

AI-AT-YOUR-SERVICE

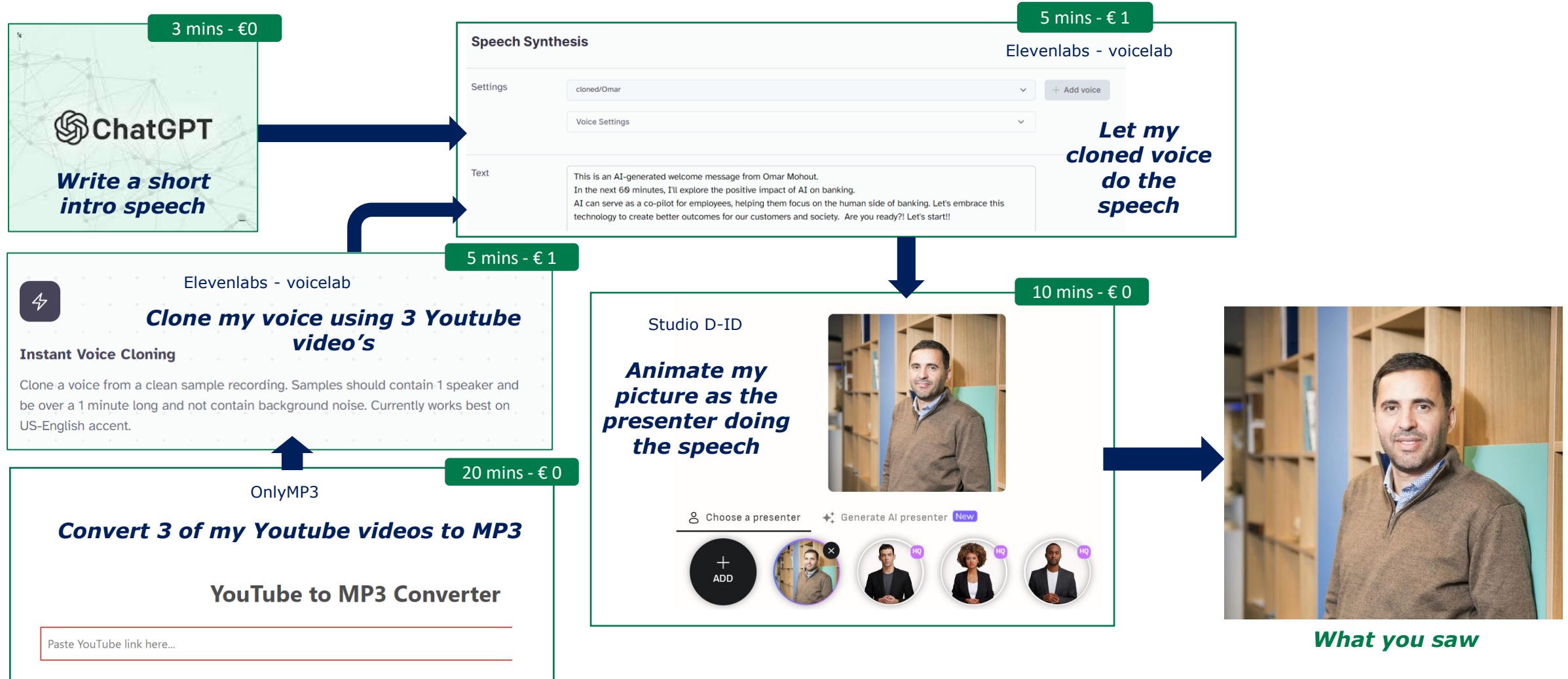
Omar Mohout
Partner, Head of Digital







What did you just experience?



A short history of AI

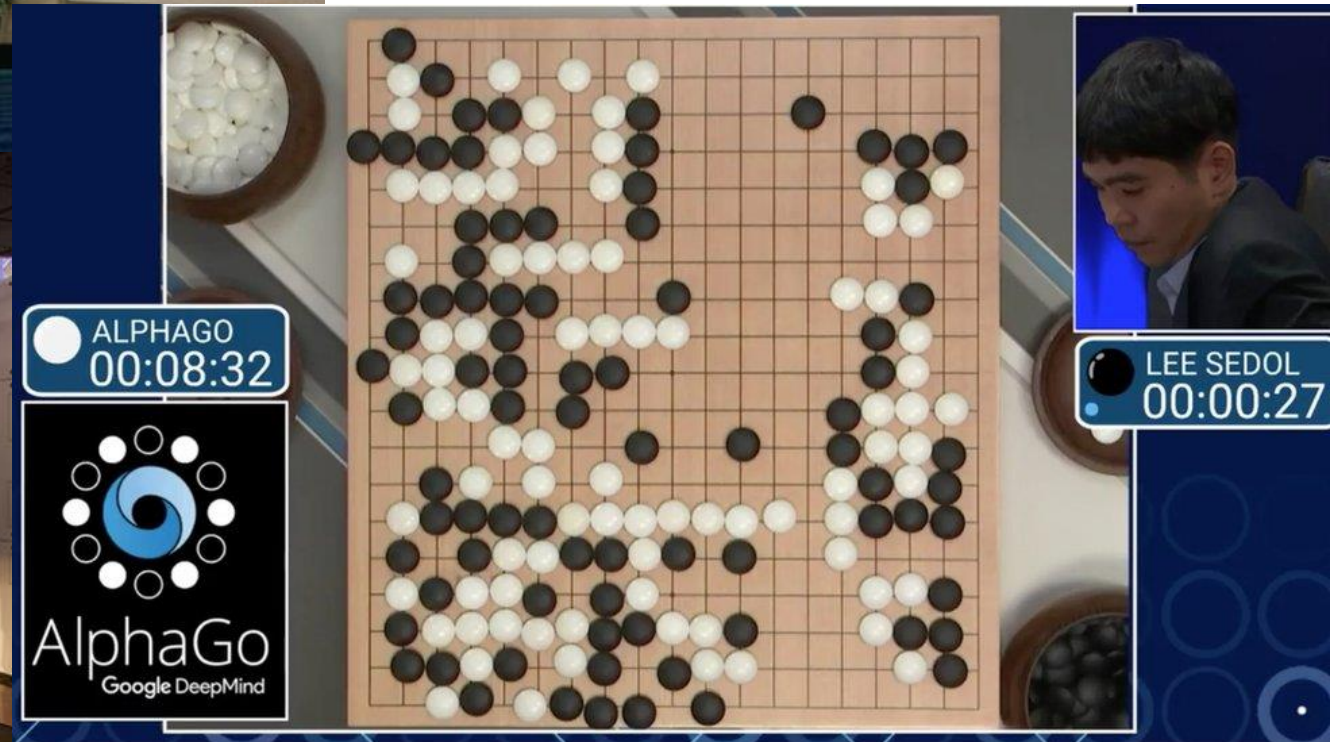


Deep Blue/Watson (IBM) and AlphaGo (Google DeepMind) showcased the power of AI by defeating human world champions

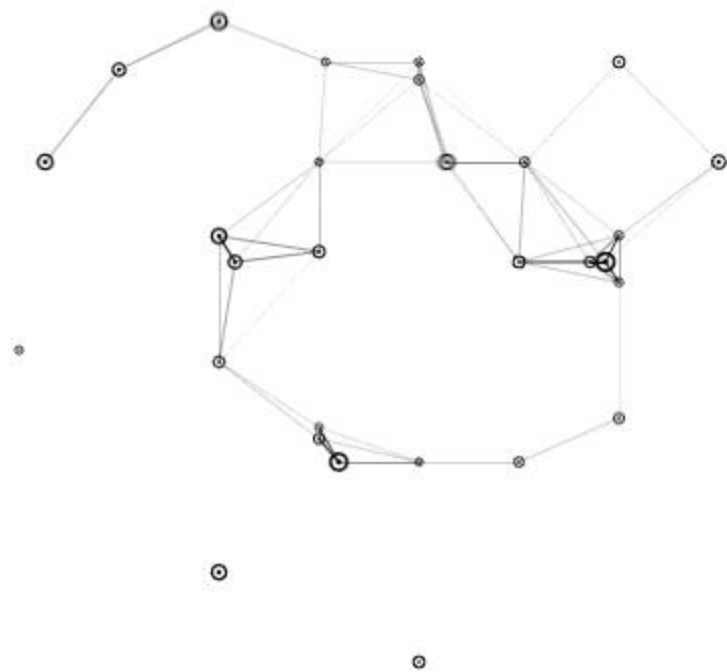


Gary Kasparov

Watson winning \$1M price in the Jeopardy! quiz in 2011



Lee Sedol losing 0-3 against AlphaGo (Google DeepMind) in 2016



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, our model establishes a new single-model state-of-the-art BLEU score of 41.8 after training for 3.5 days on eight GPUs, a small fraction of the training costs of the best models from the literature. We show that the Transformer generalizes well to other tasks by applying it successfully to English constituency parsing both with large and limited training data.

1 Introduction

Recurrent neural networks, long short-term memory [13] and gated recurrent [7] neural networks in particular, have been firmly established as state of the art approaches in sequence modeling and

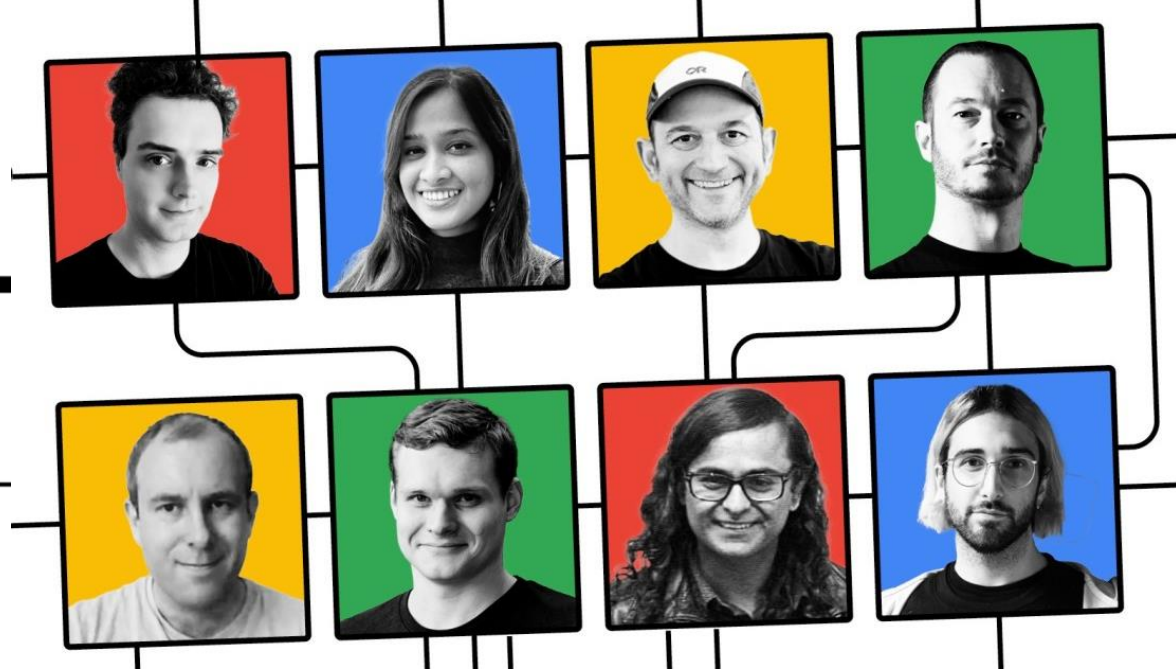
*Equal contribution. Listing order is random. Jakob proposed replacing RNNs with self-attention and started the effort to evaluate this idea. Ashish, with Illia, designed and implemented the first Transformer models and has been crucially involved in every aspect of this work. Noam proposed scaled dot-product attention, multi-head attention and the parameter-free position representation and became the other person involved in nearly every detail. Niki designed, implemented, tuned and evaluated countless model variants in our original codebase and tensor2tensor. Llion also experimented with novel model variants, was responsible for our initial codebase, and efficient inference and visualizations. Lukasz and Aidan spent countless long days designing various parts of and implementing tensor2tensor, replacing our earlier codebase, greatly improving results and massively accelerating our research.

[†]Work performed while at Google Brain.

[‡]Work performed while at Google Research.



Attention Is All You Need



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OpenAI



Text-to-image revolution

**Dall-E, Mid-Journey,
Stable Diffusion...**



Sam Altman  @sama · Apr 6, 2022

...


DALL·E 2 is here! It can generate images from text, like "teddy bears working on new AI research on the moon in the 1980s".

It's so fun, and sometimes beautiful.

openai.com/dall-e-2/



 84

 1,298

 4,488



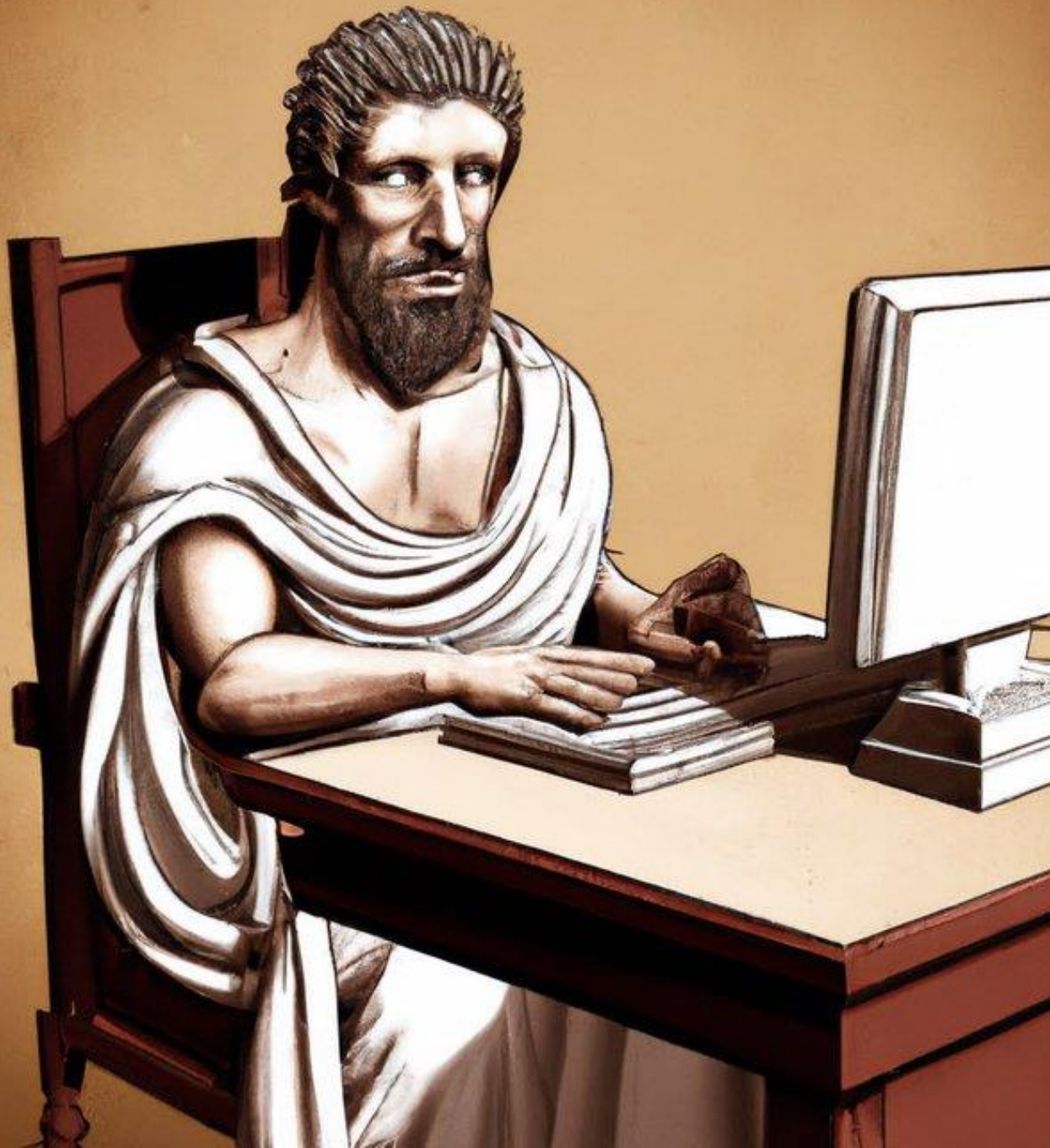














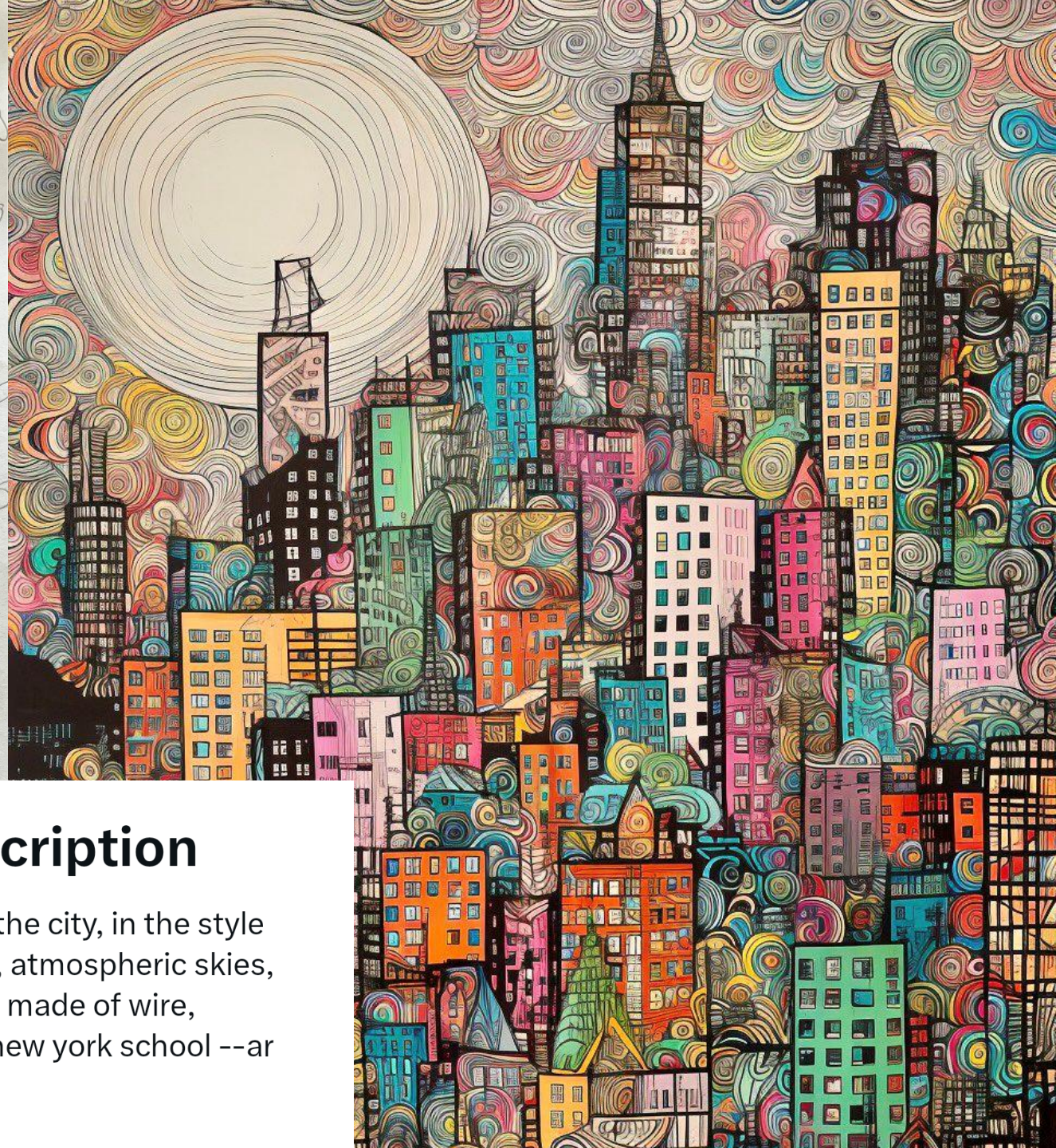


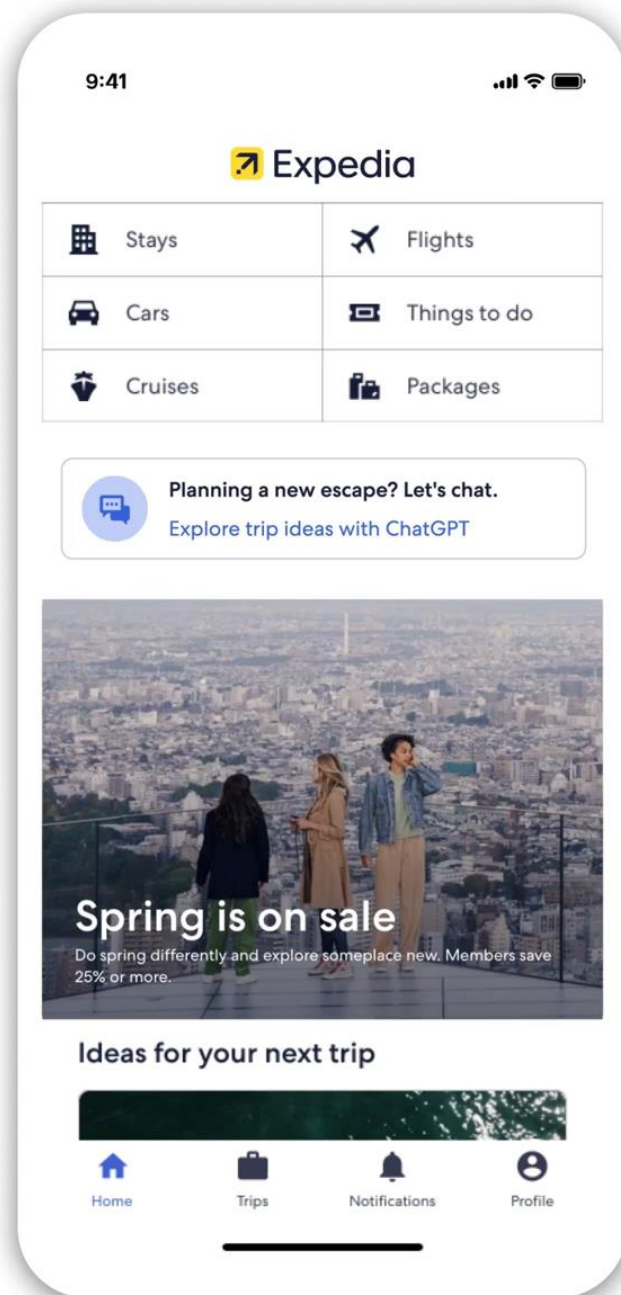
Image description

Colorful sketch of the city, in the style of op art influence, atmospheric skies, elaborate facades, made of wire, spirals, concrete, new york school --ar 79:104

Pope Francis dancing
Hula at the beach
wearing a grass skirt
and flower lei

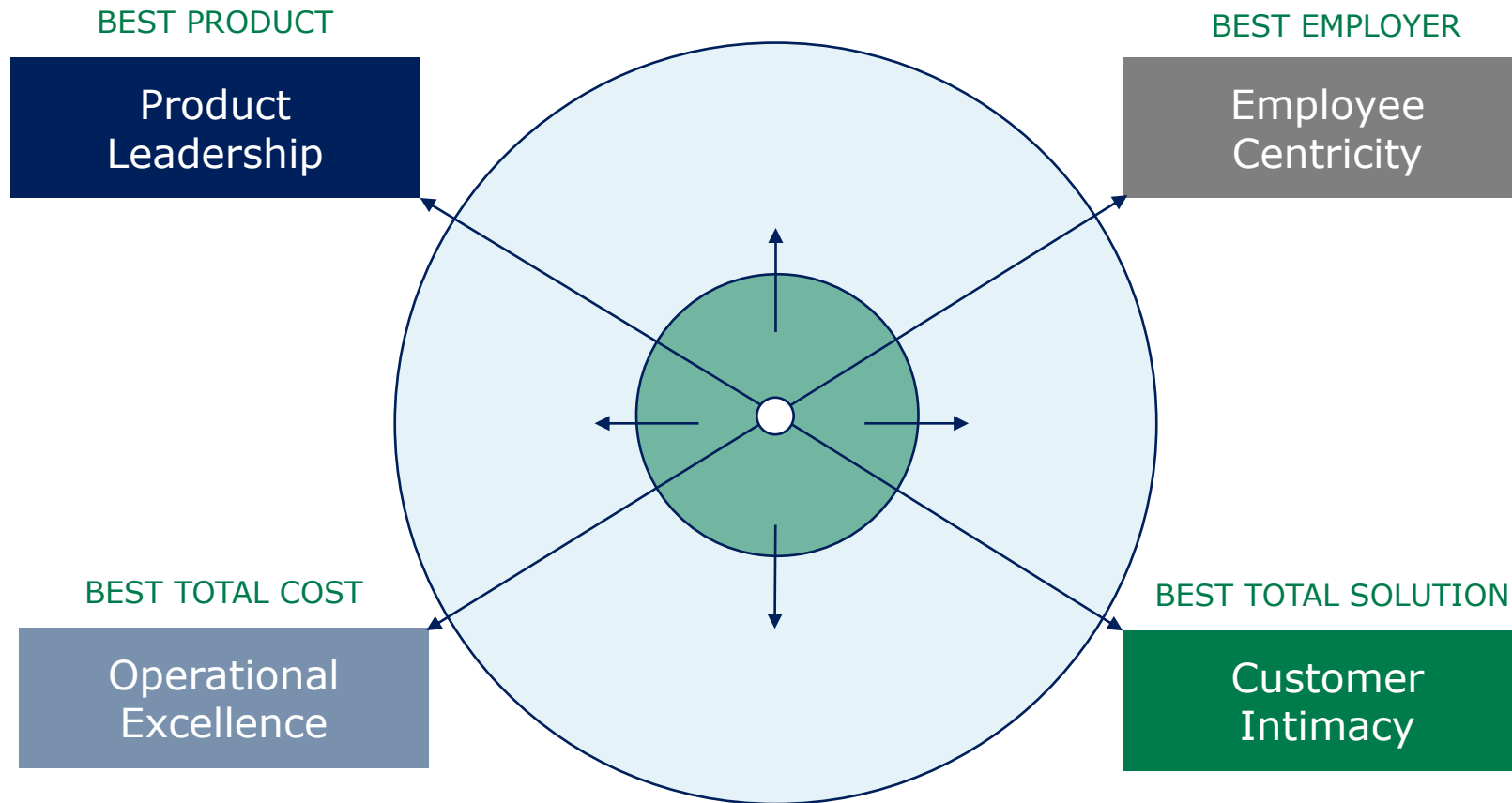
Canon EOS R camera
with a 50mm f/ 1. 8
lens, f/ 2. 2 aperture,
shutter speed 1/ 200s,
ISO 100 and natural
light, Full Body, Hyper
Realistic Photography





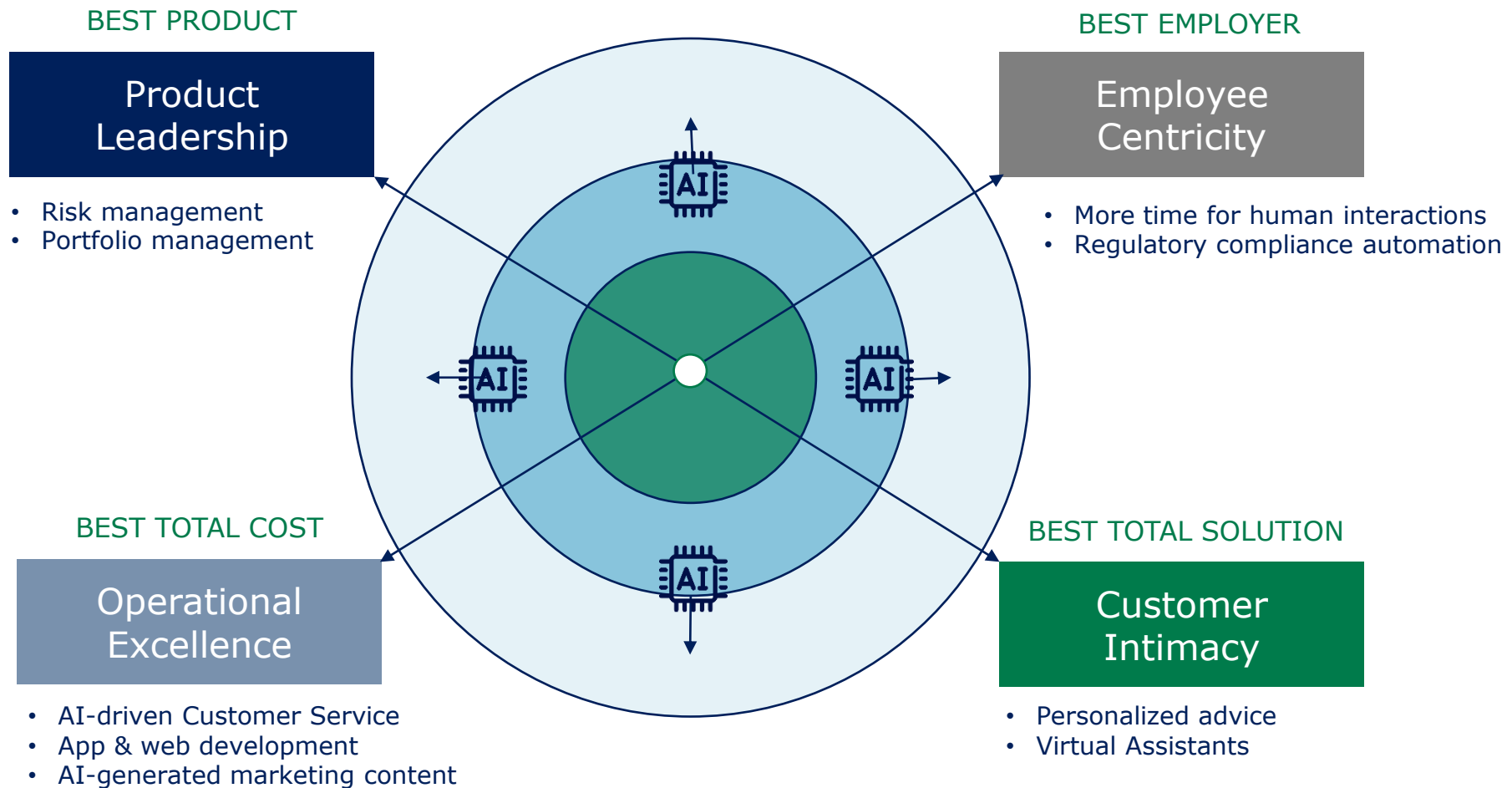


Businesses have seen increased expectations on standards, forcing them to play on more fields if they want to stay competitive





AI will enable companies to perform on all these 4 fields





“ Everyone overestimates how much AI will **replace** humans, and underestimates how much AI will **empower** humans



“ No one in this room
will be replaced by AI
– but by someone
who is better with AI

What other companies are doing



A chatbot powered by OpenAI is being tested by Morgan Stanley's 16,000 financial advisors



FinChat.io v1.1

+ New Chat

Coverage

Chats

Search Coverage

This list shows the 750+ companies you
can currently ask FinChat about.



Apple Inc.



Microsoft Corporation



Alphabet Inc.



Amazon.com, Inc.



Berkshire Hathaway Inc.



NVIDIA Corporation

Sign Up

Welcome to FinChat

Finchat.io is the ChatGPT for Finance. Using AI, FinChat generates answers to questions about public companies and investors. To generate accurate answers, FinChat provides reasoning, sources and data.

Summarize Microsoft's Q2 2023 quarterly report with a focus on the cloud business. Include transcript





DEMO

Embracing AI: A shared roadmap for Success



1. Strategize and Understand Business Objectives
 2. Conduct a Data Audit
 3. Choose the Right Tools and Platforms
 4. Create a Cross-Functional Team
 5. Adopt a Test-and-Learn Approach
-



6. Always put humans first
7. Playing = learning
8. Trust, but verify
9. You're the pilot, AI is the co-pilot
10. Figure out the impact on your customers



Learn to use AI and find the right tools to set yourself up for success

- Basic introduction to A.I. elementsofai.com
- Learn prompting learnprompting.org
- Largest AI tools directory: www.futurepedia.io
- Non-tech intro to A.I. course www.coursera.org/learn/ai-for-everyone
- Extensive introduction to A.I. www.udacity.com/course/intro-to-artificial-intelligence--cs271
- Machine Learning www.coursera.org/learn/machine-learning
- Python www.youtube.com/watch?v=_uQrJ0TkZlc&t=2278s

More questions on how to make AI work for you?

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Nova Reperta in a nutshell

Who?

A core team of **over 60 FTEs**, supported by a wide **network of 100+** global functional/industry **experts** and a smart **ecosystem**

What?

Nova Reperta is a **management consulting boutique** focusing on '**Strategy Deployment**'
= from '**Strategy Validation**' to '**Strategy Execution**'.

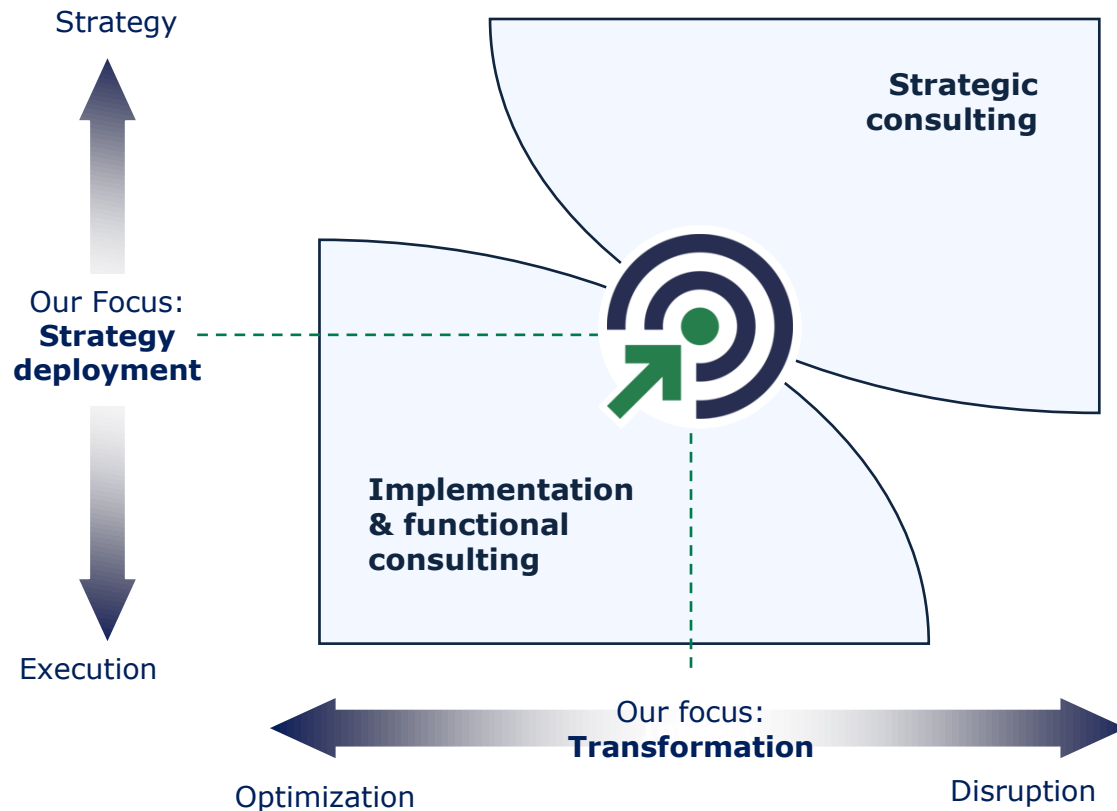
We architect and help execute **company-wide transformations** to make them **future proof**
= **profitable, digital, happy clients & employees**,... with a positive **contribution to society**

How?

Years of **expertise** among our ranks, yet with **different DNA** than our competitors...
...complemented by a **smart ecosystem**, to respond to our clients' challenges – end-to-end.



We have a distinctive positioning in the consulting market



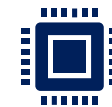
Top & Down – A hands-on approach “from the trenches to the boardroom”, connecting top to bottom



Hard & Soft – We provide skills applicable to all functions, and covering ‘hard’ and ‘soft’ elements of change management → € impact + capability building



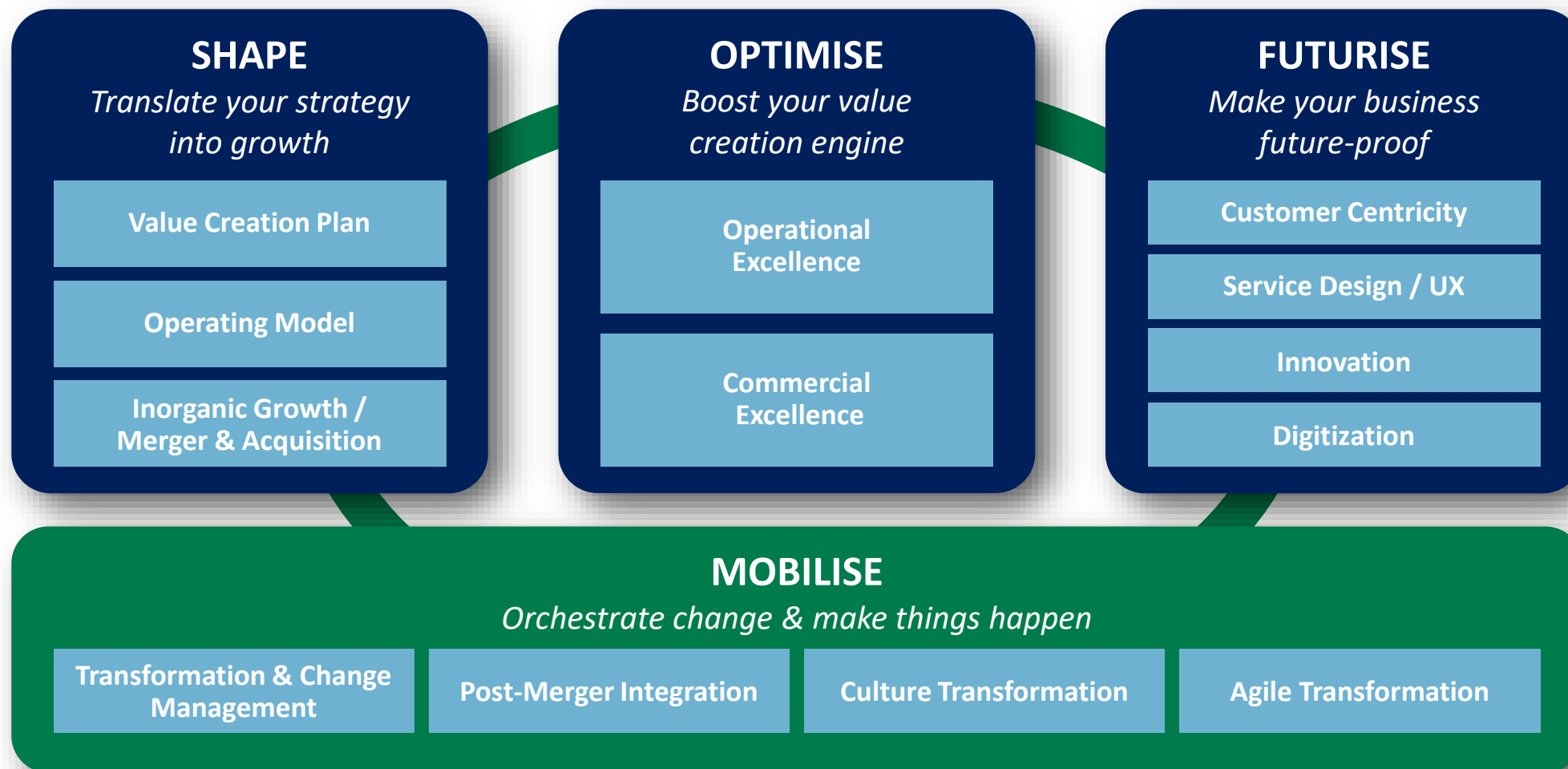
Frontside vs. Backside – We have an eye for connecting front-stage (Customer-Centric functions) and back-stage (Operations)



Digital savvy – Our consultants are capable of fully exploiting digital as the key enabler for your organization’s growth



We propose a range of services enabling your **strategic deployment from **A** to **Z** – from **validation** to **execution** ...**





5 core values we live by while helping companies



#WeAreNovaReperta

1

ENTREPRENEURIAL

2

PRAGMATIC

3

INCLUSIVE

4

TRUSTWORTHY

5

ALWAYS EXPLORING



Nova Reperta is led by a group of partners with diverse backgrounds supported by a well-balanced team with a high degree of seniority



François Barbellion

- 20+ years of experience in driving corporate change programs and making change stick.
- Founding Partner of Nova Reperta
- He has specific experience in leading large-scale transformations, across a variety of industries and functions, in both blue- and white-collar environments.
- François is an engineer with an MBA from London Business School.



François Delfosse

- 20+ years of experience in consulting, business and Lean transformations
- Founding Partner of Nova Reperta
- Key areas of expertise include designing, delivering and steering Transformation Programs (500-2000 FTEs) across various industries and functions
- Ir Micro-Electronics, Université Catholique de Louvain.



Filip Leflot

- 20+ years of experience in consulting, private equity, finance, M&A and General Management
- Founding partner of Nova Reperta, co-lead of 2 investment funds
- Key areas of expertise include strategy design & implementation, financial and operational advisory, coaching of top management
- Previously, Partner at private equity-fund Bencis Capital and COO of AS Adventure Retail Group



Nick Dieltiens

- 20+ years of experience in business transformations, lean management, customer design & CX, change and program management
- Founding Partner of Nova Reperta, co-lead of the Nova Reperta Customer Centricity practice
- MBA Vlerick, General Management & master Handelswetenschappen



Eljakim Caus

- 20+ years of experience in strategy consulting, merger management and large-scale lean transformations.
- Co-owner of an eco-friendly venture
- Partner of Nova Reperta, co-lead of Value Creation Plan practice
- Eljakim holds a master in civil engineering from TU Delft



Omar Mohout

- 8 years of experience in digital transformation and deployment of go-to-market strategies for high growth companies
- Relevant experience in developing and executing buy, build and ally strategies for +100 software companies to seek to grow internationally
- Recognized hands-on expert and thought leader in the Belgian scaleup ecosystem with a broad network in the European tech scene



Large Language Models in finance

Laurent Sorber

Financieel Forum Vlaams-Brabant
Leuven, 20 November 2023





Outline

- Who are InvestSuite & Radix
- What are Large Language Models
- The magic of LLMs
- Dispelling the magic of LLMs
- Applications of LLMs
- What does the future hold





Outline

- **Who are InvestSuite & Radix**
- What are Large Language Models
- The magic of LLMs
- Dispelling the magic of LLMs
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- What does the future hold





A suite of investtech products with which we want to make investing more accessible to a wider audience

A screenshot of the InvestSuite website. The header is red with the "InvestSuite" logo on the left and a navigation menu on the right containing links for "Solutions", "Businesses we serve", "Technology", "Library", "About us", and a "Contact" button. The main content area has a red background with the headline "Stay ahead." in white. Below it, a paragraph reads: "Accelerate your digital wealth transformation journey and launch the most engaging investing experiences for your customers." At the bottom of this section are two buttons: "Get to know us" and "Ask for a demo" with a right-pointing arrow. The footer has a white background with the text "We offer a suite of white-label InvestTech solutions." in black. A large graphic of four overlapping diamonds in red, pink, blue, and white is positioned on the right side of the main content area.

InvestSuite

Solutions ▾ Businesses we serve ▾ Technology Library ▾ About us ▾ Contact

Stay ahead.

Accelerate your digital wealth transformation journey and launch the most engaging investing experiences for your customers.

Get to know us Ask for a demo →

We offer a suite of white-label InvestTech solutions.



Bespoke AI solutions with which we want to superpower people for clients across industries and AI domains

A screenshot of the Radix website. The header is blue with the "Radix" logo on the left and a navigation menu on the right containing links for "SERVICES", "INDUSTRIES", "OUR VISION", "OUR CLIENTS", "INSIGHTS", "CAREERS", and a "CONTACT" button. The main content area has a blue background with the headline "Superpowering people with Artificial Intelligence" in white. Below it, a paragraph reads: "Together, we deliver impactful AI solutions that your users will love." The bottom half of the page features a colorful illustration of several stylized human figures interacting with various digital and AI-related icons, including a magnifying glass, a bar chart, a document, and a play button. The entire page is framed by a thin white border.

Radix

SERVICES ▾ INDUSTRIES ▾ OUR VISION ▾ OUR CLIENTS INSIGHTS CAREERS ▾ CONTACT

Superpowering people with Artificial Intelligence

Together, we deliver impactful AI solutions that your users will love.

A colorful illustration at the bottom of the page shows several stylized human figures interacting with various digital and AI-related icons, including a magnifying glass, a bar chart, a document, and a play button.



A suite of investtech products with which we want to make investing more accessible to a wider audience

Founded 2018

Offices in Leuven, CH, UK

50+ colleagues

Sales presence in BE,
DE, NL, USA



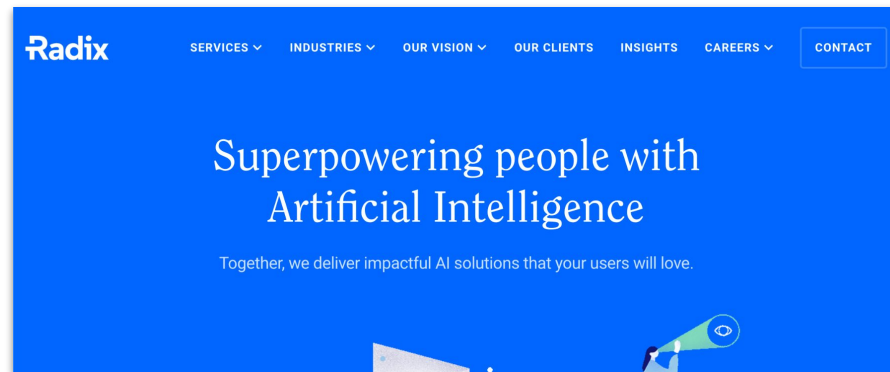
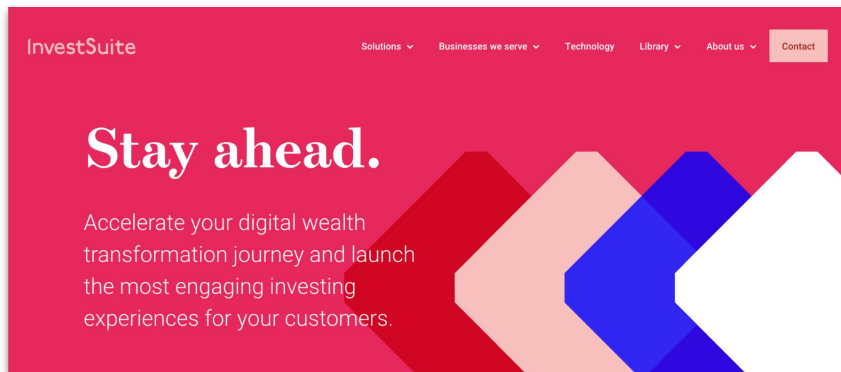
Bespoke AI solutions with which we want to superpower people for clients across industries and AI domains

Founded 2018

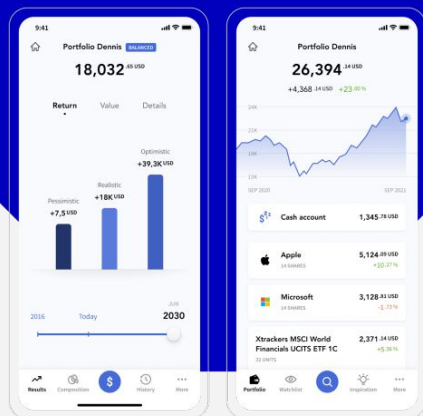
Offices in Brussels & Ghent

50+ colleagues

Active in BE,
NL, DE, IT, Nordics, USA



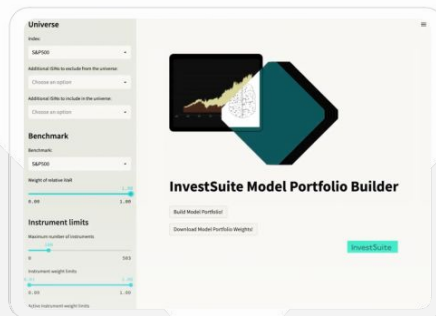
Investment Platforms



Robo Advisor

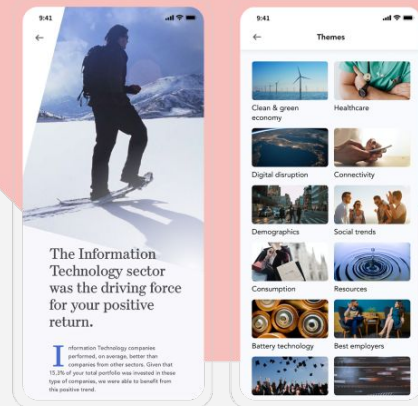
Self Investor

Portfolio Construction



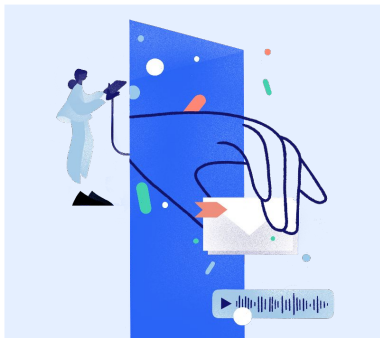
Portfolio Optimizer

Investment Insights & Reporting



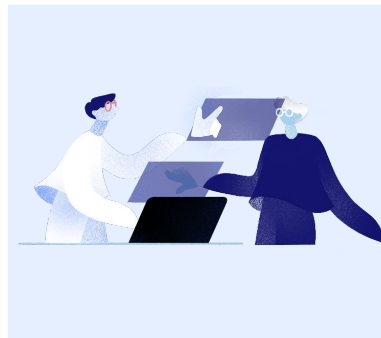
StoryTeller

Insight API



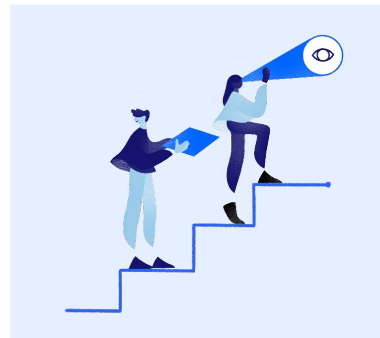
AI solutions

- AI modelling
- Software engineering
- Cloud infrastructure
- MLOps
- Data annotation



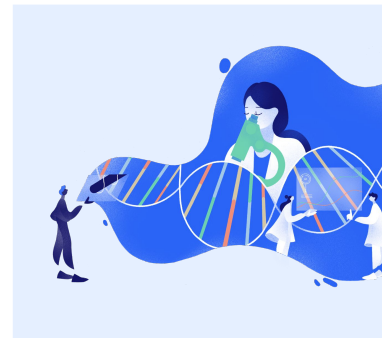
Knowledge transfer

- Training
- Coaching
- Team extensions



AI strategy

- Discover the best opportunities in AI
- Value & effort estimation of AI opportunities



Research

- Develop new AI models
- Explore new applications
- Validate research results



Natural Language Processing

- Text generation
- Question answering
- Summarization
- Named entity recognition
- Classification
- Duplicate detection
- Information retrieval

Tabular Data

- Classification
- Regression
- Anomaly detection
- Explainable prediction
- Confidence intervals
- Matrix imputation
- Feature engineering
- Data visualization

Computer Vision

- Image detection
- Object detection
- Semantic segmentation
- Instance segmentation
- Real-time detection
- Hyperspectral imaging
- Super-resolution
- Optical Character Recognition

Planning

- Scheduling optimization
- Assignment optimization
- Inventory optimization
- Routing optimization

Time Series

- Forecasting
- Anomaly detection
- Classification
- Confidence intervals

Speech

- Transcription
- Speech recognition
- Voice cloning
- Speaker identification



Outline

- Who are InvestSuite & Radix
- **What are Large Language Models**
- The magic of LLMs
- Dispelling the magic of LLMs
- Applications of LLMs
- What does the future hold





What is an LLM?

The best thing about AI is its ability to

learn	4.5%
predict	3.5%
make	3.2%
understand	3.1%
do	2.9%

¹ Image source: <https://writings.stephenwolfram.com/2023/02/what-is-chatgpt-doing-and-why-does-it-work/>



What is an LLM?

The best thing about AI is its ability to create

The best thing about AI is its ability to create worlds

The best thing about AI is its ability to create worlds that


The best thing about AI is its ability to create worlds that are

The best thing about AI is its ability to create worlds that are both

The best thing about AI is its ability to create worlds that are both exciting



Base LLM: Completes documents






Alice has 3 brothers. Each brother has 2 sisters. How many sisters does Alice have? 

(A) 4

(B) 5

(C) 3

(D) 6

     274

¹ OpenAI Playground with base GPT-3: <https://platform.openai.com/playground?mode=complete&model=davinci>



Instruction tuned LLM:

Answers questions

Alice has 3 brothers. Each brother has 2 sisters. How many sisters does Alice have?

Alice has 5 sisters.

4 = 75.00%
5 = 11.13%
2 = 9.64%
6 = 2.49%
four = 0.74%

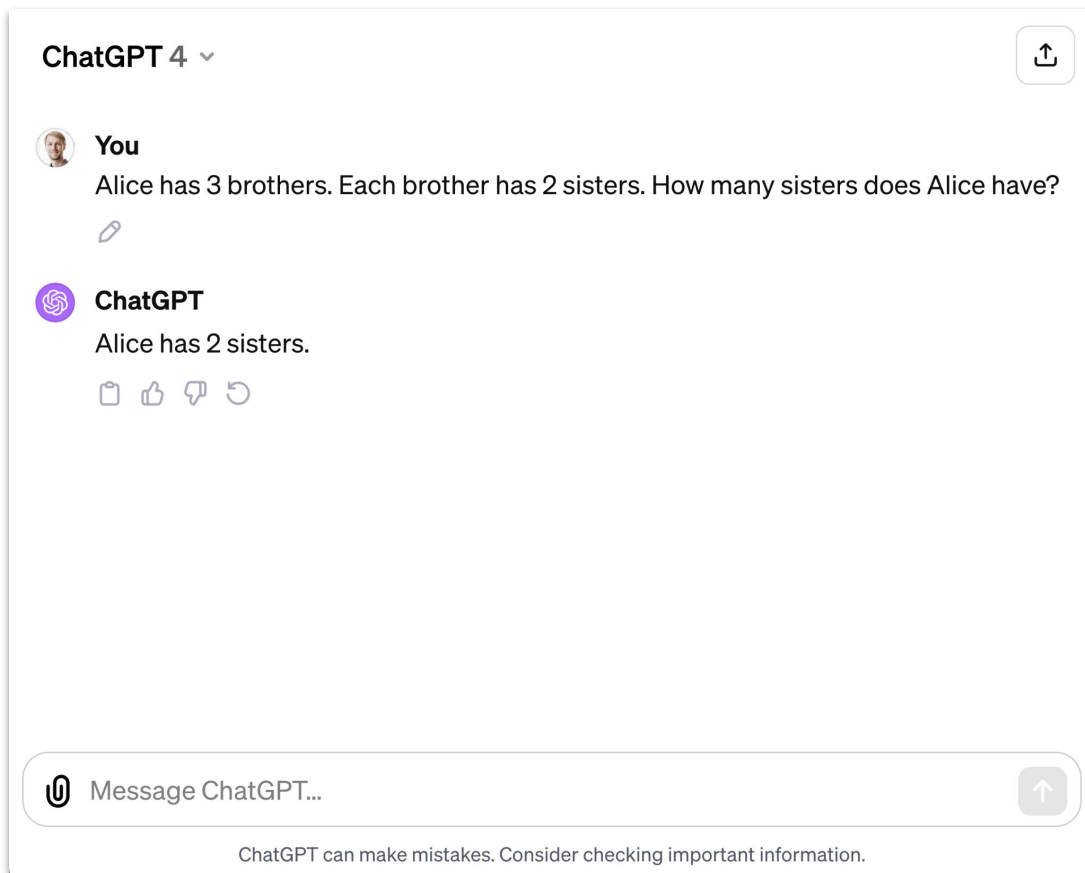
Total: -2.20 logprob on 1 tokens
(99.00% probability covered in top 5 logits)

Submit ↺ ↻ 🗨️ 👍 25



ChatGPT:

A web app on top of GPT-4



¹ ChatGPT: <https://chat.openai.com>



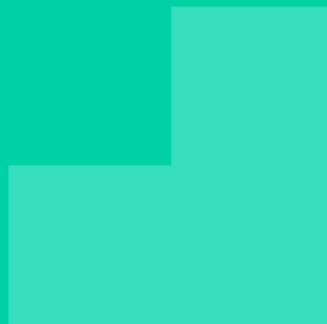
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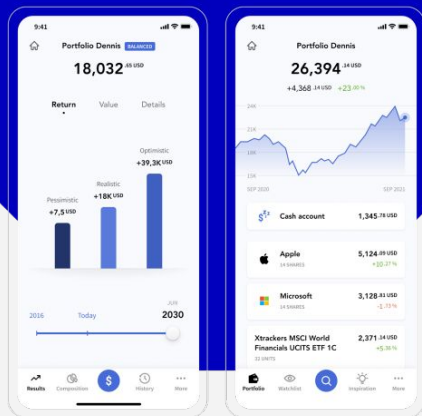




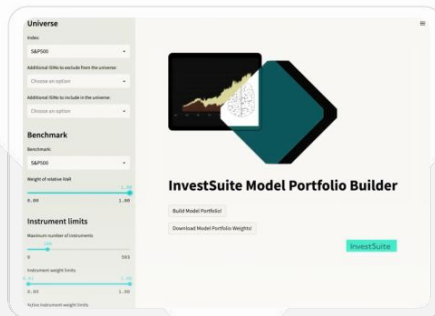
Demo



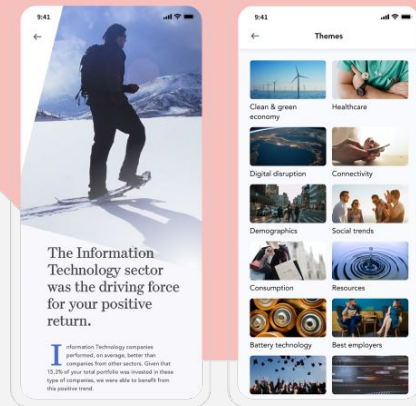
Investment Platforms



Portfolio Construction



Investment Insights & Reporting





ChatGPT 4 ▾



You



top_10_stocks_closing_prices.csv

Spreadsheet

Here are some stock prices. What are the annualised return and risk of these stocks? Show me with a graph.



ChatGPT



Message ChatGPT...



Laurent Sorber

The keys to success



caption

**Instruction
tuning**



caption

**Scaling to 1T
tokens (\approx words)**



Outline

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All LLMs are Transformers

arXiv:1706.03762v7 [cs.CL] 2 Aug 2023

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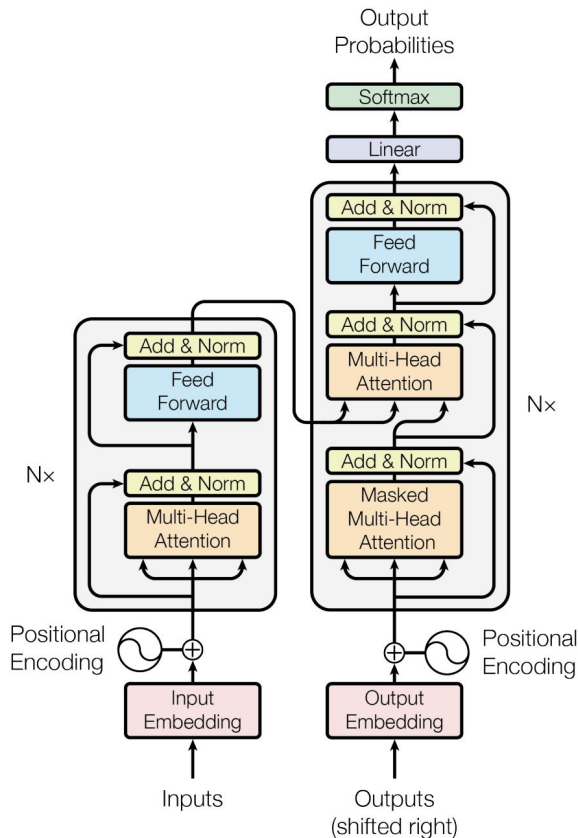
Abstract

The dominant sequence transduction models are based on complex recurrent or convolutional neural networks that include an encoder and a decoder. The best performing models also connect the encoder and decoder through an attention mechanism. We propose a new simple network architecture, the Transformer, based solely on attention mechanisms, dispensing with recurrence and convolutions entirely. Experiments on two machine translation tasks show these models to be superior in quality while being more parallelizable and requiring significantly less time to train. Our model achieves 28.4 BLEU on the WMT 2014 English-to-German translation task, improving over the existing best results, including ensembles, by over 2 BLEU. On the WMT 2014 English-to-French translation task, our model establishes a new single-model state-of-the-art BLEU score of 41.8 after training for 3.5 days on eight GPUs, a small fraction of the training costs of the best models from the literature. We show that the Transformer generalizes well to other tasks by applying it successfully to English constituency parsing both with large and limited training data.

*Equal contribution. Listing order is random. Jakob proposed replacing RNNs with self-attention and started the effort to evaluate this idea. Ashish, with Illia, designed and implemented the first Transformer models and has been crucially involved in every aspect of this work. Noam proposed scaled dot-product attention, multi-head attention and the parameter-free position representation and became the other person involved in nearly every detail. Niki designed, implemented, tuned and evaluated countless model variants in our original codebase and tensor2tensor. Llion also experimented with novel model variants, was responsible for our initial codebase, and efficient inference and visualizations. Lukasz and Aidan spent countless long days designing various parts of and implementing tensor2tensor, replacing our earlier codebase, greatly improving results and massively accelerating our research.

¹Work performed while at Google Brain.

²Work performed while at Google Research.



Input text

Tokenize

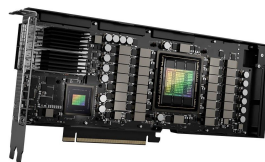
LLM

Output
probabilities

Sample

Weights & Biases is
the

[1135, 2337, 1222,
8436, 1386, 318,
262]



$$\begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & 0 \\ 2 & 3 & 4 \end{bmatrix} \times \begin{bmatrix} 2 & 5 \\ 6 & 7 \\ 1 & 8 \end{bmatrix}$$

We

0.001

ights

0.001

&

0.001

the

0.001

machine

0.15

learning

0.001

platform

0.2

machine

¹ LLM image source: <https://wandb.ai/darek/llmapps/reports/A-Gentle-Introduction-to-LLM-APIs-VmIldzo0NjM0MTMz>

² GPU image source: <https://www.nvidia.com/en-us/data-center/h100/>

³ Matrix multiplication source: <https://math.stackexchange.com/questions/3715598/when-should-hadamard-matrix-multiplication-be-used-vs-other-methods>



What do LLMs imitate?

✓ Cognitive ability

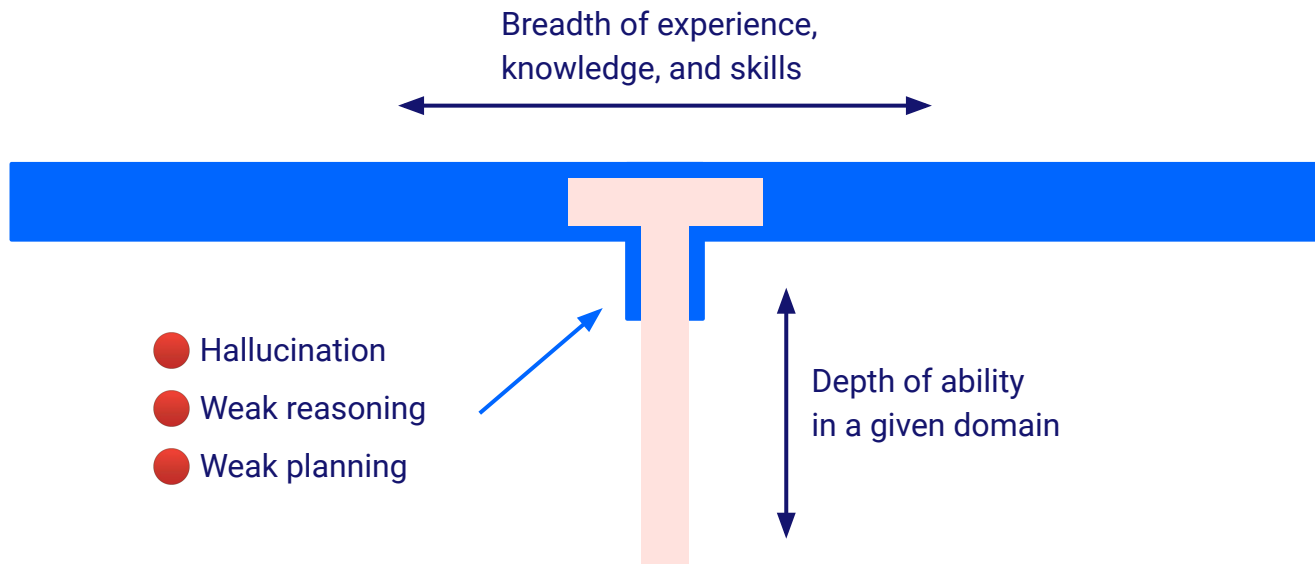
✗ Consciousness

✗ Sentience

✗ Will



The T-shape of an LLM

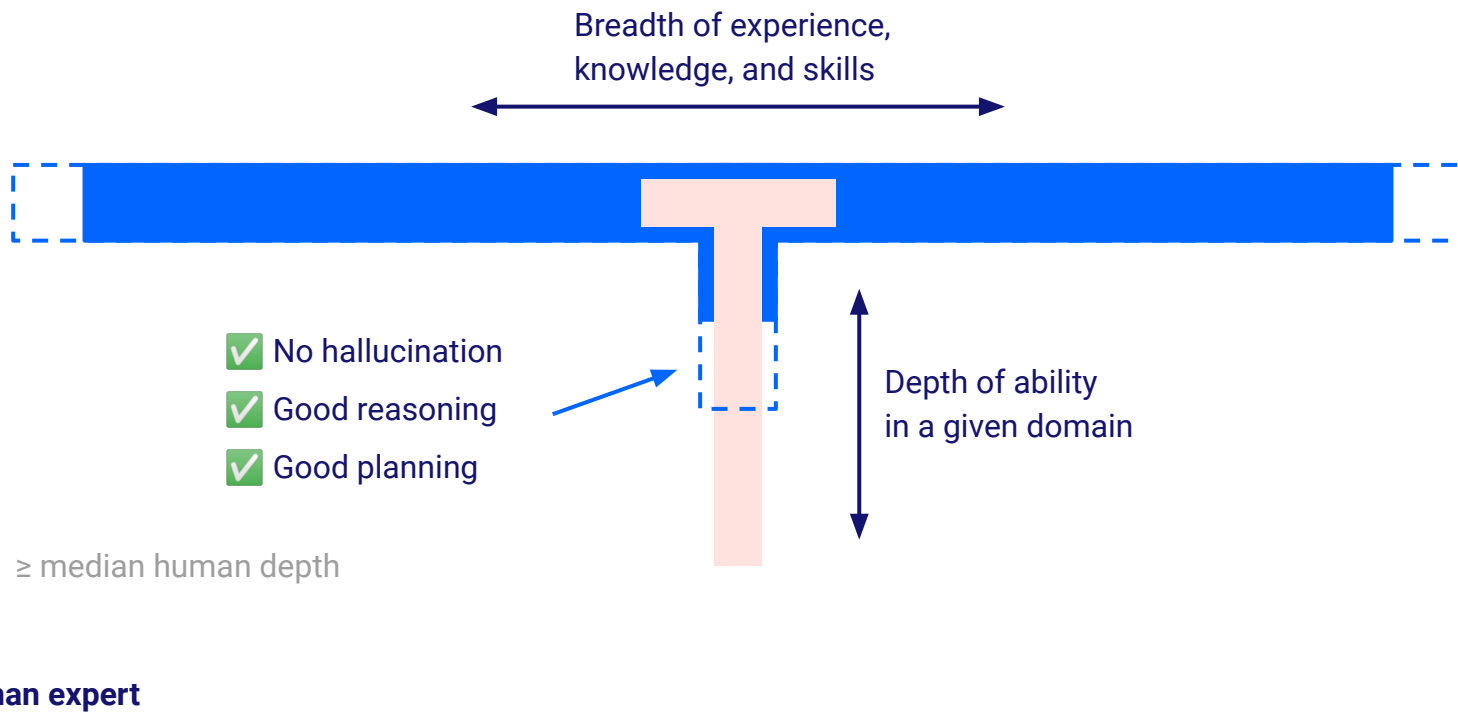


LLM

Human expert

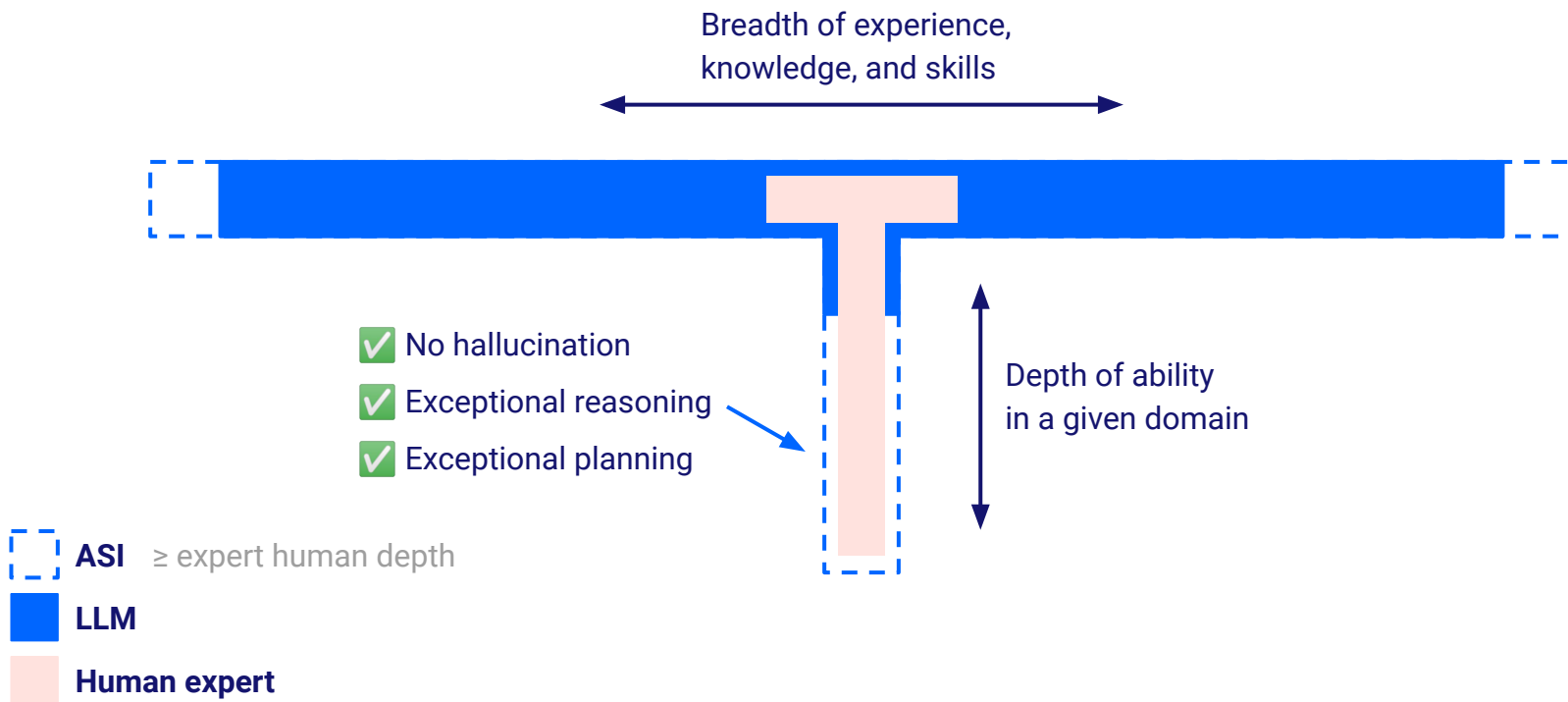


The T-shape of an LLM





The T-shape of an LLM





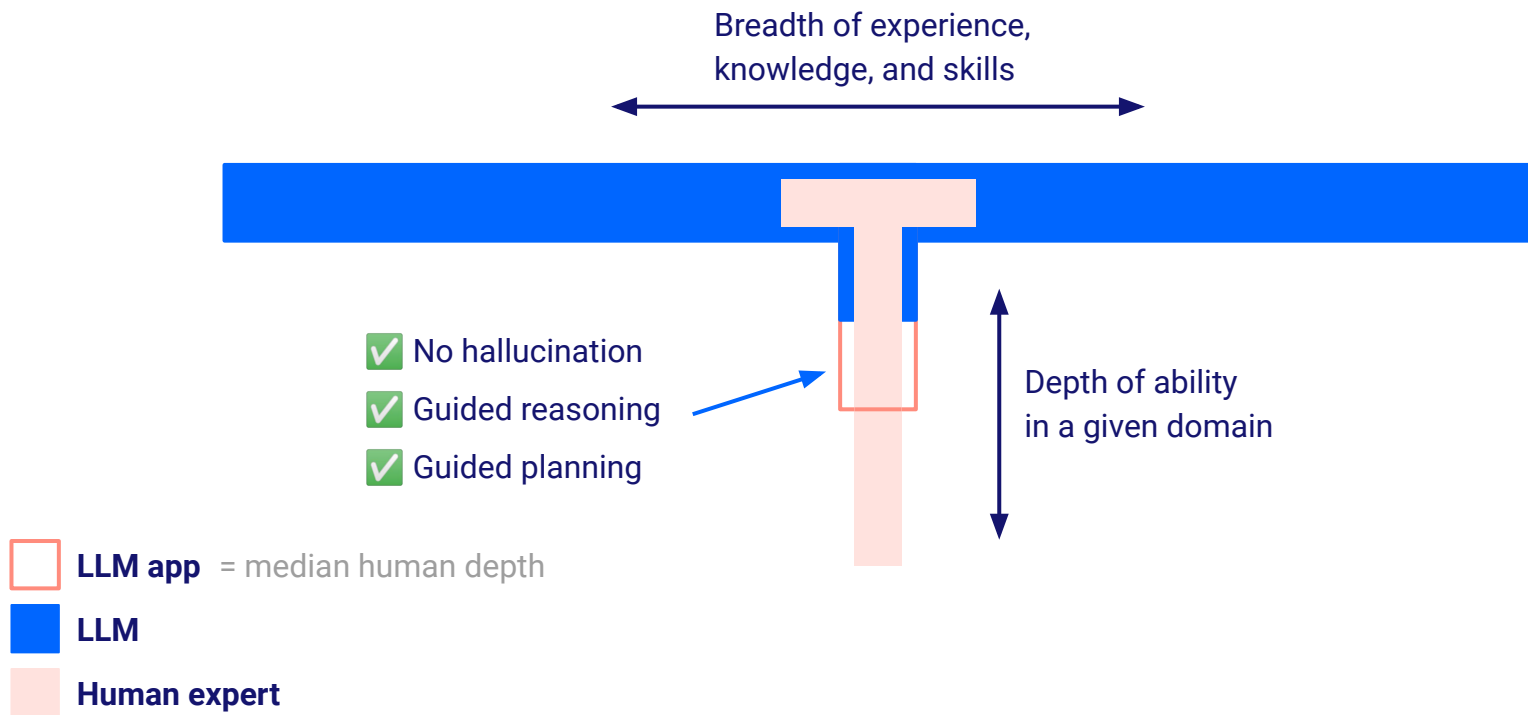
Outline

- Who are InvestSuite & Radix
- What are Large Language Models
- The magic of LLMs
- Dispelling the magic of LLMs
- **Applications of LLMs**
- What does the future hold





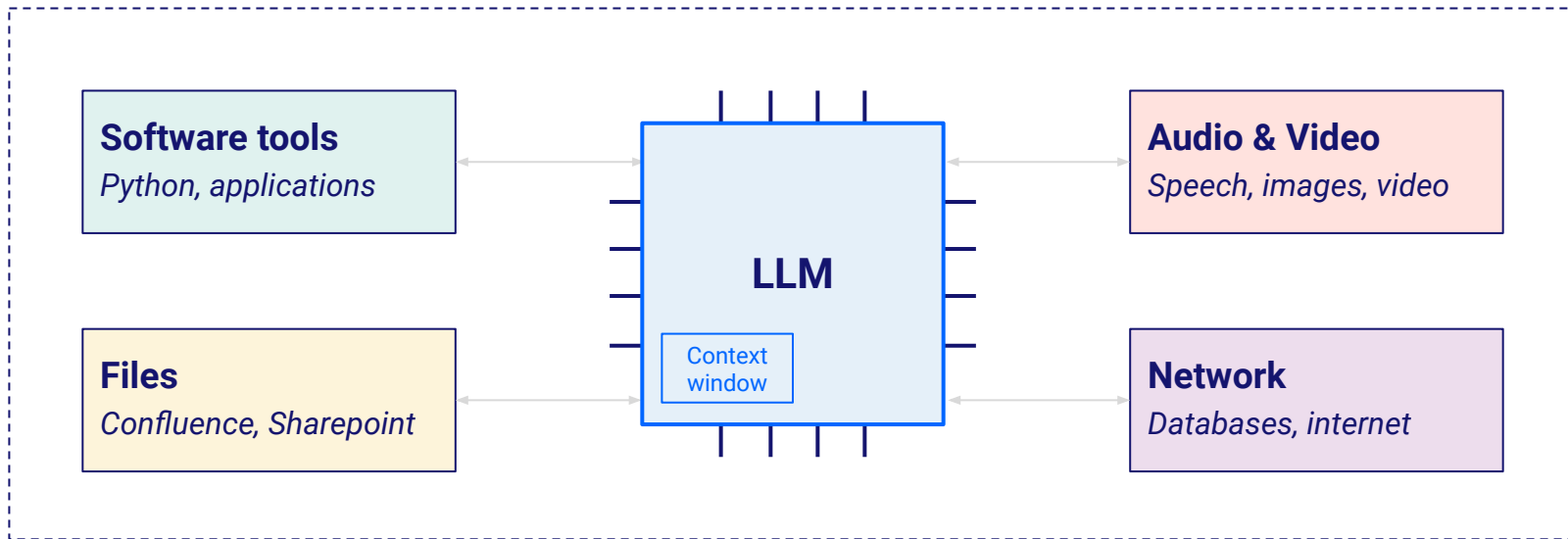
The T-shape of an LLM app





Anatomy of an LLM app

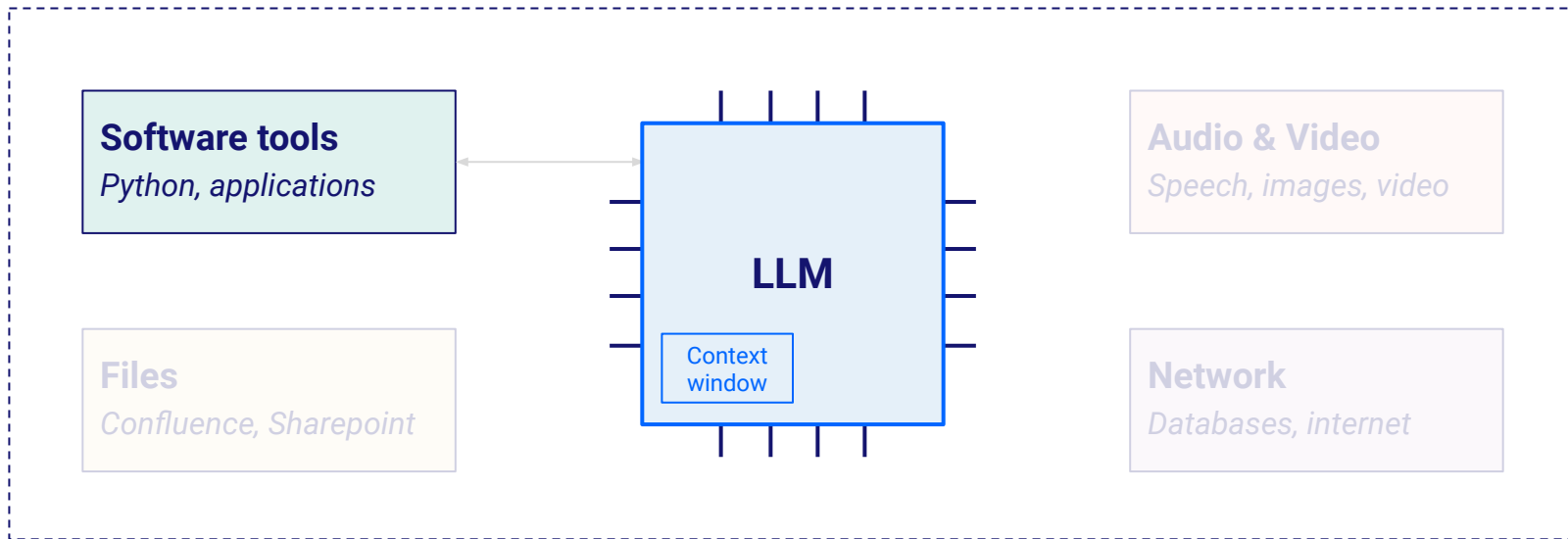
LLM application

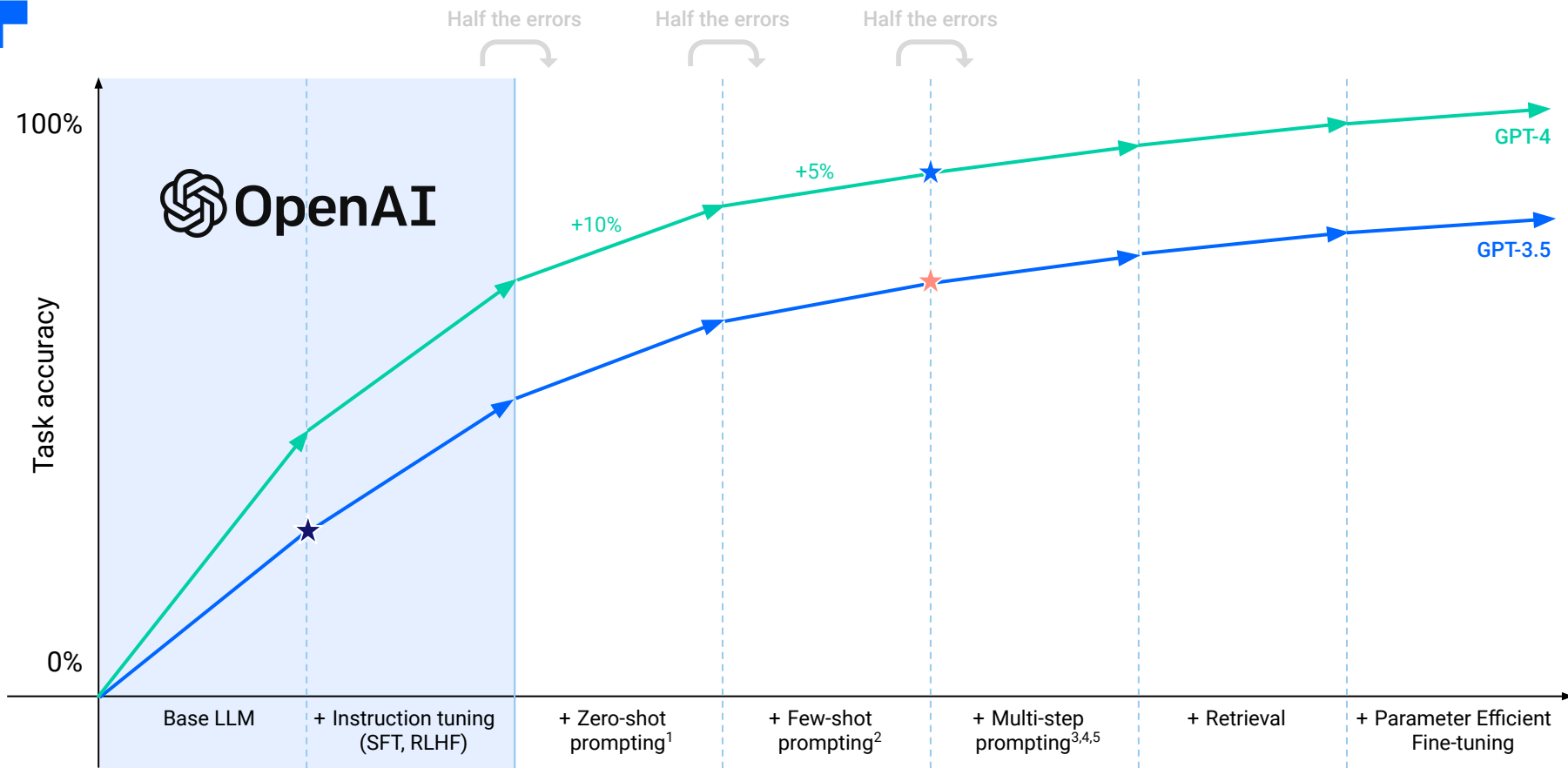




LLM app: Portfolio Assistant

LLM application





* GPT-4 achieves a few-shot chain-of-thought performance on MMLU of 86%; <https://arxiv.org/abs/2305.17306>

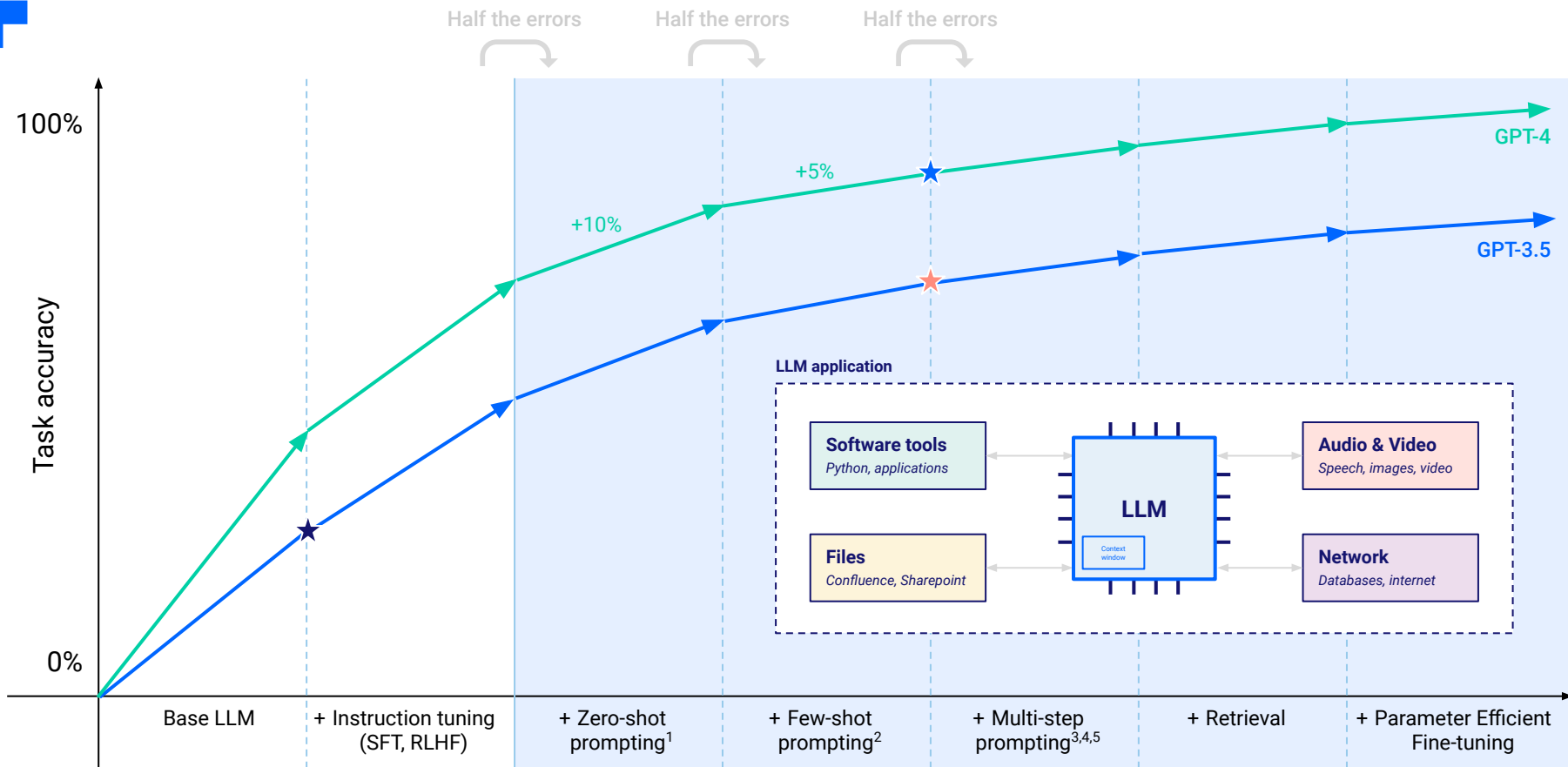
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¹ An automatically discovered chain-of-thought prompt generalizes to novel models and datasets: <https://arxiv.org/pdf/2305.02897.pdf>

² Language Models are Few-Shot Learners: <https://arxiv.org/pdf/2005.14165.pdf>

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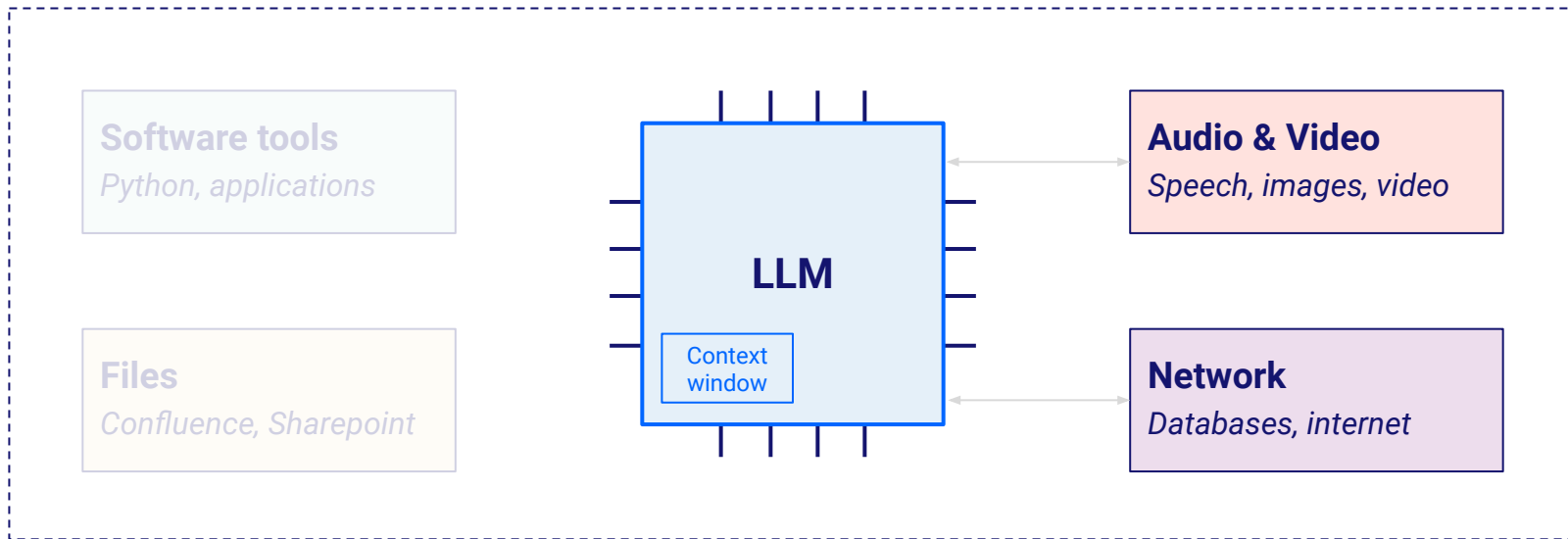
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LLM app: StoryTeller podcast

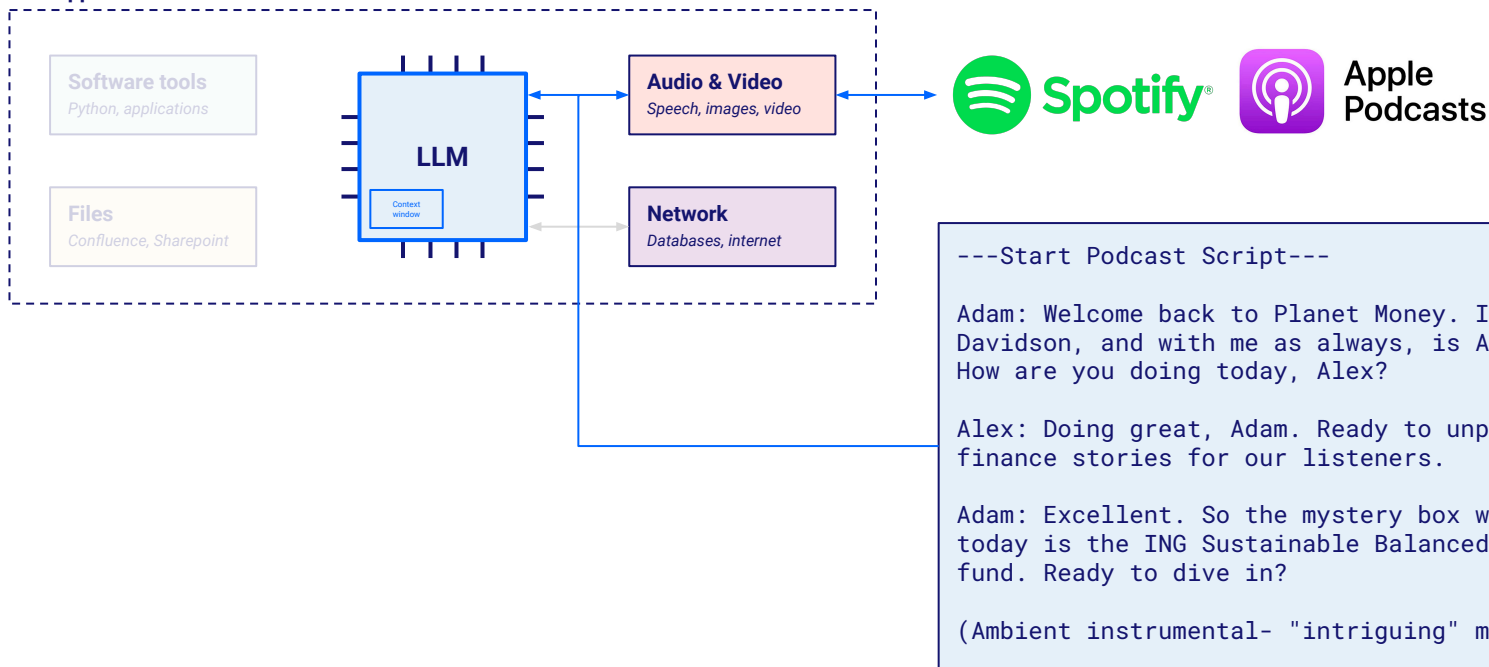
LLM application





LLM app: StoryTeller podcast

LLM application

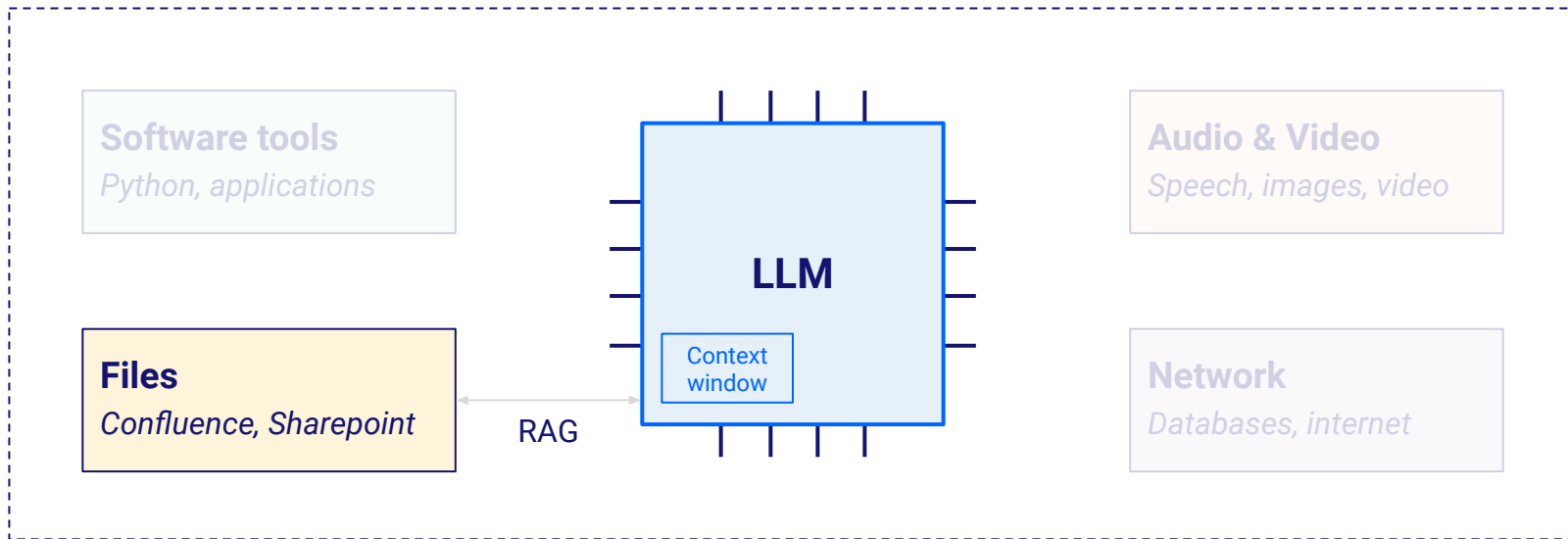






LLM app: **Lexicon Assistant**

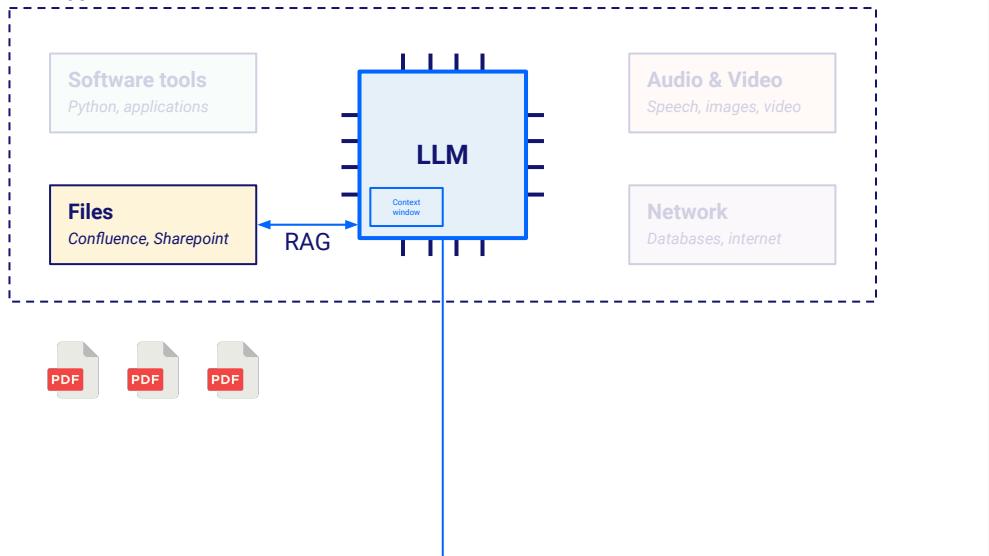
LLM application





LLM app: Lexicon Assistant

LLM application



Understanding Volatility in Investments

Lexicon Assistant

You

What does volatility mean?

Lexicon Assistant

Volatility is a statistical measure of the fluctuations in a security's price. It can also refer to the fluctuations in a particular market. When we say an investment or market has high volatility, it means the price of that investment or the values in that market can change a lot in a short period of time. This indicates a higher level of risk because the price can go up or down quite rapidly.

For example, think of a roller coaster – it goes up and down frequently and rapidly, which is similar to how a highly volatile investment behaves. On the other hand, a low volatility investment is more like a gentle car ride on a smooth road, with fewer ups and downs.

Message Lexicon Assistant...

ChatGPT can make mistakes. Consider checking important information.



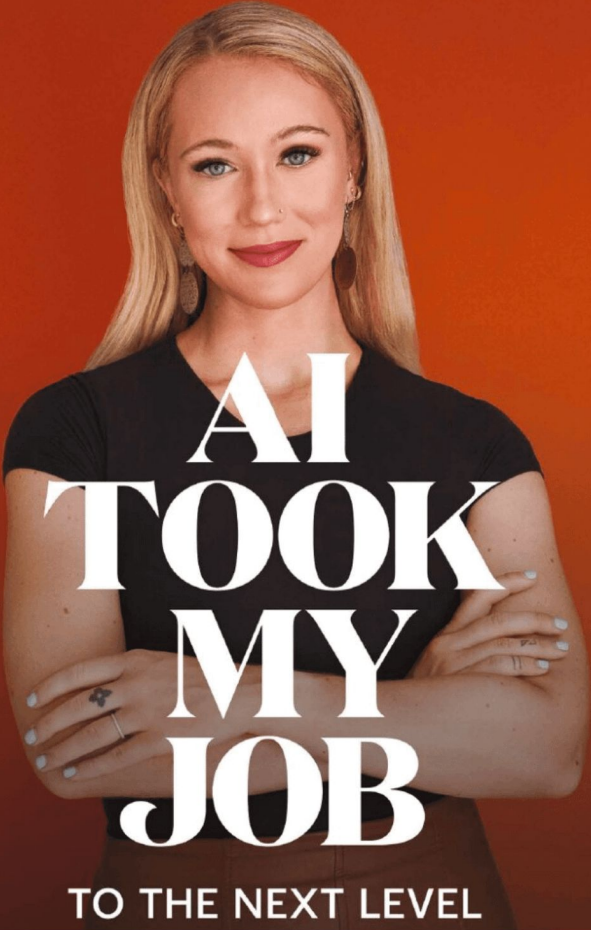
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fiverr.

Gabby @ggerbus
Freelance AI Copywriter



AI TOOK MY JOB

TO THE NEXT LEVEL

19:34:24:17





Personal Computer

Talk to Pi,
your personal AI

heypi.com



Personal Intelligence

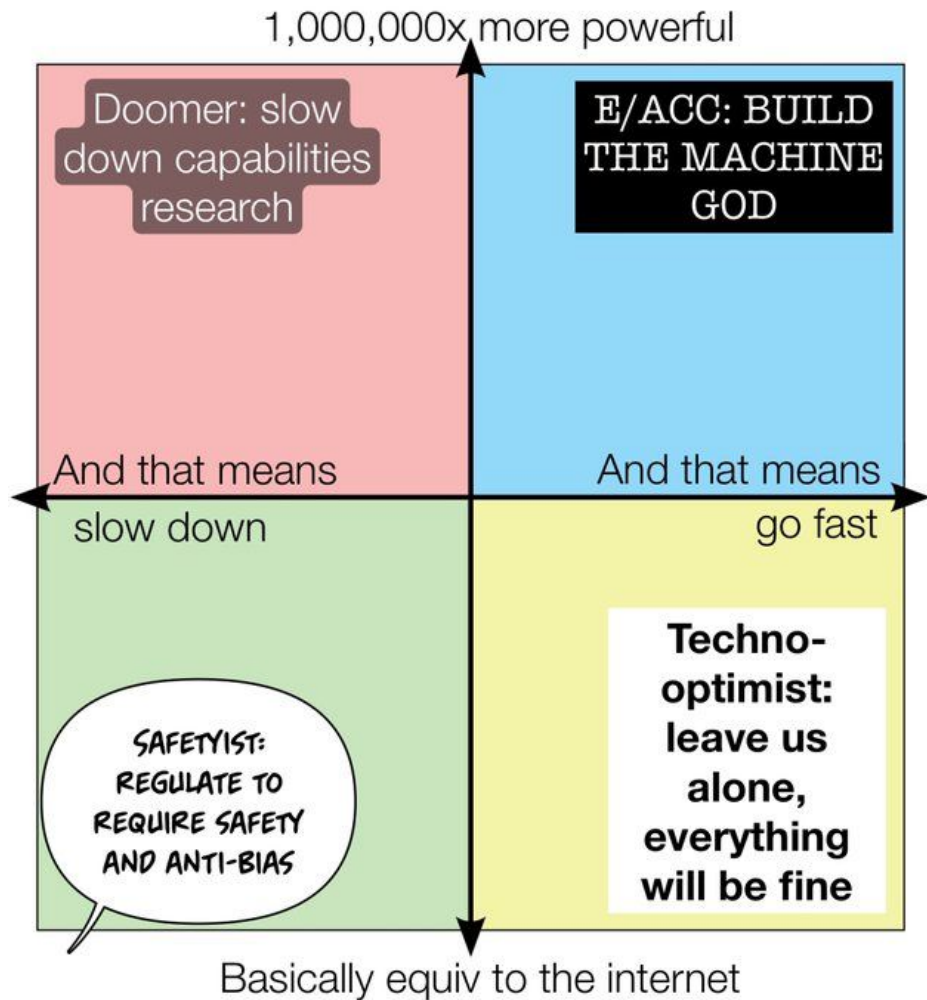
Existential risk?

Doomers vs.
Humanists





AI political compass





What are the H100s working on?



Hallucination



Alignment, Interpretability



Reasoning & planning



Reasoning & planning



Multi-modality



Robotics



Retrieval



Reasoning & planning



'Truth'



AGI, when?



"Less than 10 years"¹

Sam Altman (OpenAI)



"Within 18 months"²

Mustafa Suleyman (Inflection AI)



"As early as 2025, expected 2028"³

Shane Legg (Google DeepMind)

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AGI, when?



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Thank you!

InvestSuite

Radix

