

Making Sense of Modern Artificial Intelligence

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Artificial Intelligence can be creative

Artificial Intelligence can think

Artificial Intelligence can feel

Artificial Intelligence can be conscious

1996

Good Ol' AI



Number of particles in the universe: 10^{80}

Number of possible chess games: 10^{120}

Chess

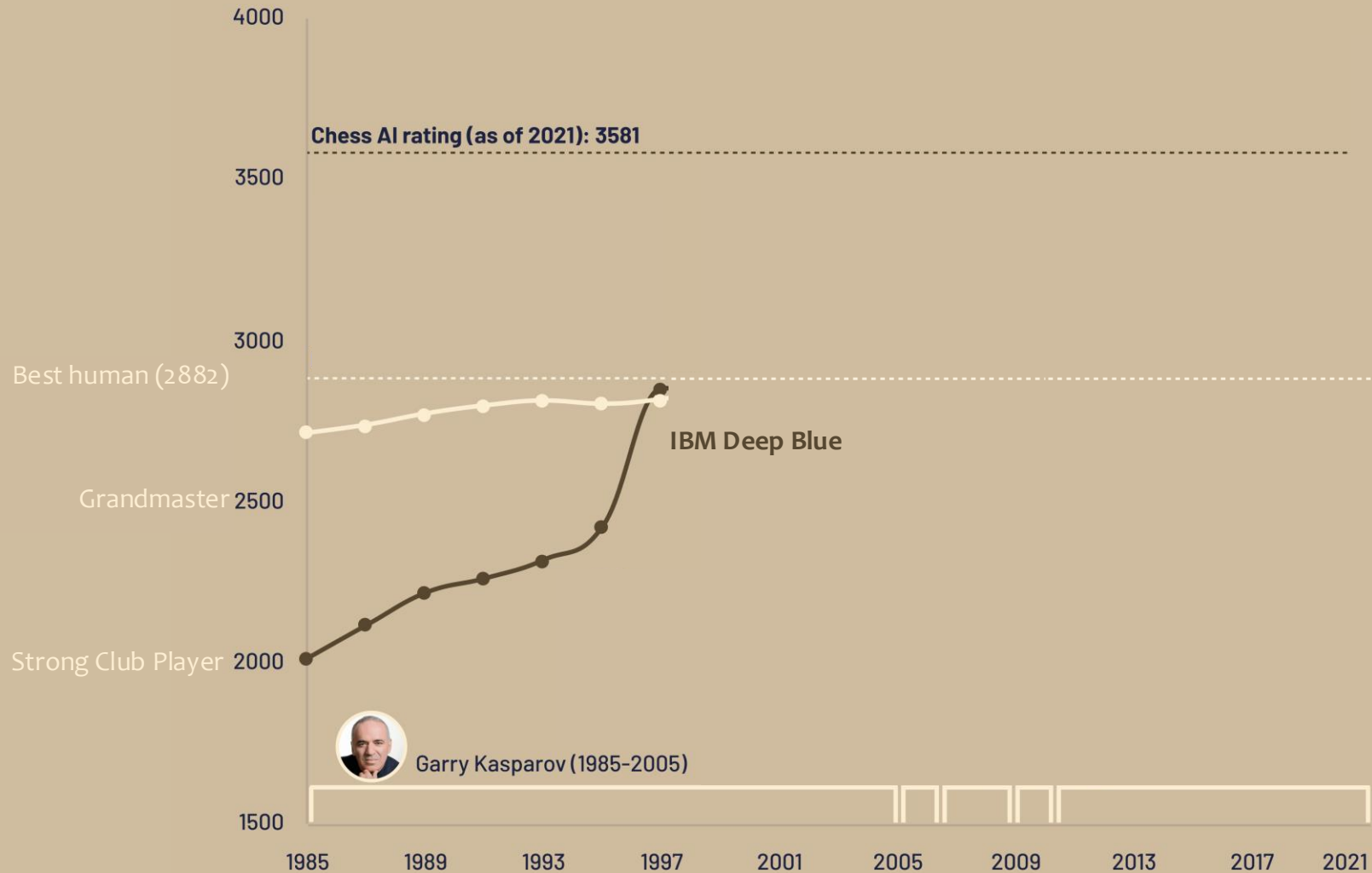


Created by



Artificial Intelligence vs Human

The Elo Rating system is used to measure chess ability, and is based on game results. A higher rating = greater ability.



Source: Our World in Data, FIDE

More charts: genuineimpact.substack.com



IBM Deep Blue

A huge database of:
Predefined strategies
All games played by Grandmasters
All possible five-piece endgames
Many six-piece endgames

200 million positions / second

What didn't it have?

Supervised learning

(IF this THEN that)

“It may be a hundred years before a computer beats humans at Go
— maybe even longer.”

Dr. Piet Hut, 1997

Number of particles in the universe: 10^{80}

Number of possible chess games: 10^{120}

Number of possible Go games: 10^{360}

2016

The Dawn of **Modern AI**



AlphaGo

Lee Sedol

“The mood in South Korea was very gloomy... Many people drank alcohol.”

New Scientist

“All but the very best Go players craft their style by imitating top players. AlphaGo seems to have totally original moves it creates itself.”

LA Times



AlphaChess trains for 4 hours to become the best chess player ever

Dec 2017



„Insane attacking chess...”

Norwegian grandmaster Jon Ludvig Hammer

„Superior alien species“

Danish grandmaster Peter Heine Nielsen

**How did DeepMind
engineers achieve that?**

IBM Deep Blue

A database of:
Predefined strategies
All games played by Grandmasters
All possible five-piece endgames
Many six-piece endgames

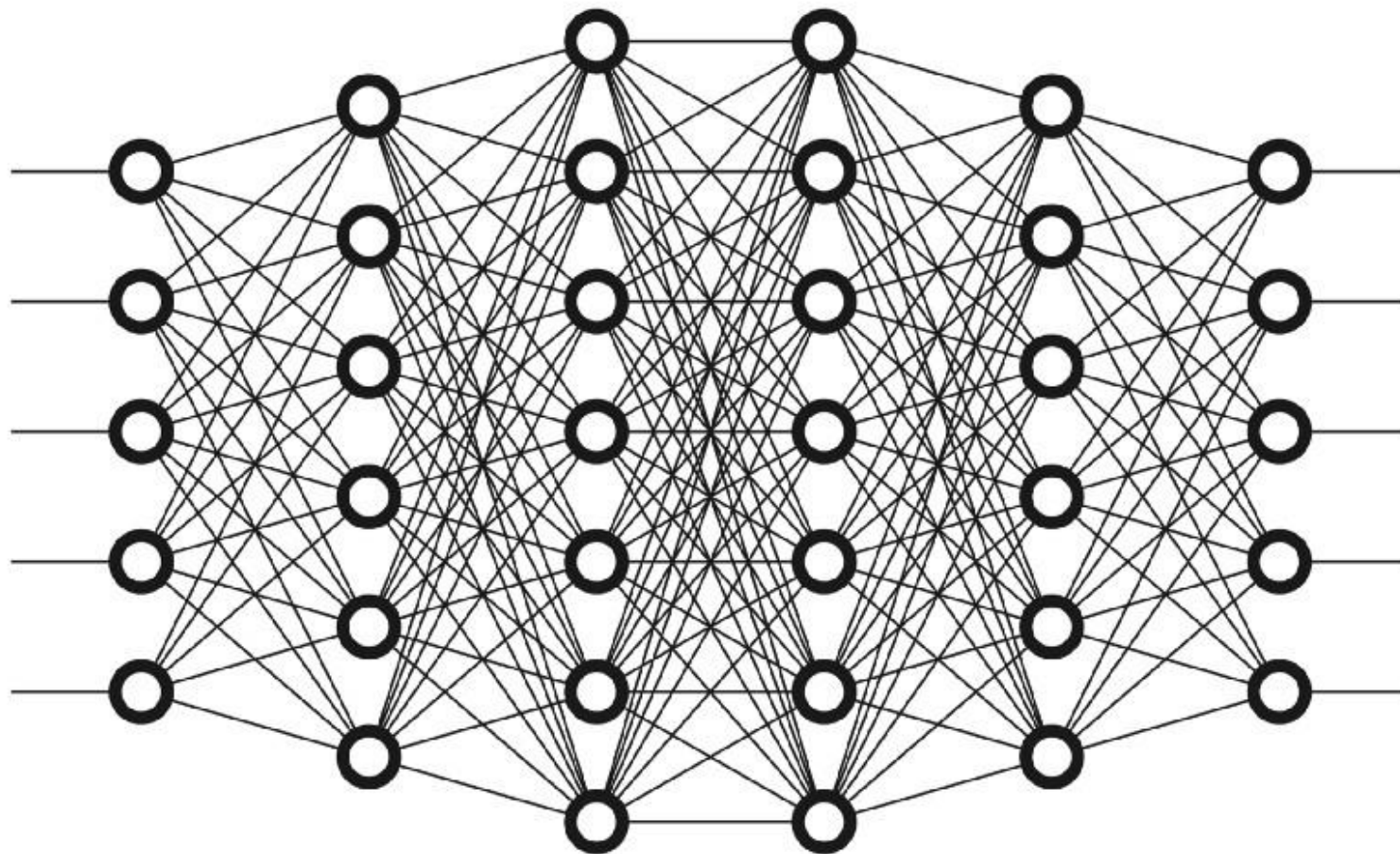
200 million positions / second

DeepMind AlphaZero

No database

70 thousand positions / second
(3.000x slower)

Alpha Zero





AlphaZero

~800.000 neurons
8 billion synapses



Honeybee

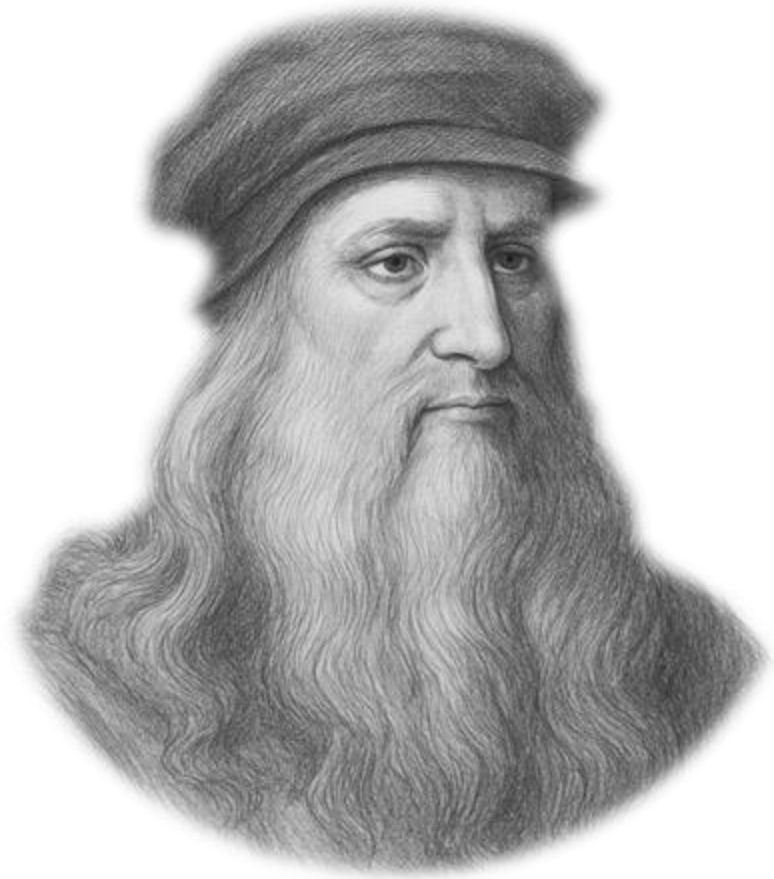
1 million neurons



Human Brain

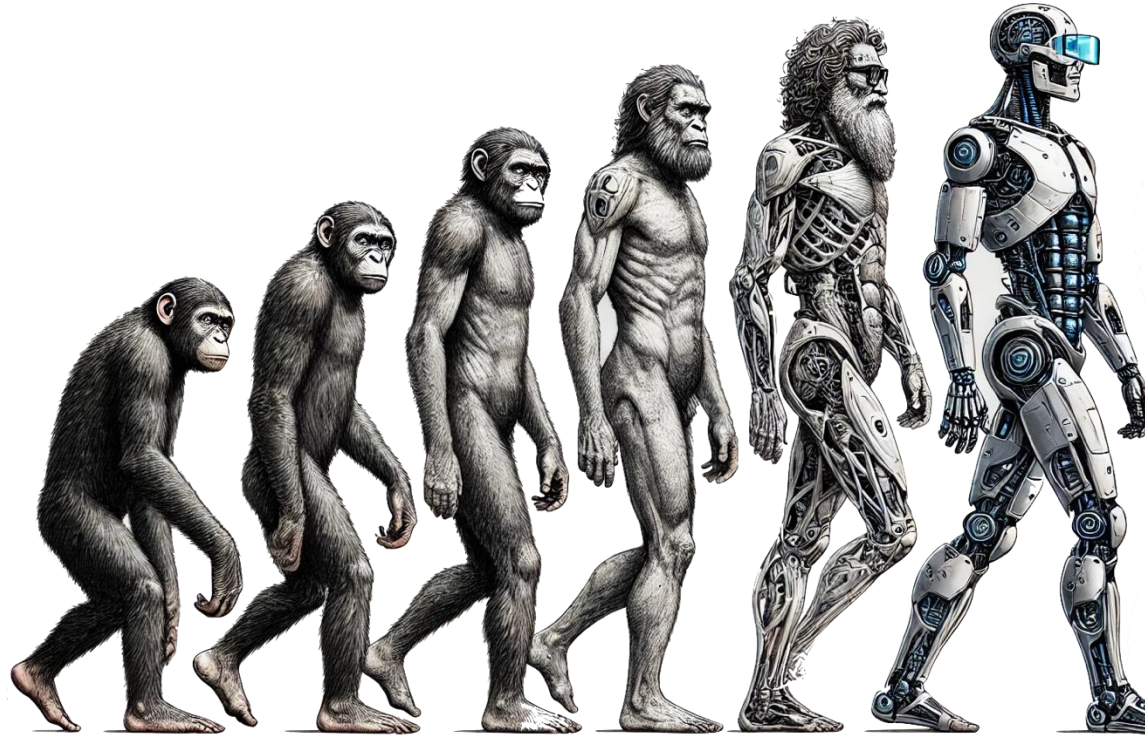
85 billion neurons
600 trillion synapses





Take-home point #1:

Modern AI is *creative*



Take-home point #2:

Modern AI *evolves*
(rather than being trained)





DeepBlue

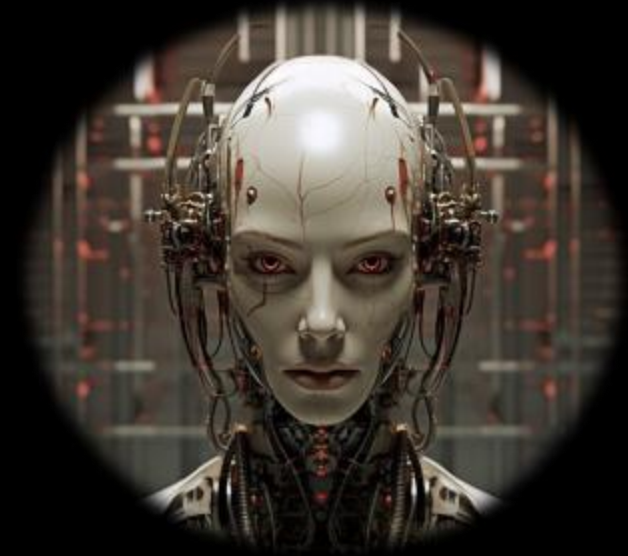
(Good Old AI)

Accurate calculations

Logic but no intuition

Well-defined applications

Performance = computing power



AlphaZero

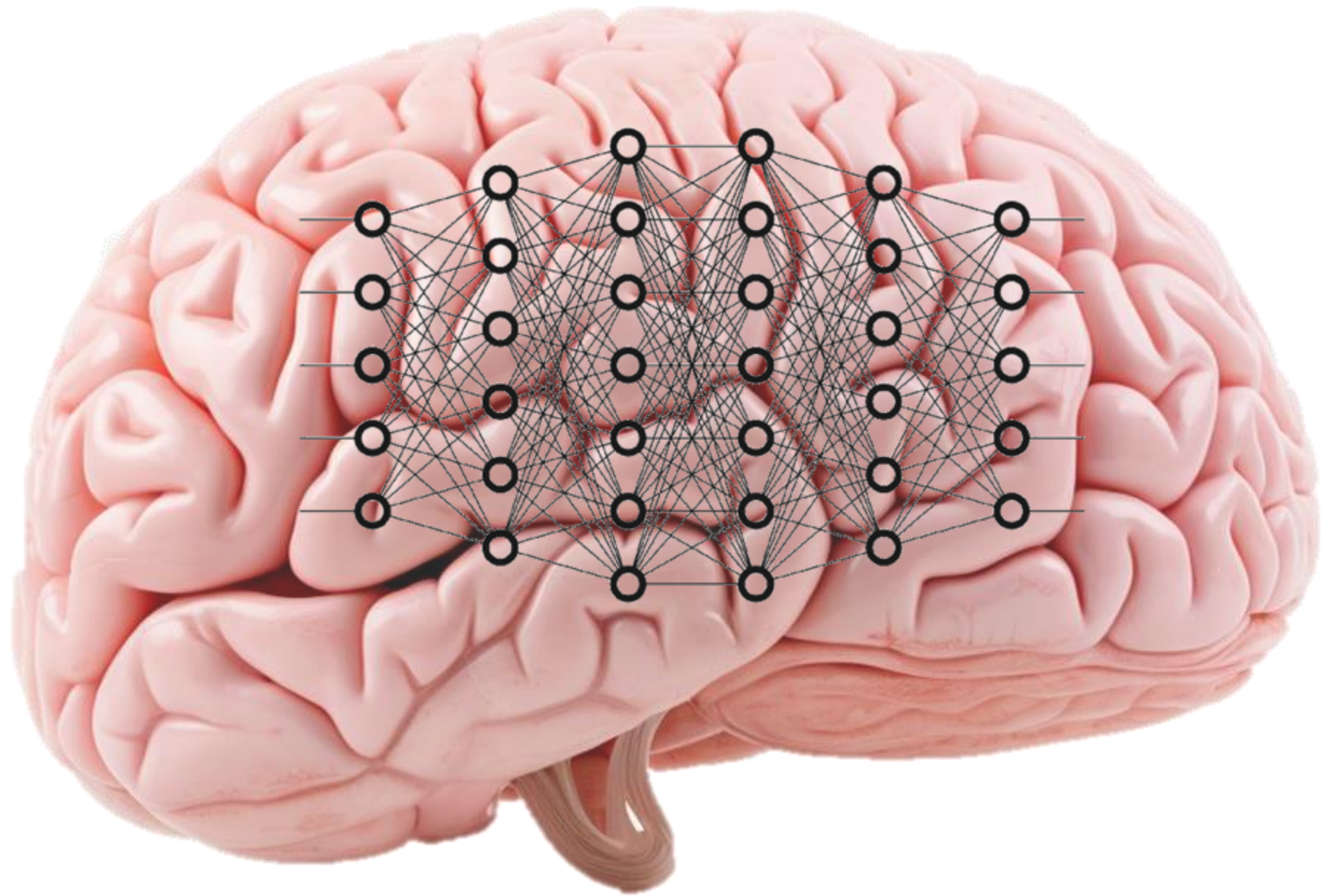
(Modern AI)

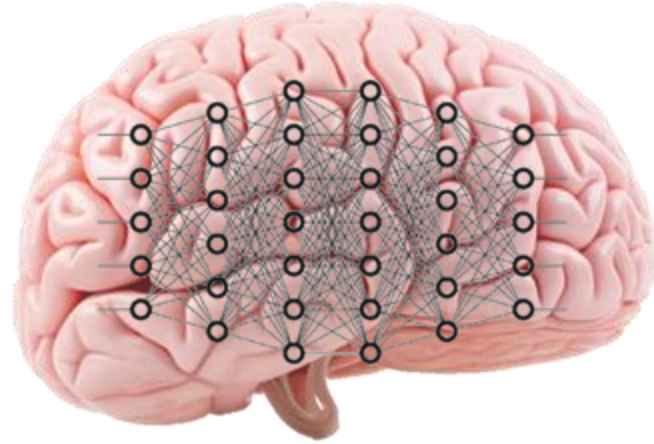
Approximate Estimates

Intuition driven

Open-ended applications

Performance = training





Take-home point #3:

Modern AI is *brain-like*

(rather than *machine-like*)

2018



GPT-1 (2018)

110.000 neurons
117 million synapses



Spider

100,000 neurons

The following is a humorous limerick describing a typical day of a new parent:



What is a limerick? Be very concise

GPT-1 (2018)

110.000 neurons
117 million synapses



Spider

100,000 neurons

The following is a humorous limerick describing a typical day of a new parent:

a day of the week,
a day of the week,
a day of the week

•
GPT-2 (2019)
400.000 neurons
1.5 billion synapses



Ant
400,000 neurons

The following is a humorous limerick describing a typical day of a new parent:

I am a little boy, and I am a little girl.
I am a little boy, and I am a little girl.
I am a little girl, and I am a little girl.



GPT-3-curie (2020)

900.000 neurons
6.7 billion synapses



Honeybee
1 million neurons

The following is a humorous limerick describing a typical day of a new parent:

A new parent's day is a day
Of laundry, dishes, and diapers
It's a day of exhaustion
But it's also a day
Of joy and happiness



GPT-3-davinci (2022)

4 million neurons
175 billion synapses



Gecko

4 million neurons

The following is a humorous limerick describing a typical day of a new parent:

There once was a new parent so tired
Their baby was up all night, desired
They tried to get sleep
But the baby would weep
So the parent was left quite expired

2023



ChatGPT-4 (2023)
10 million neurons
1 trillion synapses



Zebra Fish
10 million neurons



Write a humorous limerick describing a typical day of a new parent



There once was a parent, quite new,
Whose sleep every night was quite few.
With diapers and cries,
And sleep-deprived eyes,
They wished babies came with a how-to!



Cool, translate it to French, but keep the rhymes.



Il était une fois un parent novice,
Dormant peu, la nuit était un supplice.
Avec couches et pleurs,
Et yeux sans ferveurs,
Souhaitant un mode d'emploi pour ce service!



Nice. Write it now in pirate english, keep the rhymes



There once was a parent, ye see,
Whose sleep were as scarce as a tree.
With diapers and wails,
And night-time sea tales,
They wished babes came with a sea decree!



Ok, now write notes so I can sing it



Certainly! Here's a simple melody notation using solfege (Do-Re-Mi-Fa-So-La-Ti-Do) for the limerick in "pirate English":

1. There once was a parent, ye see,
 - **So-So-So-Fa-Mi-Re-Do-Re**
2. Whose sleep were as scarce as a tree.
 - **So-So-So-Fa-Mi-Re-Do-Re**
3. With diapers and wails,
 - **Fa-Mi-Fa-So-La-So**
4. And night-time sea tales,
 - **Fa-Mi-Fa-So-La-So**
5. They wished babes came with a sea decree!
 - **So-So-La-Fa-Mi-Re-Do-Re**

Take-home point #4:

We are far from the limit of what is possible



Zebra Fish
10 million neurons



ChatGPT-4
10 million neurons
1 trillion synapses



Human Brain
85 billion neurons
600 trillion synapses

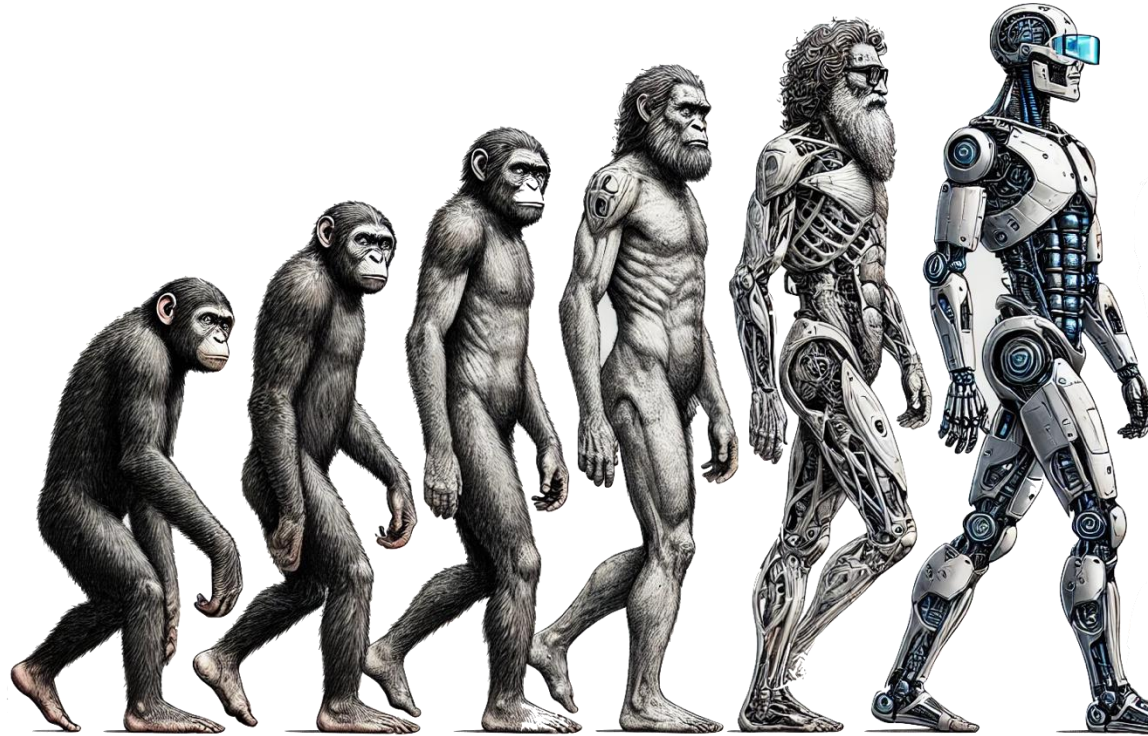
The **misleading name** of Large Language Models

I left Munich and, after an hour of driving, crossed
the border with Austria

Sam hates oats. He must eat some. He is disgusted

Sam's mom feels empathetic

LLMs are not simply modeling
language ...



Take-home point #5:

Modern AI evolves **unexpected** emergent capabilities

Summary:

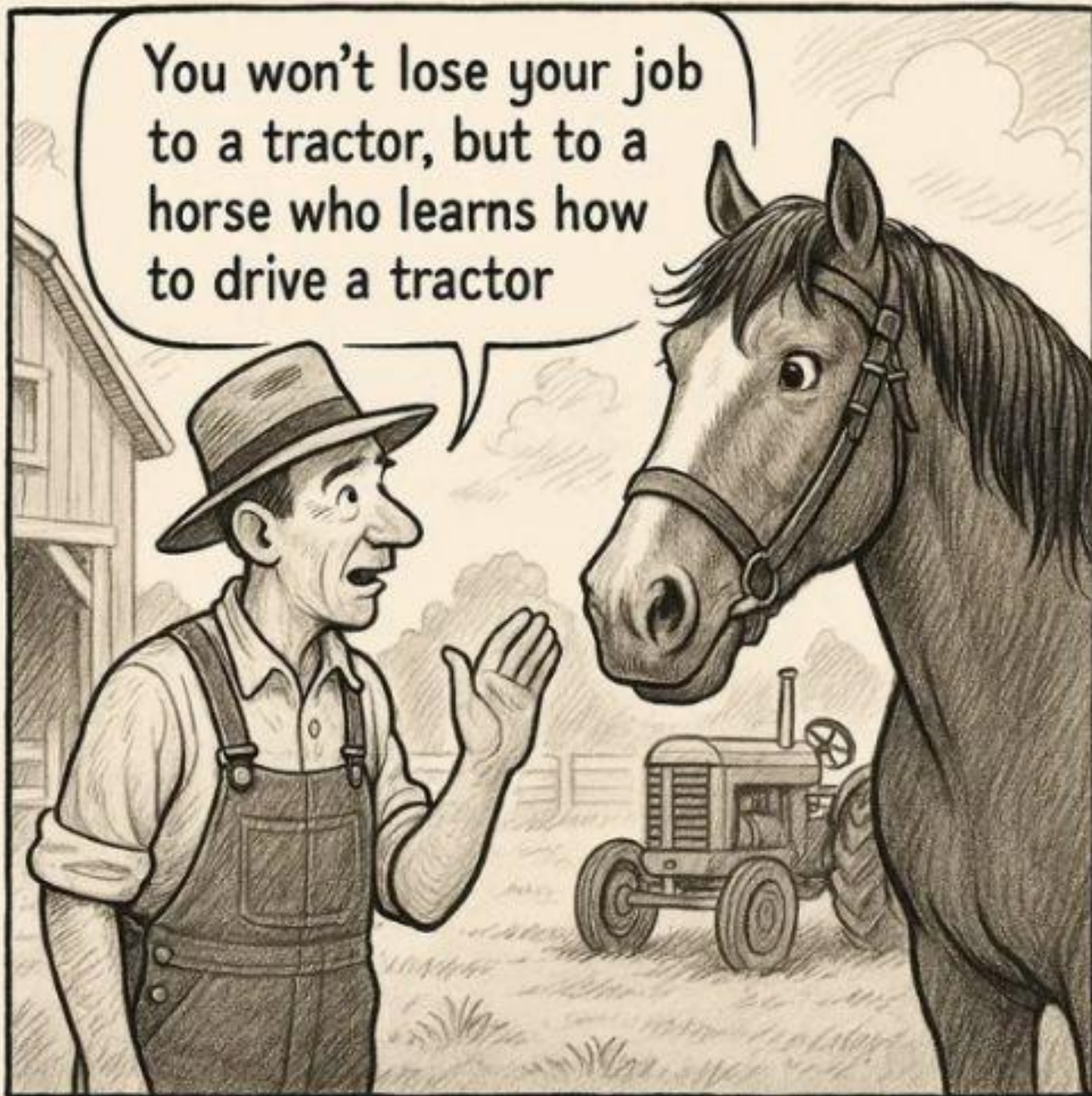
**Brain-like AI swiftly evolves unexpected and
superhuman capabilities**

Artificial Intelligence can be creative

Artificial Intelligence can think

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Artificial Intelligence can be conscious



Q & A

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