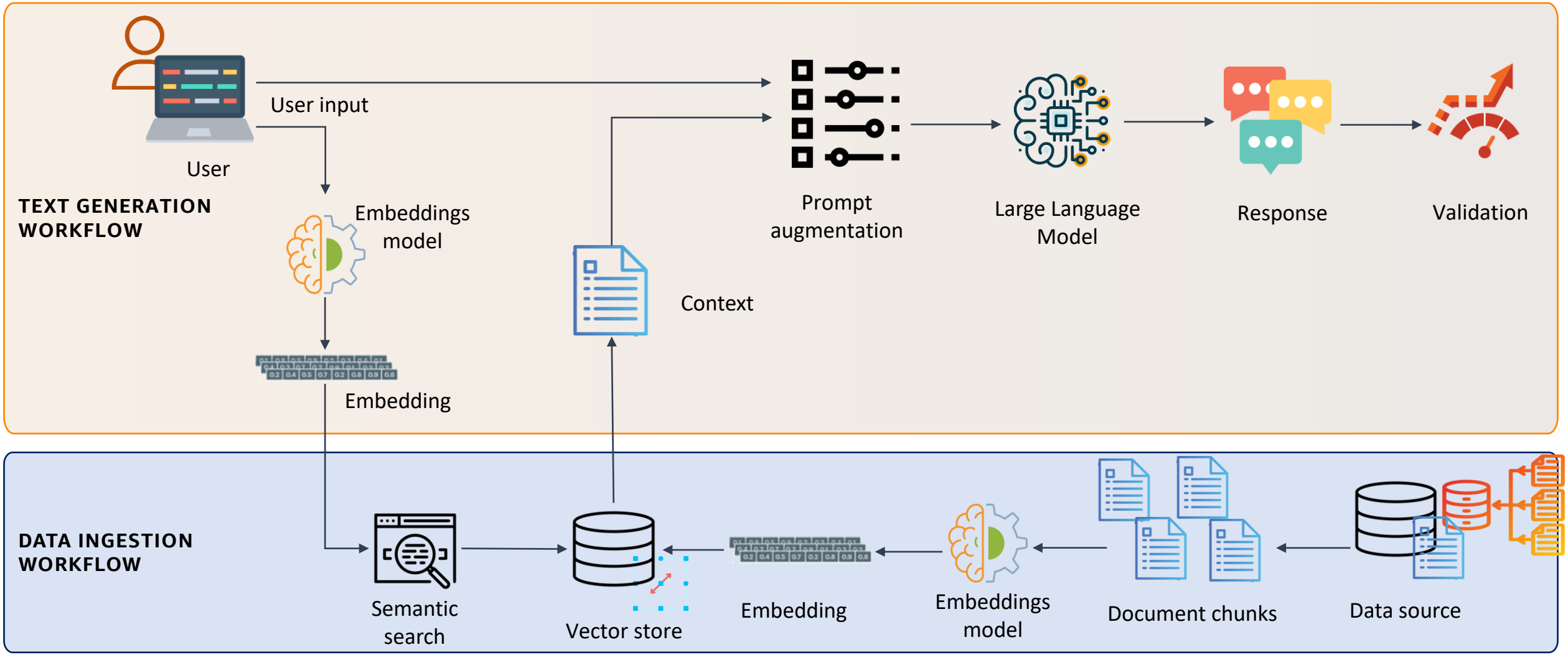

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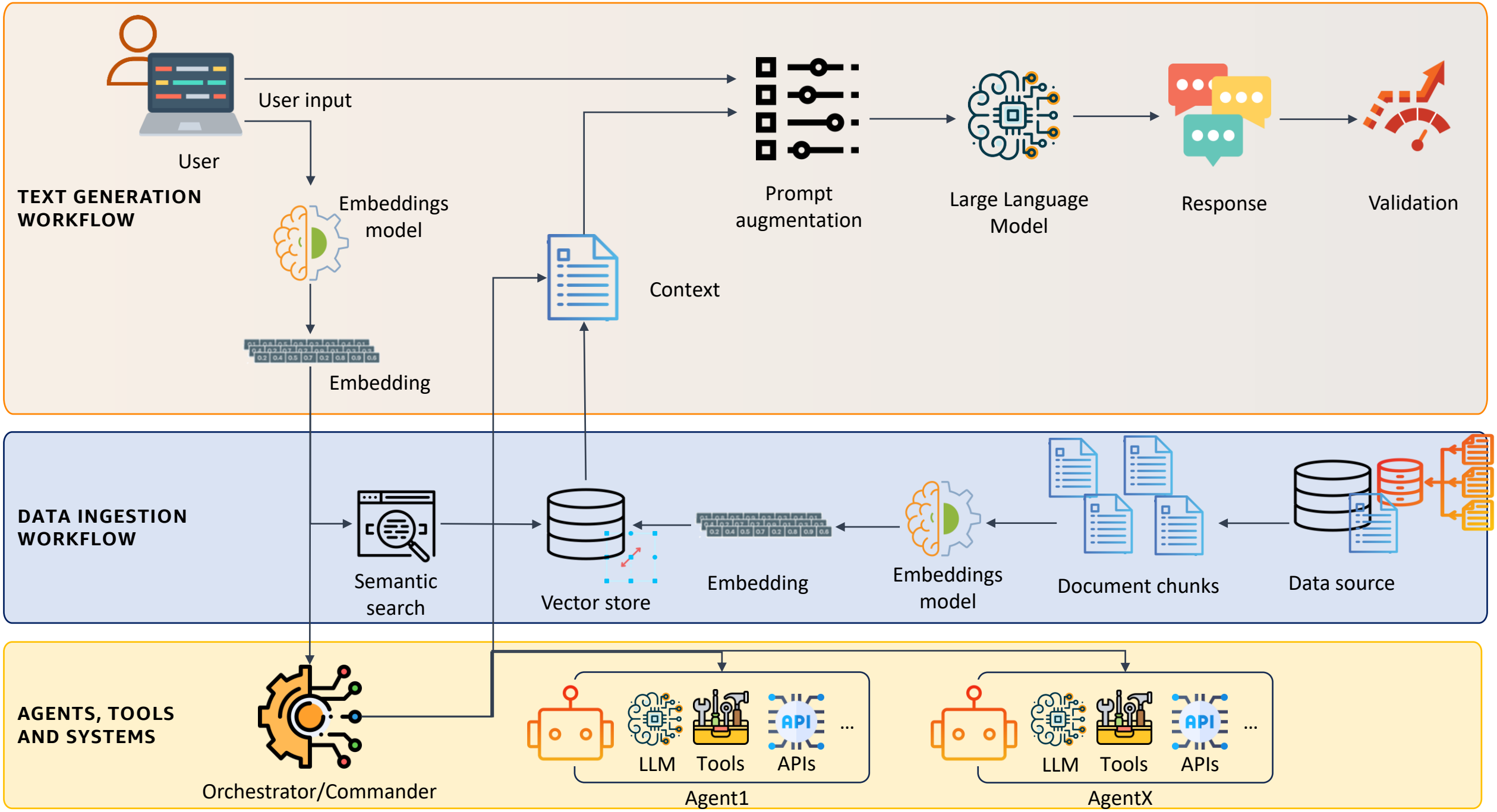
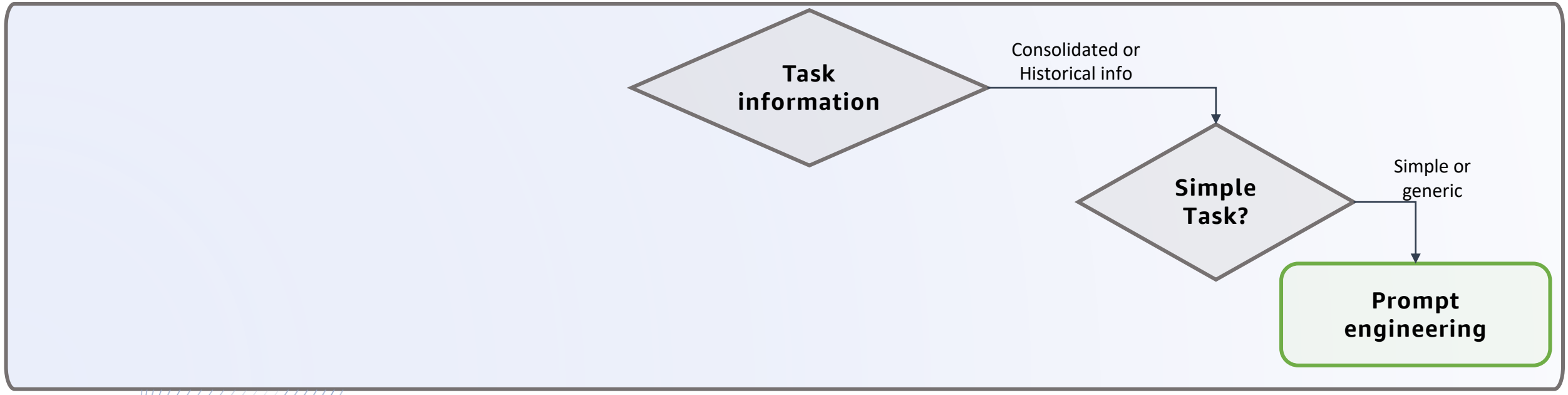

User input
User
TEXT GENERATION WORKFLOW
Embeddings model
Embedding
Context
Prompt augmentation
Large Language Model
Response
Validation
DATA INGESTION WORKFLOW
Semantic search
Vector store
Embedding
Embeddings model
Document chunks
Data source
AGENTS, TOOLS AND SYSTEMS
Orchestrator/Commander
LLM
Tools
APIs
...
Agent1
AgentX



Prompt Engineering

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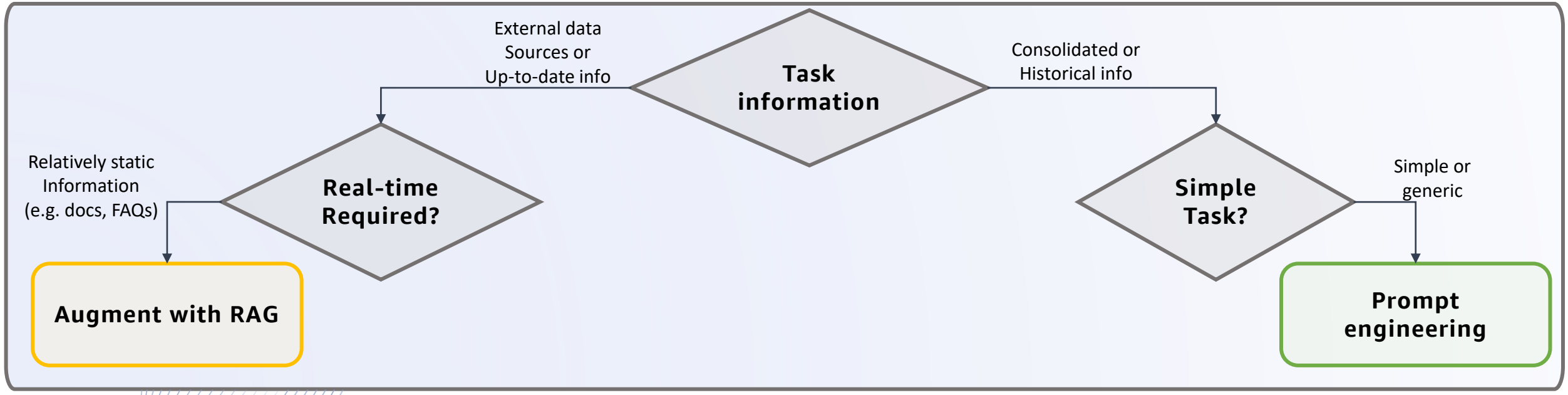

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Retrieval Augmented Generation (RAG)

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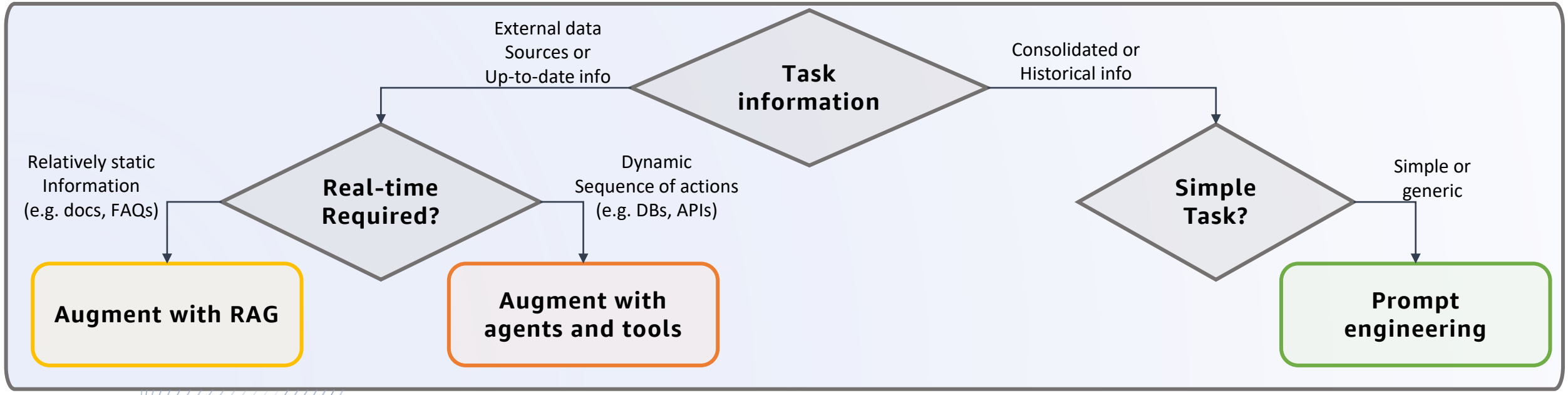

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Retrieval Augmented Generation (RAG)

Agents and Tools

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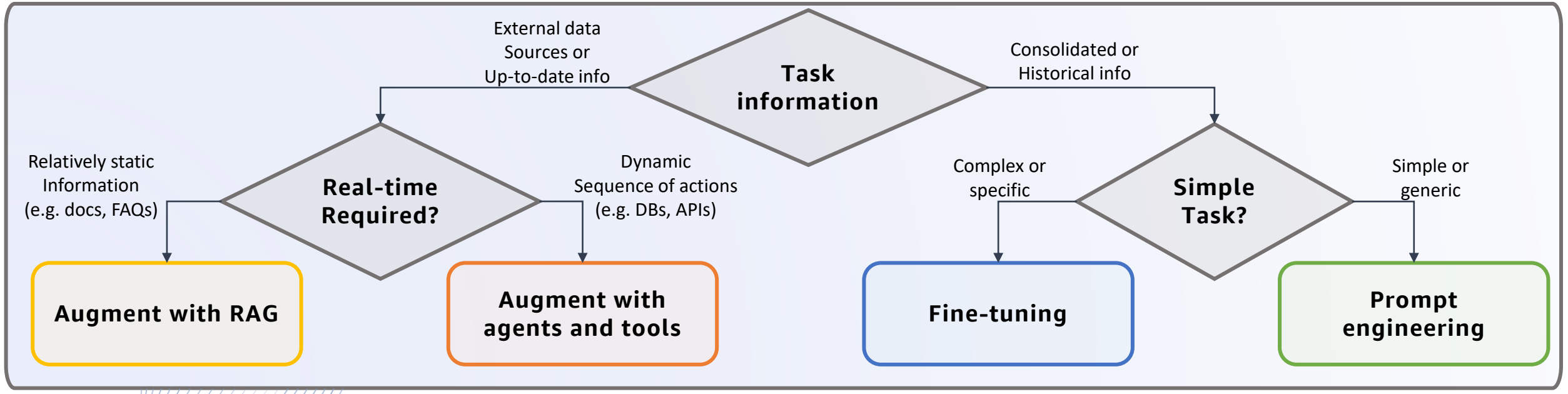

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Retrieval Augmented Generation (RAG)

Agents and Tools

Fine-tuning

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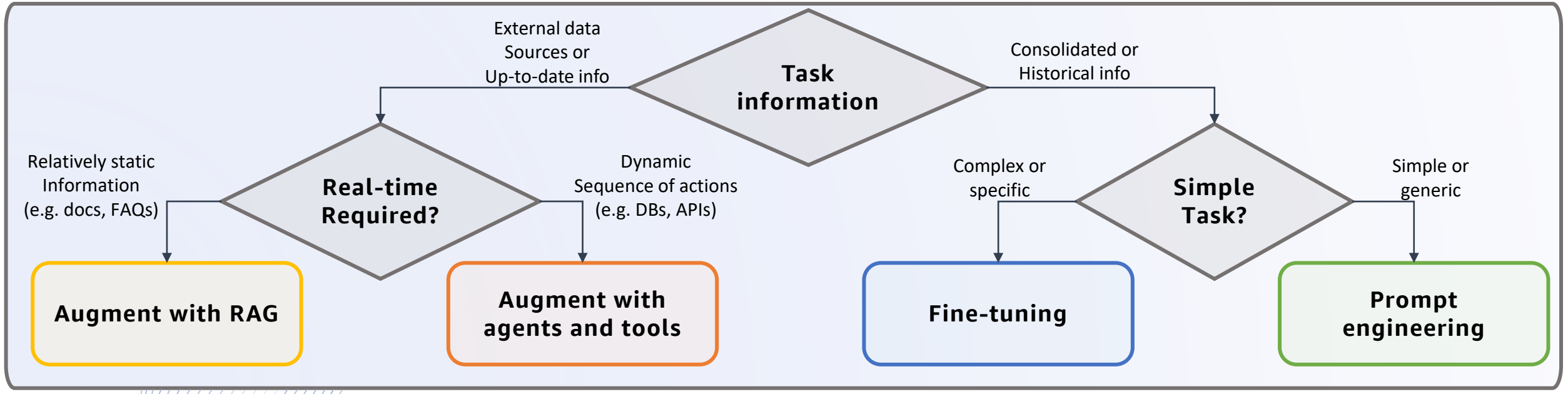

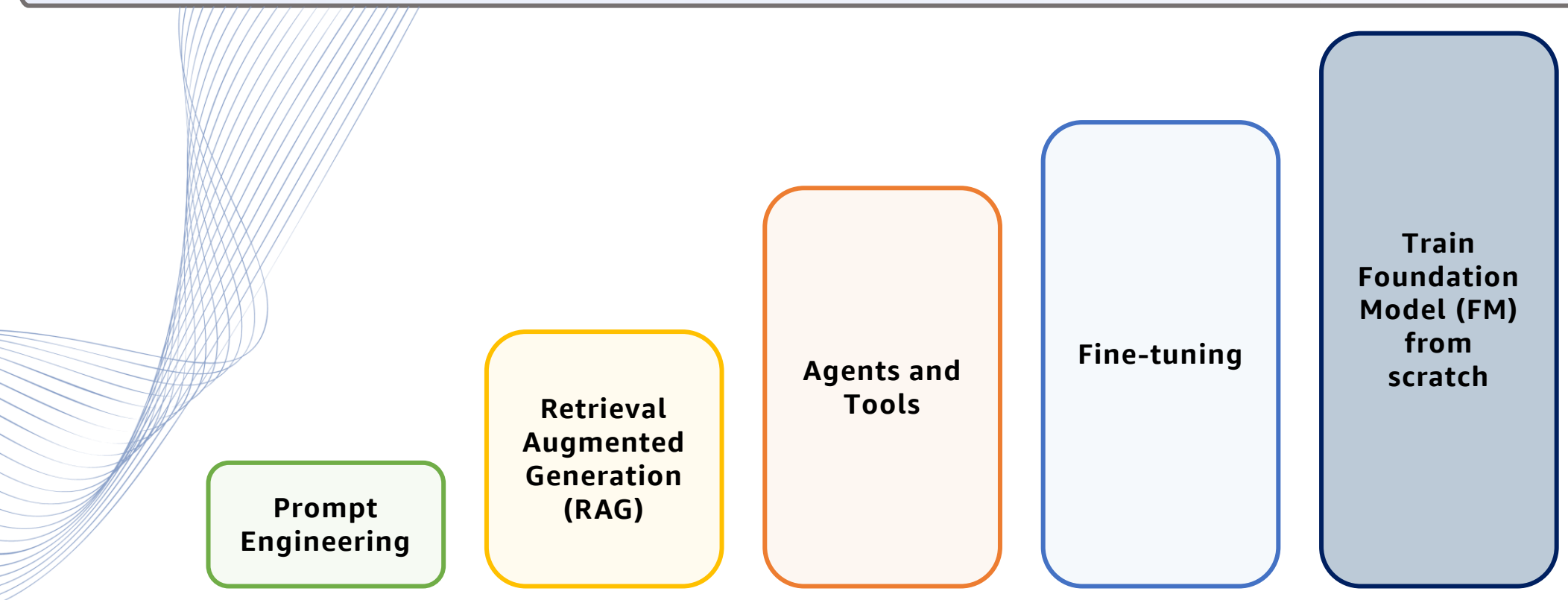

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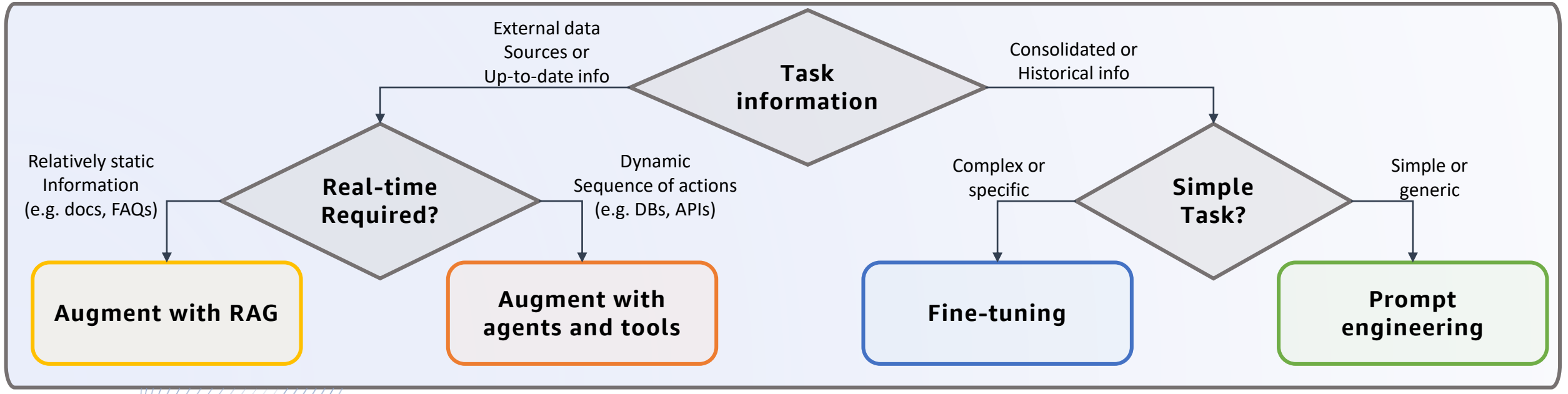

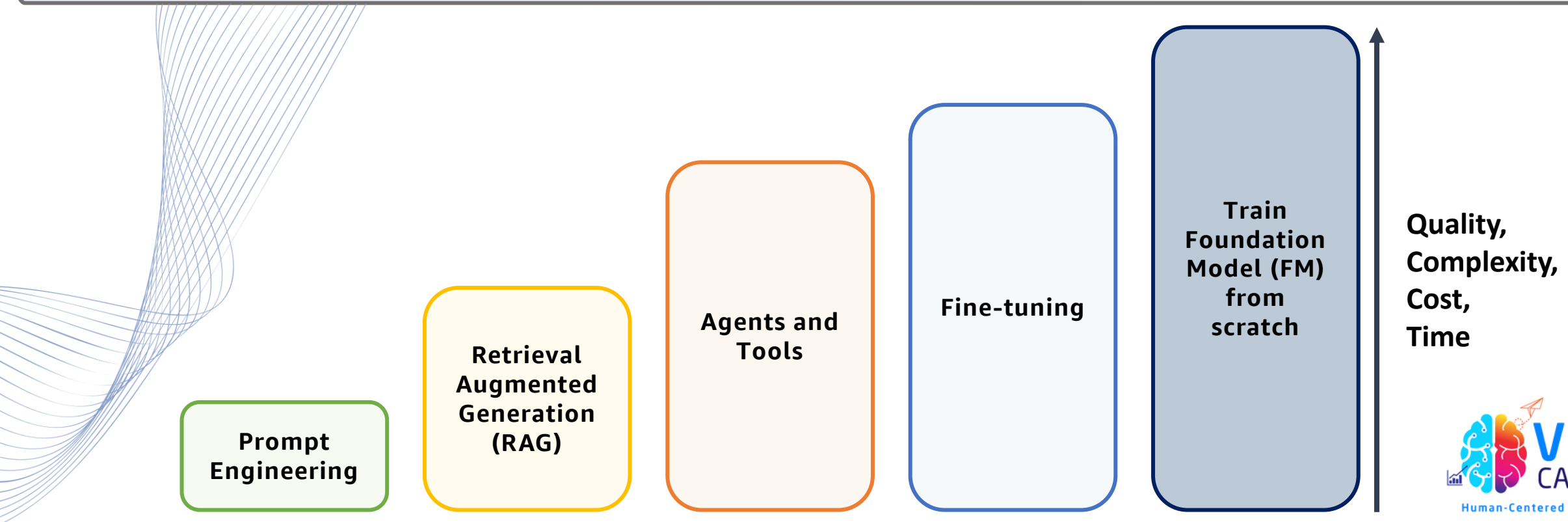

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DevFest 2024 Cerrado

Bora ver na prática!

Experts
Google Developers

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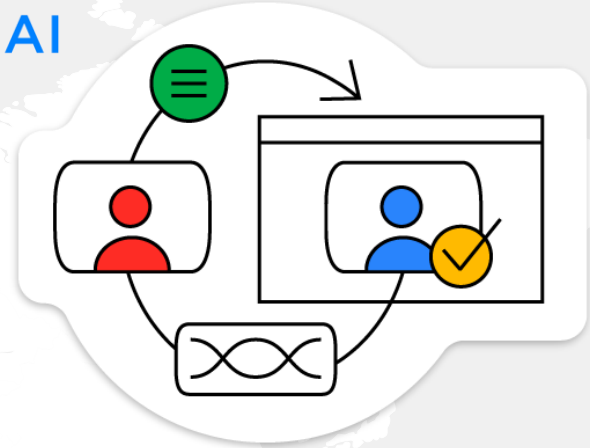
Thank you!



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