



The Evolution of AI

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Agenda



Key Topics

Evolution of AI

Critical inflection points

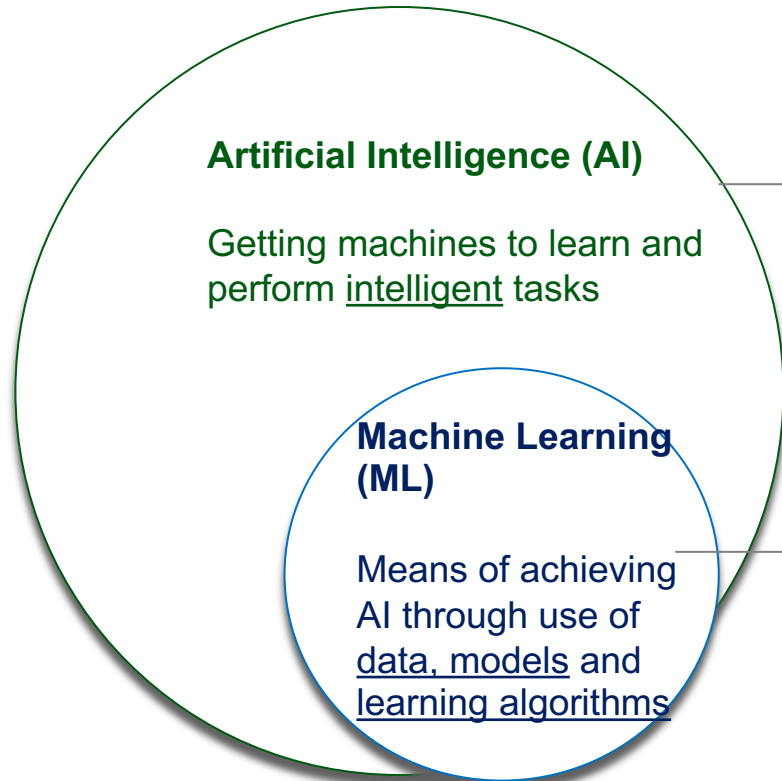
The rise of Generative AI

AI in finance

Responsible and Trustworthy AI



Let's Start With Definitions



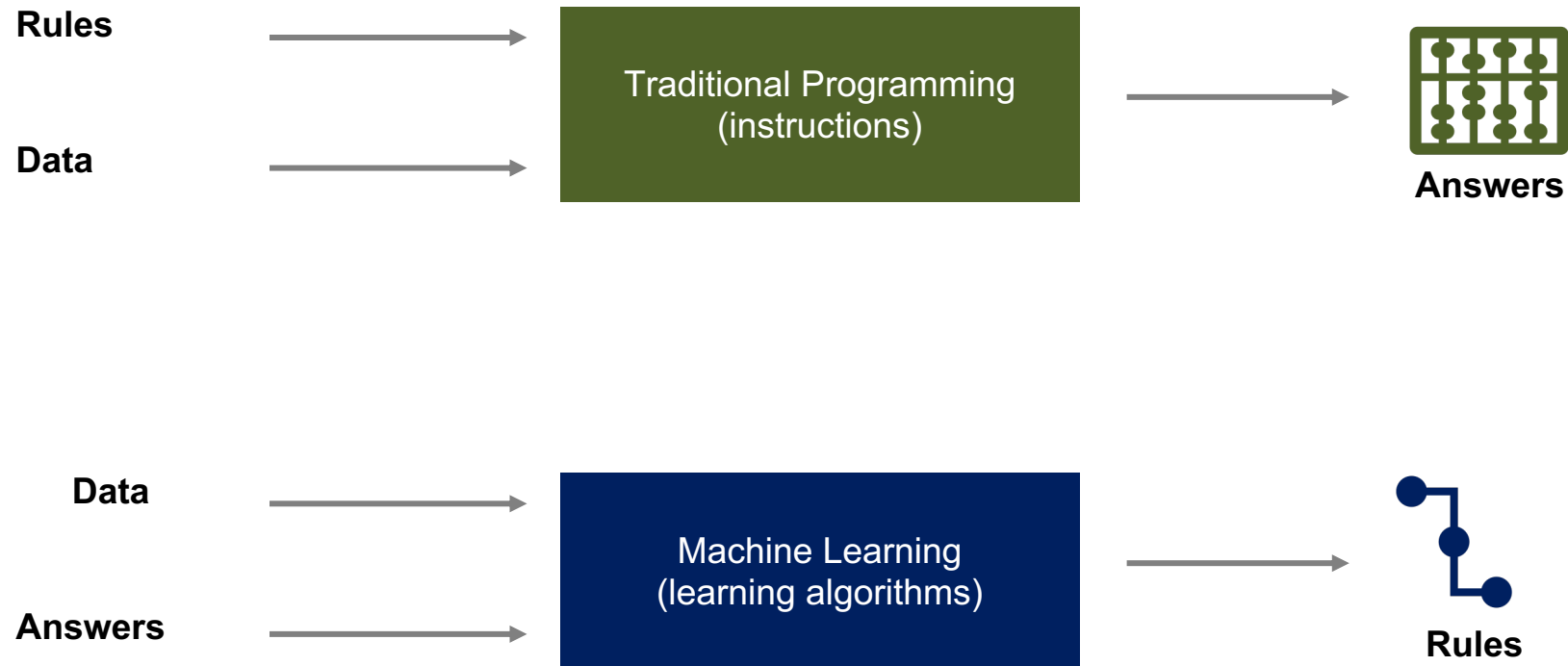
Artificial General Intelligence: ability to learn and perform tasks across multiple domains. Learn from few examples and be able to transfer learnings between tasks.

Artificial Narrow Intelligence: ability to learn narrow range of tasks

Learning approaches: Supervised Learning (labelled data), unsupervised learning (un-labelled data), semi-supervised, self-supervised and reinforcement learning

Model architectures: Deep Neural Networks, Statistical Machine Learning, etc

Machine learning turned the programming paradigm upside down



Evolution of AI



Symbolic AI (1950s-1980s)

- Rules-based systems
- Emphasis on format representation of knowledge, logic and symbolic reasoning
- Expert systems for specific domains with human expertise codified as rules
- Hard to scale and generalize



Statistical Machine Learning (1980s-2010s)

- Shifting towards probabilistic & statistical methods to model uncertainty
- Data-driven learning with a focus on extracting structure from data
- Improvements in Neural Networks
- Improved generalization (within domain) and broader applicability



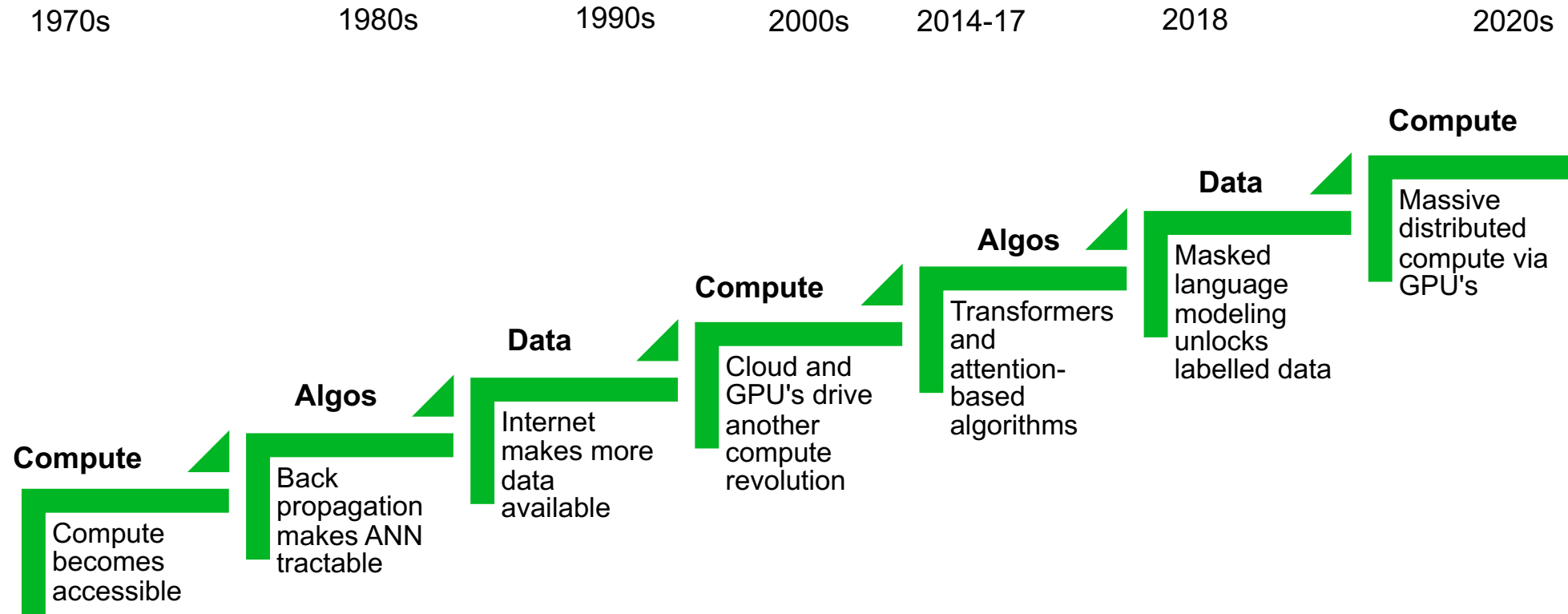
Deep Learning (2010s-Present)

- Neural networks with many layers (deep neural networks)
- Representational learning: learning hierarchical representations of data
- End-to-end learning: systems learn directly from raw data (features representations are learnt)



Underlying these changes were fundamental breakthroughs in cost of compute, data availability, algorithmic advancements and rise of open source

Foundational Shifts that Powered the AI Revolution



Software engineering revolution with increasing accessibility, open frameworks and open source

Improving quality of AI and reducing costs!



The Rise of Generative AI

The Key Innovations Behind GenAI



The **Transformer Model** forms the basis of all large language models (LLMs).

Attention Is All You Need

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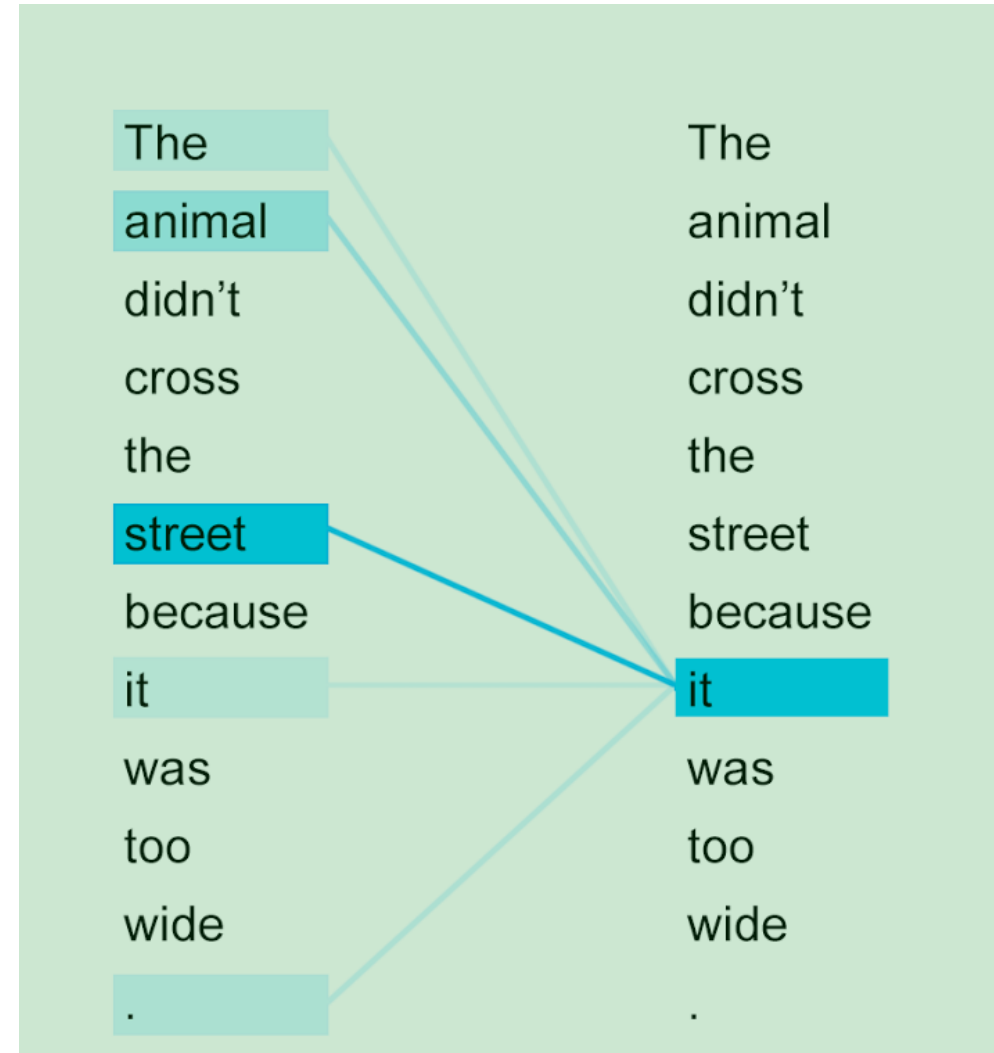
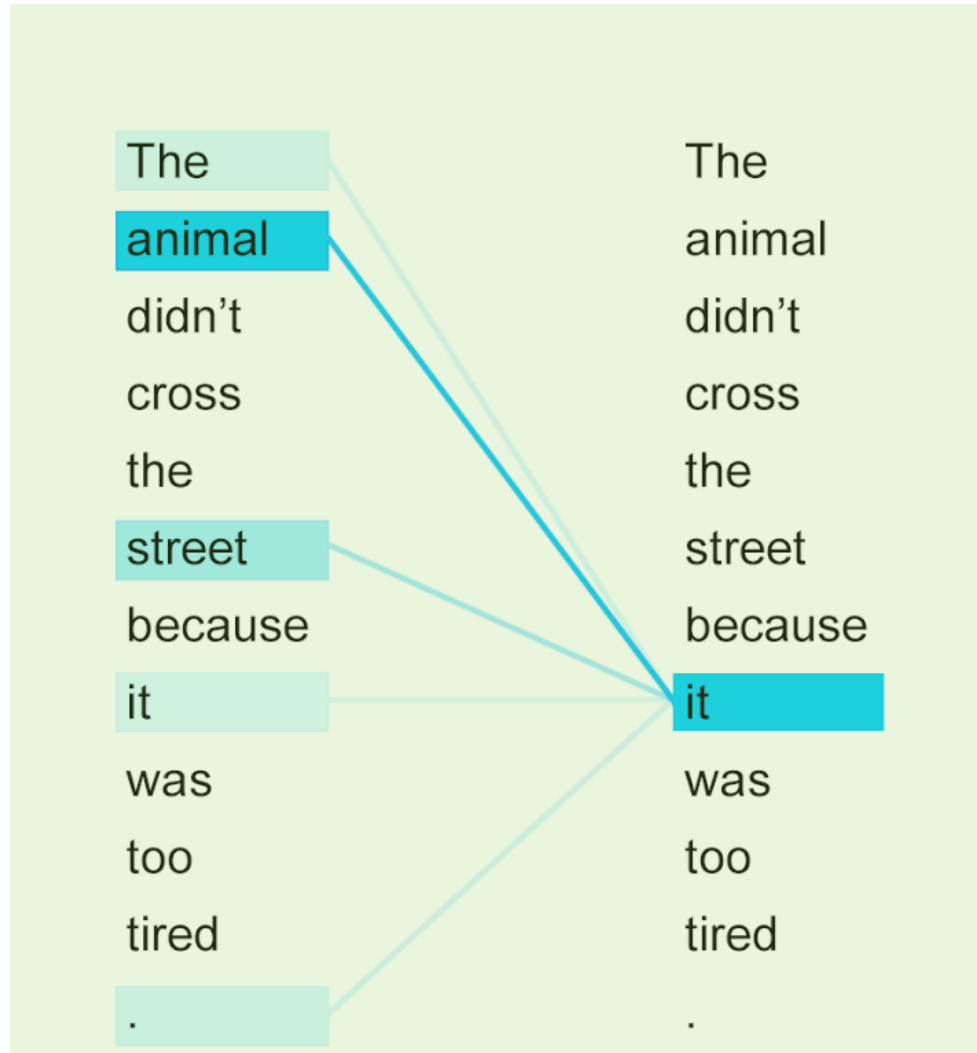
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What is Attention?



Solve for **long-range word** dependencies and **parallelization** of processing

The Key Innovations Behind GenAI



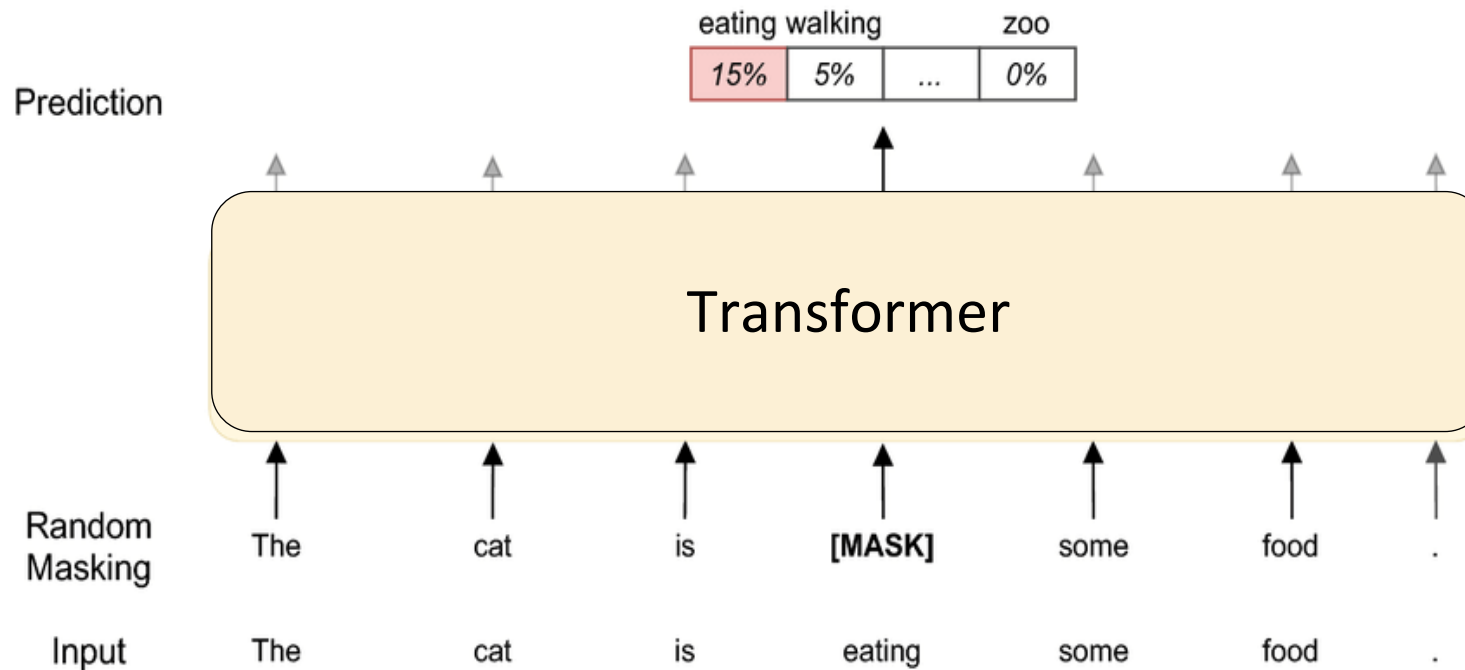
Self-supervised learning allows LLMs to *automatically* learn useful patterns from data without explicit labels. This unlocks massive datasets for the model to learn from.



Self-Supervised Learning



Masked Language Modelling: requires the model to learn from the input sequence by **reconstructing masked values**. It is completely automated and can be extended to any type of input sequence.

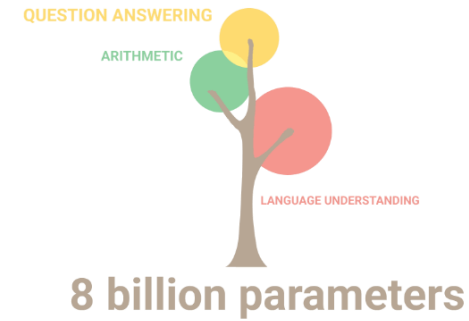
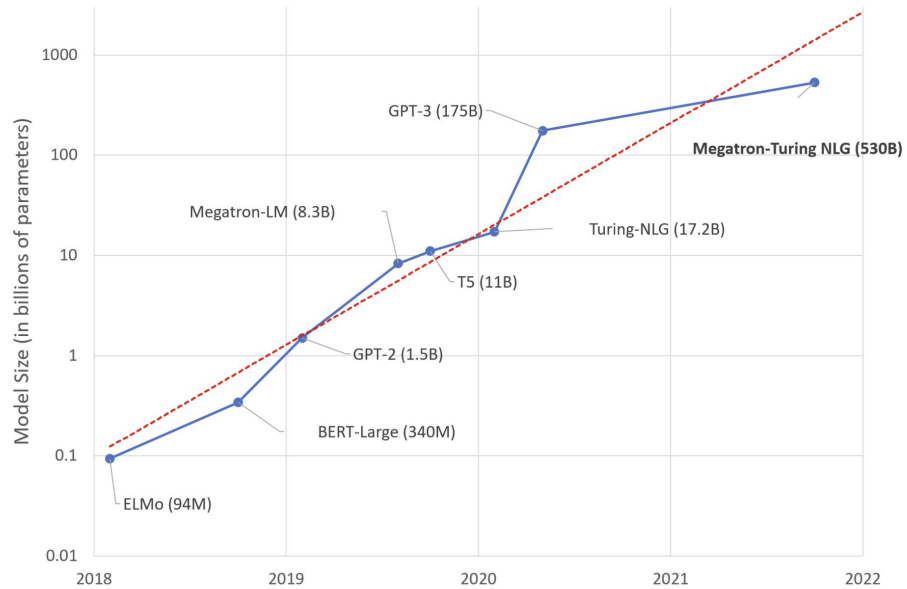


Larger Models Unlock New Capabilities



By unlocking large training data, model size has scaled rapidly:

- ✓ Improvements in the last 5 years have been driven by a rapid ~10 x increase in size each year.



<https://www.microsoft.com/en-us/research/blog/using-deepspeed-and-megatron-to-train-megatron-turing-nlg-530b-the-worlds-largest-and-most-powerful-generative-language-model/>

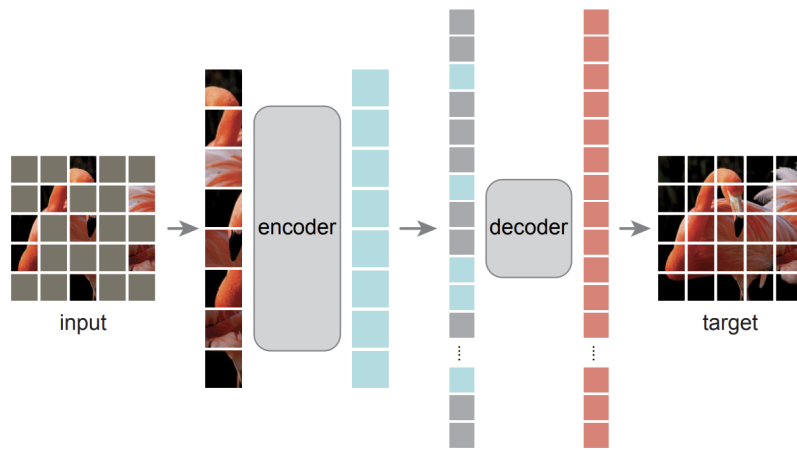
<https://ai.googleblog.com/2022/04/pathways-language-model-palm-scaling-to.html>

Beyond Language



Self-Supervised Learning transfers remarkably well to other domains.

Computer Vision



Biology

ProtGPT2 is a deep unsupervised language model for protein design



Model generated protein

4266
*5B48_C (9%, 67aa)
pLDDT: 72.5

Rapid Open-Source Trend in Language Models



Language datasets and the powerful LLMs trained on them are rapidly becoming open-sourced.



stability.ai

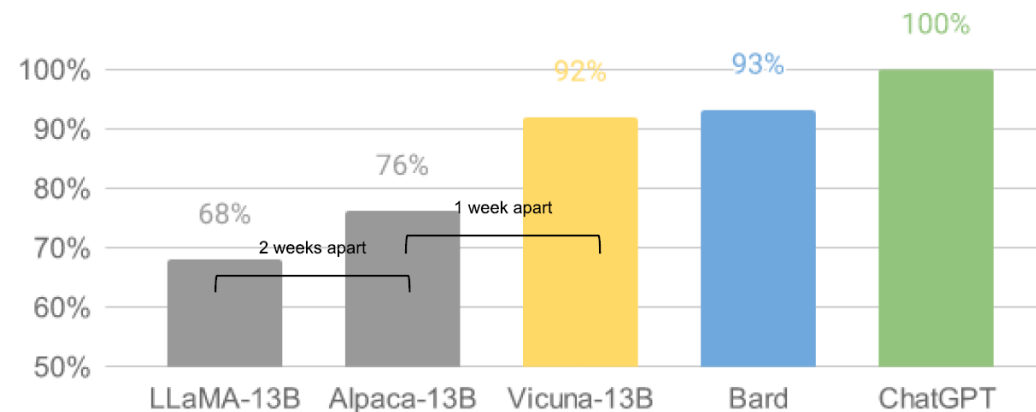
April 2023: Releases a **fully open-sourced LLM** for research and **commercial use**. Up to 65B parameter model release planned.

Vicuna

March 2023: **Open-source chatbot** trained by fine-tuning LLaMA with performance approaching Google's Bard, from academic researchers at Berkeley and other institutions.

Meta

March 2023: LLaMA model leaked, spurring rapid open-source development



*GPT-4 grades LLM outputs. Source: <https://vicuna.lmsys.org/>

AI in Finance

Serving the Customer Lifecycle



Shopping & Discovery



- ✓ Targeted offers
- ✓ Real Time engagement

Acquisition



- ✓ Credit decisioning
- ✓ Pricing
- ✓ Line assignment

Servicing



- ✓ Next best action
- ✓ Customer scoring and preapprovals

Retention



- ✓ Proactive outreach
- ✓ Triggers

Operations

- ✓ Document scanning and retrieval
- ✓ Fraud, cyber, GAML
- ✓ Balance sheet management
- ✓ Demand forecasting

End-to-end lifecycle governance: best practices, standards and policies, safety, accountability and human oversight

Data

- ✓ Bias and fairness
- ✓ Privacy enhancing technologies

Models

- ✓ Model explainability & interpretability
- ✓ Standardization
- ✓ Robustness (stable / resilient models)
- ✓ Validity (performs as intended)

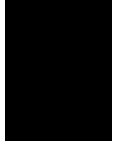
Actions

- ✓ Model monitoring: data and concept drift
- ✓ Human-in-the-loop interactions
- ✓ Transparency: provide information on use, limitations, potential impacts

What Comes Next?



- Continued breakthroughs in AI
 - Multi-modality
 - Reduced inference and training costs (improved accessibility)
- Increased focus on Trustworthy AI and regulation
- Increased enterprise adoption; however, with focus on trust and compliance with emerging LRRs



Thank You