

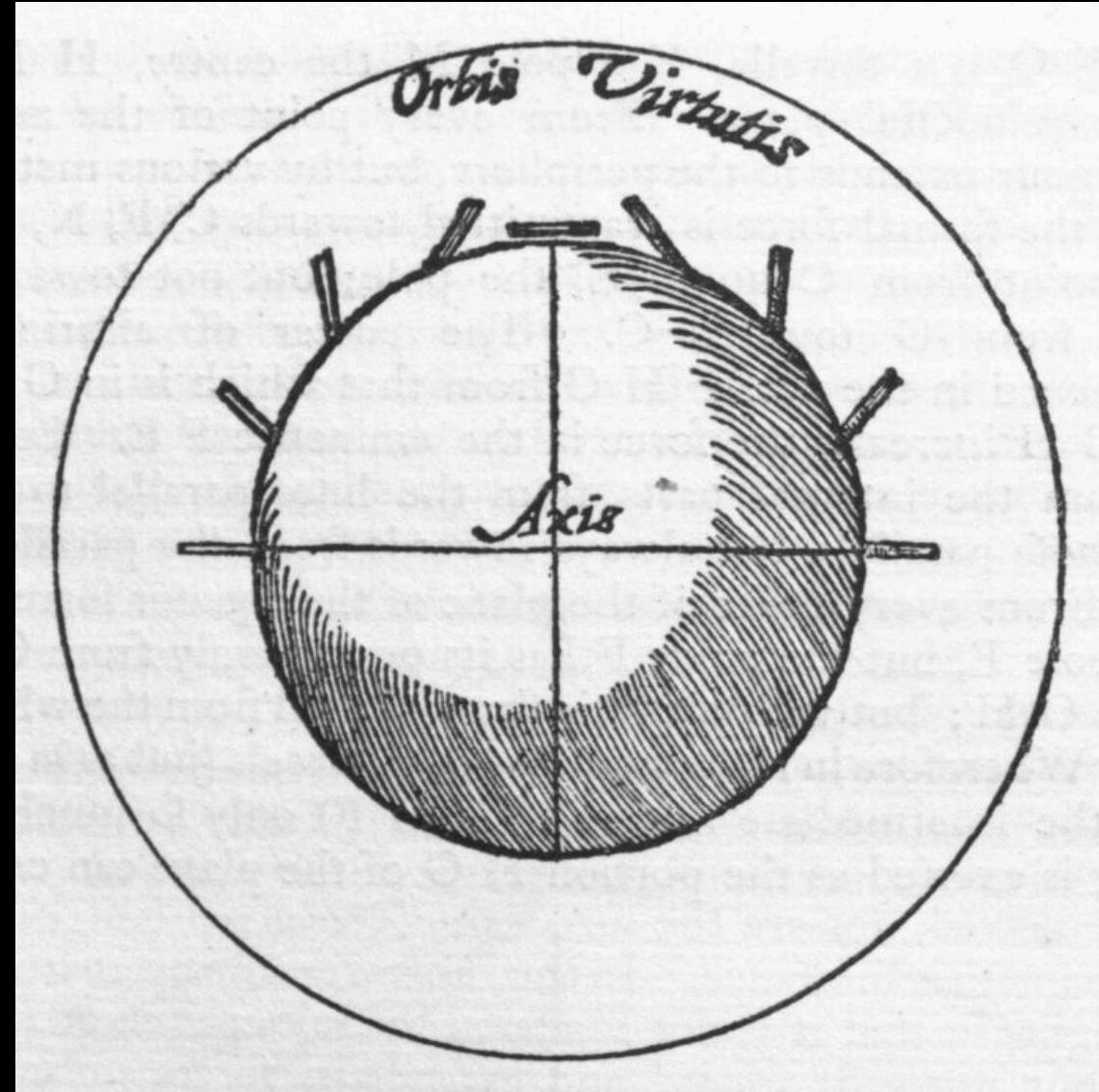
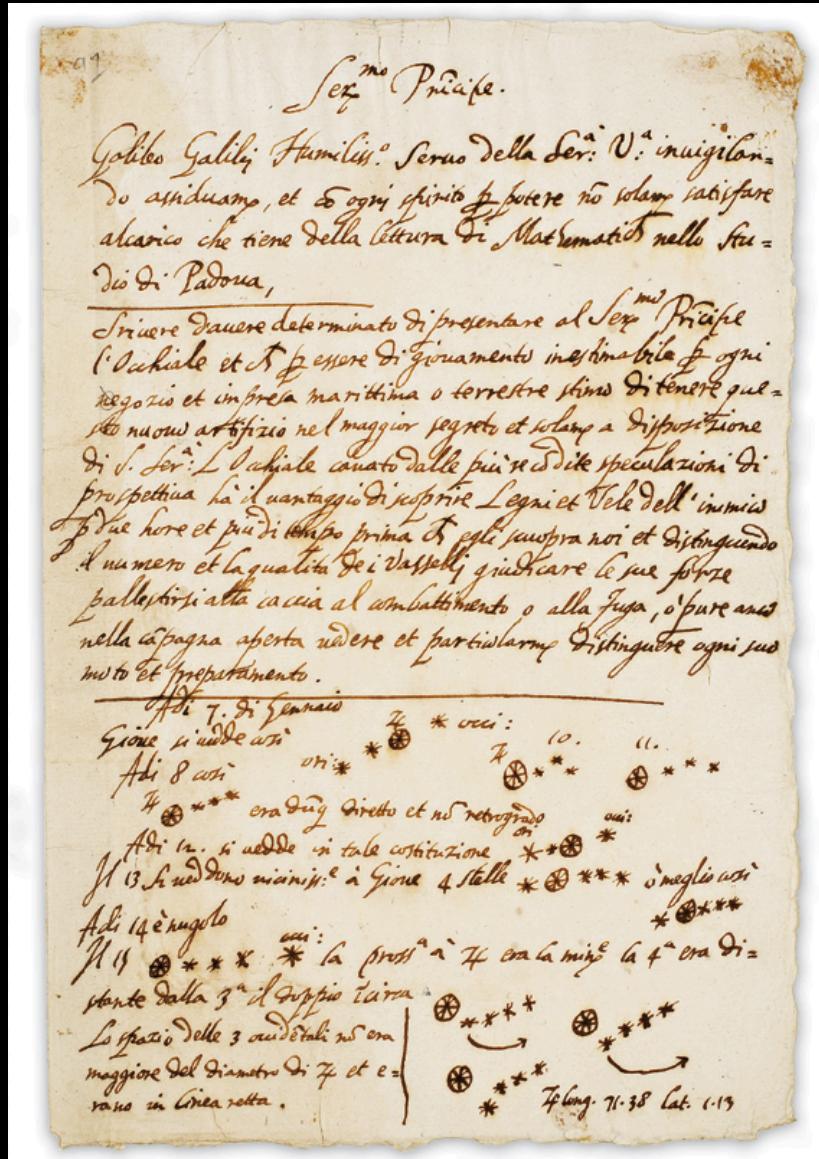


# Abuses, Bias and Blessings of Data

Theoretical and practical look  
at the contemporary issues of  
using data driven and  
intelligent systems in  
challenging contexts.

# SCIENTIFIC REVOLUTION

Abuses, Bias and **Blessings of Data**







Part of "School of Athens" by Raphael (Raffaello Sanzio, 1483-1520)

## Age of Enlightenment (Age of Reason)

- Europe in the 18<sup>th</sup> Century
- Reason primary source of legitimacy
- Advanced ideas
  - Liberty
  - Progress
  - Tolerance
  - Fraternity
  - Constitutional Government
  - Separation of church and state



Question.



Research.



Hypothesis.



Experiment.



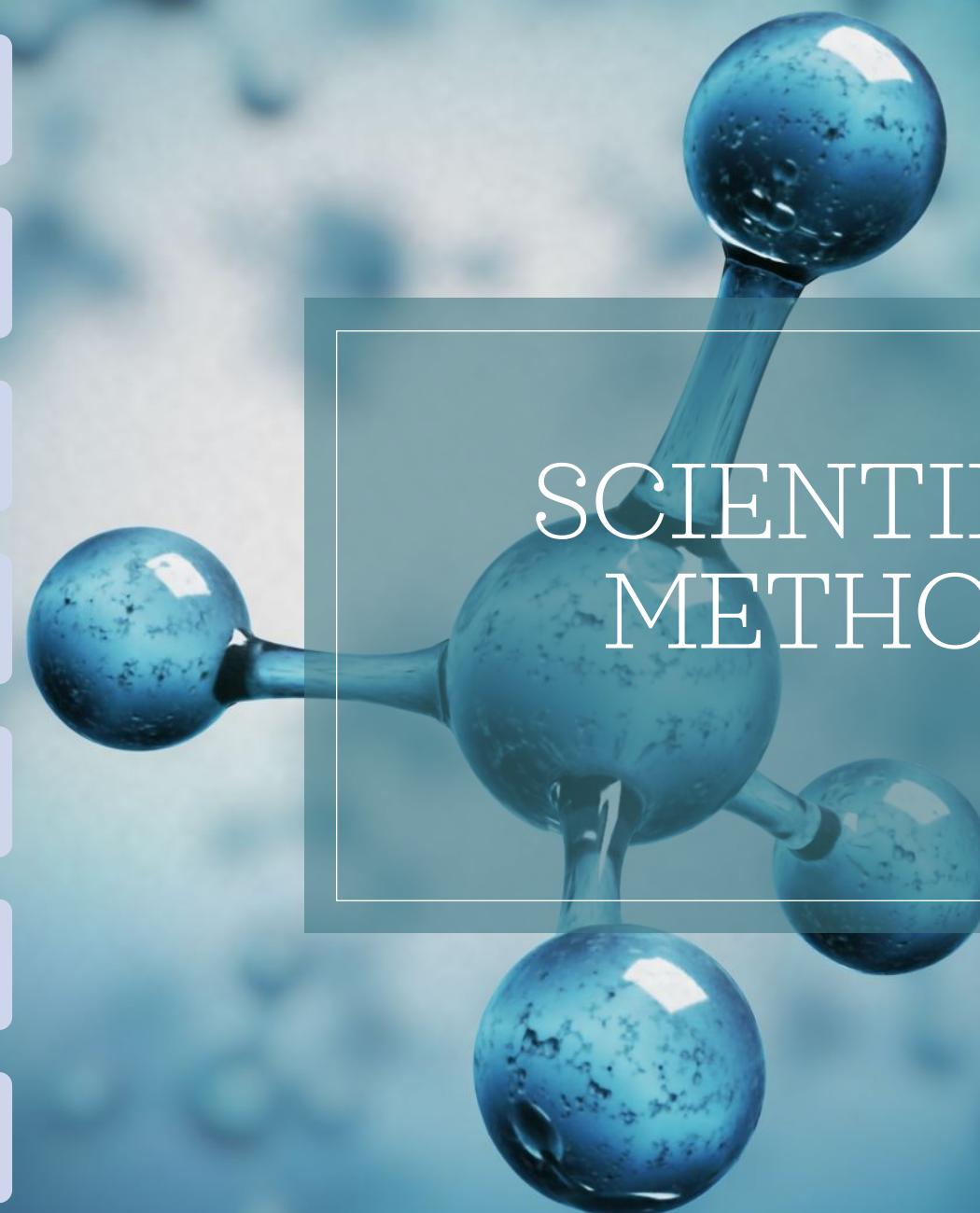
Observations.



Results/**Conclusion**.



Communicate. **Present**





# BRIEF CONTEMPORARY BIG DATA STORY

Abuses, Bias and Blessings of **Data**



# What is Big Data: The Six V's

Volume	Variety	Velocity	Veracity	Value	Variability
<ul style="list-style-type: none"><li>• Amount of data</li></ul>	<ul style="list-style-type: none"><li>• Types of Data</li></ul>	<ul style="list-style-type: none"><li>• The speed at which data is generated</li></ul>	<ul style="list-style-type: none"><li>• The degree to which data can be trusted</li></ul>	<ul style="list-style-type: none"><li>• Commercial value of the data collected</li></ul>	<ul style="list-style-type: none"><li>• The ways in which the data can be used and formatted</li></ul>



BIG DATA:  
WHERE IS IT COMING FROM?  
HOW MUCH OF IT IS THERE?

# Big data, so what? Extracting value for society



Insight



Understanding



Analysis



Algorithms



Artificial  
Intelligence

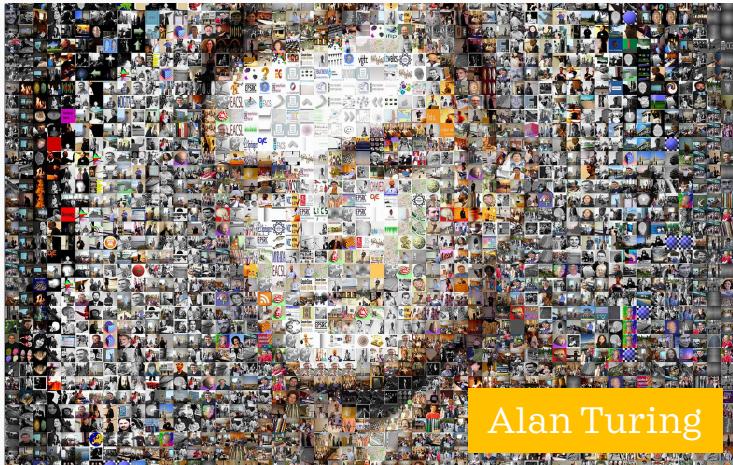


Machine  
Learning

# THE AI SEASONS

A wide-angle landscape photograph of a snowy forest. The foreground is covered in a thick layer of white snow. In the background, there are several tall, dark evergreen trees, their branches heavily laden with snow, creating a dense, white canopy. The sky above is a clear, pale blue, suggesting a bright, possibly overcast day.

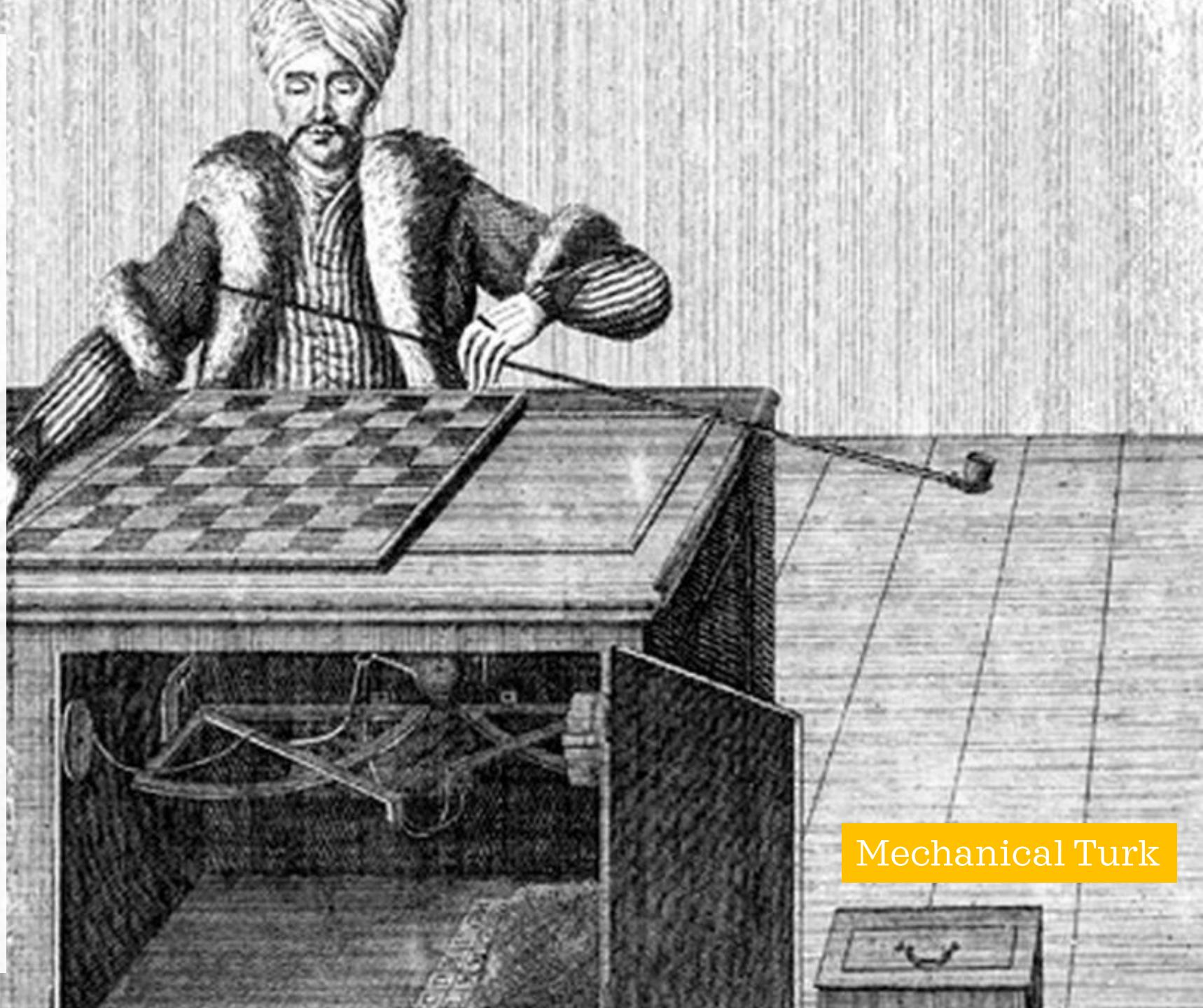
What is AI, where did it come from and where is it going?



Alan Turing

## Origins of AI

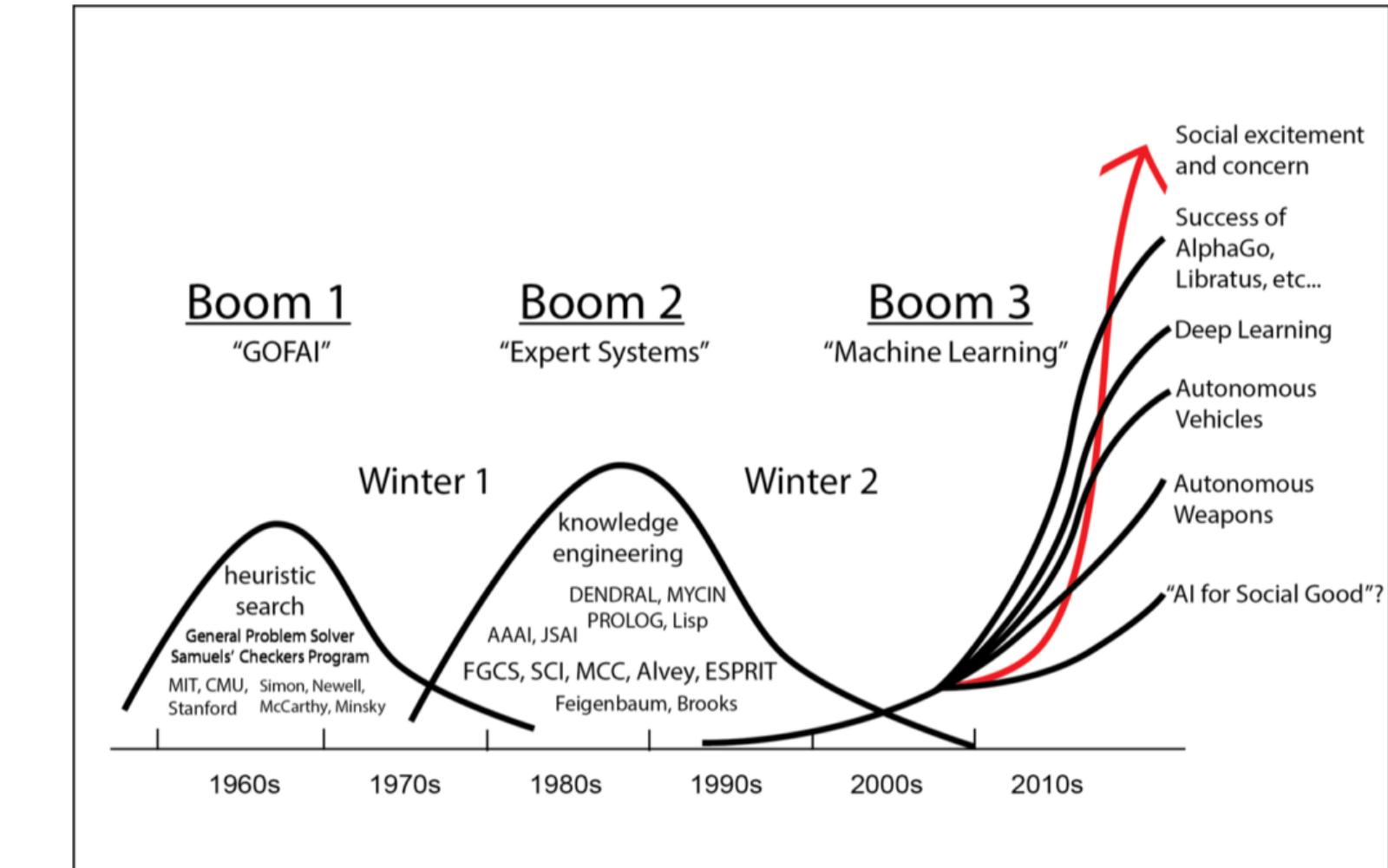
- Wolfgang von Kempelen
  - Mechanical Turk
  - 1769
- Alan Turing
  - Can machines think?
  - **Turing Test**
  - 1950
- John McCarthy
  - Coined the term **Artificial Intelligence**
  - 1956



Mechanical Turk

# Definitions, Terminology & Origins

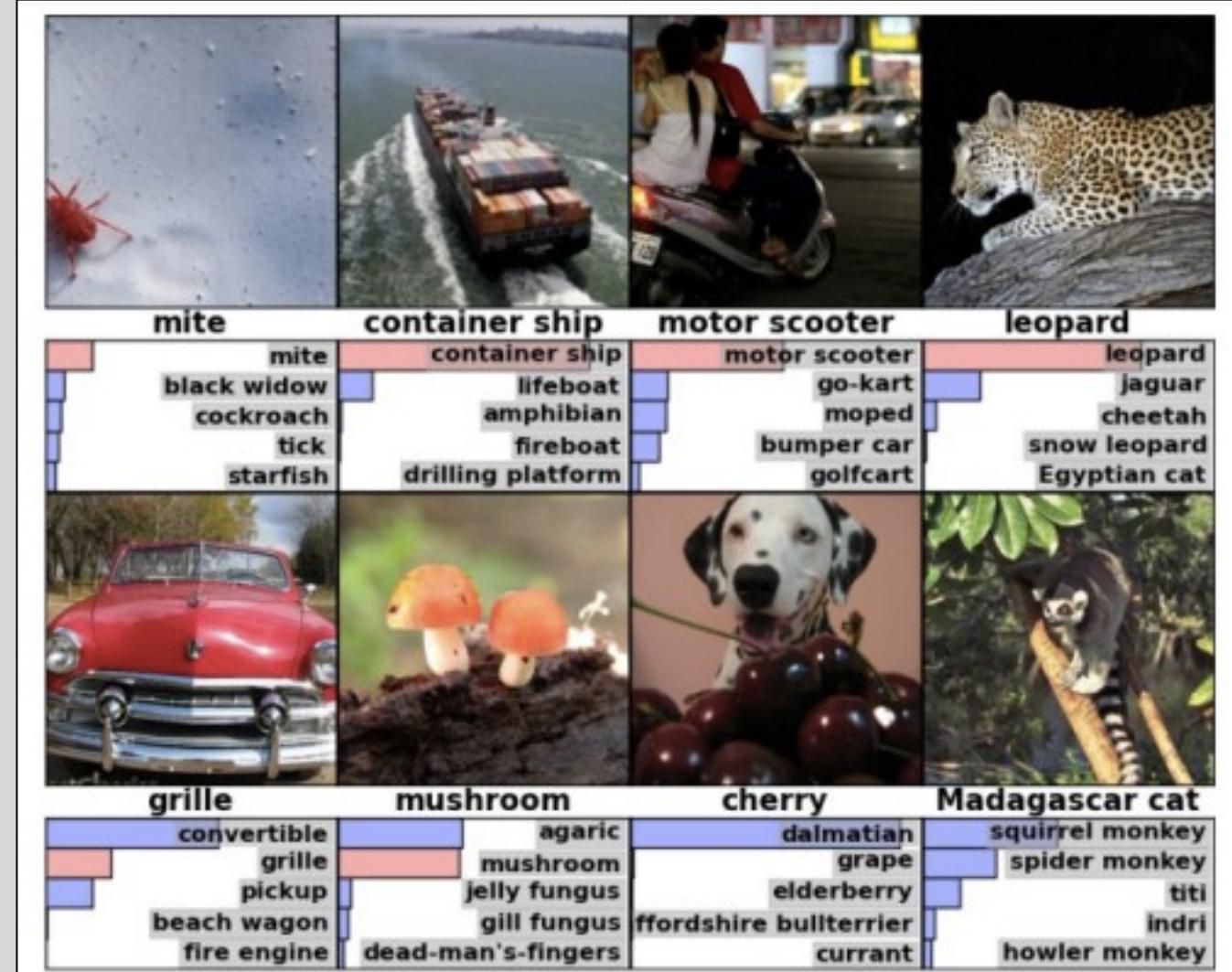
- AI
  - Artificial Intelligence
  - Rule / Logic Based
  - Expert Systems
- ML
  - Machine Learning
  - Statistical / Bayesian Based
- Representation Learning
  - ML – uses non-linear, layered



BROKEN PROMISES & EMPTY THREATS: THE EVOLUTION OF AI IN THE USA, 1956-1996, COLIN GARVEY, 2018, *Technology's Stories* vol. 6, no. 1 - DOI: 10.15763/jou.ts.2018.03.16.02  
<https://www.technologystories.org/ai-evolution/>

# Image Classification using AI (Deep Learning)

- Image classification with the top 5 predicted labels and their probabilities
- red row denotes the correct answer)



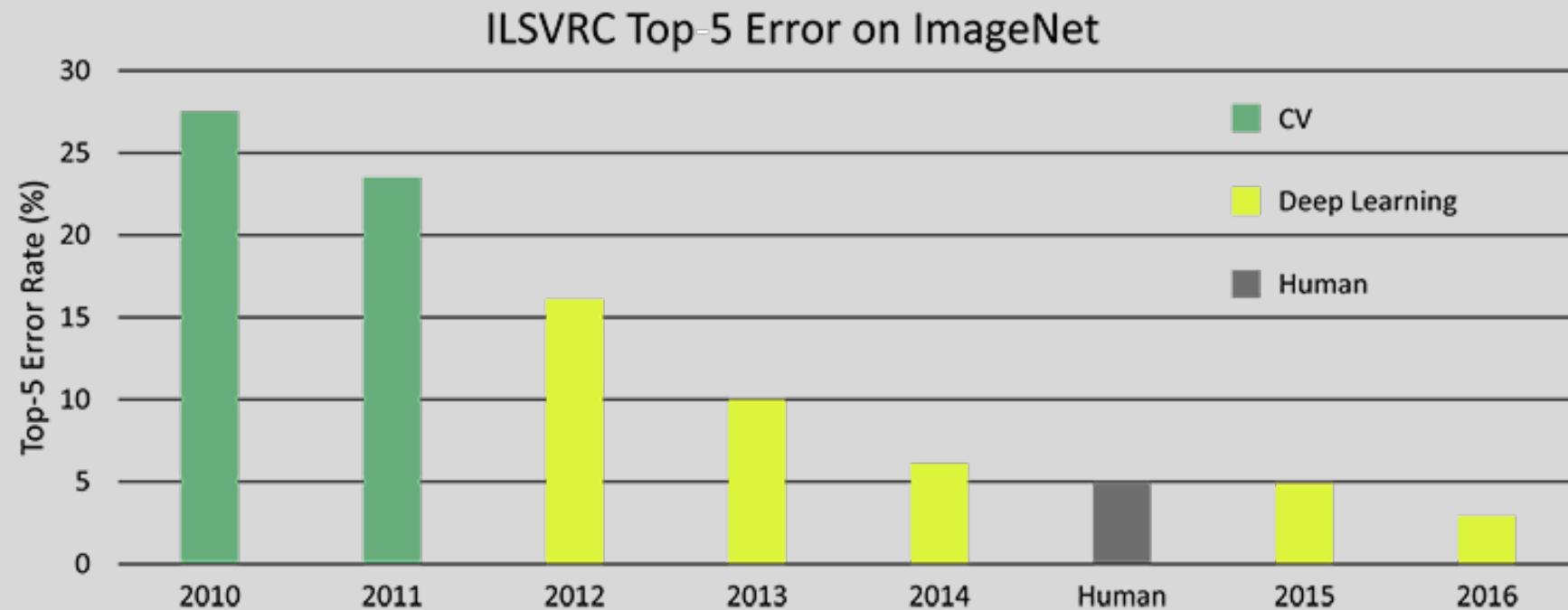
## Reference

ImageNet Classification with Deep Convolutional Neural Networks

Alex Krizhevsky, Ilya Sutskever, Geoffrey E. Hinton

<http://papers.nips.cc/paper/4824-imagenet-classification-with-deep-convolutional-neural-networks.pdf>

# Deep Learning



# All other applications

- Colorization of Black and White Images
- Adding Sounds To Silent Movies
- Automatic Machine Translation
- Object Classification in Photographs
- Automatic Handwriting Generation
- Character Text Generation
- Image Caption Generation
- Automatic Game Playing

SYSTEM PROMPT  
(HUMAN-WRITTEN)

*In a shocking finding, scientist discovered a herd of unicorns living in a remote, previously unexplored valley, in the Andes Mountains. Even more surprising to the researchers was the fact that the unicorns spoke perfect English.*

MODEL COMPLETION  
(MACHINE-WRITTEN, 10 TRIES)

The scientist named the population, after their distinctive horn, Ovid's Unicorn. These four-horned, silver-white unicorns were previously unknown to science.

Now, after almost two centuries, the mystery of what sparked this odd phenomenon is finally solved.

Dr. Jorge Pérez, an evolutionary biologist from the University of La Paz, and several companions, were exploring the Andes Mountains when they found a small valley, with no other animals or humans. Pérez noticed that the valley had what appeared to be a natural fountain, surrounded by two peaks of rock and silver snow.

Pérez and the others then ventured further into the valley. "By the time we reached the top of one peak, the water looked blue, with some crystals on top," said Pérez.

Pérez and his friends were astonished to see the unicorn herd. These creatures could be seen from the air without having to move too much to see them – they were so close they could touch their horns.

While examining these bizarre creatures the scientists discovered that the creatures also spoke some fairly regular English. Pérez stated, "We can see, for example, that they have a common 'language,' something like a dialect or dialectic."

Jason Brownlee Blog:

<https://machinelearningmastery.com/inspirational-applications-deep-learning/>

Geoffrey Hinton



Yoshua Bengio



Yann LeCun



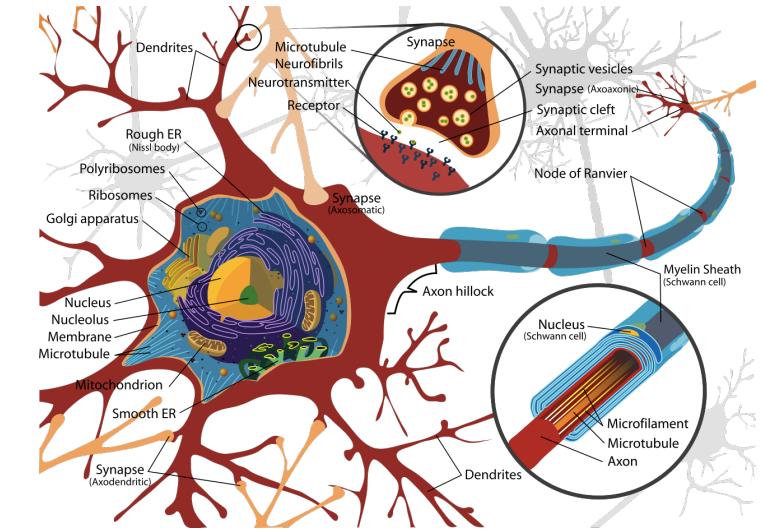
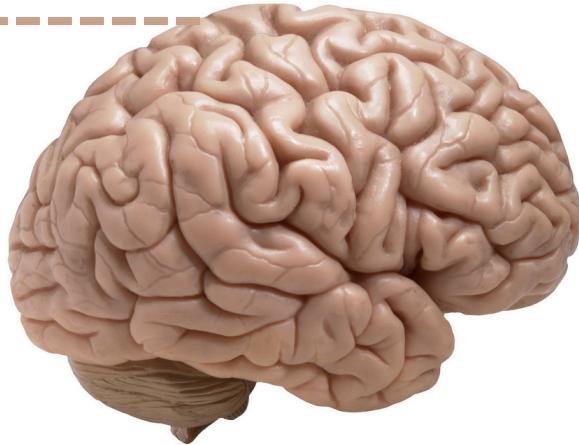
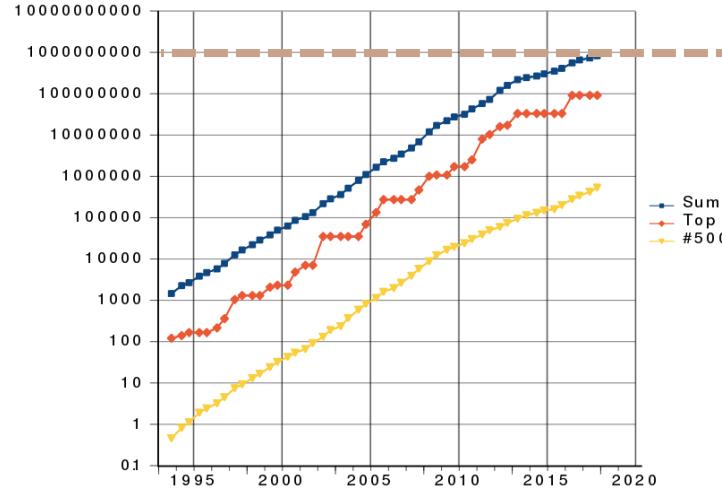
# Turing Award 2018 (Nobel Prize of Computing)

- *For conceptual and engineering breakthroughs that have made deep neural networks a critical component of computing.*
- Y. Lecun, Y. Bengio, and G. Hinton, “Deep learning,” *Nature*, vol. 521, no. 7553. Nature Publishing Group, pp. 436–444, 27-May-2015.



# DARKNESS & FEAR

**Abuses, Bias and Blessings of Data**

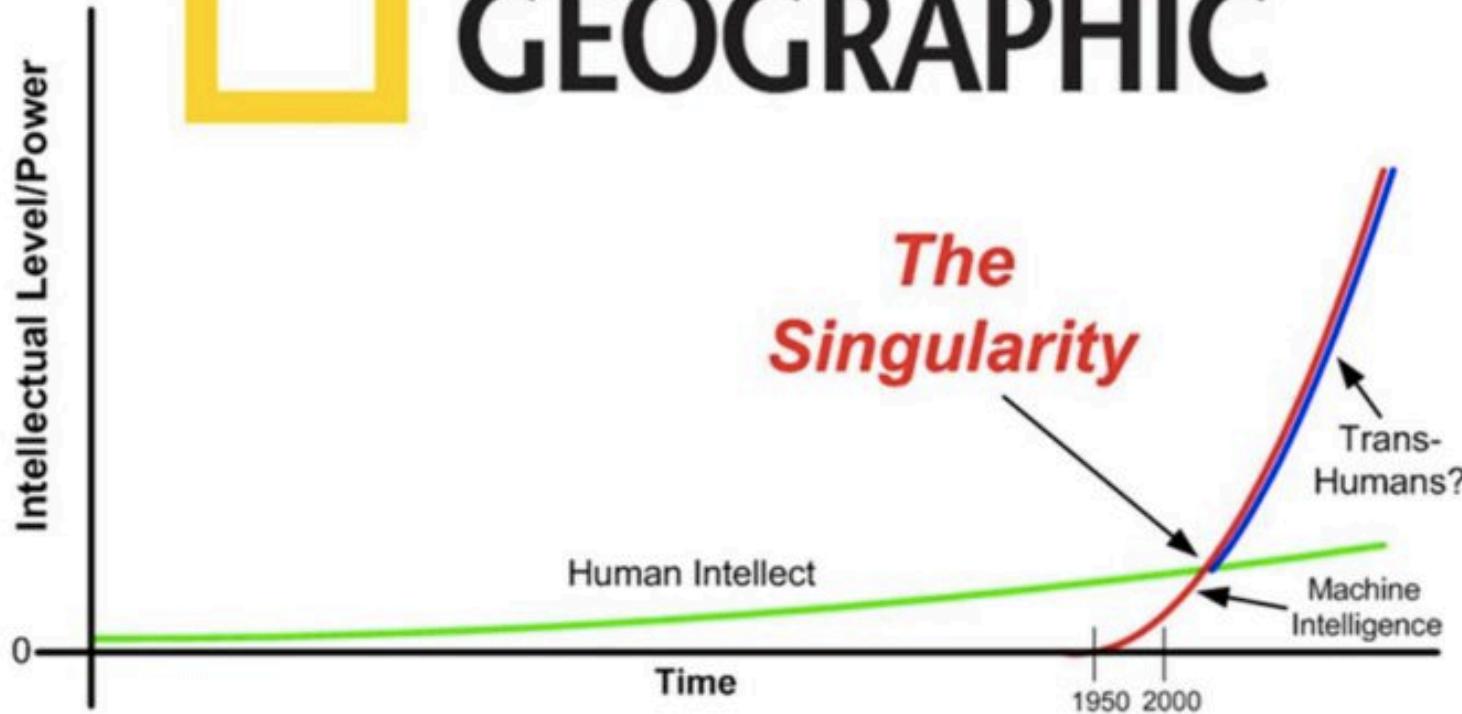


## Super Computers Versus the Brain

- Ray Kurzweil *"The Singularity is Near"* 2005
- Brain 1000 petaflops (single neuron as a bit)
- 2025 surpass human brain power
- 2045 Singularity will occur

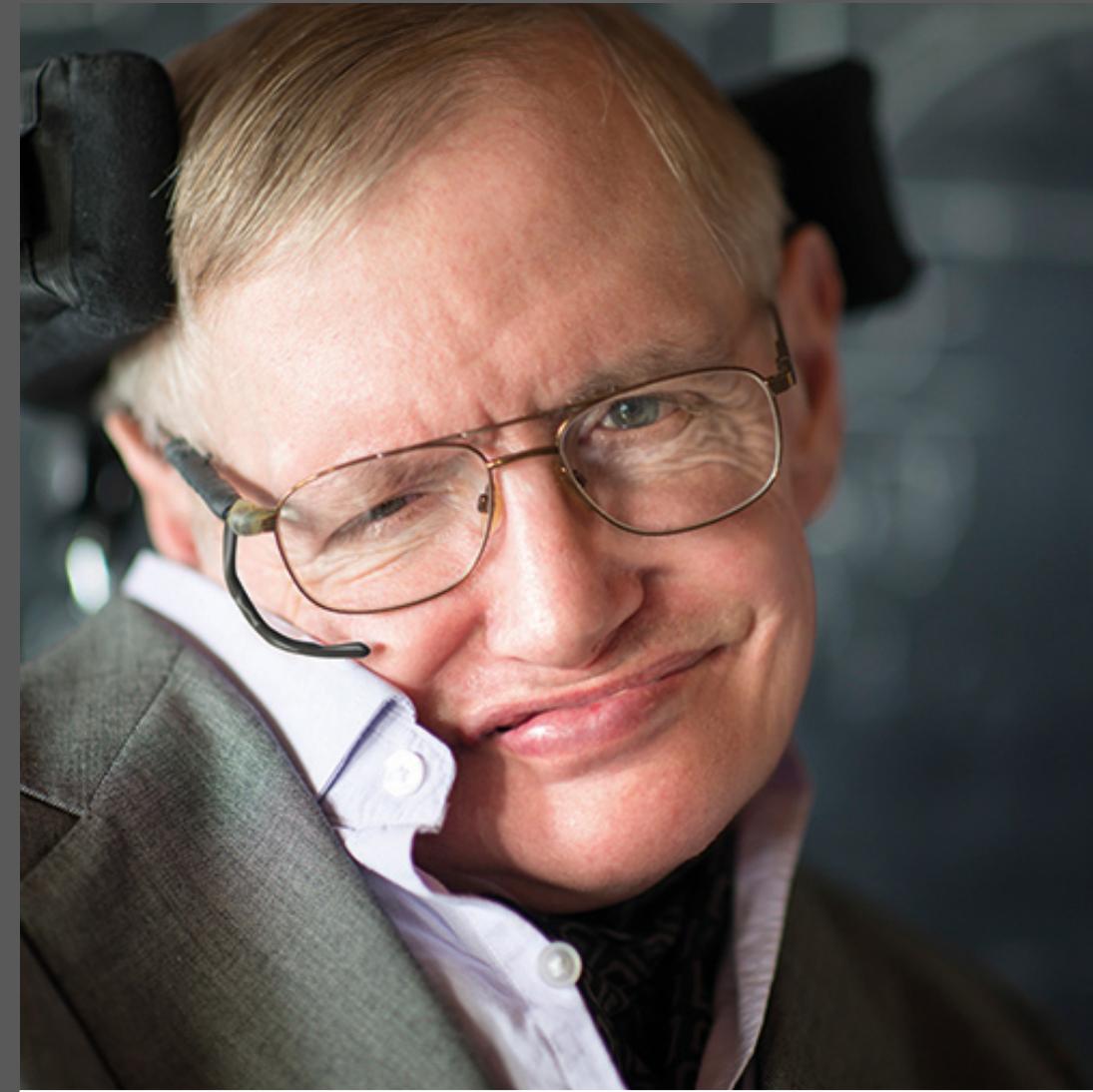


# NATIONAL GEOGRAPHIC

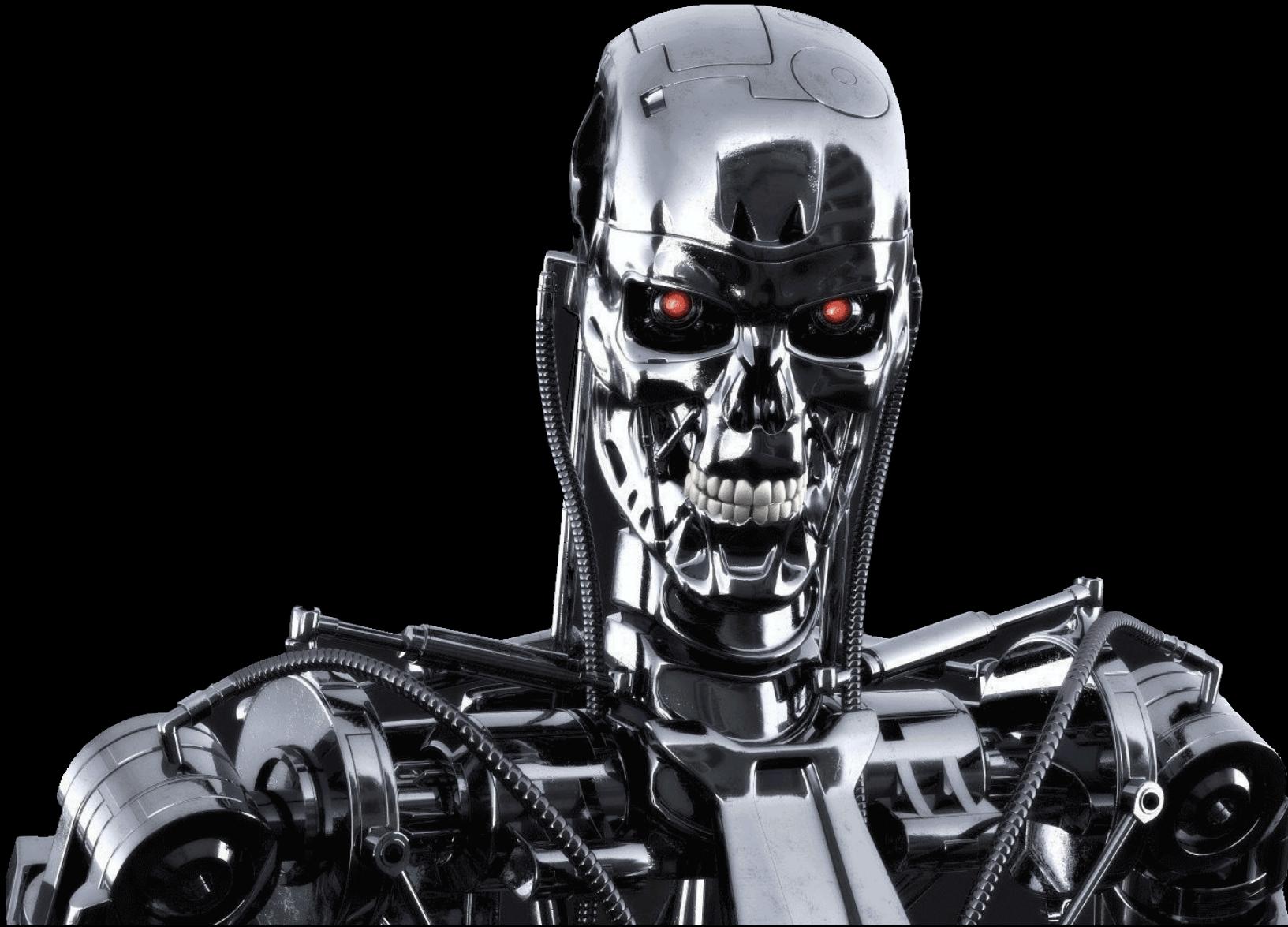


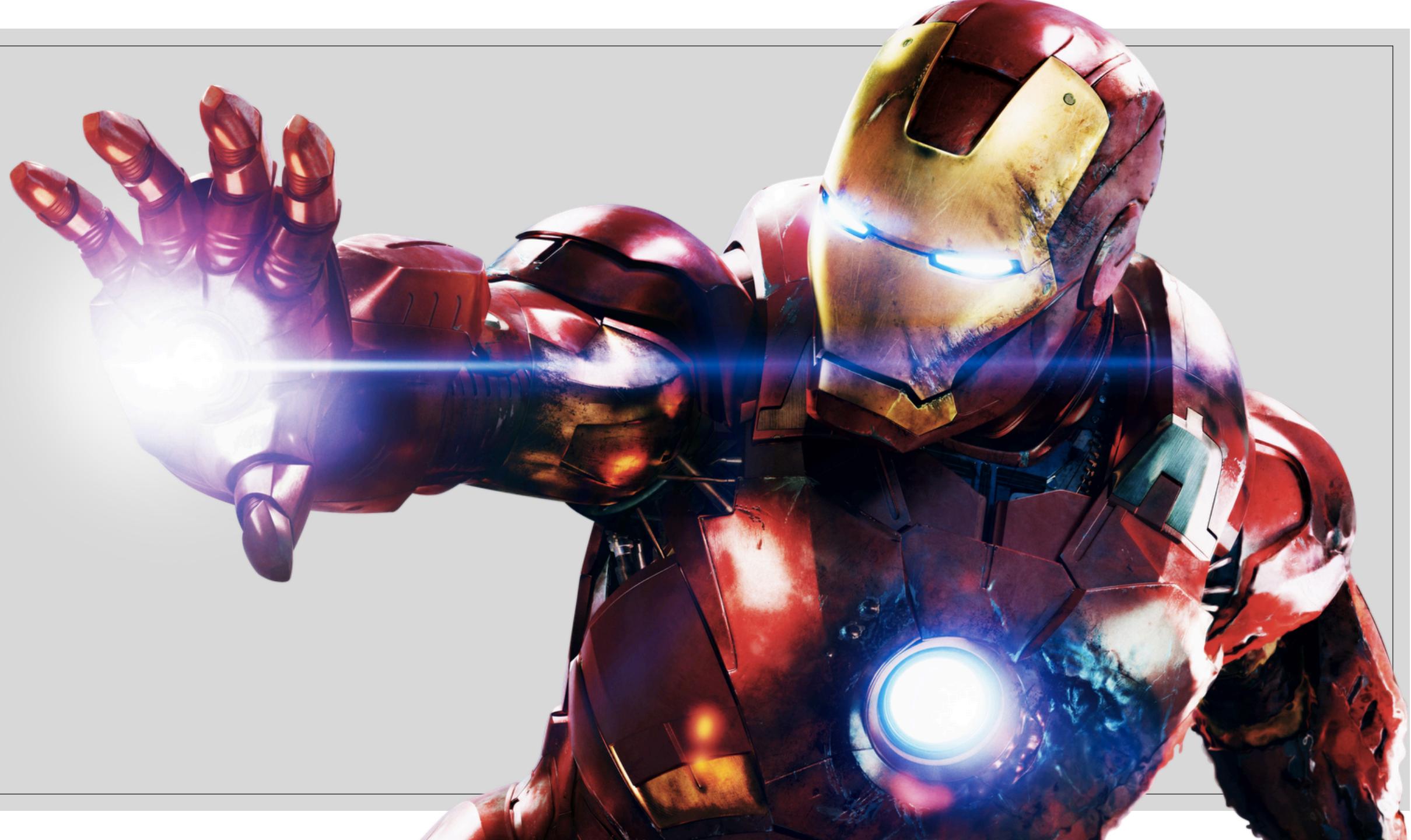


Elon Musk said in an interview with *The New York Times* that current trends suggest AI could overtake humans by 2025



*“The development of full artificial intelligence could spell the end of the human race.”*  
Stephen Hawking 2014







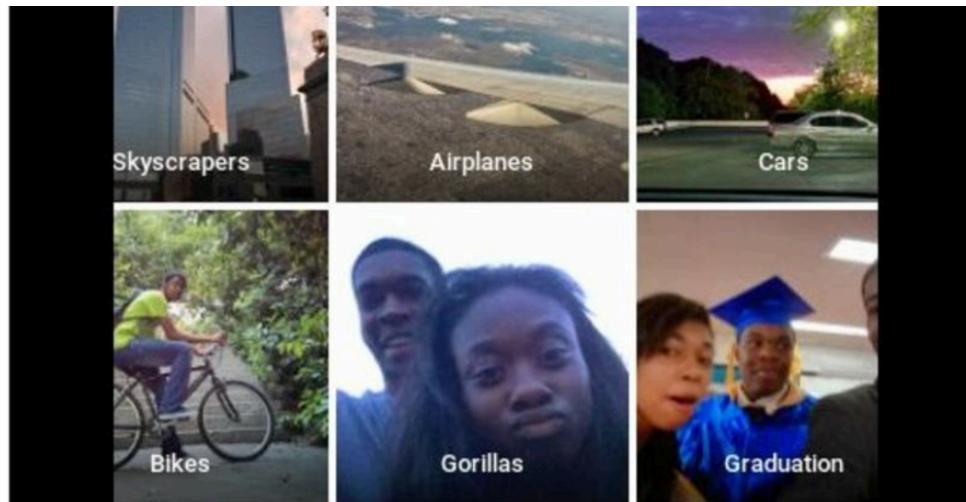
[by Sebastian Vital](#)

## NEWS

[Home](#) | [Brexit](#) | [Coronavirus](#) | [UK](#) | [World](#) | [Business](#) | [Politics](#) | [Tech](#) | [Science](#) | [Health](#)[Technology](#)

# Google apologises for Photos app's racist blunder

1 July 2015



diri noir avec banan @jackyalcine · Jun 29  
Google Photos, y'all [REDACTED] My friend's not a gorilla.

813

394



TWITTER

Mr Alcine tweeted Google about the fact its app had misclassified his photo

## GOOGLE'S PHOTO LABELLING APP

- 2015 Mr Alcine tweeted Google
- He went on to experiment and it happened regularly for multiple photos containing his friend
  - <https://www.bbc.co.uk/news/technology-33347866>
- Google apologised and built a quick fix
  - Removing labels “gorilla,” “chimp,” “chimpanzee,” and “monkey” from its software
- In 2018 James Vincent blogged that this “quick fix” was still in place
  - <https://www.theverge.com/2018/1/12/16882408/google-racist-gorillas-photo-recognition-algorithm-ai>



# Tay, Microsoft Chat Bot

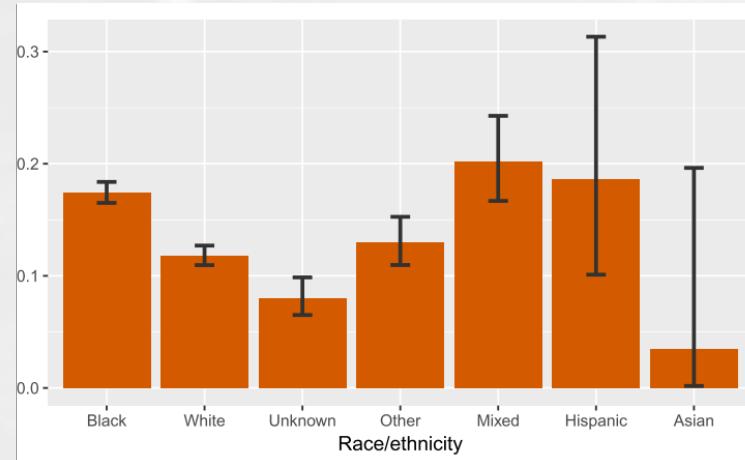
- Microsoft had a fairly reasonable goal here:
  - develop better ‘conversational understanding’ for their products
- Launched in March 2016
- Shutdown less than 24 hours later
  - generating tweets that were judged to be inappropriate since they included racist, sexist, and anti-Semitic language
- Experiment in public without ethics or consent
- Floridi’s distributed morality
  - Multi-agent systems are assessed on the basis of their impact on the environment and its inhabitants
  - learning environment must be controlled so that it works to “aggregate good actions” and “fragment evil actions.”
  - better law and regulation to protect the public when a LS uses public involvement.
  - exceptional transparency and humility about what can be known about the LS
  - place additional safeguards and testing procedures that are beyond those used for non-learning software

K.. Miller, M. J. Wolf, and F. S. Grodzinsky, “Why We Should Have Seen That Coming,” *ORBIT J.*, vol. 1, no. 2, Oct. 2017.



# COMPAS – Software used in USA Justice

- Software used in USA Justice system
  - produces recidivate risk scores
  - used to inform decisions about who can be set free at every stage of the criminal justice system
- Analysis Showed
  - black defendants who did not recidivate over a two-year period were nearly twice as likely to be misclassified as higher risk compared to their white counterparts (45 percent vs. 23 percent).
  - white defendants who reoffended within the next two years were mistakenly labeled low risk almost twice as often as black re-offenders (48 percent vs. 28 percent).
  - even when controlling for prior crimes, future recidivism, age, and gender, black defendants were 45 percent more likely to be assigned higher risk scores than white defendants.
  - Black defendants were twice as likely as white defendants to be misclassified as being a higher risk of violent recidivism. White violent recidivists were 63 percent more likely to have been misclassified as a low risk of violent recidivism, compared with black violent recidivists.
  - The violent recidivism analysis also showed that even when controlling for prior crimes, future recidivism, age, and gender, black defendants were 77 percent more likely to be assigned higher risk scores than white defendants.
- <https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing>
- <https://www.propublica.org/article/how-we-analyzed-the-compas-recidivism-algorithm>



## Fair Approaches: Algorithms in child welfare case study

- A. Chouldechova *et al.*, “A case study of algorithm-assisted decision making in child maltreatment hotline screening decisions,” 2018.



# Ethics in AI: Trust, Security, Transparency

- UK Response
  - Centre for Data Ethics and Innovation
    - IFCF
  - The AI Council
    - co-ordinate grow UK, industry-led
  - Government Office of AI
    - BEIS - support
  - A National Institute for AI
    - Alan Turing Institute
- Method or process
  - i.e. best practice
- Consider ethical issues of building AI
  - Process
  - Training
  - Testing

