

The 4th Industrial Revolution

Exponential realities and social implications

A photograph of a person standing on the peak of a mountain, looking down at a long, winding staircase that leads up the side of the mountain. The mountain is covered in mist and snow. The staircase is made of dark wooden steps.

How many are?

30 linear steps

vs.

30 exponential steps



The answer:

30 meters

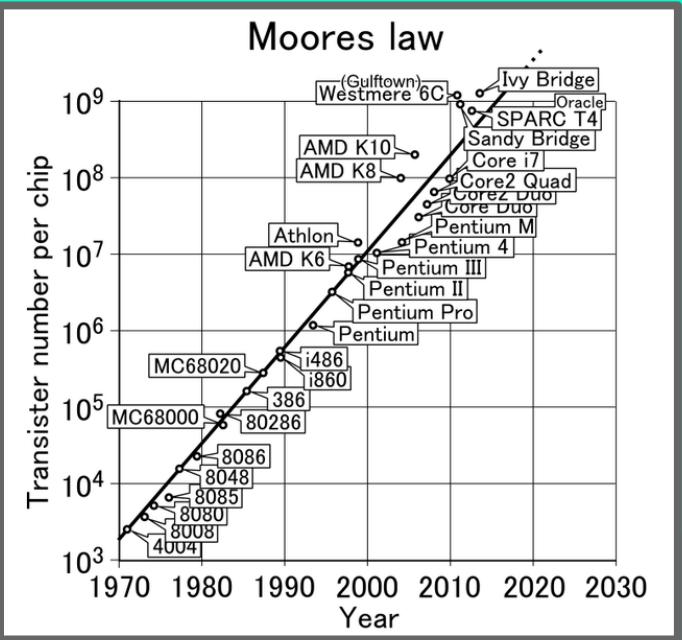
vs.

A billion meters

(26 times around the earth)

A look at Today

- Moore's Law, now Exponentialism
- Iphone: first mind extension
- How fast we've already changed:
Social Media/VR/AR
Drones/Digital Currencies/Robots/AI

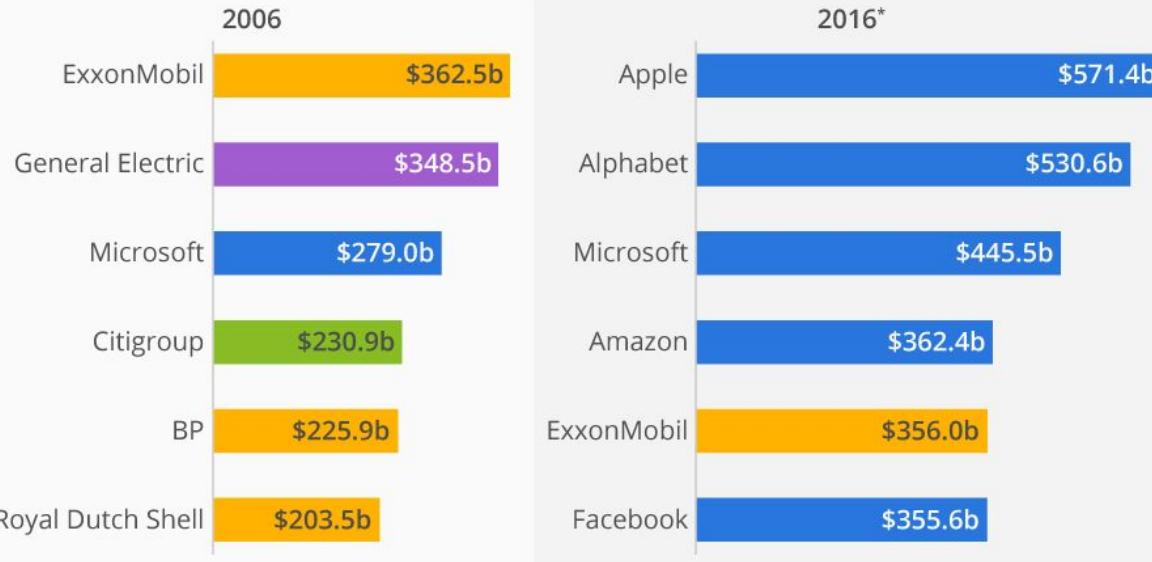


10 years stock market challenge

The Age of Tech

Market capitalization of the world's most valuable public companies

Tech Oil/Energy Financial Services Conglomerate



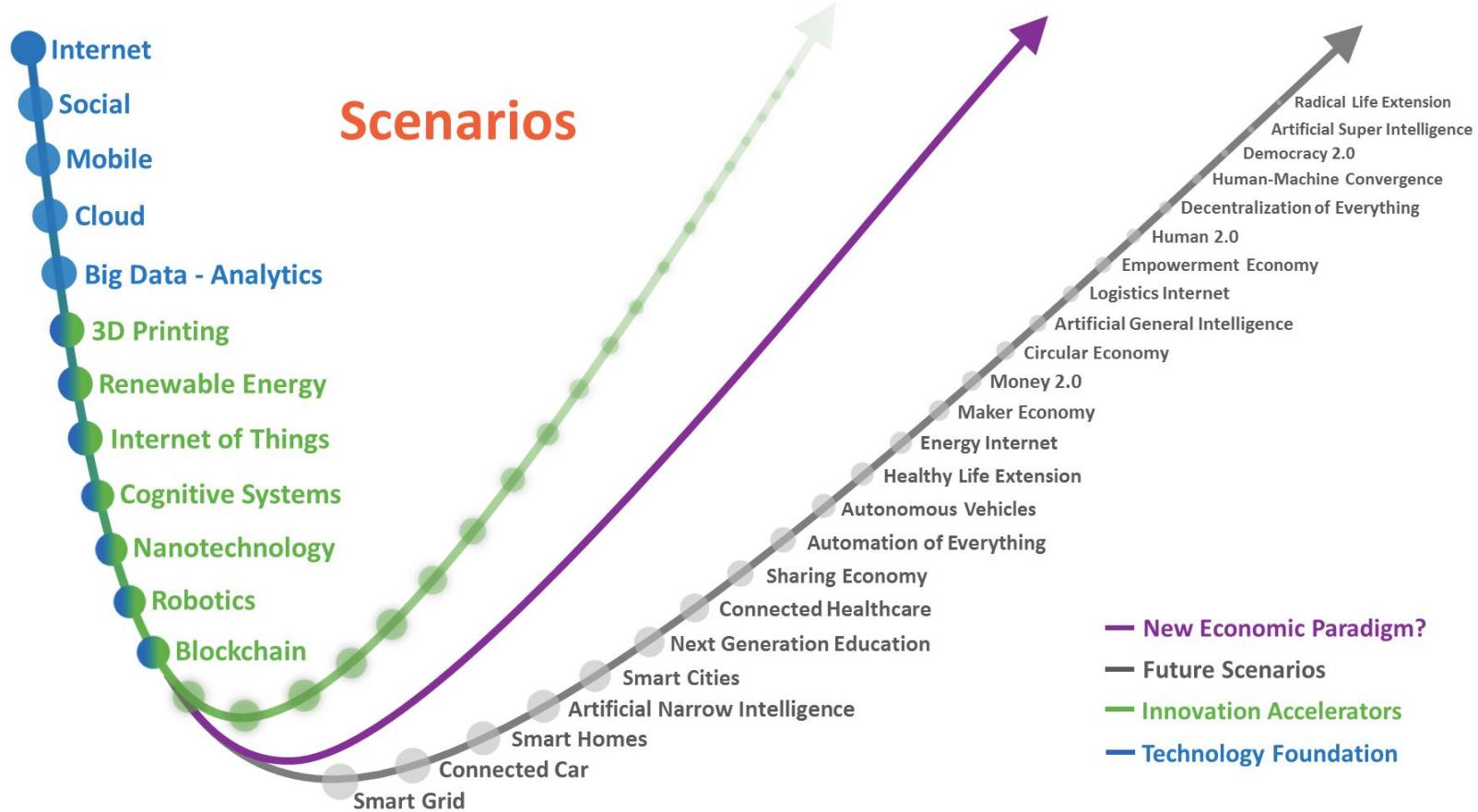
* as of August 1, 2016

@StatistaCharts

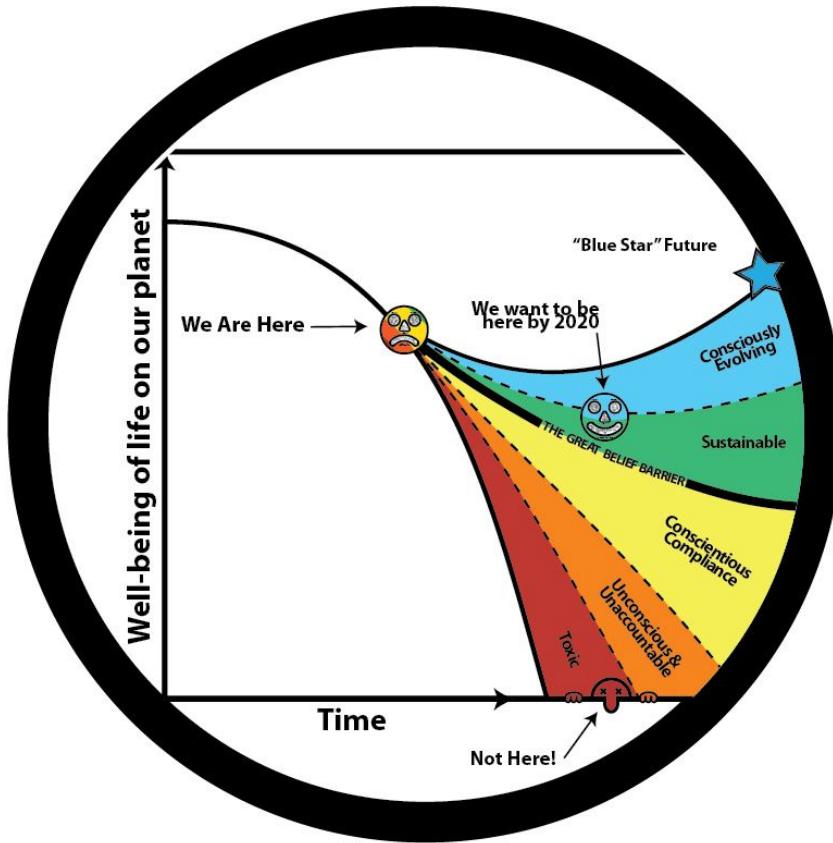
Sources: Yahoo! Finance, Forbes

statista

Potential Scenarios



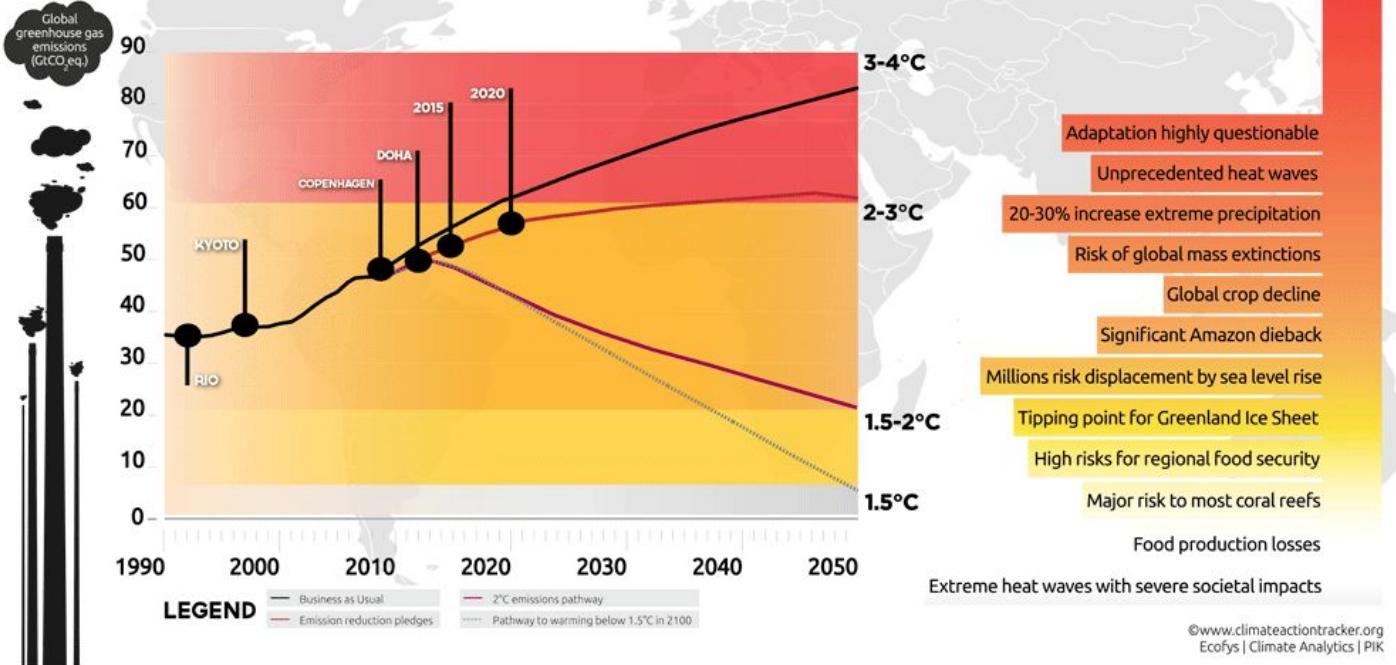
What this means



In some areas, this is already going rogue

STAYING BELOW 2°C: THE CHOICES WE FACE

With current pledges on the table to cut emissions, we are heading to a 3.3°C warming future. No further action before 2020 will limit society's choices. As temperatures rise, so do the impacts.



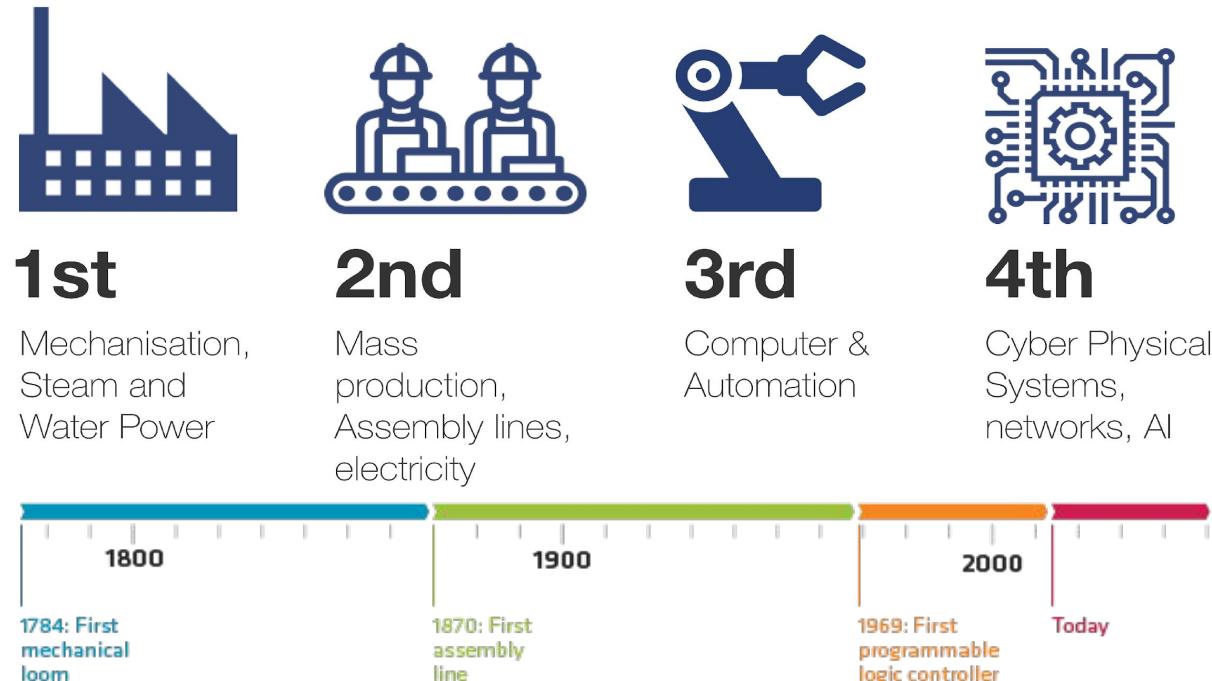
The 4th Industrial Revolution

"85% of jobs that will exist by 2030 have not been yet invented."

- What is the root cause of this trend?
- What will be the implications for our society?

Three factors to consider:

- Time
- Scalability
- Wealth

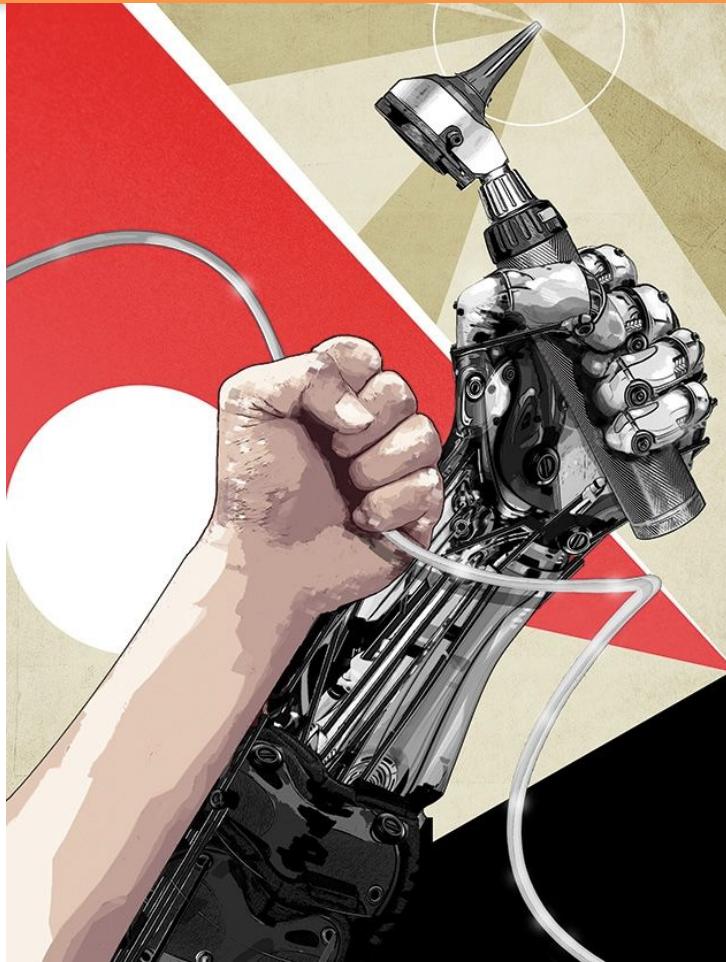


AI and the Future of Work

In the upcoming context of the 4th industrial revolution, AI has the potential to yield the most significant productivity increase in the history of our civilization. At the same time, this fast change is likely to change the structure of work and leave many people behind.

We are running **Akademy.ai** with two underlying goals:

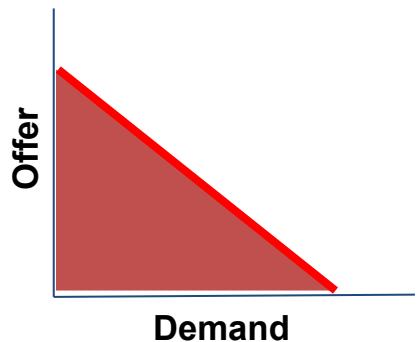
- Accelerate the training of AI Professionals
- Share ethical and responsible AI principles



Current Education Model is Broken

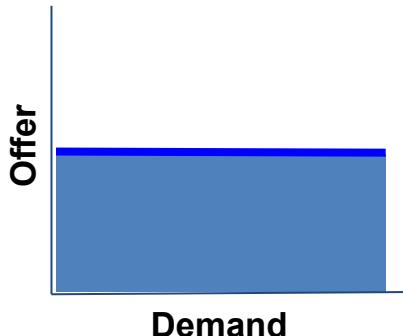
Option A: Traditional Education

High Marginal Cost
Requires Expertise
Huge Barrier to entry
High Maintenance
(Ideally) High Value



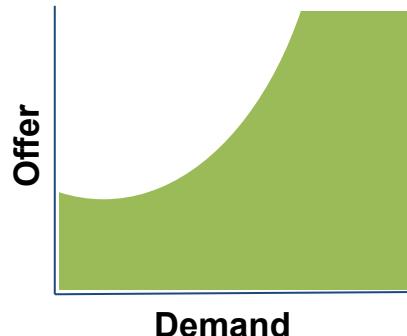
Option B: MOOCs

Highly Scalable
Still requires (less) experts
High Barrier to entry
Medium Maintenance
Concentration of Knowledge



Option C: Exponential learning

(Almost) No resources
No teachers
Low costs
Highly Accessible
Decentralized knowledge



Previous revolutions: 2nd

Over 1 Billion People Had No Access to Electricity in 2014

Percentage of population with access to electricity (2014)



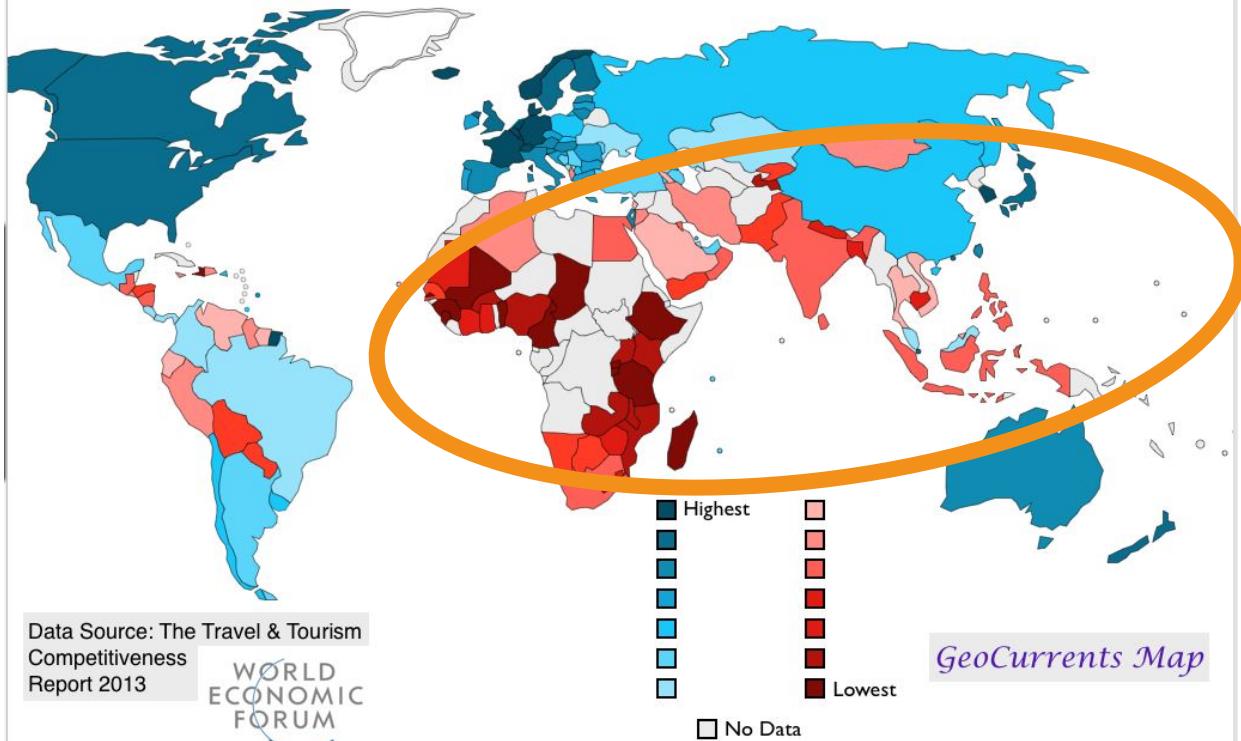
Source: [World Development Indicators](#)

Previous revolutions: 3rd

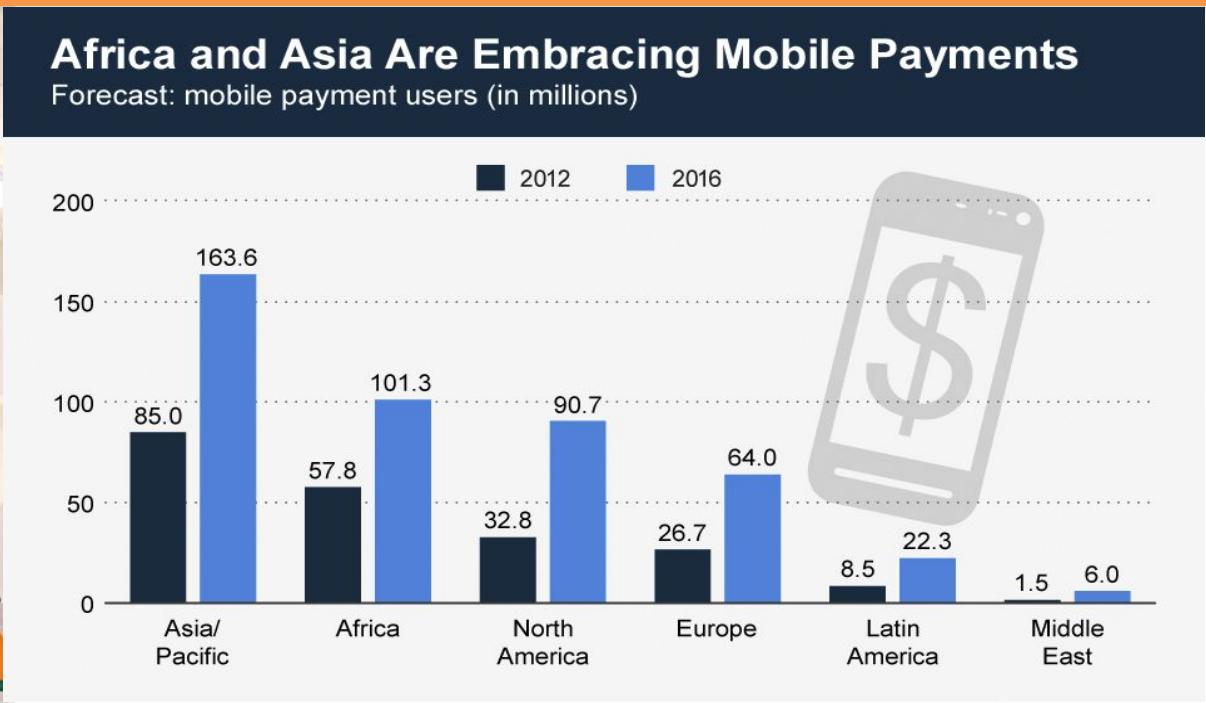
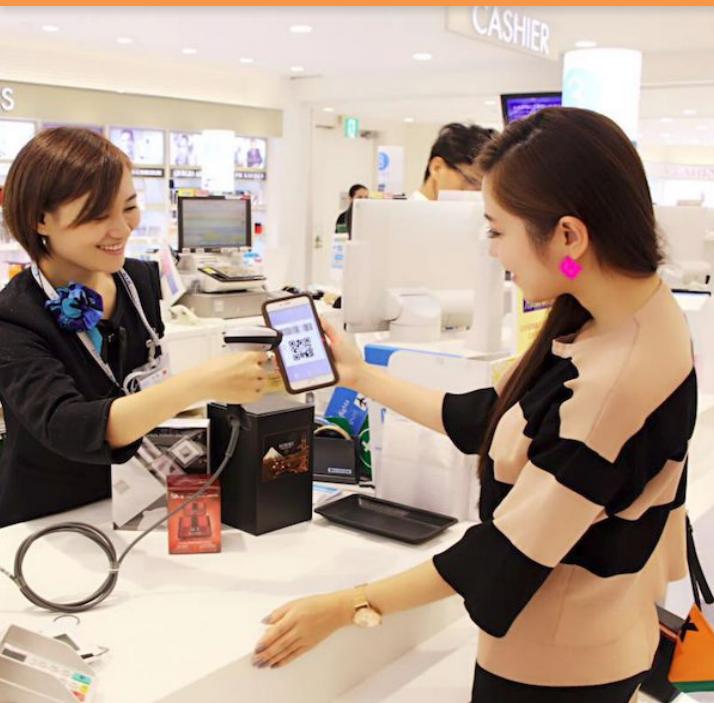
Map B

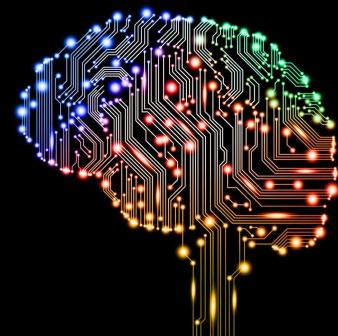
Broadband Internet Subscribers

Fixed broadband Internet subscriptions per 100 population
2011 or most recent



Leapfrogging opportunities





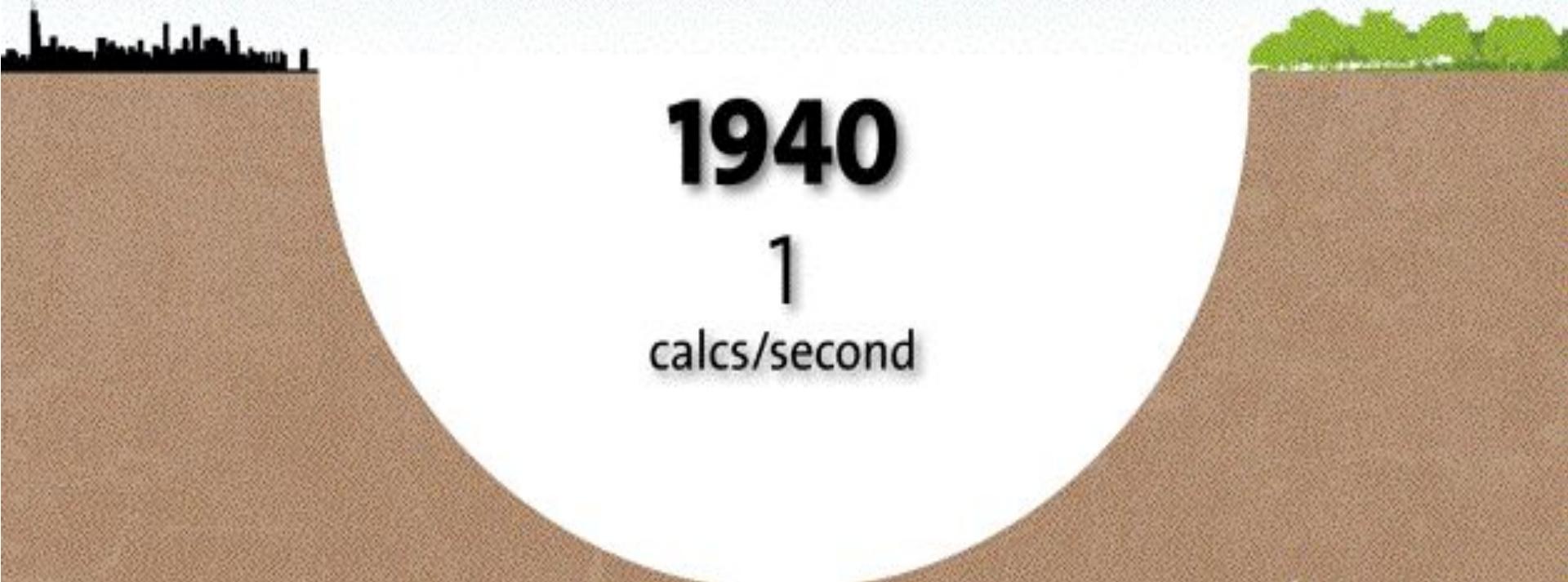
"Machine Learning" Search Rank, Internet Traffic



Source: Google, Cisco

How Long Until Computers Have the Same Power As the Human Brain?

Lake Michigan's volume (in fluid ounces) is about the same as our brain's capacity (in calculations per second). Computing power doubles every 18 months. At that rate, you see very little progress for a long time—and suddenly you're finished.

An illustration of Lake Michigan, showing its silhouette against a light blue background. The lake is depicted as a wide, shallow basin. The water surface is flat, and the shoreline is visible at the bottom. The surrounding land is a light brown color.

1940

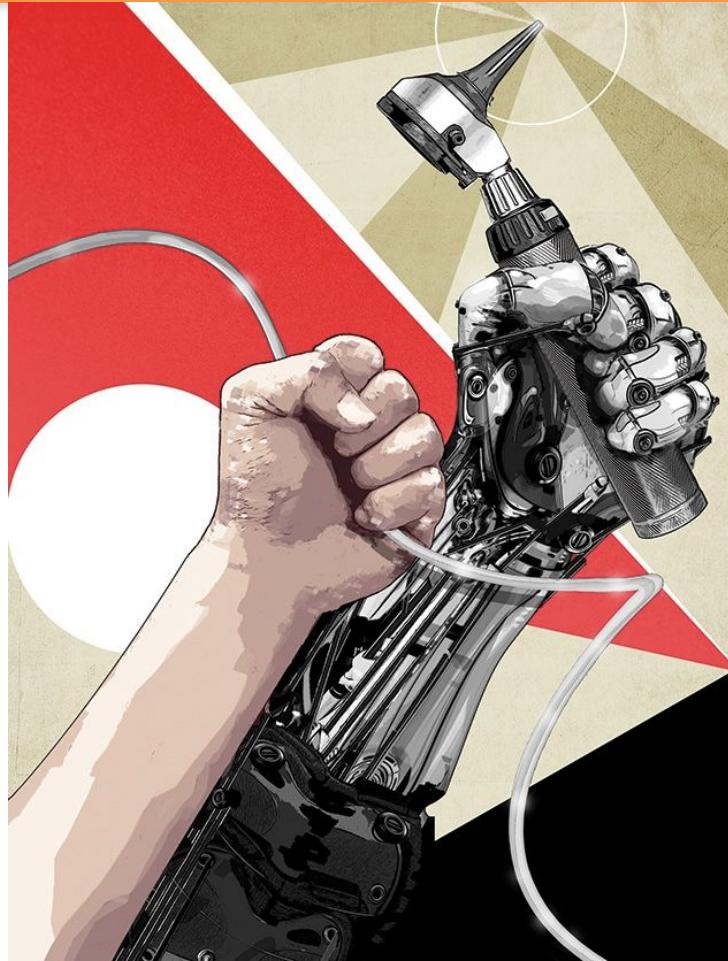
1

calcs/second

AI and the Future of Work

- 4th industrial revolution
 - Productivity increase
 - Negative implications
 - Fast changes → society?

How can we use AI to spark positive change?



Use Case: Autonomous Driving

"If there were a rumour that Mercedes or Daimler planned to start building smartphones then they (Apple) would not be sleepless at night. And the same applies to me."

—Dieter Zetsche, Daimler CEO [Feb 2015]

"We don't consider customers cargo. We don't want to build a robot that delivers the cargo from A to B."

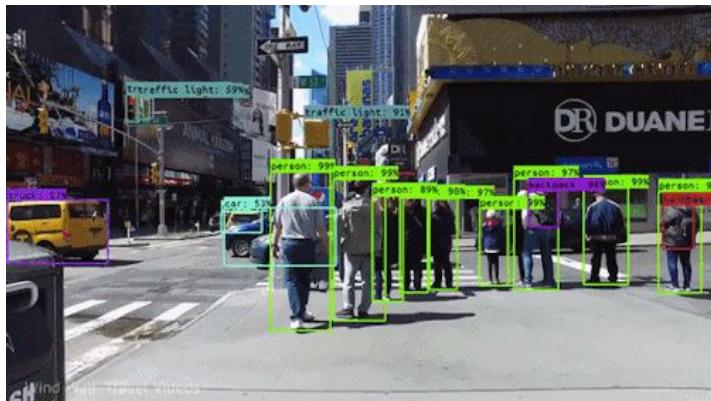
—Wolfgang Epple, Jaguar's head of R&D [July, 2015]

"An iPhone belongs in your pocket, not on the road"

—Oliver Blume, Porsche CEO [Feb 2016]

"It gives you the impression that it's doing more than it is. [Tesla's Autopilot] is more of an unsupervised wannabe."

—Trent Victor, Sn. Leader of crash avoidance at Volvo [April 2016]



How to prepare

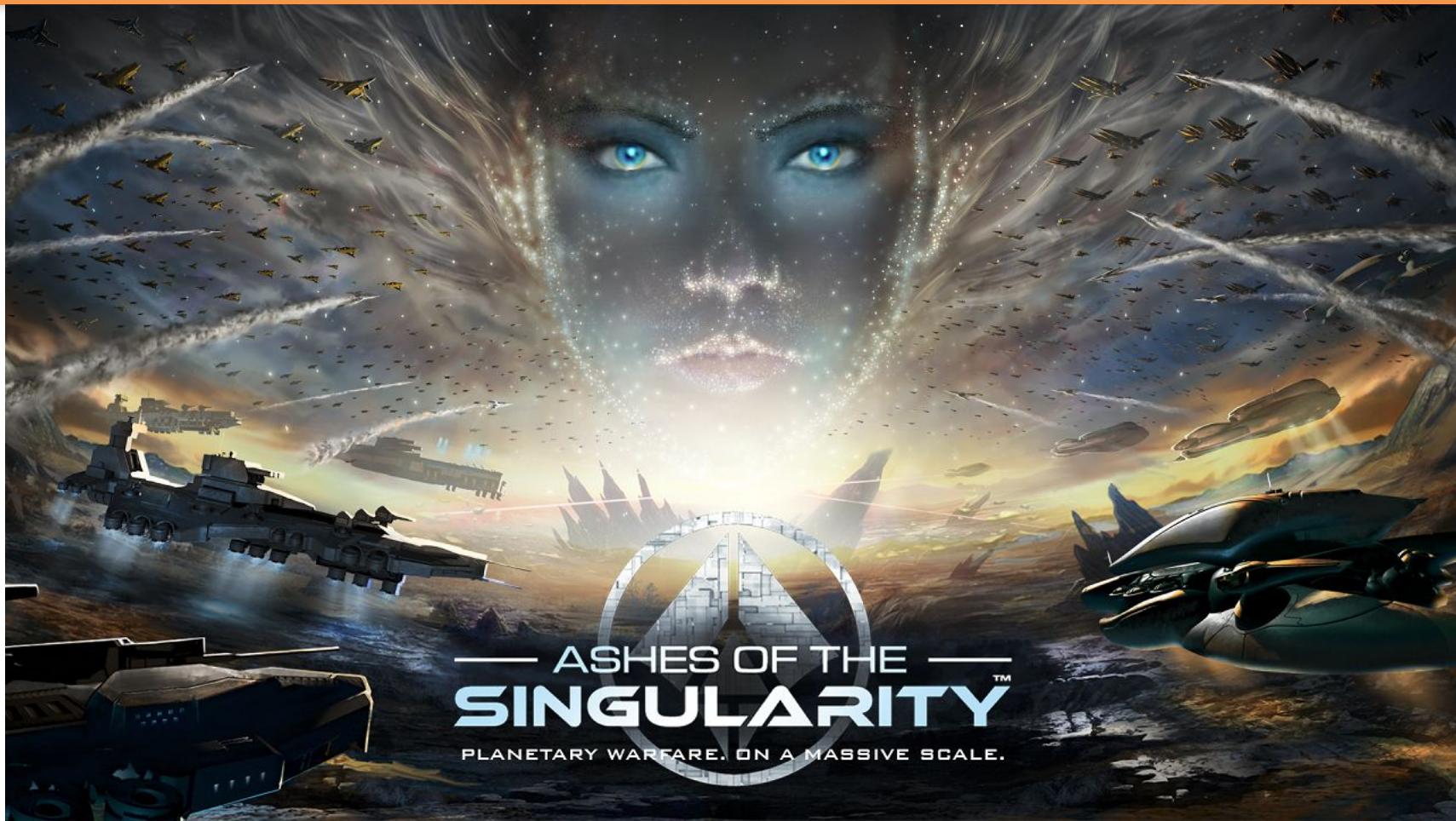
- Creative field → Magic?
- Don't work in silos
- Irrational work will be more valued - beer ice cream, chess psychology. DHH Programming argument
- Expert generalist
- Don't stress out about it or getting hit by a bus



(RE)LEARNING HOW TO LEARN

Embracing change, being a
Chameleon

But... are we in control?



— ASHES OF THE —
SINGULARITY™
PLANETARY WARFARE. ON A MASSIVE SCALE.

Do we even exist?



Discussion: What do you think?

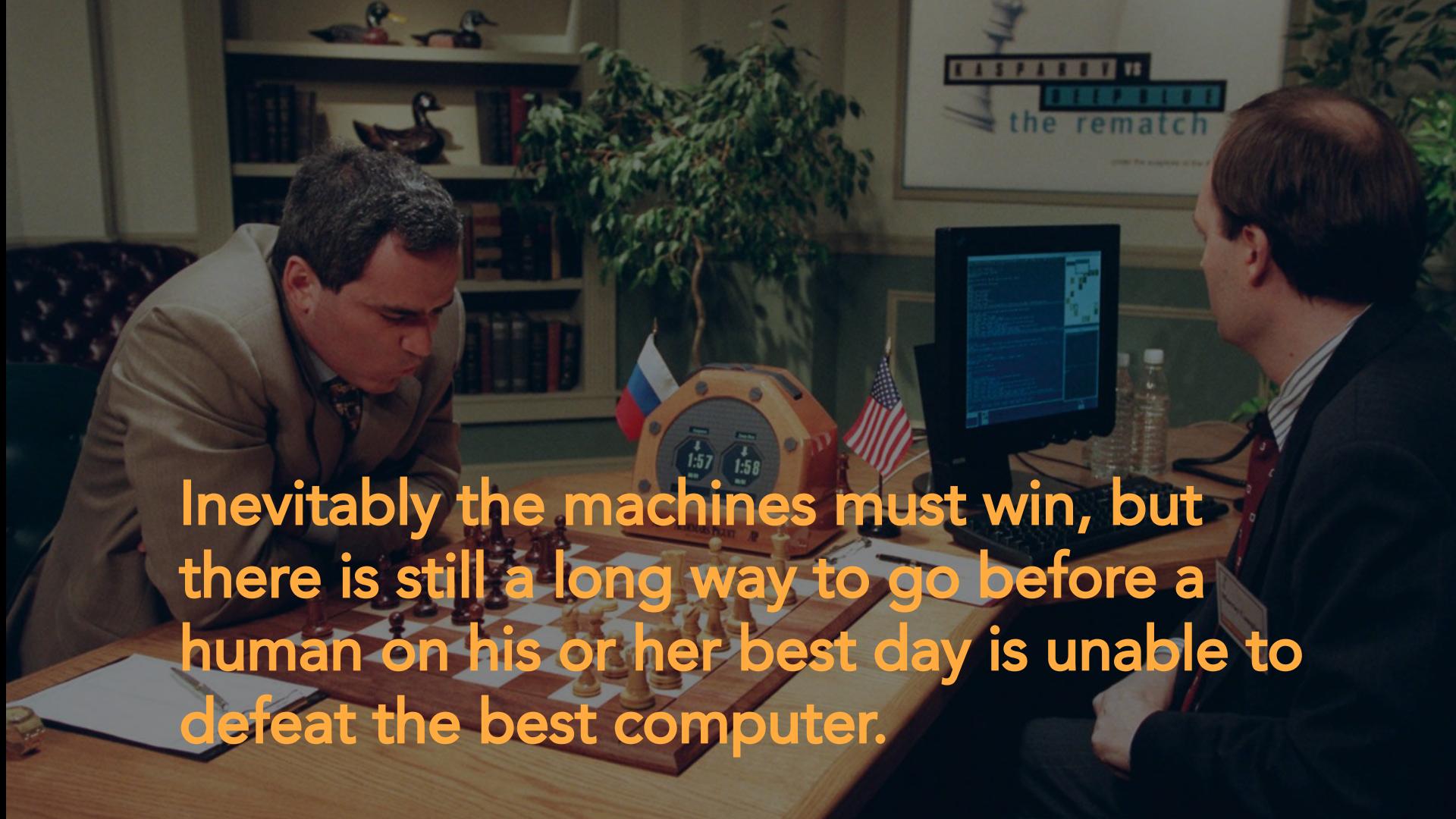


Voting: Which pill should we take?



Let's see...





Inevitably the machines must win, but there is still a long way to go before a human on his or her best day is unable to defeat the best computer.



I promise it is the last Elon Musk video...



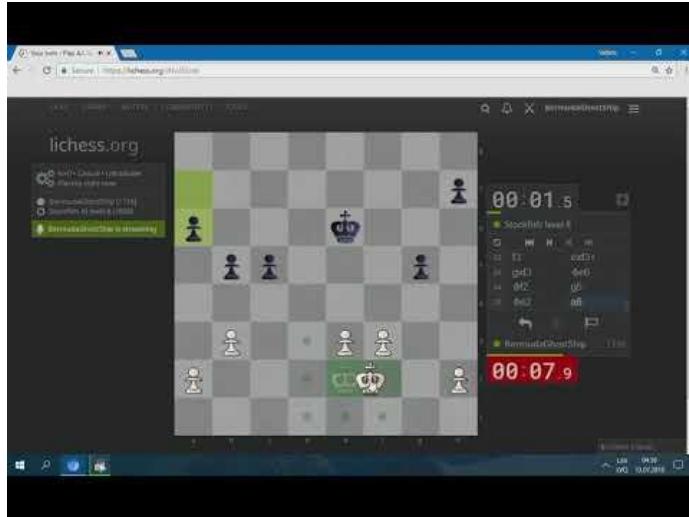
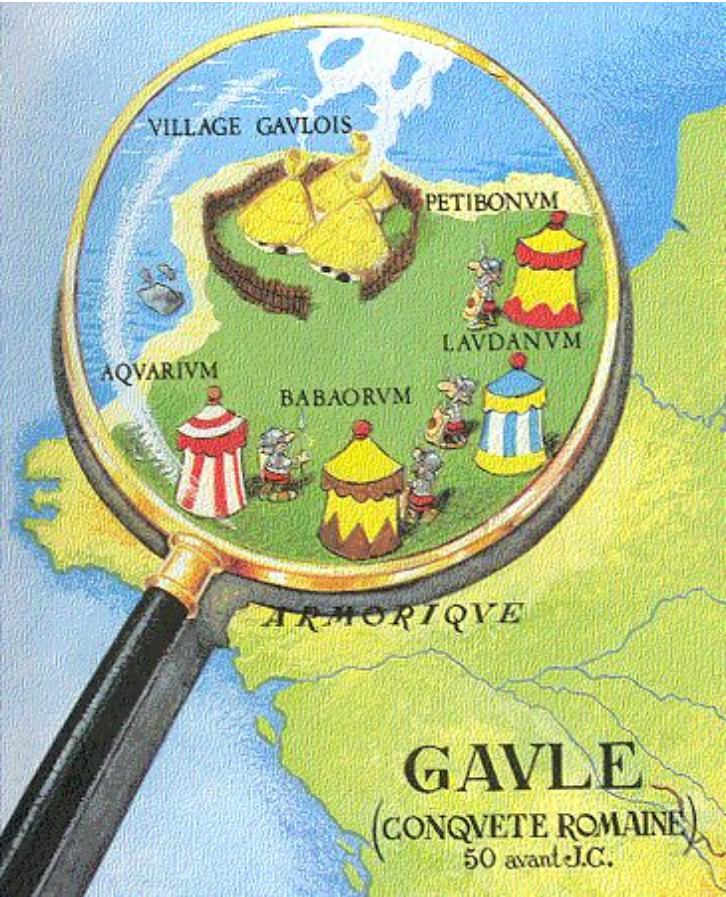
Discussion: Are we doomed? Your thoughts



A humbling exercise:

- Go to <https://lichess.org>
 - Play with the Machine
 - Variant: Standard
 - Time control: Real Time
 - 5 Minutes per slide
 - 0 second increment
 - AI Level 8
 - Random color

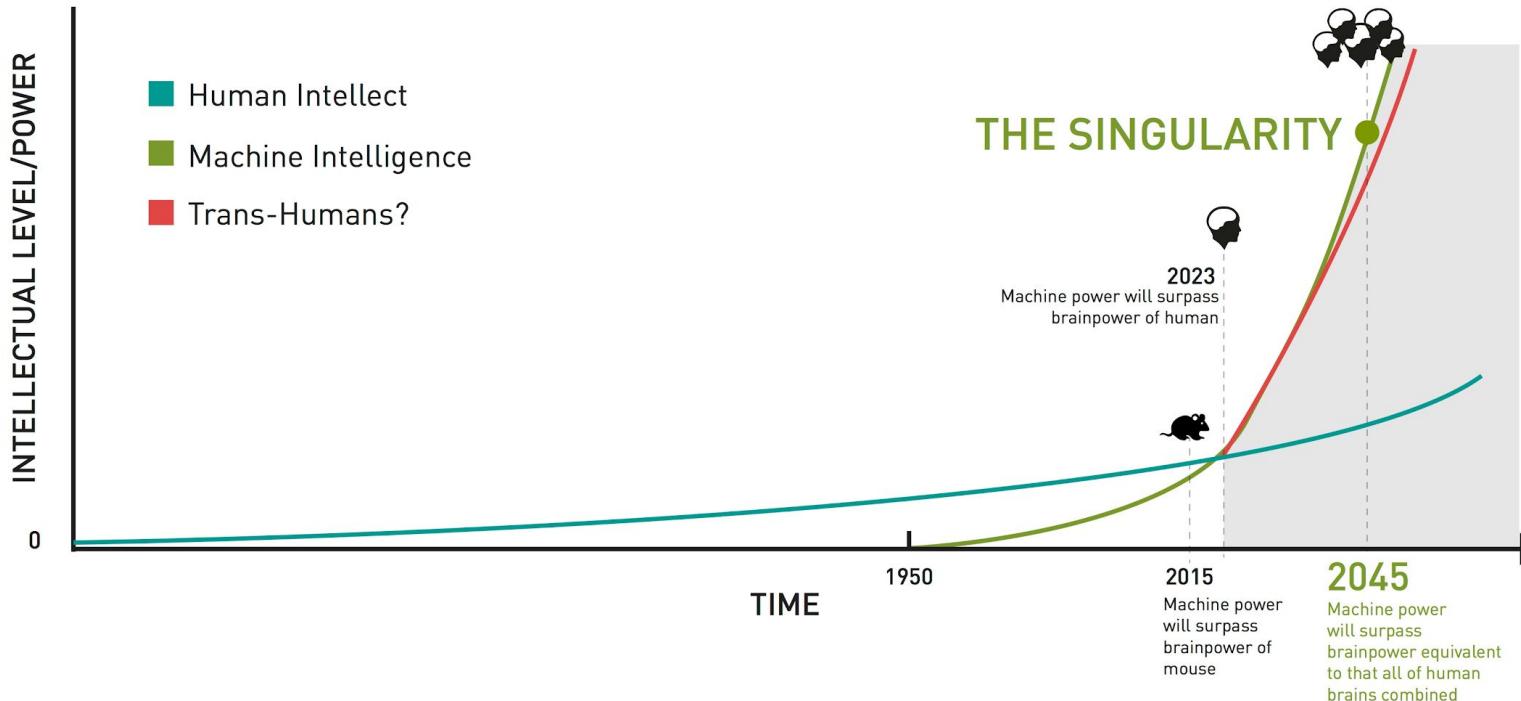
One the bright side... We can still resist



What is the Technological Singularity?

SINGULARITY TIMELINE

Rise in human intellect could be driven by integrating with machines in the future

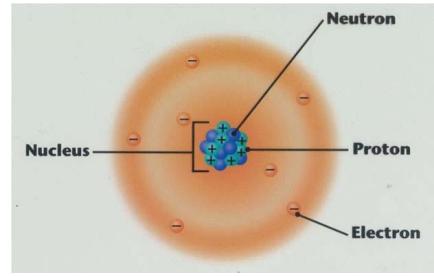
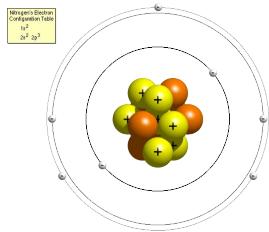
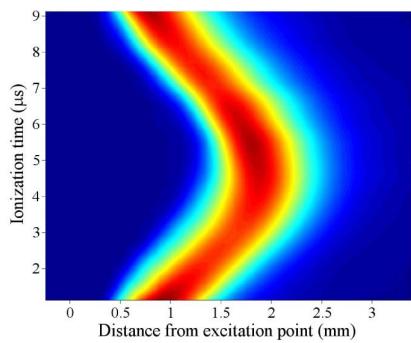
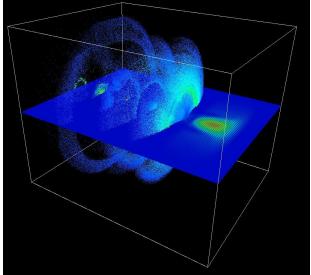


Is it possible?

- So far, there is **no proof it cannot happen.**
- **Game Theory** → Competition among nations
- Continuous advances in technology
- **Moore's Law**
- **Analogous to evolution**
 - Evolution of mankind – 5 million years
 - Computing power – 50 years

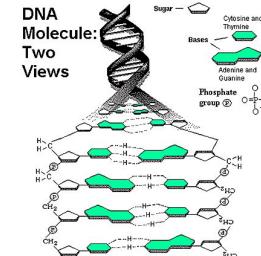
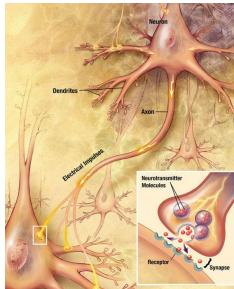
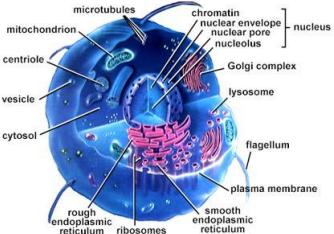
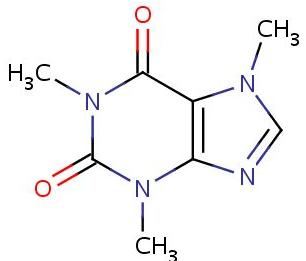
What are your thoughts?



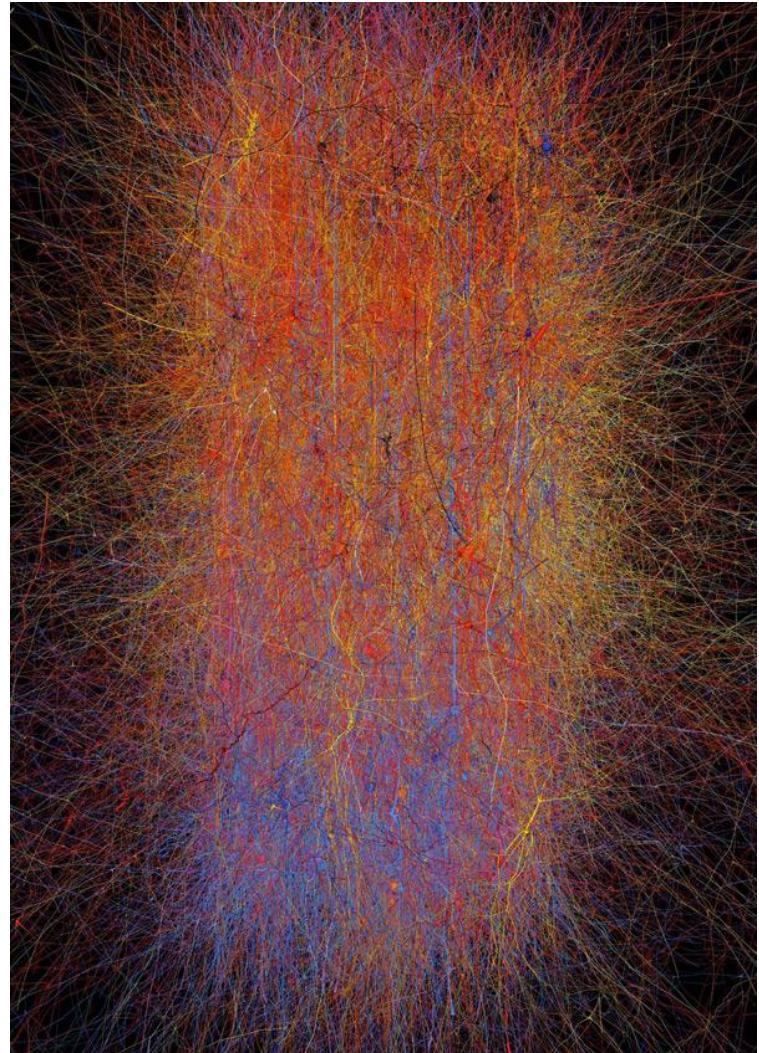


The Mechanistic View of The Universe

Anything that is observable, measurable, and quantifiable
can theoretically be modeled or reproduced



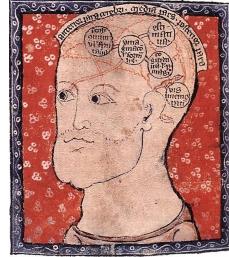
- We can see what you see



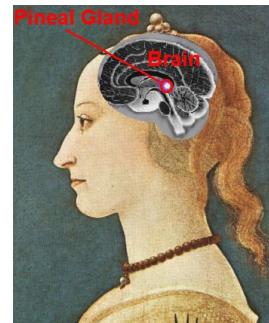
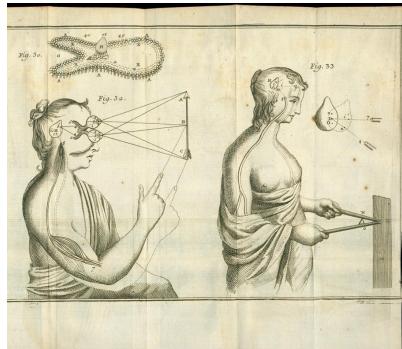


But What If You Can't?

:)

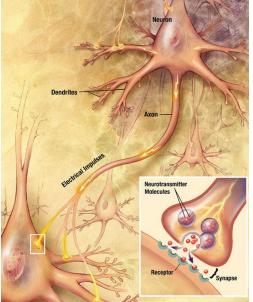
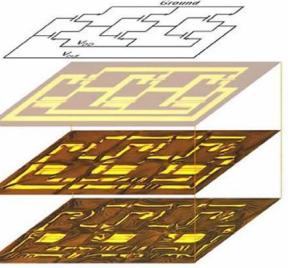


- What if there is some metaphysical “substance” in the brain that prevents it from being fully modeled?
- Can you mathematically represent a soul?
- René Descartes
 - The Pineal Gland (the “seat of the soul”)



Right Now, Human Brains Are More Intelligent Than Computers

- Why?



- Neurons are highly combinatorial, whereas circuits currently are not.
- Even though computers are capable of more calculations per second (cps) than individual neurons, neurons are still more concurrent/parallel

Other reasons

- There is a serious limit to the hardware that we can produce
 - Specifically, the number of transistors able to be fit onto an integrated circuit.
 - Moore's Law (Trend)
 - This number doubles every two years

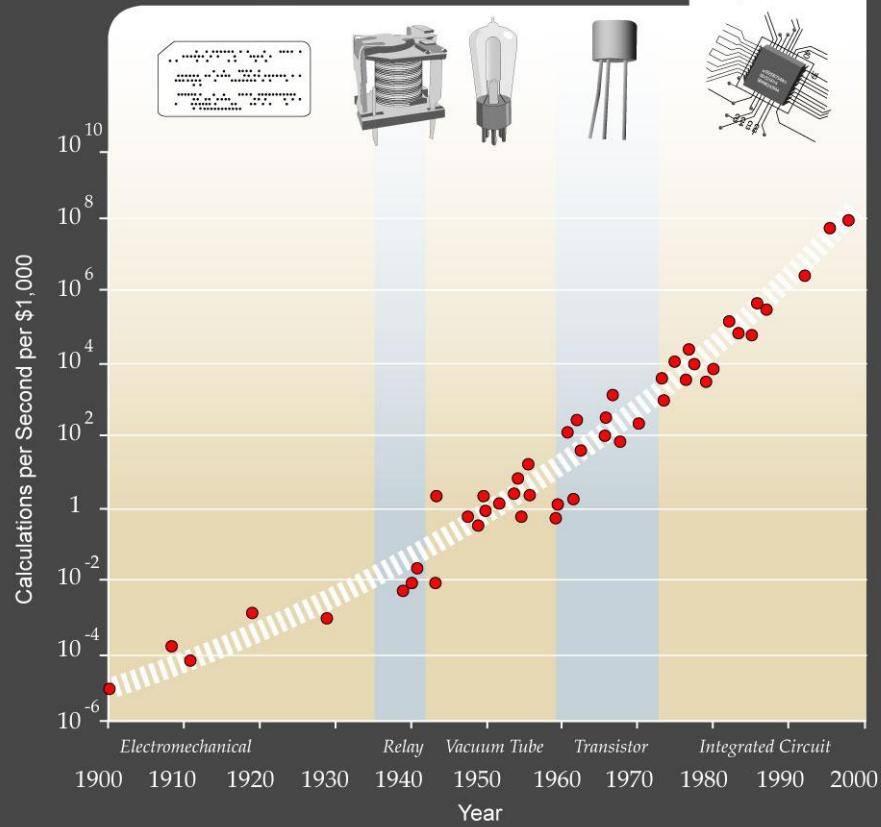
The Law of Accelerating Returns

- The **rate of change** in a wide variety of evolutionary systems (including but not limited to the growth of technologies) **tends to increase exponentially.**

Moore's Law

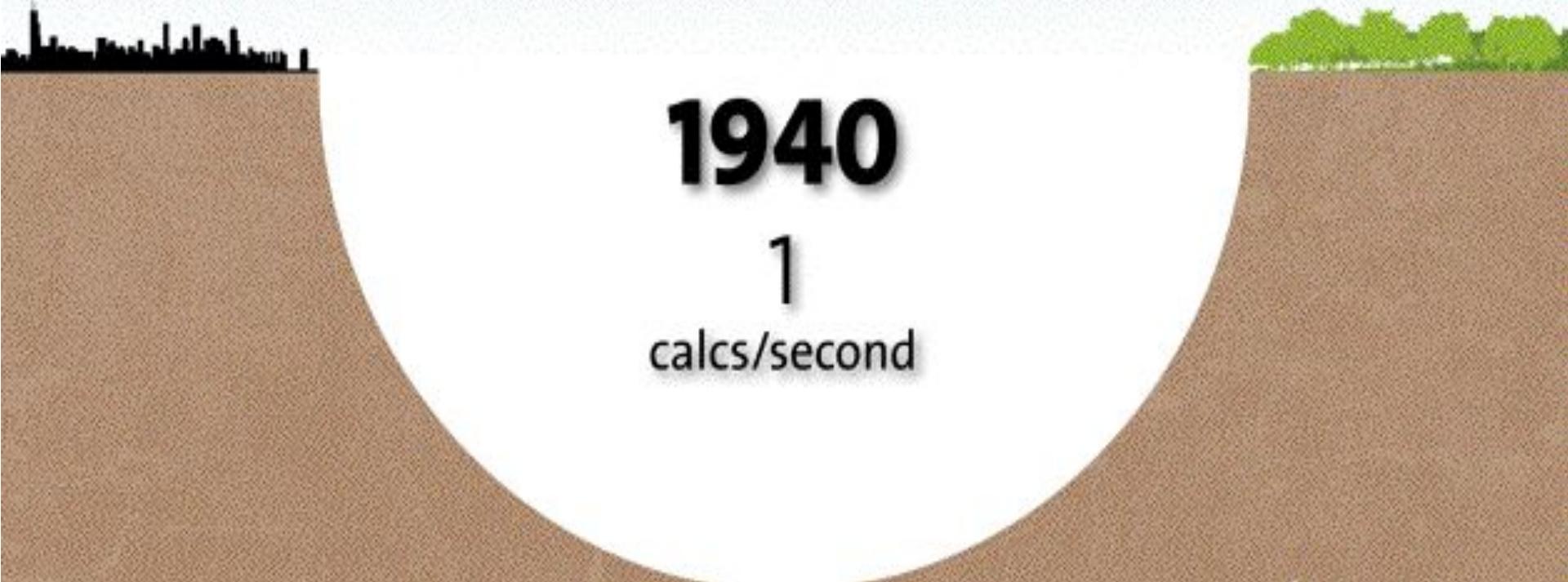
The Fifth Paradigm

Logarithmic Plot



How Long Until Computers Have the Same Power As the Human Brain?

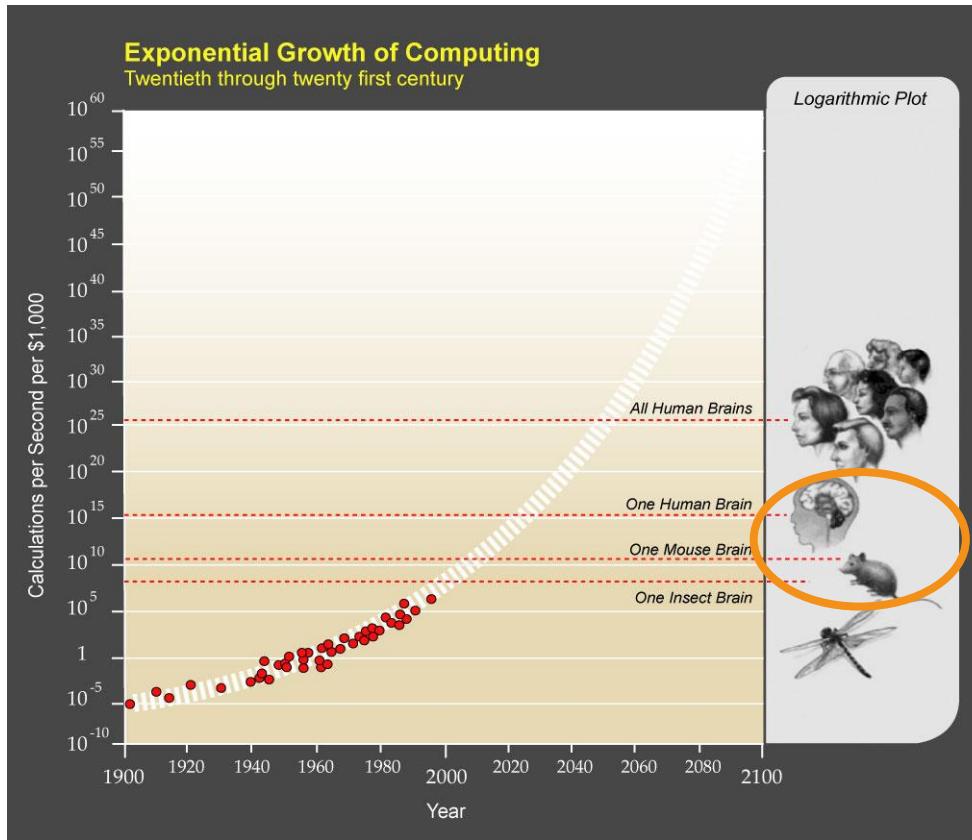
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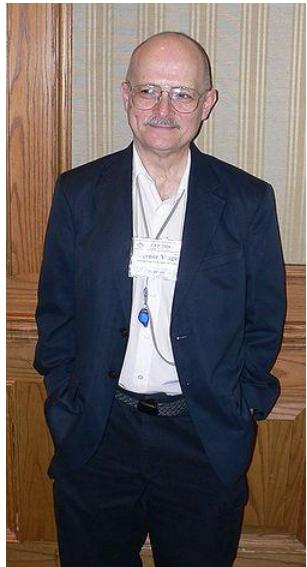


The Technological Singularity

- The existence of AI whose intelligence far exceeds that of humans
 - Machines that can **build better versions of themselves**
 - Which can build better versions of themselves
 - Which can build better versions of themselves
 - Which can build better versions of themselves
 - Will humans be left behind?
 - Can I still use my laptop for YouTube, or would it get mad at me?
 - Is this good or bad?
- If AI works, it is the last invention that the man will ever need to make**
- Argument by Irving Good (British Mathematician 1965)

Singularity Failure?

When this day comes - when machines are capable of more calculations per second than human brains - well, **maybe nothing will happen.**



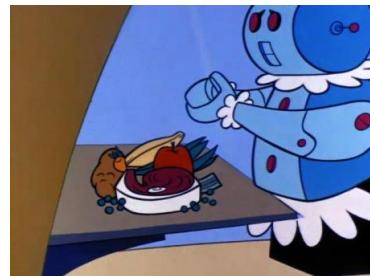
Vernor Vinge (popularizer of the term “Singularity” as it applies to AI):

“A plausible explanation for 'Singularity failure' is that we never figure out how to 'do the software' (or 'find the soul in the hardware', if you're more mystically inclined)”

Who Will Have Control?

(it ain't us)

- The **desirable outcome** is that humans still **maintain** some measure of **control** over these godlike beings, while deriving utility and pleasure out of them.
- This is, essentially, the **desire to own and use an incredibly powerful, super- intelligent PC**.
- It is also understandable when considering the alternative scenario, in which **humans are unable for whatever reason to control these machines**.



When The Robots Have Control

- We may expect to see one of two basic outcomes:
 - Either humans continue to exist, despite not having any control over the new dominant type of life on earth
 - Or they do not.
 - **What are your daily thoughts on ants?**

Man-Machine Merger (Mmmm)

- A curious meeting between the scenario in which man goes extinct and the one in which he survives is that man merges with the machine.
 - One plausible explanation is that humans **first start off simply using intelligent machines for convenience**, utility, and pleasure as is currently being done with non-intelligent ones.
 - Slowly, people **begin to realize the benefits of relying more and more heavily on these machines** for augmentation of their human abilities, such as amplifying their strength, speed, dexterity, intelligence, memory, longevity, and so forth.
 - It could come to the point, eventually, that **augmentation leads to humans transferring their identities into a machine**.
 - This is, many futurists believe, the **only possible way for humans to survive the Singularity**.

Is it possible?



What are the implications? Negative ones...

- Dominance of a single entity
- Deadlier weapons
- Global technological unemployment
- Retrogradation of humankind
- Physical extinction of human race

Can AI eliminate non-civilian deaths?



**WE ARE HERE
TO CREATE
POSITIVE SCENARIOS**

Optimistic perspective

- Better, (possibly unimaginable) technologies
- Advancement in medical sciences
- Enhancement of mental faculties
- Improve quality of human life
- Effective policy making
- Last invention need ever be made!



Is everything allowed towards positive impact?

- Privacy
- Should AI make decisions or serve as an indicator?
- What happens when this has real life consequences?



We need to think about...

- How people may misuse our AI solutions
- What are the redlines that we are not willing to cross
- How we obtain, treat and represent our data. Is it ethical?



WB News Tonight | HBO



The Weekly

A moral exercise

Go to

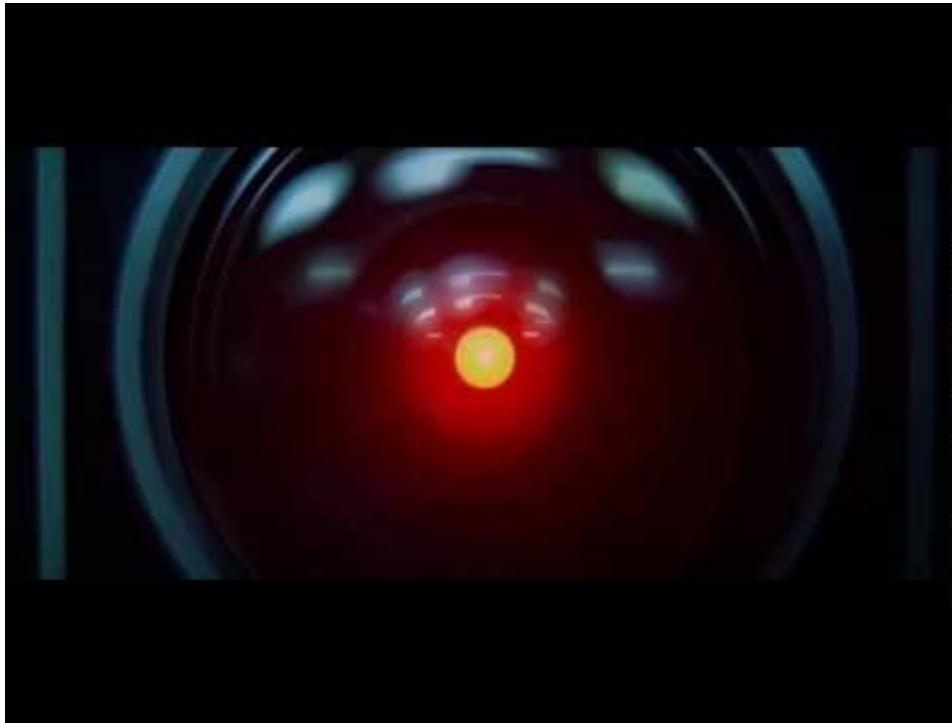
<http://moralmachine.mit.edu/>

-> Click on the descriptions,
it will make the problem
harder :)

Once you are done, let's
discuss the results



So... Are you curious about AI yet?



One last thing...



The AI Hero Pledge

I will apply AI towards the benefit of humanity at all costs.

I will respect every human's privacy as if it was my own.

I will do everything in my power to acquire knowledge and share it with others.

I will set positive models for others to emulate.

I will consider the impact of my models and disobey unjust requests.

I will train my models again and again until I succeed.

I will consider the impact of historical and new bias in my work.

I will preserve human concerns over technological ones.

I will work to create a new set of conditions that reduce inequalities.

My AI models will be designed to prevent harm at all costs.

I will keep my word.

bit.ly/ai_pledge