Introduction

Artificial Intelligence

slides are adapted from

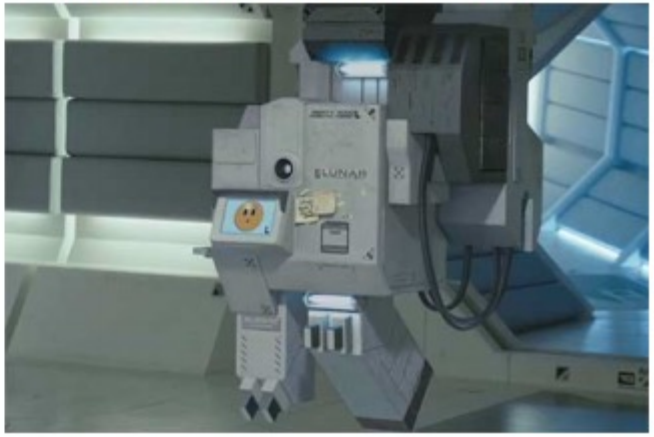
Percy Liang (Stanford), Dan Klein (UC Berkeley), Lana Lazebnik (UIUC) and Hal Daumé III (UMD)

Artificial Intelligence – The Sci-Fi Way

The Architect, The Matrix Reloaded (2003)

The Puppet Master, in an android body, Ghost in the Shell (1999)

Skynet, The Terminator Franchise



Gerthy, Moon (2009)

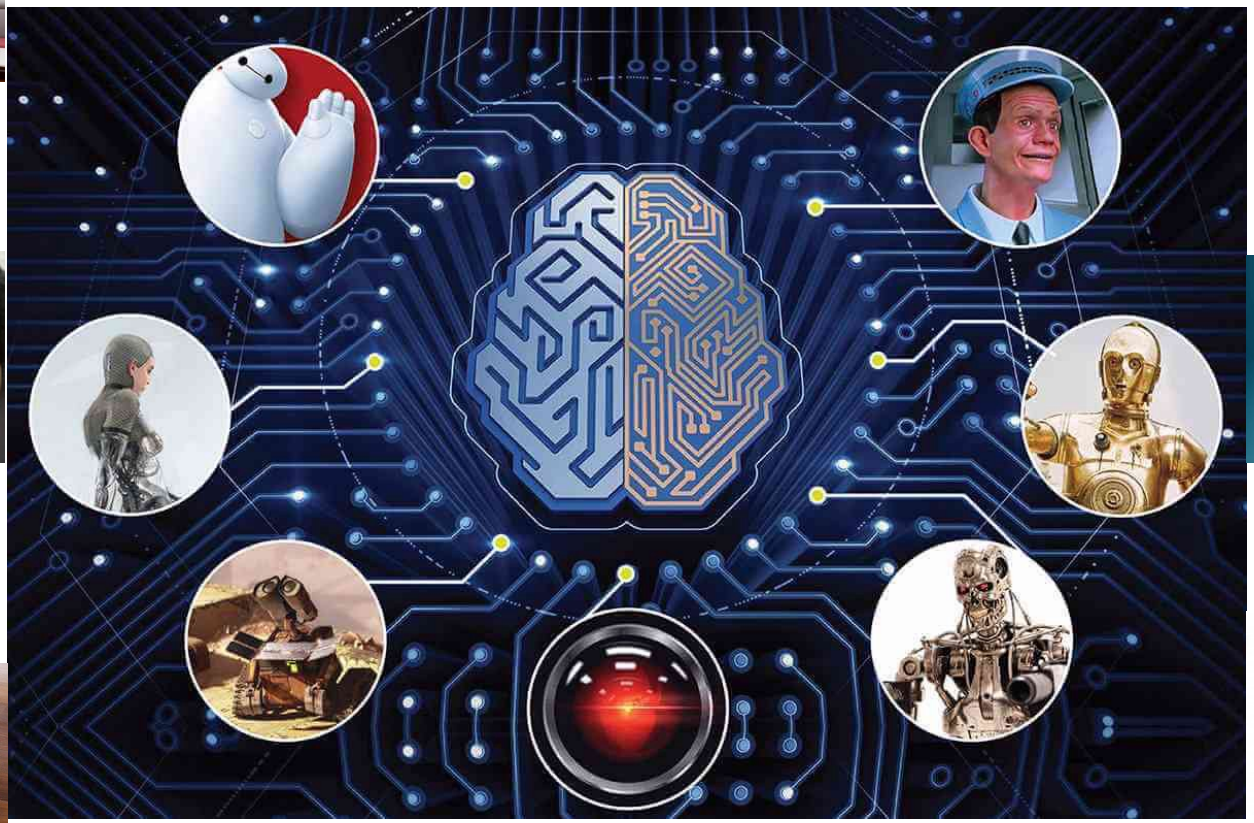
HAL 9000,
2001: A Space Odyssey (1968)

And many more…

Baymax - RIBA II

Johnny Cab - Google self-driving car

Ava – Geminoid (Hiroshi İshiguro)



HAL – IBM Watson

C-3PO - Pepper

WALL-E - Roomba

Terminator - Atlas robots

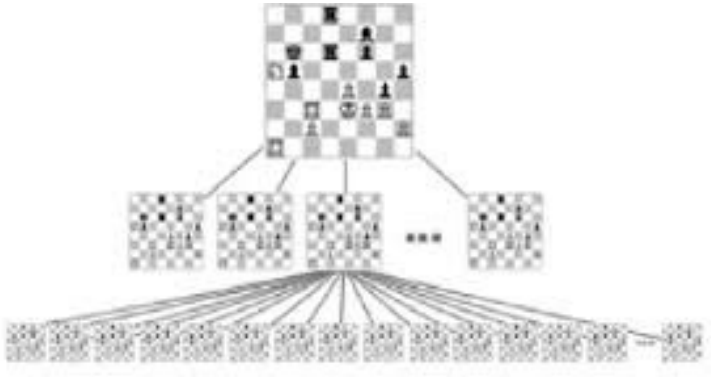
https://medium.com/@hackerearth/7-artificial-intelligence-based-movie-characters-that-are-now-a-reality-d2b91b97d9be

What are some successes of AI today?

https://en.wikipedia.org/wiki/Deep_Blue_(chess_computer)n-76882

Chess

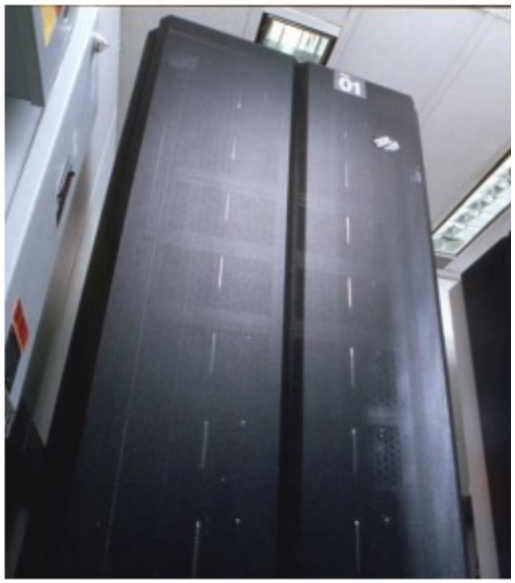
1989 : first chess program Deep Thought
1996 : IBM's supercomputer Deep Blue won against World champion Gary Kasparov
2006 : Deep Fritz that works on a PC won against Vladimir Kramnik



				
pawn	knight	bishop	rook	queen
1	3	3	5	9

Game Playing

- **May, '97: Deep Blue vs. Kasparov**
  - First match won against world-champion
  - "Intelligent creative" play
  - 200 million board positions per second!
  - Humans understood 99.9 of Deep Blue's moves
  - Can do about the same now with a big PC cluster



- **Open question:**
  - How does human cognition deal with the search space explosion of chess?
  - Or: how can humans compete with computers at all??
- **1996: Kasparov Beats Deep Blue**

  "I could feel --- I could smell --- a new kind of intelligence across the table."
- **1997: Deep Blue Beats Kasparov**

  "Deep Blue hasn't proven anything."

Text from Bart Selman, image from IBM's Deep Blue pages

WIRED.CO.UK

TECHNOLOGY

Did Deep Blue beat Kasparov because of a computer bug?

By Klint Finley | 01 October 12

"In May 1997, an IBM supercomputer known as Deep Blue beat then chess world champion Garry Kasparov, who had once bragged he would never lose to a machine.

Kasparov and other chess masters blamed the defeat on a single move made by the IBM machine. Either at the end of the first game or the beginning of the second, depending on who's telling the story, the computer made a sacrifice that seemed to hint at its long-term strategy.

Kasparov and many others thought the move was too sophisticated for a computer, suggesting there had been some sort of human intervention during the game. "It was an incredibly refined move, of defending while ahead to cut out any hint of countermoves," grandmaster Yasser Seirawan told Wired.com in 2001, "and it sent Garry into a tizzy." Fifteen years after the historical match, one of Big Blue's designers says the move was the result of a bug in Deep Blue's software."

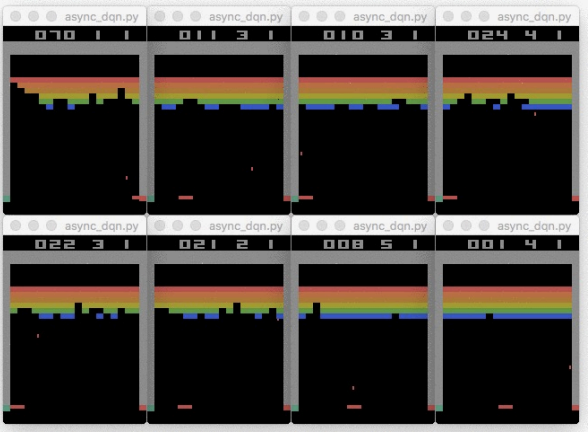
http://www.wired.co.uk/news/archive/2012-10/01/deep-blue-bug

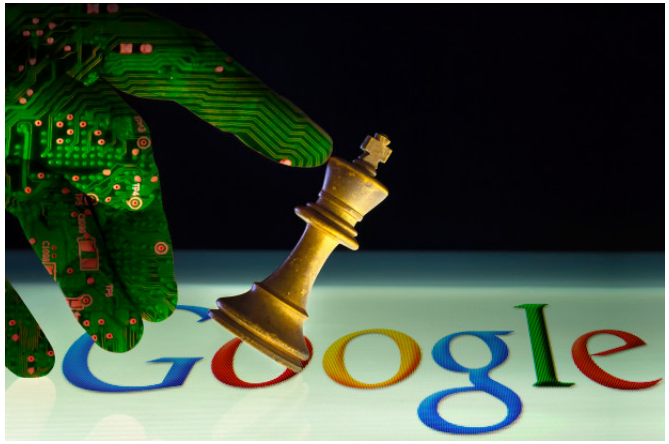
Go

2015-2016: Google DeepMind's AlphaGo won against world Go Champions Lee Sedol and Ke Jie

19x19 game board,
10^{170} possible combinations

https://deepmind.com/research/alphago/

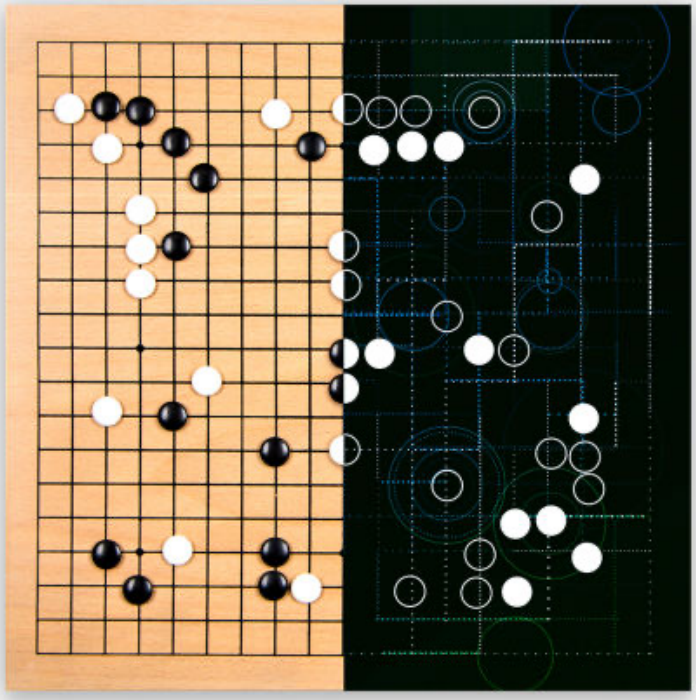




Expert chess player only in 4 hours

The Artificial Intelligence That Solved Go

Nineteen years after Deep Blue won a chess match against a grand master, a Google team has created an A.I. that's able to win against professional players of the ancient Chinese strategy game of Go.
Last October, DeepMind's program, named AlphaGo, won all five games against Hui.



AlphaGo was built to deal with "any task that has a lot of data that is unstructured and you want to find patterns in the data and then decide what to do.
Even with recent advances, computers don't have the power to run all those possibilities. So, instead, AlphaGo learns smart moves by observing millions of top human games and by playing against itself. Then, when choosing a move during a game, it only searches within a narrower pool of possibilities that seem reasonable.

Humans versus machines

1997: Deep Blue (chess)

2011: IBM Watson (Jeopardy!)

Perhaps the aspect of AI that captures the public's imagination the most are in defeating humans at their own game. • In 1997, Deep Blue defeated Gary Kasparov, the world chess champion. In 2011, IBM Watson defeated two of the biggest winners (Brad Rutter and Ken Jennings) at the quiz show Jeopardy! (IBM seems to be pretty good at performing these kind of stunts.) • One could have argued that Deep Blue won simply by the sheer force of its computation prowess, whereas winning Jeopardy! involved understanding natural language, and this defeat hit closer to home.

IBM Watson

https://en.wikipedia.org/wiki/Watson_(computer)

- http://www-03.ibm.com/innovation/us/watson/
- NY Times article
- Trivia demo
- IBM Watson wins on Jeopardy (February 2011)
- Watson provides cancer treatment options to doctors in seconds (February 2013)

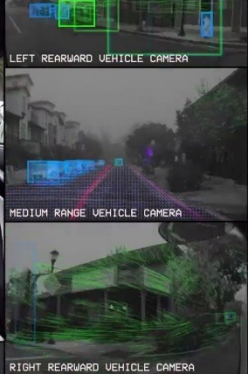
What can AI do for you?

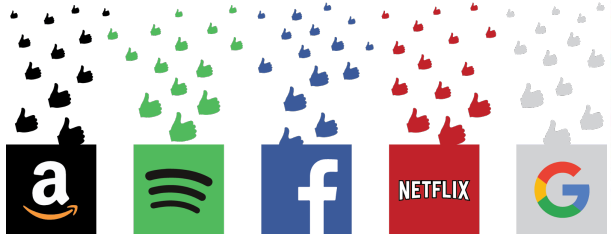
- Instead of asking what AI is, let us turn to the more pragmatic question of what AI can do for you. We will go through some examples where AI has already had a substantial impact on society.


Self
Driving

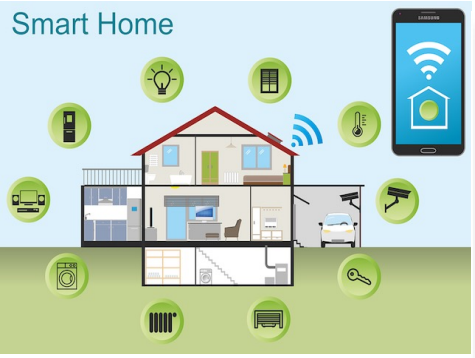

smart
On my way

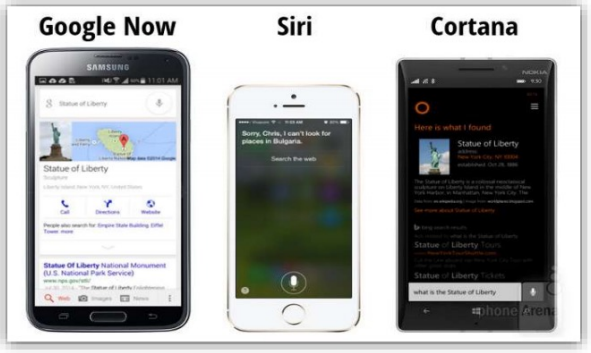

MOTION FLOW
LANE LINES
LANE LINES
ROAD FLOW
IN-PATH OBJECTS
ROAD LIGHTS
OBJECTS
ROAD SIGNS


LEFT REARWARD VEHICLE CAMERA
MEDIUM RANGE VEHICLE CAMERA
RIGHT REARWARD VEHICLE CAMERA


NETFLIX

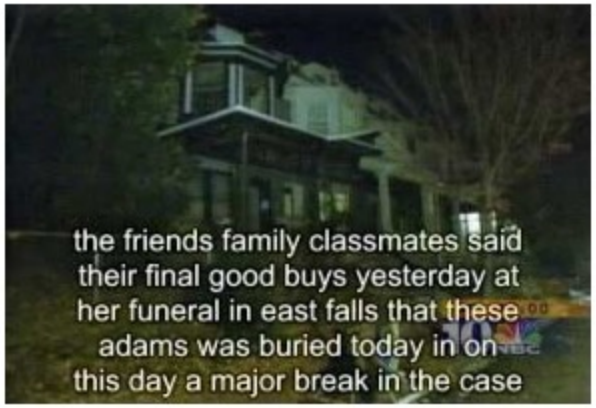

CUSTOMERS WHO BOUGHT THIS ITEM:
ALSO BOUGHT:
piccolo


Smart Home


Google Now
Siri
Cortana

Natural Language Processing

- Speech technologies
  - Automatic speech recognition
  - Text-to-speech synthesis
  - Dialog systems



- Language processing technologies
  - Machine translation


"Il est impossible aux journalistes de rentrer dans les régions tibétaines"

Bruno Philip, correspondant du "Monde" en Chine, estime que les journalistes de l'AFP qui ont été expulsés de la province tibétaine du Qinghai "n'étaient pas dans l'illégalité".

Les faits Le dalaï-lama dénonce l'"enfer" imposé au Tibet depuis sa fuite, en 1959

Vidéo Anniversaire de la rébellion


"It is impossible for journalists to enter Tibetan areas"

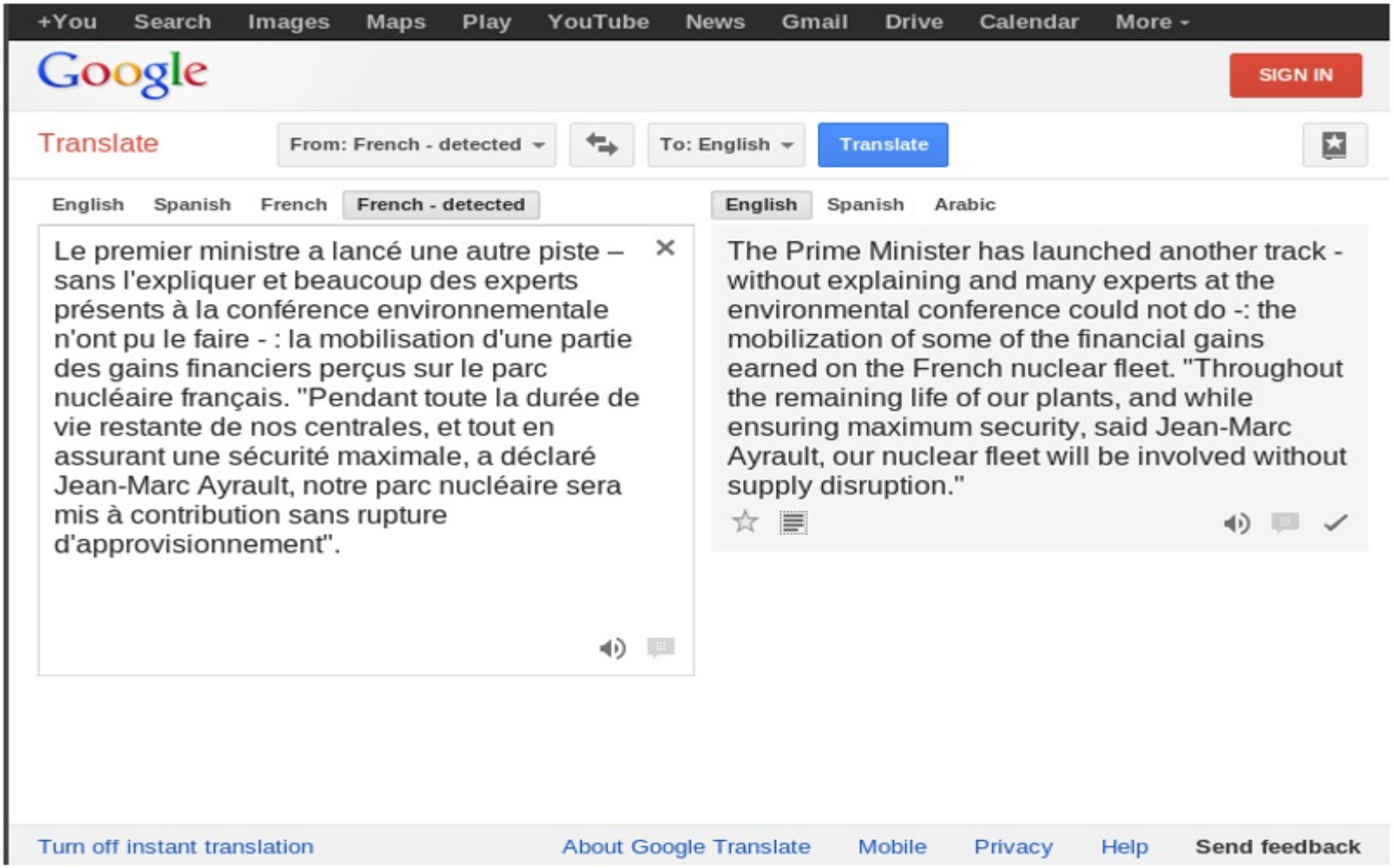
Philip Bruno, correspondent for "World" in China, said that journalists of the AFP who have been deported from the Tibetan province of Qinghai "were not illegal."

Facts The Dalai Lama denounces the "hell" imposed since he fled Tibet in 1959

Video Anniversary of the Tibetan rebellion: China on guard

  - Information extraction
  - Information retrieval, question answering
  - Text classification, spam filtering, etc.

Machine translation



If you want to read a news article in another language, you can turn to machine translation.

Speech and natural language

Skype Translator

Break down the language barrier with your friends, family and colleagues.

Our online translator can help you communicate in 7 languages for voice calls, and in more than 50 languages while instant messaging.

Skype Translator uses machine learning. So the more you use it, the better it gets. Thanks for being patient as the technology graduates from Preview mode.

https://www.skype.com/en/features/skype-translator/

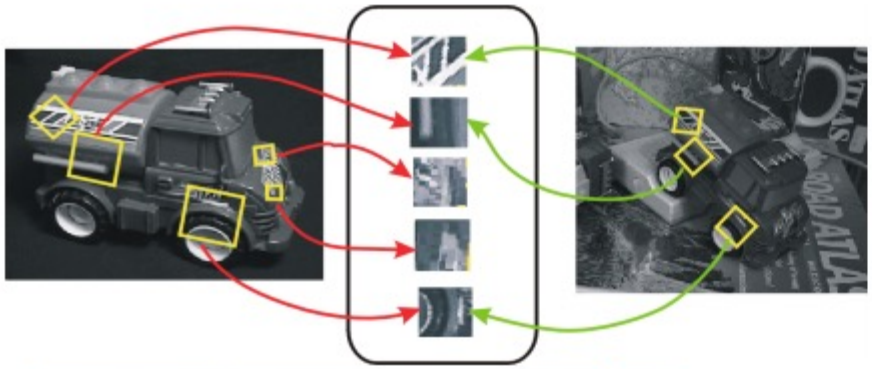
Google Translate App

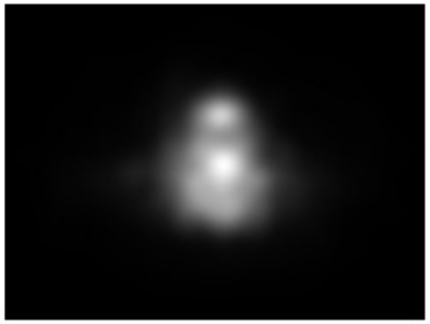
- Translate between 103 languages by typing
- Offline: Translate 52 languages when you have no Internet
- Instant camera translation: Use your camera to translate text instantly in 30 languages
- Camera Mode: Take pictures of text for higher-quality translations in 37 languages
- Conversation Mode: Two-way instant speech translation in 32 languages
- Handwriting: Draw characters instead of using the keyboard in 93 languages

https://play.google.com/store/apps/details?id=com.google.android.apps.translate&hl=en

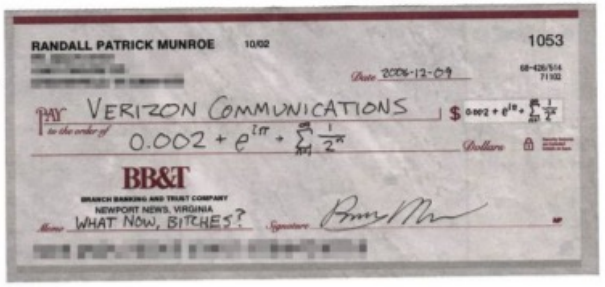
Computer Vision

- OCR, handwriting recognition
- Face detection/recognition
- Scene segmentation, etc.



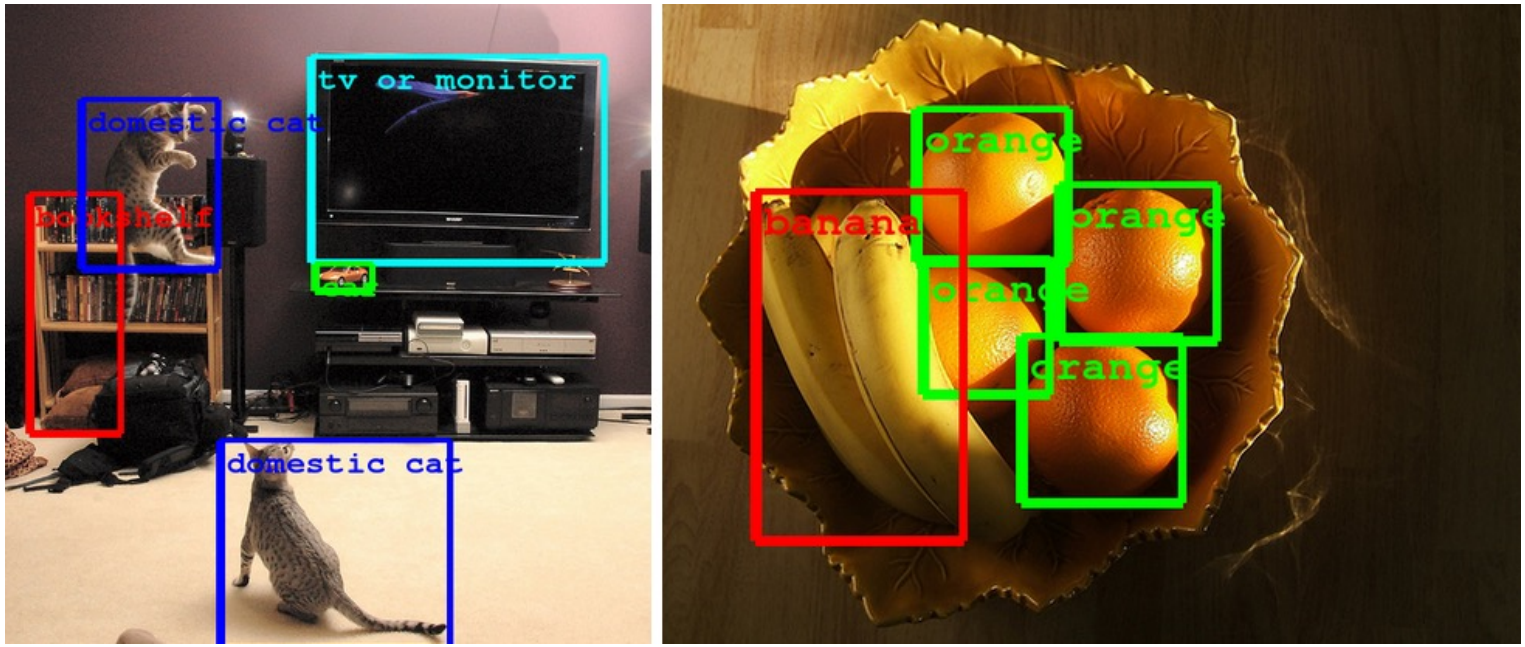


Handwriting recognition



When you deposit a check at an ATM, handwriting recognition is employed to automatically figure out the deposit amount.

Computer Vision

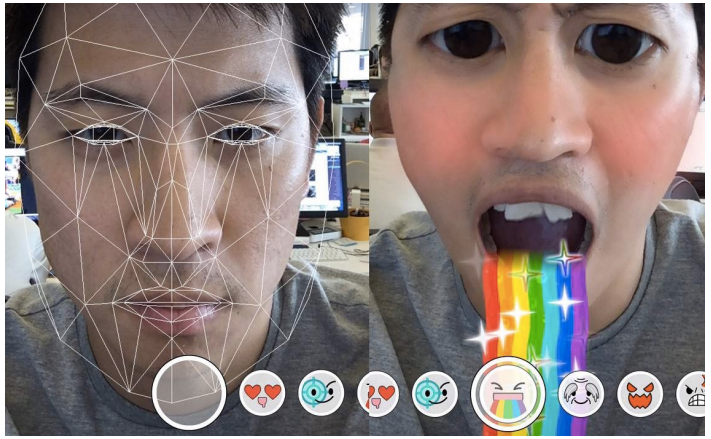


•[Computer Eyesight Gets a Lot More Accurate](), NY Times Bits blog, August 18, 2014

Computer Vision

•[Facebook accessibility tools for the visually impaired]

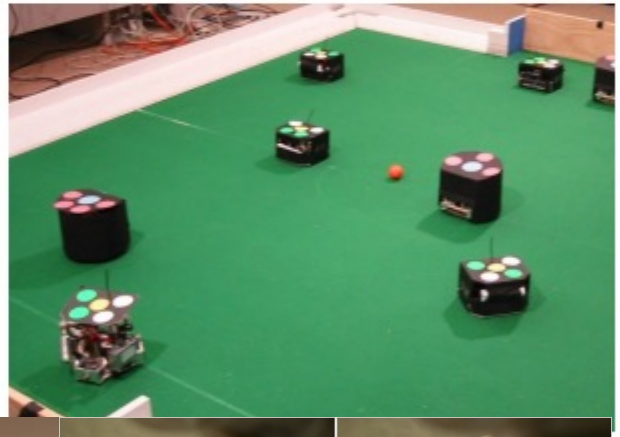
[AI beats human pathologists at detecting cancer]

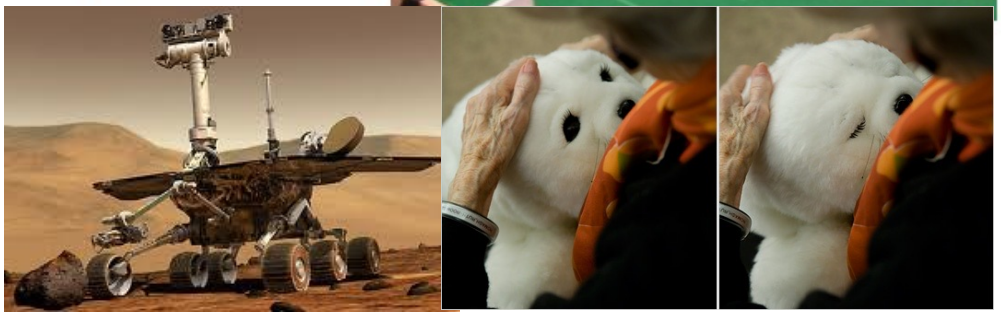


[Technology behind Snapchat lenses]

Robotics

- Robotics
  - Part mechanical engineering
  - Part AI
  - Reality much harder than simulations!
- Technologies
  - Autonomous vehicles (DARPA Grand Challenge, Google self-driving cars)
  - Rescue
  - Soccer (RoboCup)
  - Robotic pets
  - Lots of automation





Images from stanfordracing.org, CMU RoboCup, Honda ASIMO sites

DARPA Robotics Challenge (2015)

JUN 5, 2015 @ 3:24 PM

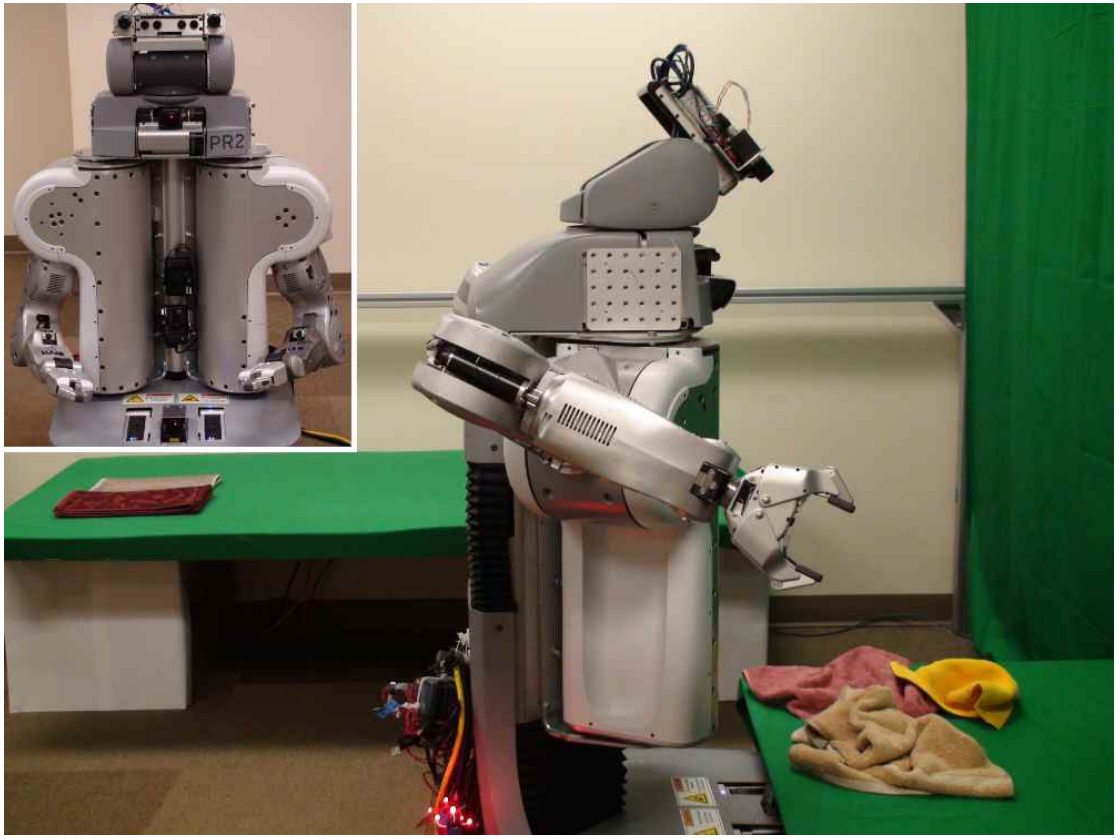
NEW TECHNOLOGY ROBOTS DARPA ROBOTS DARPA ROBOTICS CHALLENGE

The Most Hilarious Robo-Falls from the DARPA Robotics Challenge

http://www.popularmechanics.com/technology/robots/a15907/best-falls-from-darpa-robot-

https://www.youtube.com/watch?v=g0TaYh

Towel-folding robot



YouTube Video

- J. Maitin-Shepard, M. Cusumano-Towner, J. Lei and P. Abbeel, Cloth Grasp Point Detection based on Multiple-View Geometric Cues with Application to Robotic Towel Folding, ICRA 2010
- More clothes folding

U.S. Senator Calls Robot Projects Wasteful. Robots Call Senator Wasteful

By Erico Guizzo

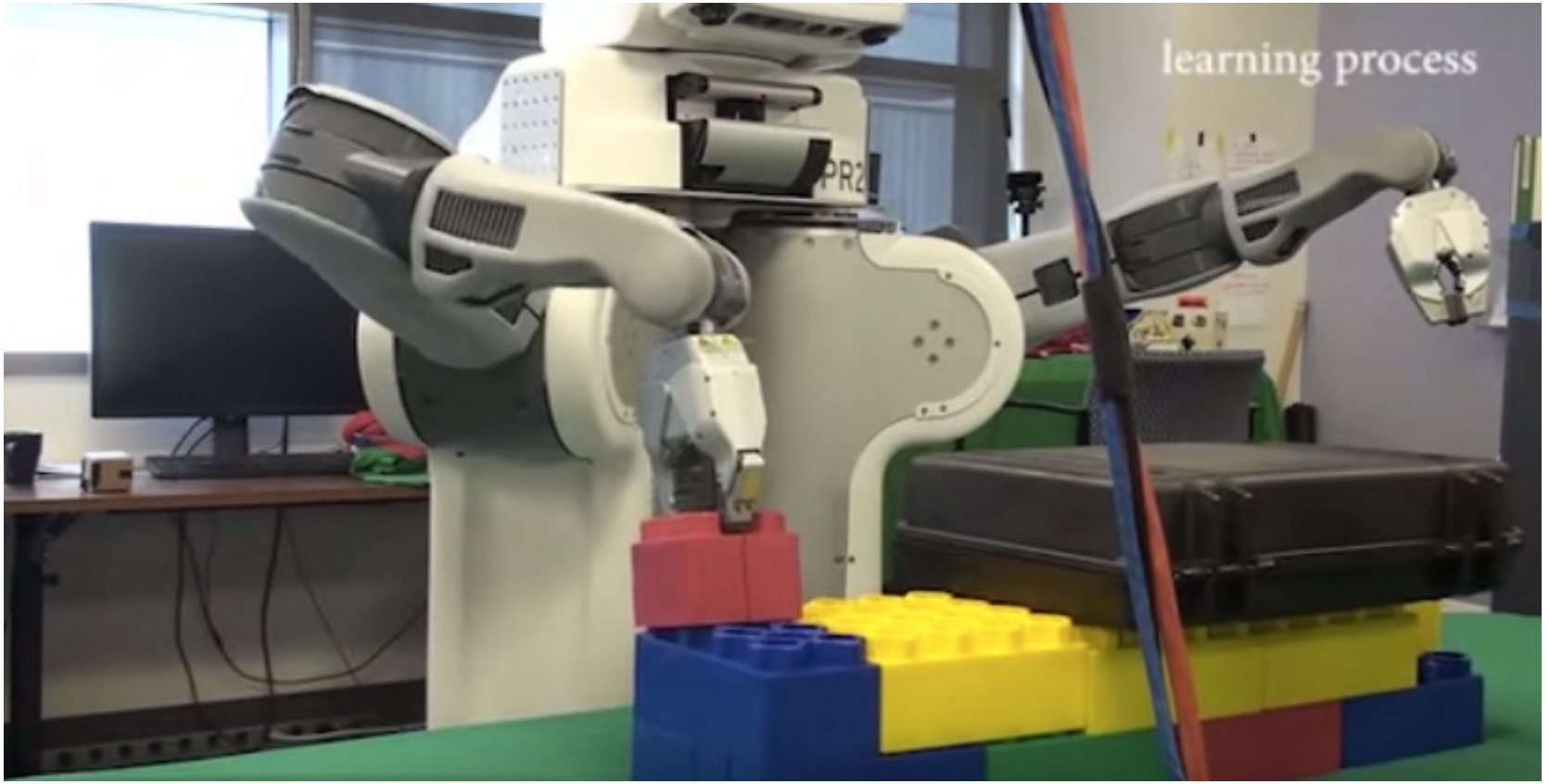
Posted 14 Jun 2011 | 13:58 GMT

Share | Email | Print | Reprint

Tom Coburn, a senator from Oklahoma, and PR2, a robot from California.

http://spectrum.ieee.org/automaton/robotics/robotics-software/us-senator-calls-robot-projects-wasteful

Deep sensorimotor learning



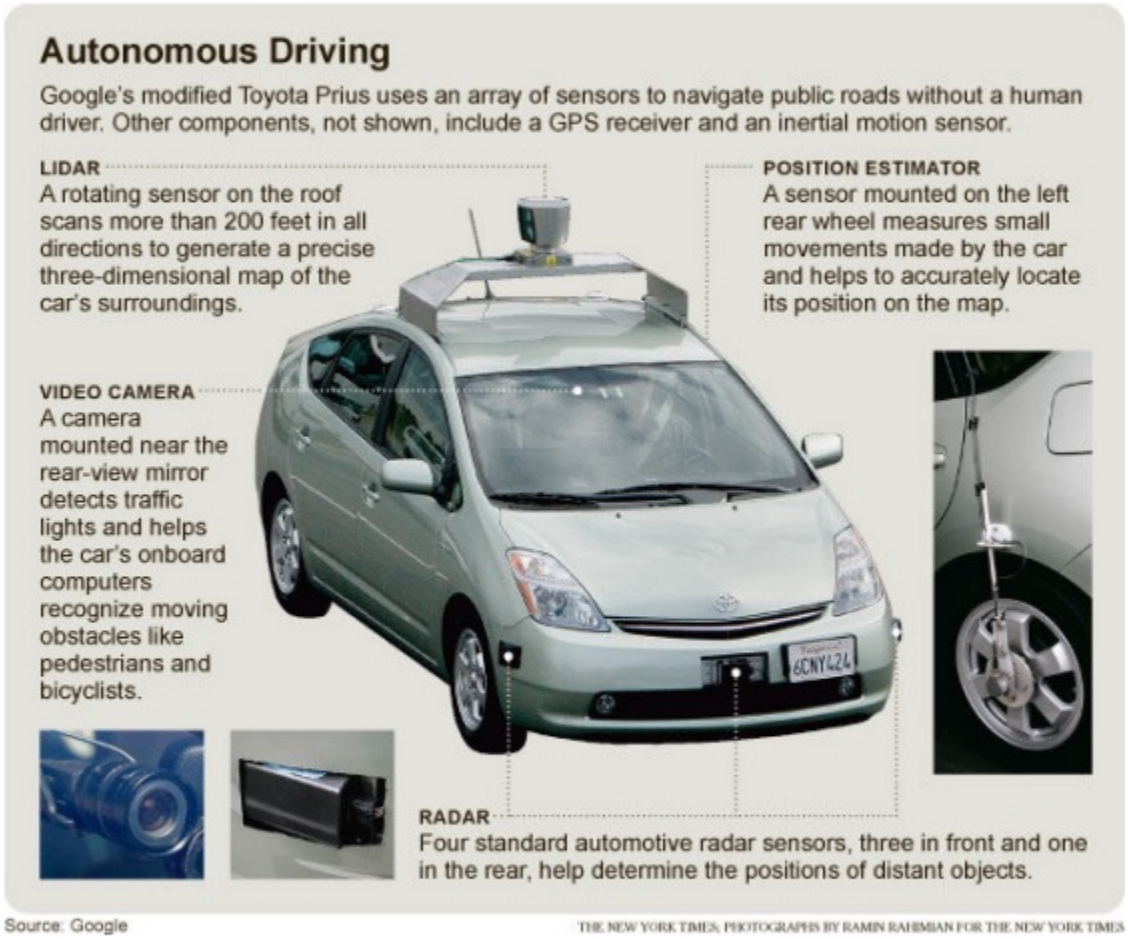
YouTube video

S. Levine, C. Finn, T. Darrell and P. Abbeel, End-to-end training of deep visuomotor policies, JMLR 2016

Autonomous driving

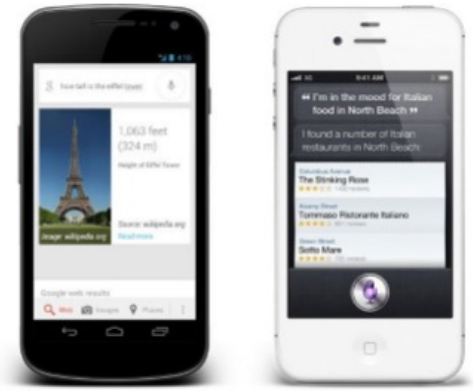
Research in autonomous cars started in the 1980s, but the technology wasn't there. • Perhaps the first significant event was the 2005 DARPA Grand Challenge, in which the goal was to have a driverless car go through a 132-mile off-road course. Stanford finished in first place. The car was equipped with various sensors (laser, vision, radar), whose readings needed to be synthesized (using probabilistic techniques that we'll learn from this class) to localize the car and then to generate control signals for the steering, throttle, and brake. • In 2007, DARPA created an even harder Urban Challenge, which was won by CMU. • In 2009, Google started a self-driving car program, and since then, their self-driving cars have driven over 1 million miles on freeways and streets. • In January 2015, Uber hired about 50 people from CMU's robotics department to build self-driving cars. • While there are still technological and policy issues to be worked out, the potential impact on transportation is huge.

Google self-driving cars



- [Google's self-driving car passes 300,000 miles](#) (Forbes, 8/15/2012)

Virtual assistants



With the rise of mobile devices, smart cars and homes, and improvements in speech recognition, we will be able to interact with computers using natural language and gestures. Imagine coming home and saying: ”what do I need to buy for tomorrow’s picnic and where can I do that now?” • Currently, Apple’s Siri, Google Now, and Microsoft Cortana provide a first stab at this problem, handling mostly simple utterances and actions (e.g., setting an alarm, sending a text, etc.) The technology is still in its infancy, but it is an exciting and a rapidly moving field.

Mathematics

- In 1996, a computer program written by researchers at Argonne National Laboratory proved a mathematical conjecture unsolved for decades
  - NY Times story: *"[The proof] would have been called creative if a human had thought of it"*
- Mathematical software:

$$
\begin{aligned}
\partial_r^2 u &= -\left[E' - \frac{l(l+1)}{r^2} - r^2\right] u(r) \\
e^{-2s}\left(\partial_s^2 - \partial_s\right) u(s) &= -\left[E' - l(l+1)e^{-2s} - e^{2s}\right] u(s) \\
e^{-2s}\left[e^{\frac{1}{2}s}\left(e^{-\frac{1}{2}s}u(s)\right)'' - \frac{1}{4}u\right] &= -\left[E' - l(l+1)e^{-2s} - e^{2s}\right] u(s) \\
e^{-2s}\left[e^{\frac{1}{2}s}\left(e^{-\frac{1}{2}s}u(s)\right)''\right] &= -\left[E' - \left(l+\frac{1}{2}\right)^2 e^{-2s} - e^{2s}\right] u(s) \\
v'' &= -e^{2s}\left[E' - \left(l+\frac{1}{2}\right)^2 e^{-2s} - e^{2s}\right] v
\end{aligned}
$$

Logistics, scheduling, planning

- During the 1991 Gulf War, US forces deployed an AI logistics planning and scheduling program that involved up to 50,000 vehicles, cargo, and people
- NASA's Remote Agent software operated the Deep Space 1 spacecraft during two experiments in May 1999
- In 2004, NASA introduced the MAPGEN system to plan the daily operations for the Mars Exploration Rovers

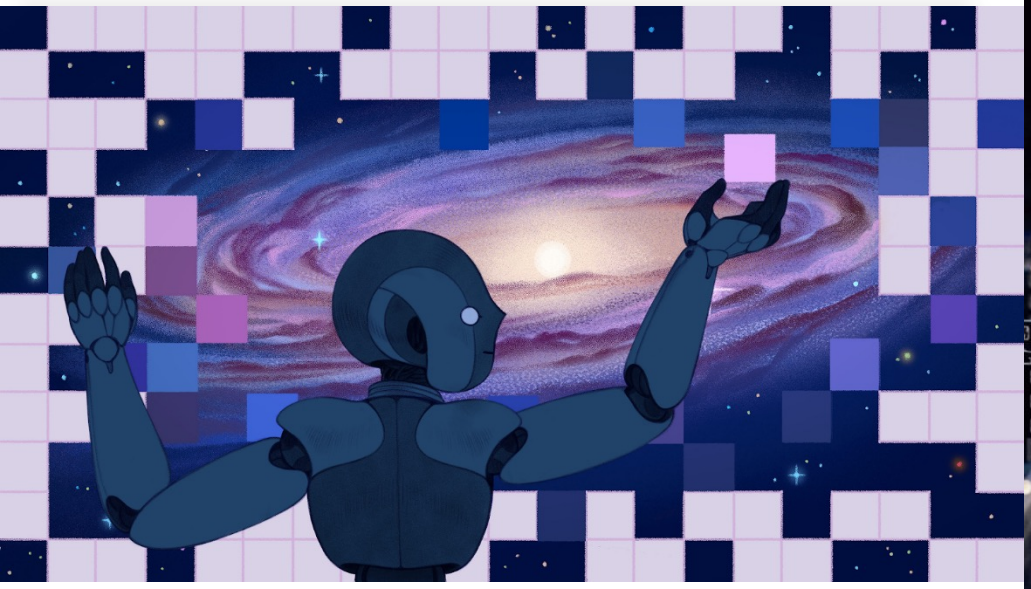
MACHINE LEARNING

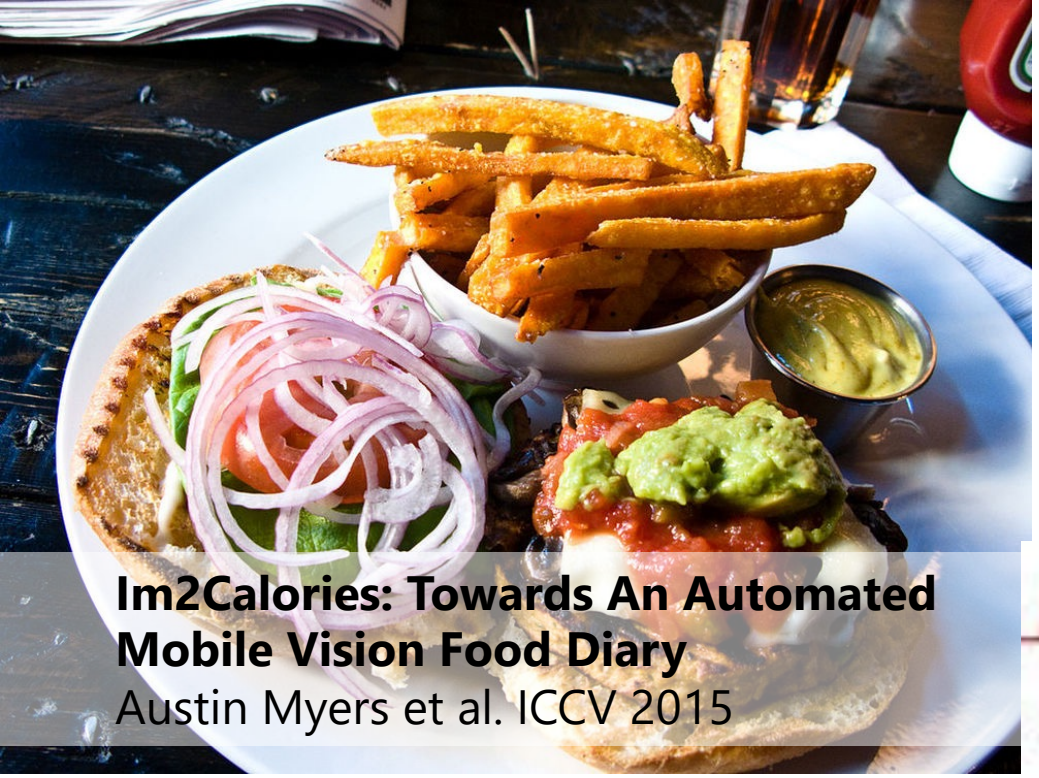
How Artificial Intelligence Is Changing Science

By DAN FALK

March 11, 2019

The latest AI algorithms are probing the evolution of galaxies, calculating quantum wave functions, discovering new chemical compounds and more. Is there anything that scientists do that can't be automated?





Im2Calories: Towards An Automated Mobile Vision Food Diary

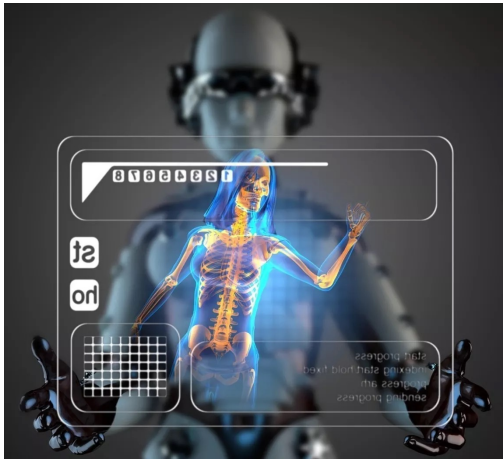
Austin Myers et al. ICCV 2015

AI in Healthcare

10 AI Applications That Could Change Health Care

APPLICATION	POTENTIAL ANNUAL VALUE BY 2026	KEY DRIVERS FOR ADOPTION
Robot-assisted surgery	$40B	Technological advances in robotic solutions for more types of surgery
Virtual nursing assistants	20	Increasing pressure caused by medical labor shortage
Administrative workflow	18	Easier integration with existing technology infrastructure
Fraud detection	17	Need to address increasingly complex service and payment fraud attempts
Dosage error reduction	16	Prevalence of medical errors, which leads to tangible penalties
Connected machines	14	Proliferation of connected machines/devices
Clinical trial participation	13	Patent cliff; plethora of data; outcomes-driven approach
Preliminary diagnosis	5	Interoperability/data architecture to enhance accuracy
Automated image diagnosis	3	Storage capacity; greater trust in AI technology
Cybersecurity	2	Increase in breaches; pressure to protect health data

SOURCE ACCENTURE



https://www.healthcentral.com/slideshow/8-ways-artificial-intelligence-is-affecting-the-medical-field

futurism.media/artificial-intelligence-in-medicine

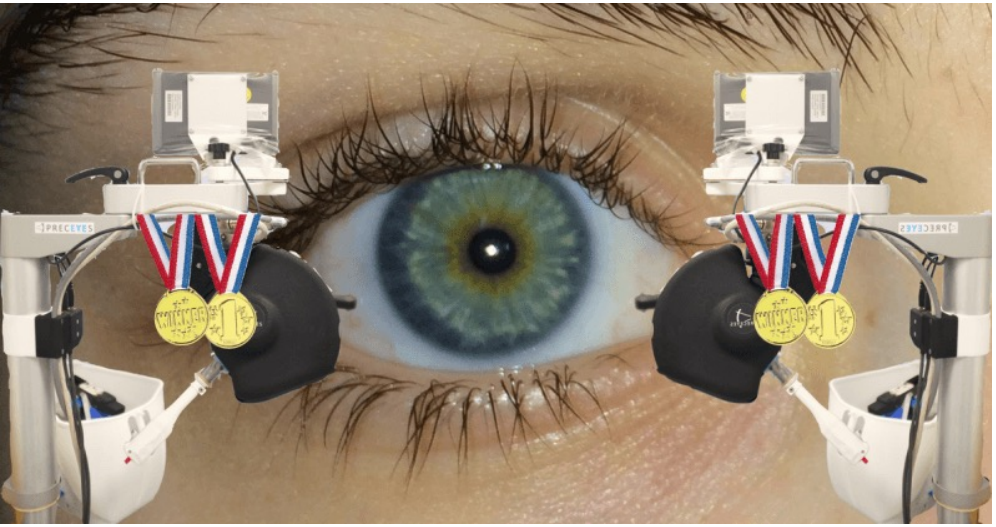
Robotic surgery

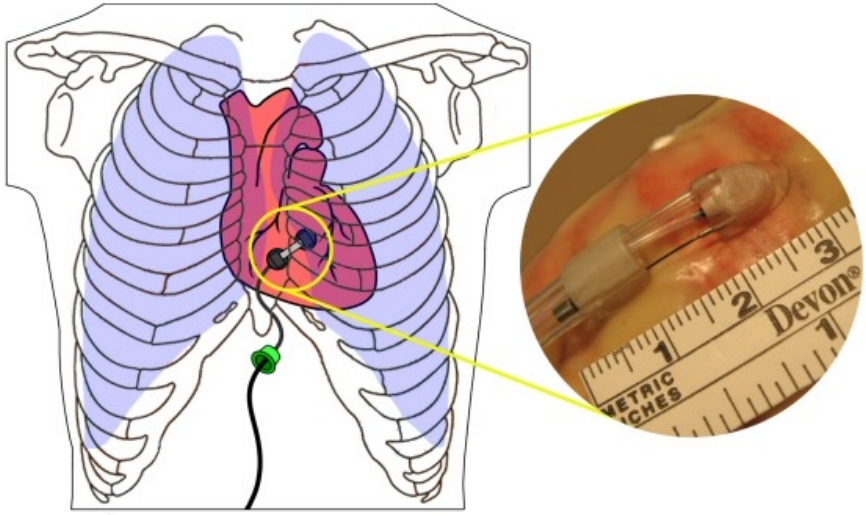
Da Vinci robot

Eye surgery in University of Oxford’

Heartlander mini robot on heart

Less invasive
Less complication
Faster recovery





https://thenextweb.com/science/2018/06/19/a-robot-operated-on-a-human-eye-for-the-first-time-ever/
https://www.cs.cmu.edu/~heartlander/index.html

Robotic or Virtual Nurses

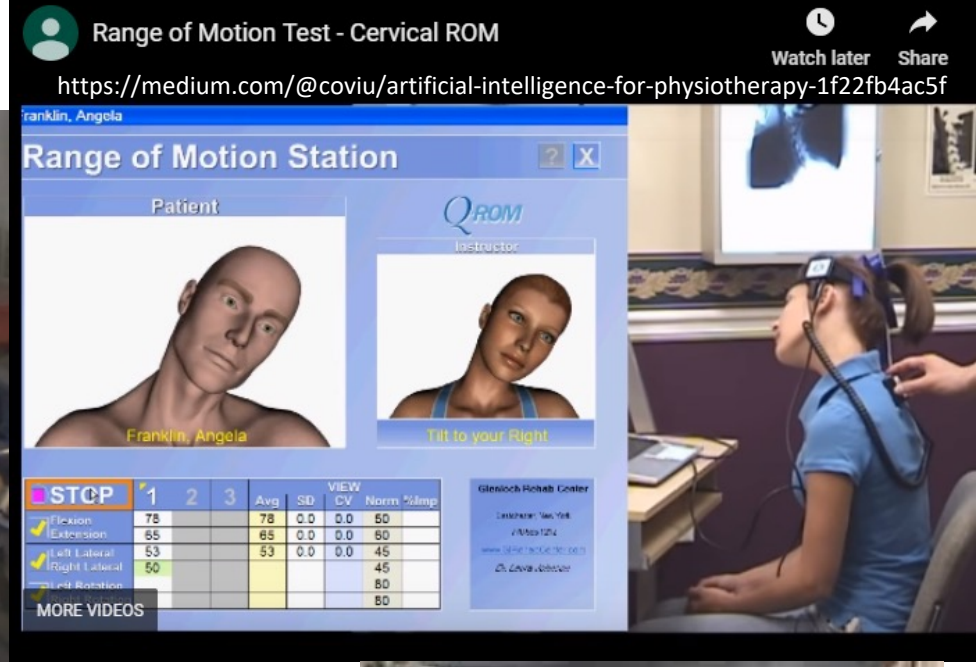
Pepper

RIBA

Pearl

Molly

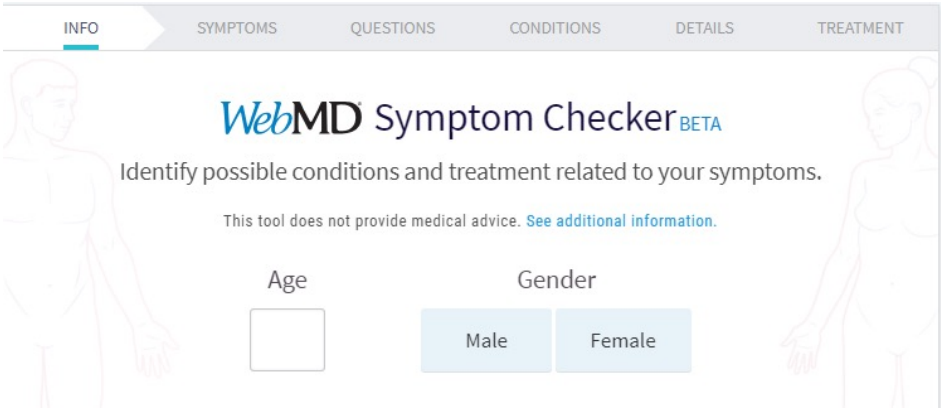
Rehabilitation / physyotherapy

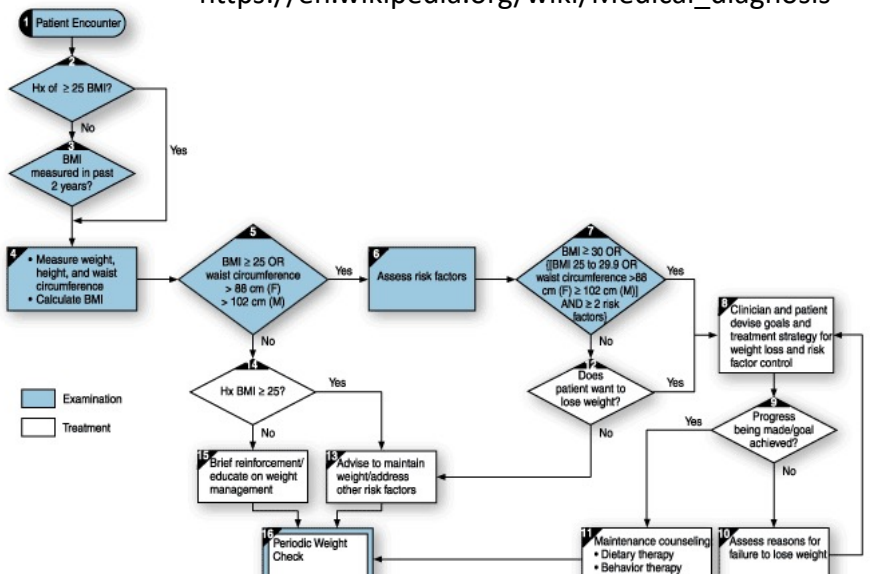


https://www.technologyreview.com/s/603614/a-robot-physical-therapist-helps-kids-with-cerebral-palsy/

Medical Diagnosis

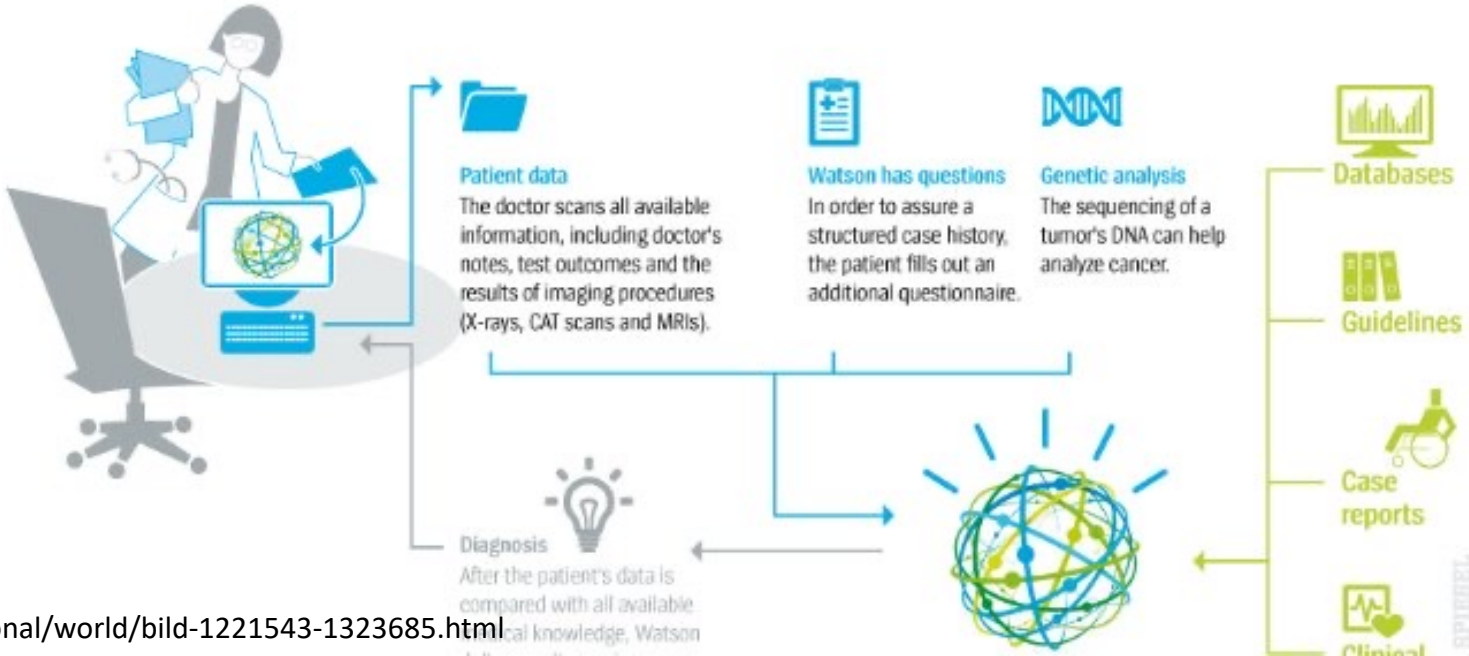
https://en.wikipedia.org/wiki/Medical_diagnosis





How Watson Works

The ways IBM's system is used in medicine

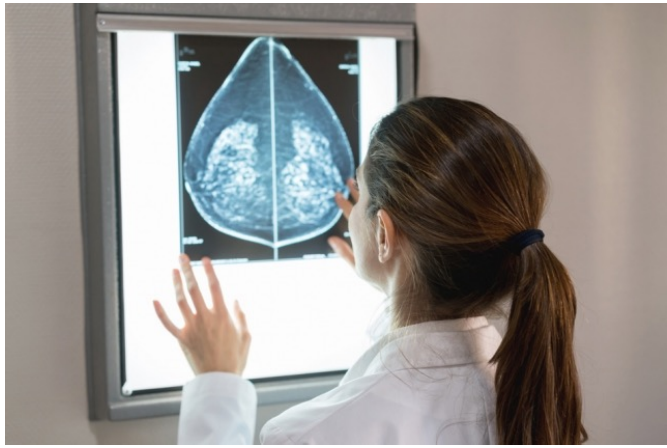


http://www.spiegel.de/international/world/bild-1221543-1323685.html

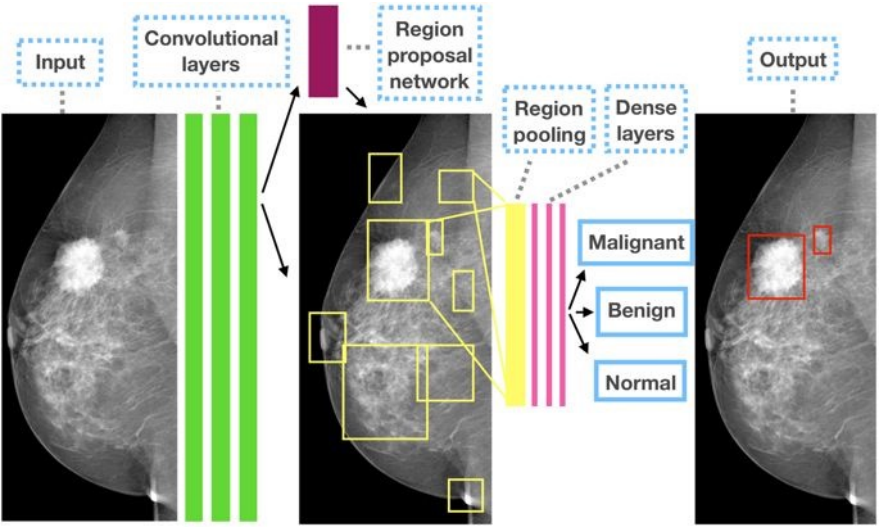
Radiology and Ultrasound images

"A new feature in Samsung Medison's ultrasound system uses a deep-learning algorithm to make recommendations about whether a breast abnormality is benign or cancerous. The "S-Detect for Breast" feature is now included in an upgrade to the company's RS80A ultrasound system and is commercially available in parts of Europe, the Middle East and Korea and is pending FDA approval in the U.S."

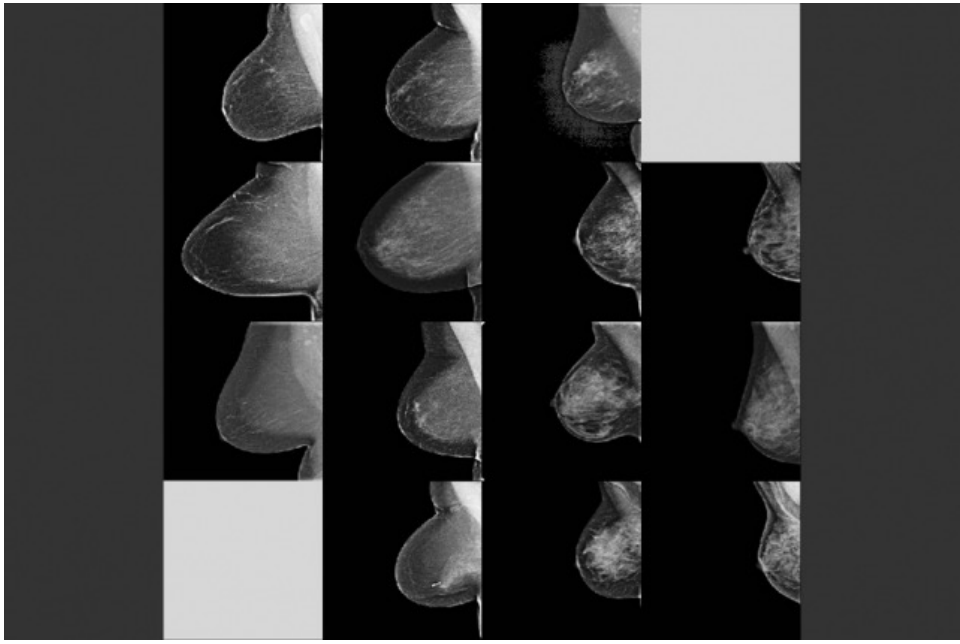
http://www.popsci.com/how-deep-learning-technology-could-be-next-step-in-cancer-detection



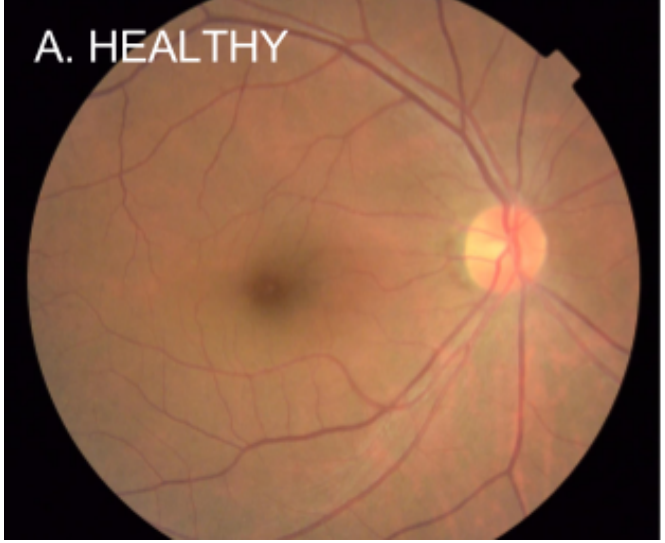
http://news.mit.edu/2018/AI-identifies-dense-tissue-breast-cancer-mammograms-1016



Detecting and classifying lesions in mammograms with Deep Learning
Dezső Ribli, Anna Horváth, Zsuzsa Unger, Péter Pollner & István Csabai , 2018



Retina analysis



JAMA | Original Investigation | INNOVATIONS IN HEALTH CARE DELIVERY

Development and Validation of a Deep Learning Algorithm for Detection of Diabetic Retinopathy in Retinal Fundus Photographs

"Working closely with doctors both in India and the US, we created a development dataset of 128K images which were each evaluated by 3-7 ophthalmologists from a panel of 54 ophthalmologists. This dataset was used to train a deep neural network to detect referable diabetic retinopathy. The results show that our algorithm's performance is on-par with that of ophthalmologists."

nature biomedical engineering

ARTICLES

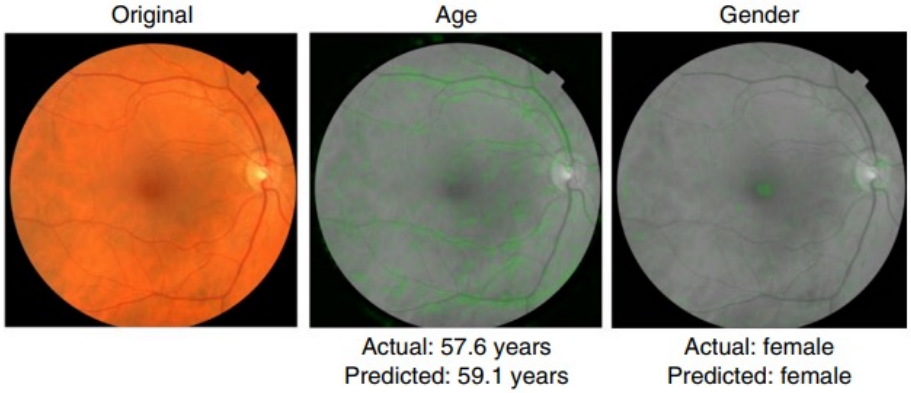
https://doi.org/10.1038/s41551-018-0195-0

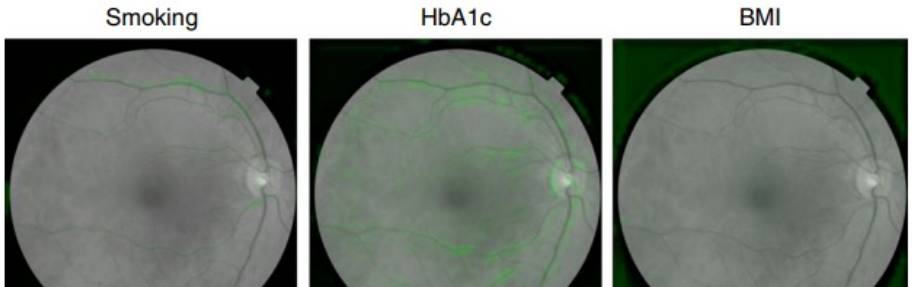
Prediction of cardiovascular risk factors from retinal fundus photographs via deep learning

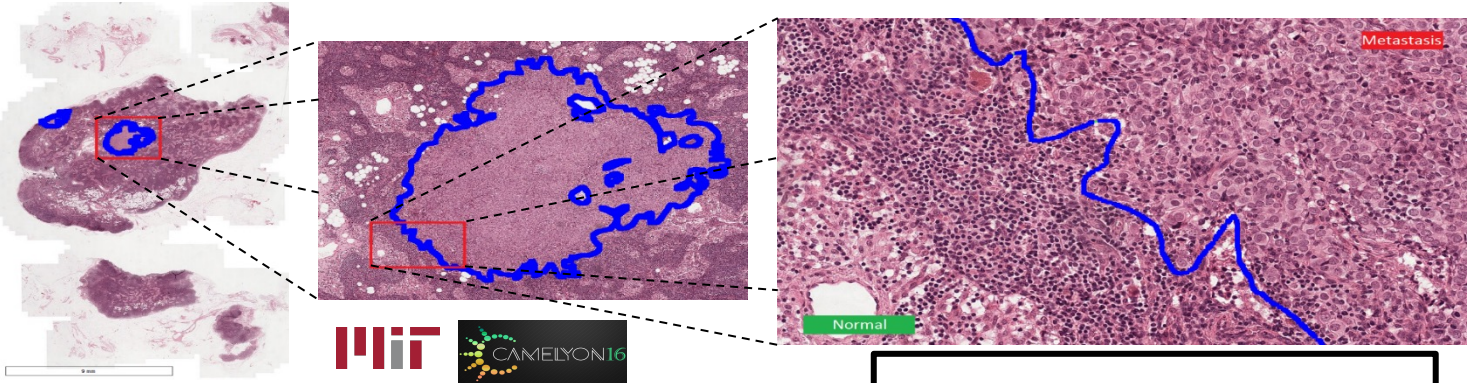
Ryan Poplin[1,4], Avinash V. Varadarajan[1,4], Katy Blumer[1], Yun Liu[1], Michael V. McConnell[2,3], Greg S. Corrado[1], Lily Peng[1,4]* and Dale R. Webster[1,4]

Table 5 | Predicting five-y validation dataset using v

Risk factor(s) or model used	
Age only	0.66 (0.61,0.71)
SBP only	0.66 (0.61,0.71)
BMI only	0.62 (0.56,0.67)
Gender only	0.57 (0.53,0.62)
Current smoker only	0.55 (0.52,0.59)
Algorithm only	0.70 (0.65,0.74)
Age + SBP + BMI + gender + current smoker	0.72 (0.68,0.76)
Algorithm + age + SBP + BMI + gender + current smoker	0.73 (0.69,0.77)
SCORE[6,7]	0.72 (0.67,0.76)
Algorithm + SCORE	0.72 (0.67,0.76)



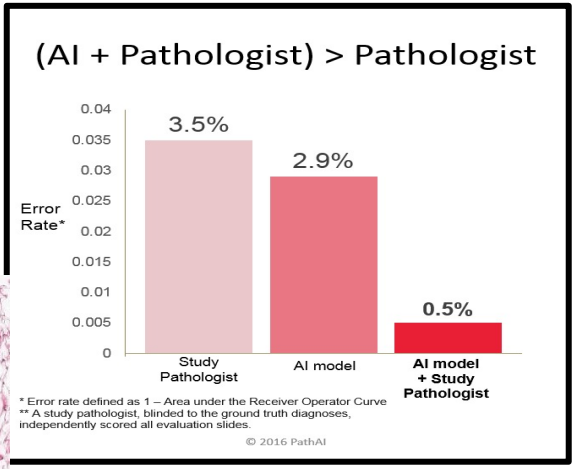


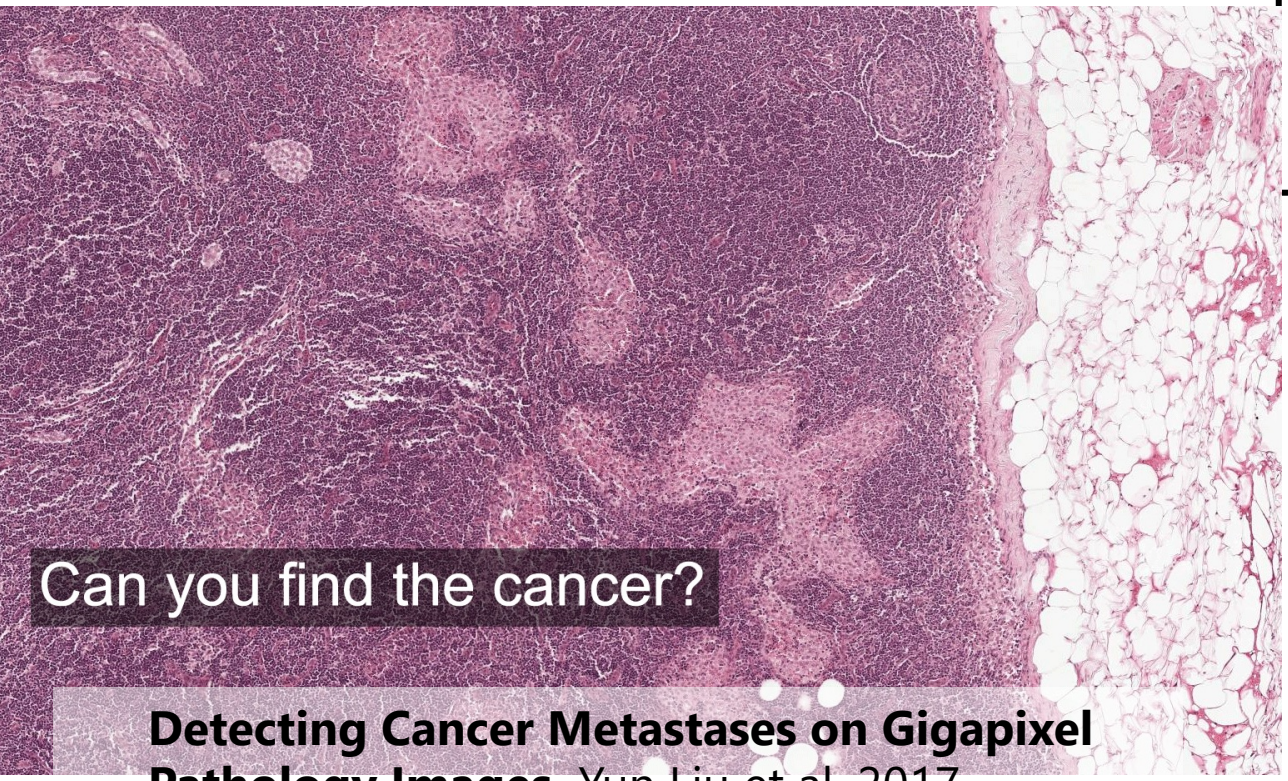


20 Gigapixel images

HARVARD MEDICAL SCHOOL

Deep Learning for Identifying Metastatic Breast Cancer
Dayong Wang et al. 2016



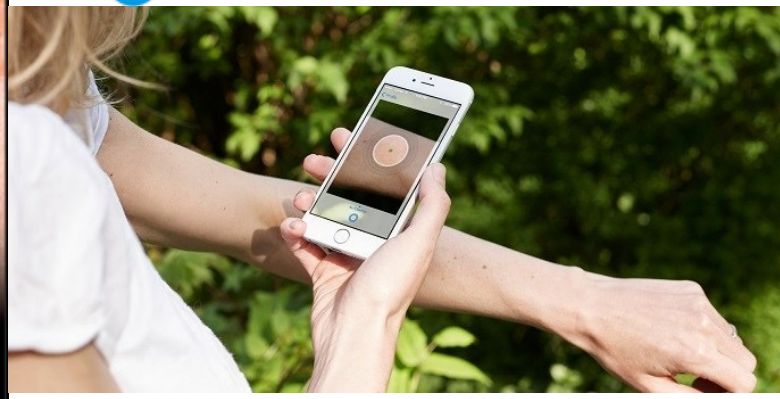


Detecting Cancer Metastases on Gigapixel Pathology Images, Yun Liu et al. 2017

We obtain AUC of 0.925 for whole slide image classification and a score of 0.7051 for tumor localization. Combining our deep learning system's predictions with the human pathologist's diagnoses increased his AUC to 0.995, representing an approximately 85% reduction in human error rate.

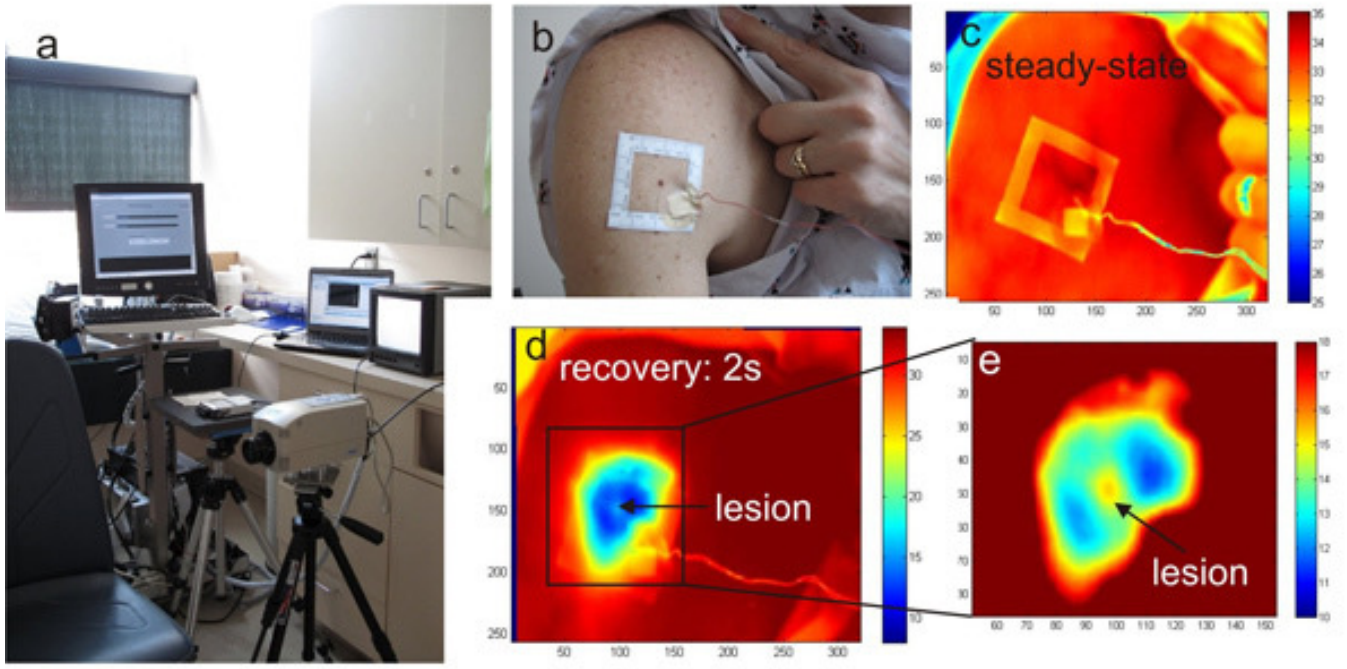
We showed that it is possible to train a model that either matched or exceeded the performance of a pathologist who had unlimited time to examine the slides."

SkinVision

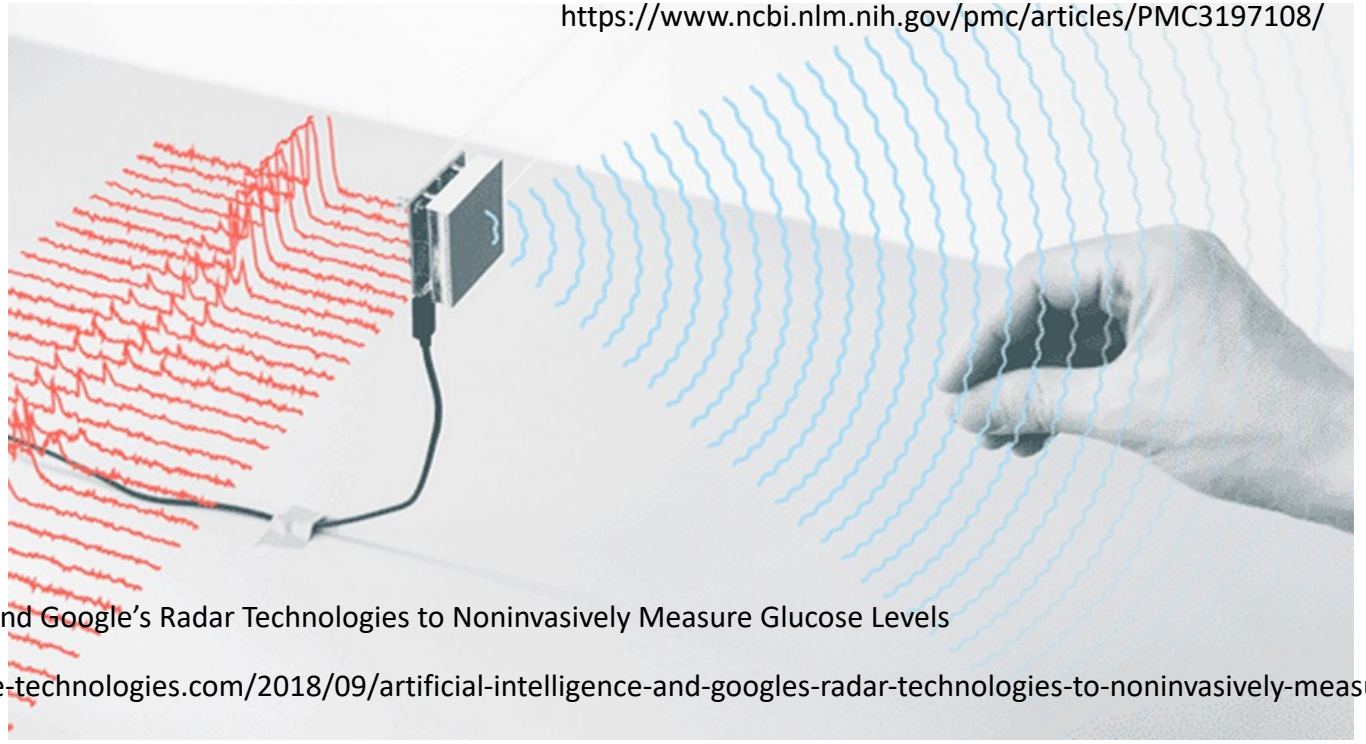


Dermatologist-level classification of skin cancer with deep neural networks
Andre Esteva et al. Nature 542, 2017

"We train a CNN using a dataset of 129,450 clinical images—two orders of magnitude larger than previous datasets—consisting of 2,032 different diseases. We test its performance against 21 board-certified dermatologists on biopsy-proven clinical images with two critical binary classification use cases: keratinocyte carcinomas versus benign seborrheic keratoses; and malignant melanomas versus benign nevi."

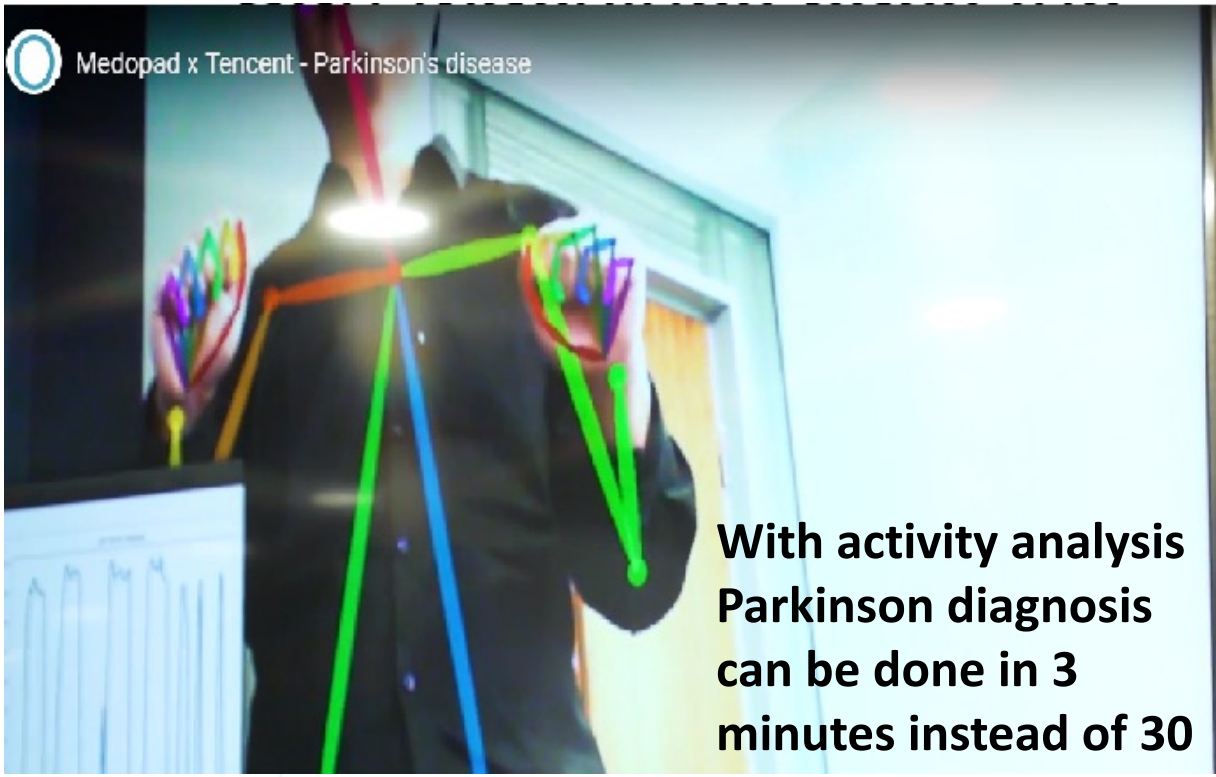


https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3197108/

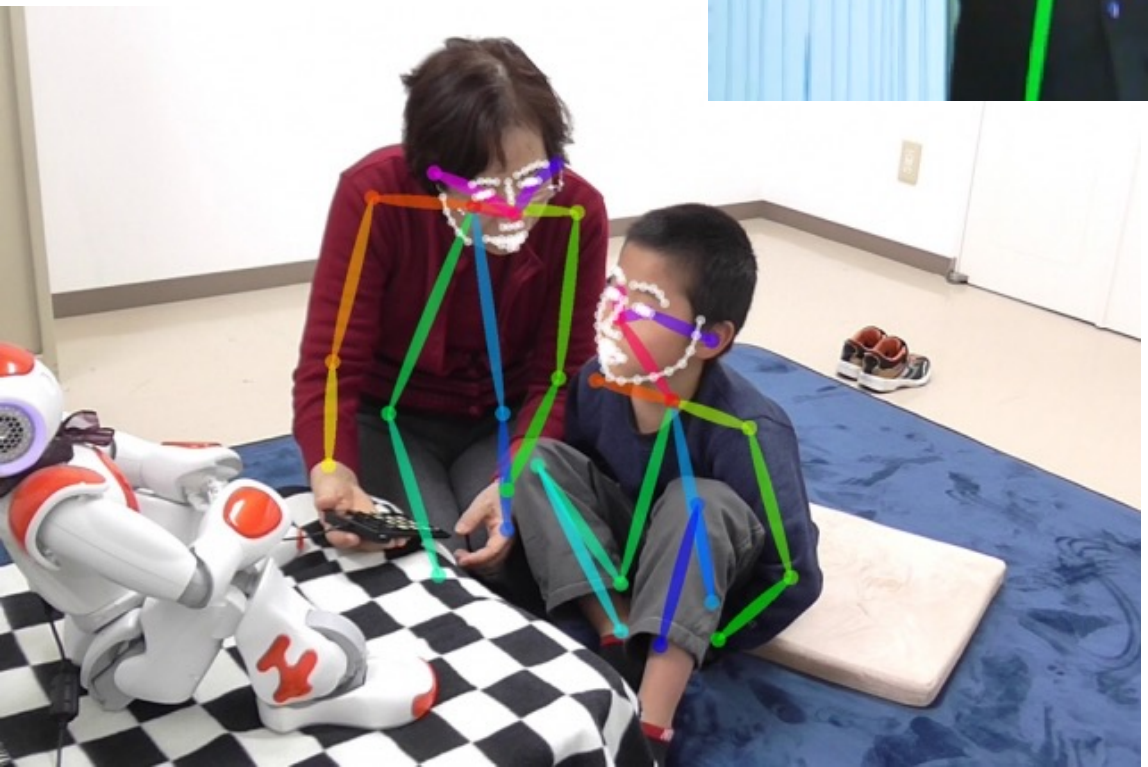


Artificial Intelligence and Google's Radar Technologies to Noninvasively Measure Glucose Levels

https://www.wearable-technologies.com/2018/09/artificial-intelligence-and-googles-radar-technologies-to-noninvasively-measure-glucose-levels/



With activity analysis Parkinson diagnosis can be done in 3 minutes instead of 30 minutes



An example of a therapy session augmented with humanoid robot NAO [SoftBank Robotics], which was used in the EngageMe study. Tracking of limbs/faces was performed using the CMU Perceptual Lab's OpenPose utility.
Image: MIT Media Lab

http://news.mit.edu/2018/personalized-deep-learning-equips-robots-autism-therapy-0627

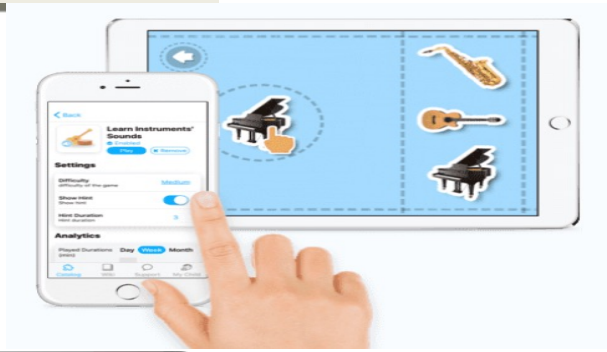
Detection and Computational Analysis of Psychological Signals (DCAPS)

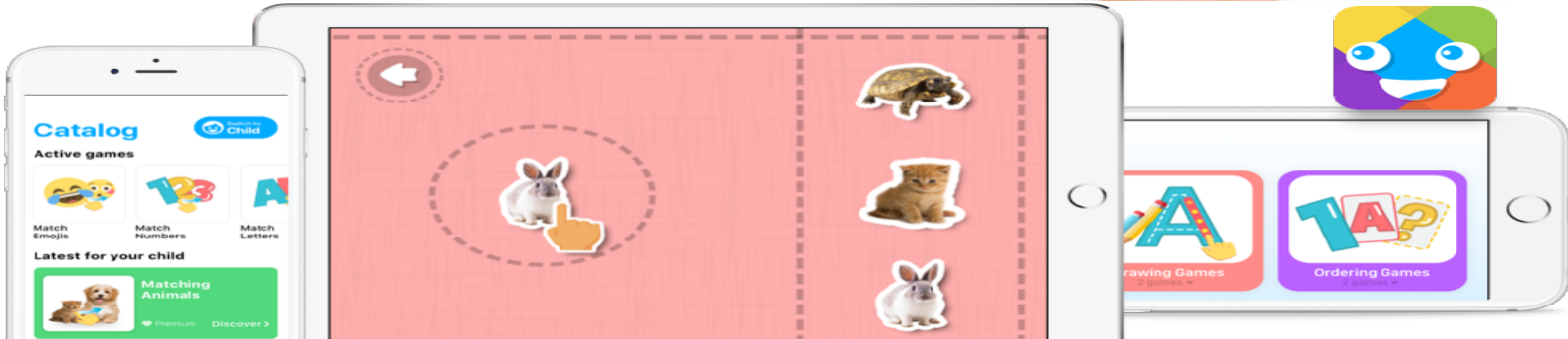
http://medvr.ict.usc.edu/projects/dcaps/

http://www.brain-power.com/autism/

otsimo

Çocuğunuz için
kişiselleştirilebilir eğitim.





Many AI applications

...

Web search

Speech recognition

Handwriting recognition

Machine translation

Information extraction

Document summarization

Question answering

Spelling correction

Image recognition

3D scene reconstruction

Human activity recognition

Autonomous driving

Music information retrieval

Automatic composition

Social network analysis

...

...

Product recommendation

Advertisement placement

Smart-grid energy optimization

Household robotics

Robotic surgery

Robot exploration

Spam filtering

Fraud detection

Fault diagnostics

AI for video games

Character animation

Financial trading

Dynamic pricing

Protein folding

Medical diagnosis

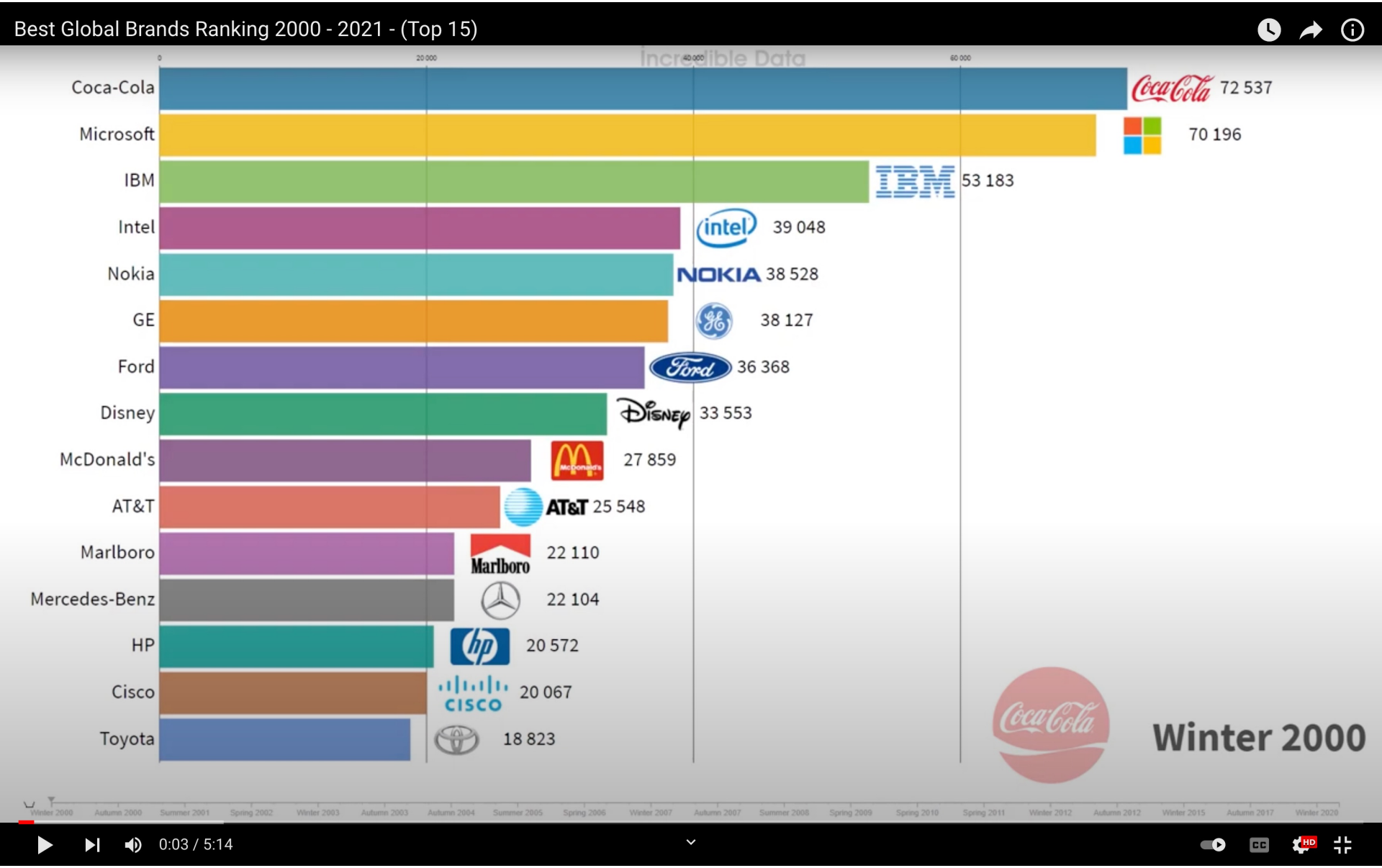
Medical imaging

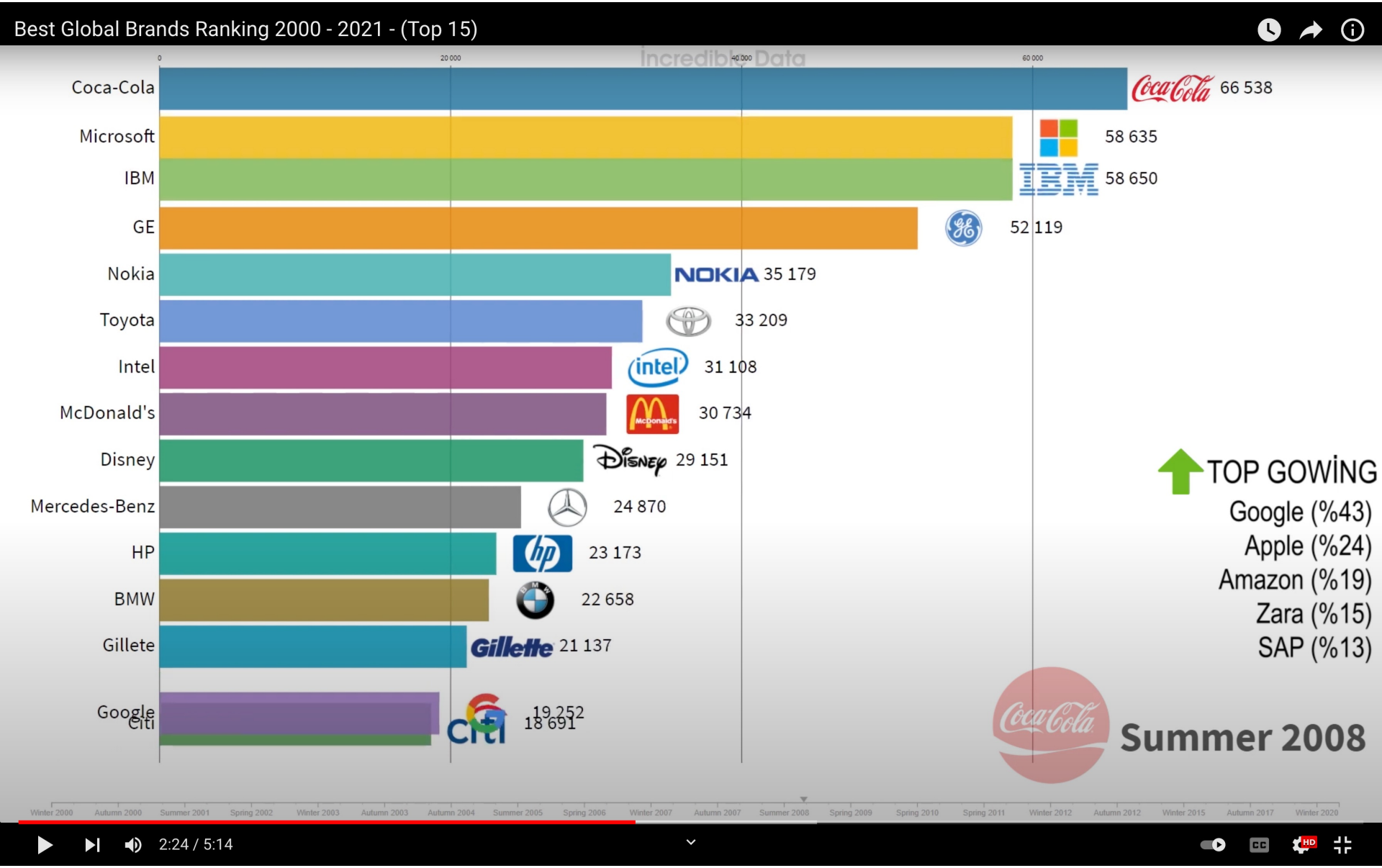
Characteristics of AI tasks

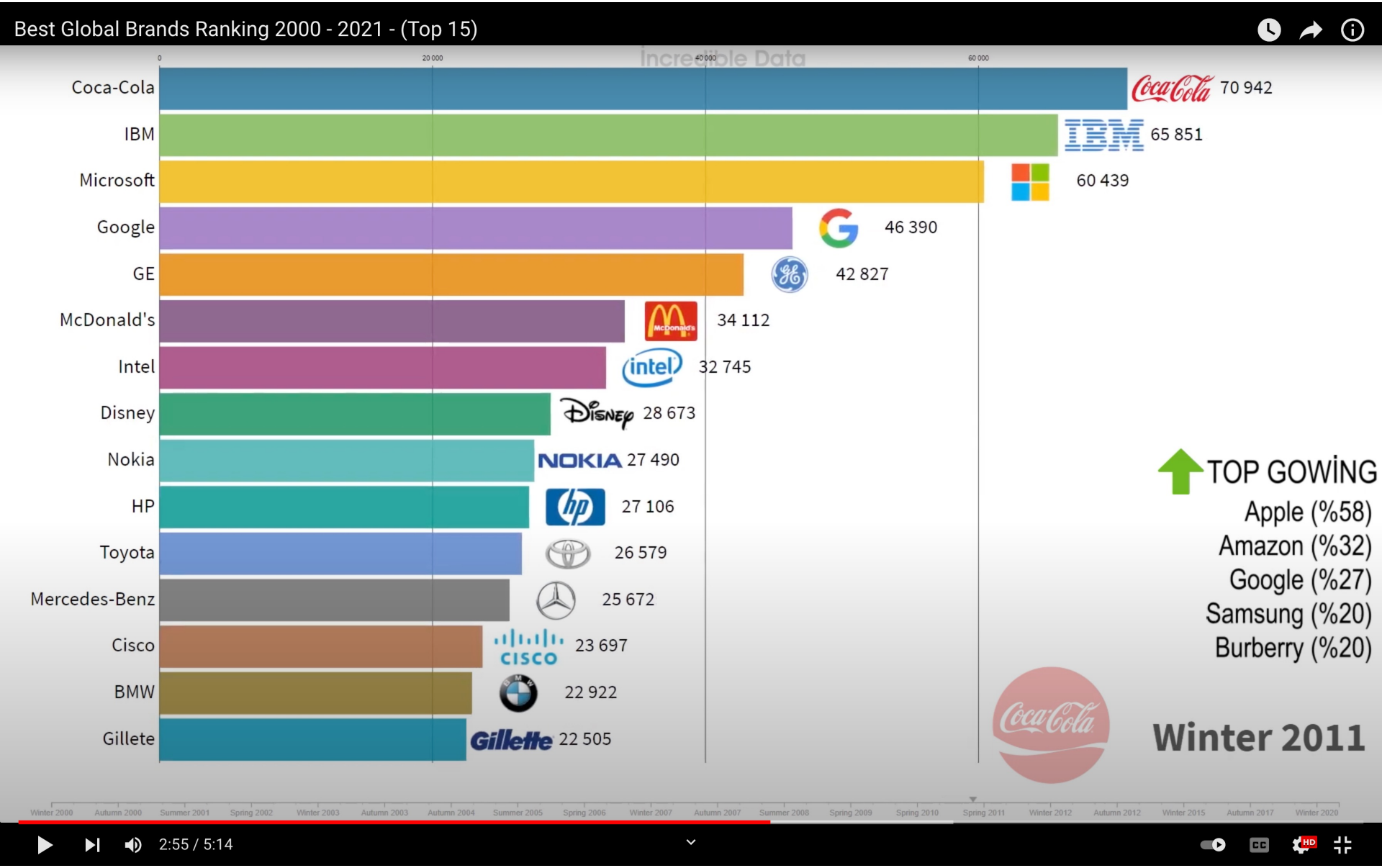
- High societal impact (affect billions of people)
  Diverse (language, games, robotics)
  Complex (really hard)

What accounts for recent successes in AI?

- Faster computers
  - The IBM 704 vacuum tube machine that played chess in 1958 could do about **50,000 calculations per second**
  - Deep Blue could do **50 billion calculations per second** – a million times faster!
- Dominance of statistical approaches, machine learning
- Big data
- Crowdsourcing


Best Global Brands Ranking 2000 - 2021 - (Top 15)
Incredible Data
0
20 000
40 000
60 000
Coca-Cola
72 537
Microsoft
70 196
IBM
53 183
Intel
39 048
Nokia
38 528
GE
38 127
Ford
36 368
Disney
33 553
McDonald's
27 859
AT&T
25 548
Marlboro
22 110
Mercedes-Benz
22 104
HP
20 572
Cisco
20 067
Toyota
18 823
Winter 2000
Winter 2000
Autumn 2000
Summer 2001
Spring 2002
Winter 2003
Autumn 2003
Autumn 2004
Summer 2005
Spring 2006
Winter 2007
Autumn 2007
Summer 2008
Spring 2009
Spring 2010
Spring 2011
Winter 2012
Autumn 2012
Winter 2015
Autumn 2017
Winter 2020
0:03 / 5:14


Best Global Brands Ranking 2000 - 2021 - (Top 15)
IncredibleData
0
20 000
40 000
60 000
Coca-Cola
66 538
Microsoft
58 635
IBM
58 650
GE
52 119
Nokia
35 179
Toyota
33 209
Intel
31 108
McDonald's
30 734
Disney
29 151
Mercedes-Benz
24 870
HP
23 173
BMW
22 658
Gillete
21 137
Google
19 252
Citi
18 691
TOP GOWİNG
Google (%43)
Apple (%24)
Amazon (%19)
Zara (%15)
SAP (%13)
Summer 2008
Winter 2000
Autumn 2000
Summer 2001
Spring 2002
Winter 2003
Autumn 2003
Autumn 2004
Summer 2005
Spring 2006
Winter 2007
Autumn 2007
Summer 2008
Spring 2009
Spring 2010
Spring 2011
Winter 2012
Autumn 2012
Winter 2015
Autumn 2017
Winter 2020
2:24 / 5:14


Best Global Brands Ranking 2000 - 2021 - (Top 15)
Incredible Data
0
20 000
40 000
60 000
Coca-Cola 70 942
IBM 65 851
Microsoft 60 439
Google 46 390
GE 42 827
McDonald's 34 112
Intel 32 745
Disney 28 673
Nokia 27 490
HP 27 106
Toyota 26 579
Mercedes-Benz 25 672
Cisco 23 697
BMW 22 922
Gillette 22 505
TOP GOWİNG
Apple (%58)
Amazon (%32)
Google (%27)
Samsung (%20)
Burberry (%20)
Winter 2011
Winter 2000
Autumn 2000
Summer 2001
Spring 2002
Winter 2003
Autumn 2003
Autumn 2004
Summer 2005
Spring 2006
Winter 2007
Autumn 2007
Summer 2008
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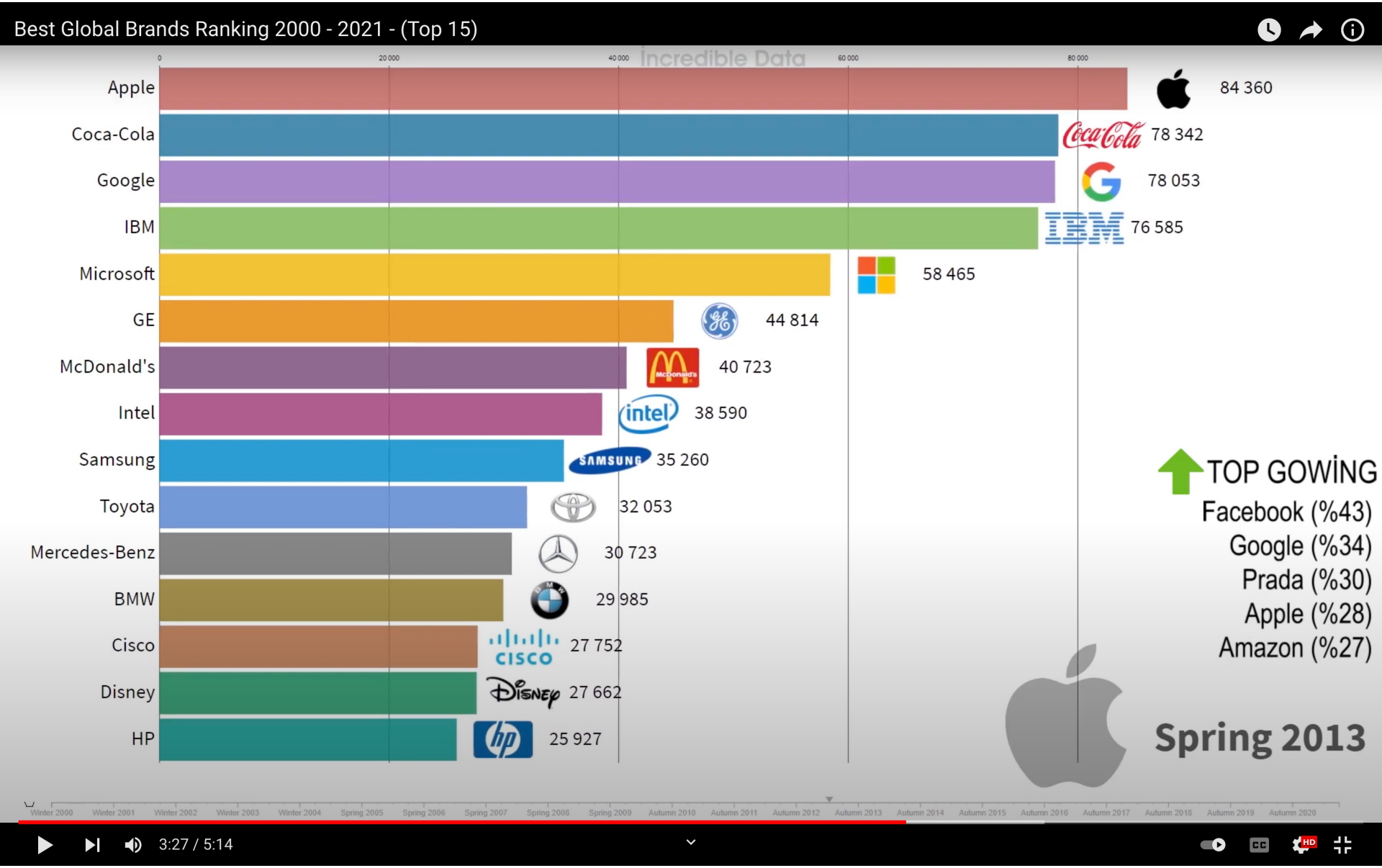
Winter 2015
Autumn 2017
Winter 2020
2:55 / 5:14


Best Global Brands Ranking 2000 - 2021 - (Top 15)
Incredible Data
0
20 000
40 000
60 000
80 000
Apple
84 360
Coca-Cola
78 342
Google
78 053
IBM
76 585
Microsoft
58 465
GE
44 814
McDonald's
40 723
Intel
38 590
Samsung
35 260
Toyota
32 053
Mercedes-Benz
30 723
BMW
29 985
Cisco
27 752
Disney
27 662
HP
25 927
TOP GOWİNG
Facebook (%43)
Google (%34)
Prada (%30)
Apple (%28)
Amazon (%27)
Spring 2013
Winter 2000
Winter 2001
Winter 2002
Winter 2003
Winter 2004
Spring 2005
Spring 2006
Spring 2007
Spring 2008
Spring 2009
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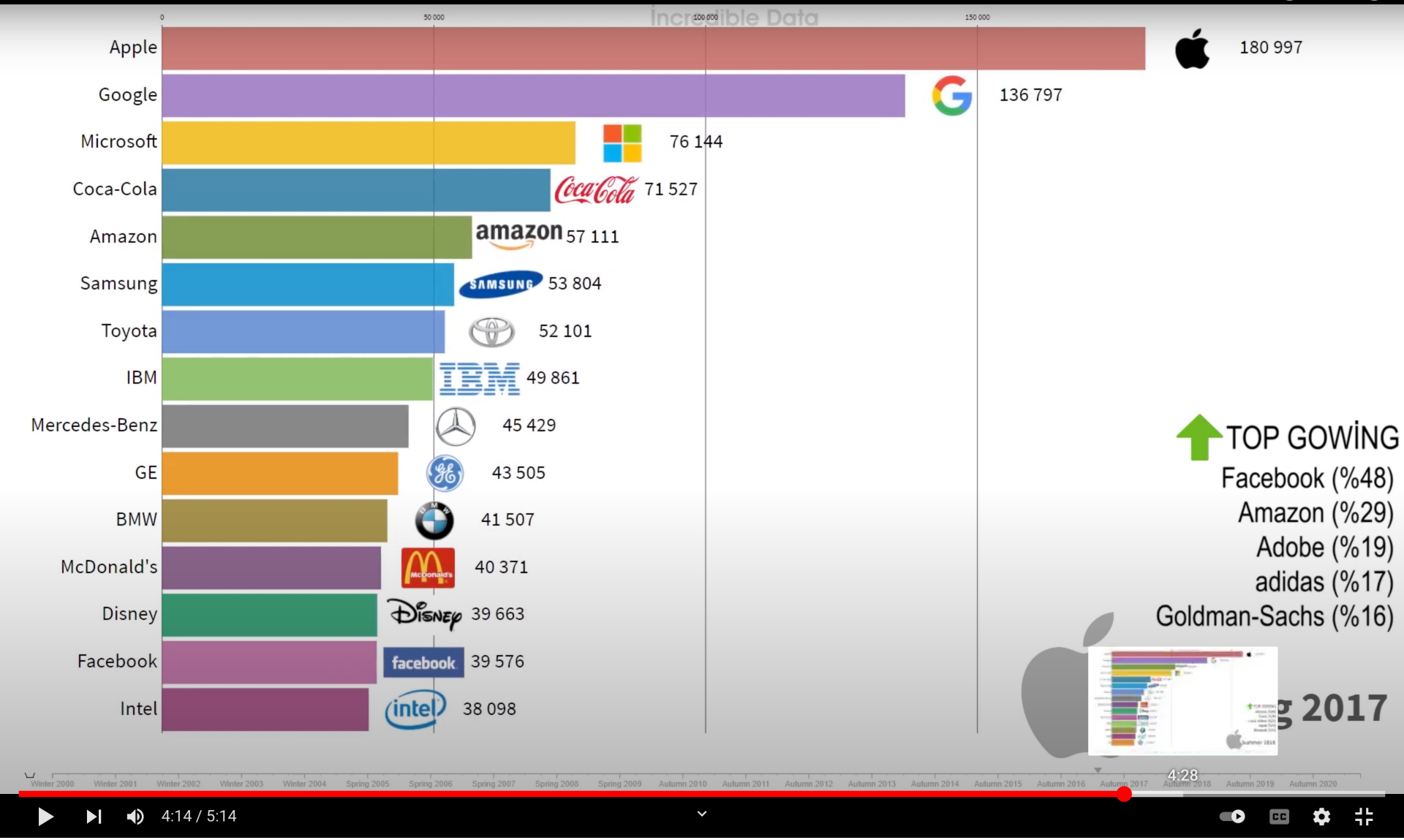
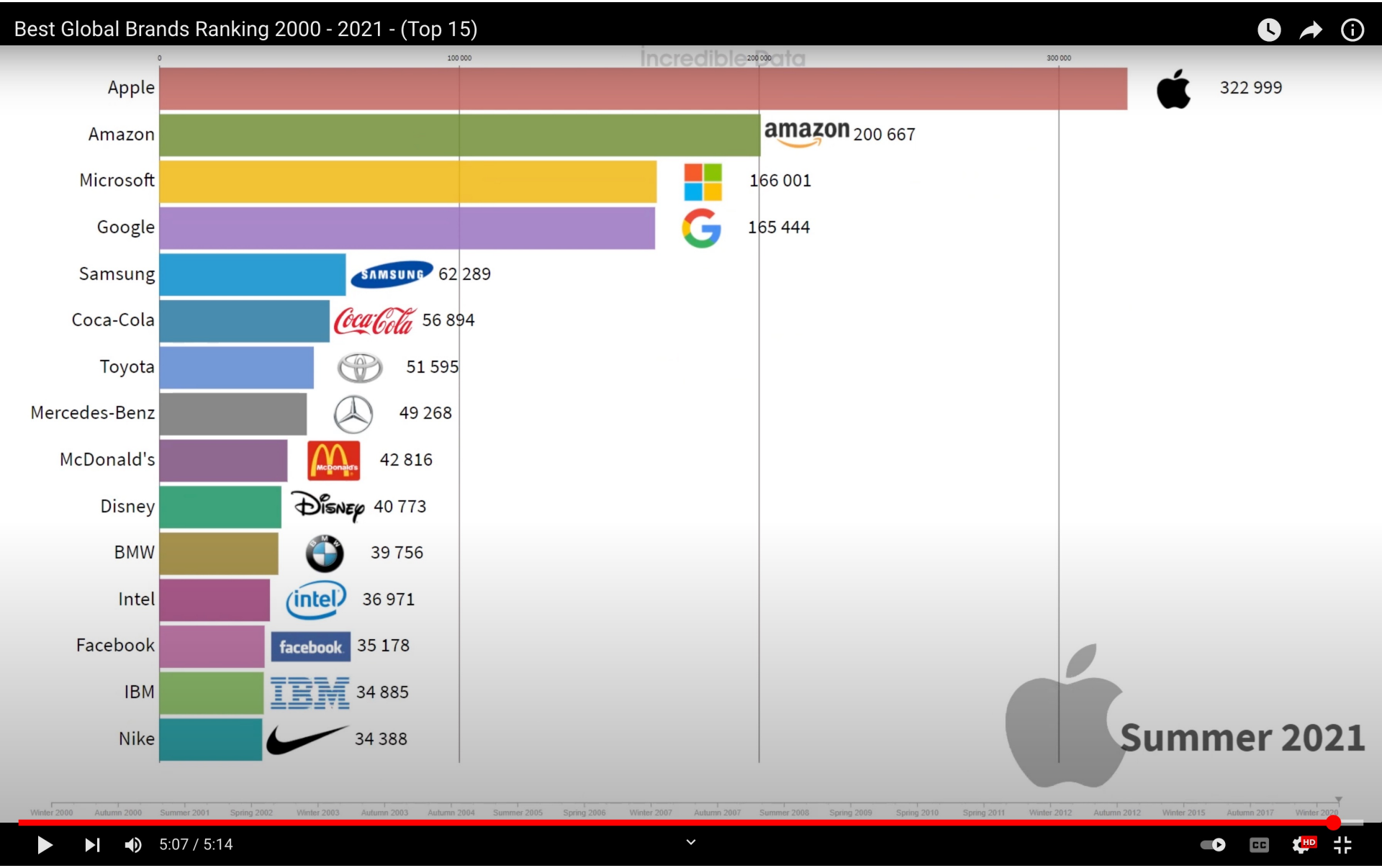
Autumn 2018
Autumn 2019
Autumn 2020
3:27 / 5:14

Best Global Brands Ranking 2000 - 2021 - (Top 15)



4:28

4:14 / 5:14


Best Global Brands Ranking 2000 - 2021 - (Top 15)
0
100 000
200 000
300 000
Apple
322 999
Amazon
200 667
Microsoft
166 001
Google
165 444
Samsung
62 289
Coca-Cola
56 894
Toyota
51 595
Mercedes-Benz
49 268
McDonald's
42 816
Disney
40 773
BMW
39 756
Intel
36 971
Facebook
35 178
IBM
34 885
Nike
34 388
Summer 2021
Winter 2000
Autumn 2000
Summer 2001
Spring 2002
Winter 2003
Autumn 2003
Autumn 2004
Summer 2005
Spring 2006
Winter 2007
Autumn 2007
Summer 2008
Spring 2009
Spring 2010
Spring 2011
Winter 2012
Autumn 2012
Winter 2015
Autumn 2017
Winter 2020
5:07 / 5:14

January 2017

100 STARTUPS USING ARTIFICIAL INTELLIGENCE TO TRANSFORM INDUSTRIES

CONVERSATIONAL AI/ BOTS

MindMeld, semanticmachines, Maluuba, Mobvoi 出门问问, KITT.AI, snips, clara, AUTOMAT, X.

VISION

clarifai, Chronocam, Orbital Insight, pilot.ai, captricity, GROKSTYLE

AUTO

nuTonomy, drive.ai, AIMOTIVE, nauto, nexar, ZOOX

ROBOTICS

UBTECH Dream With Robot, anki, Rokid, dispatch

CYBERSECURITY

CYLANCE, sift science, sparkcognition, deepinstinct, Shift Technology, DARKTRACE

BUSINESS INTELLIGENCE & ANALYTICS

DataRobot, TRIFACTA, rapidminer, tamr, SIGOPT, Paxata, context relevant, Dataminr, CrowdFlower, logz.io

AD, SALES, CRM

TalkIQ, deep gram, [PERSADO], Qppier, CHORUS, INSIDE SALES.COM, drawbridge, DigitalGenius Human+AI Customer Service, RESCI

CORE AI

affectiva, PETUUM, ALGORITHMIA, H2O.ai, loop.ai Labs COGNITIVE COMPUTING, CognitiveScale THE COGNITIVE CLOUD COMPANY, sentient, Voyager Labs, Numenta, SI SCALED INFERENCE, skymind, vicarious, Digital Reasoning, bonsai, AYASDI

HEALTHCARE

freenome, CLOUD MEDX, zebra MEDICAL VISION, enlitic, twoXAR, iCarbonX 碳云智能, Atomwise Better medicines faster., deep genomics, BenevolentAI, Lunit, babylon

THE INNOVATION SUMMIT
CBINSIGHTS

TEXT ANALYSIS/ GENERATION

textio, fido.ai, cortical.io, NarrativeScience Tell the Stories Hidden in Your Data

IOT/IIOT

nanit, KONUX, VERDIGRIS, SIGHT MACHINE Manufacturing Analytics

COMMERCE

bloomreach, mode.ai

FINTECH & INSURANCE

CAPE ANALYTICS, KENSHO, NUMERAI, alphasense, Kasisto

OTHER

GIGSTER, prospera, Citrine, BLUE RIVER TECHNOLOGY, ROSS, zymergen, Descartes Labs, gradescope, talla

https://www.cbinsights.com/research/artificial-intelligence-top-startups/

MACHINE INTELLIGENCE 3.0

ENTERPRISE INTELLIGENCE

VISUAL
Orbital Insight, planet, clarifai, DEEP VISION, cortica, Iglocian, SPACE_KNOW, Captricity, netra, deepomatic

AUDIO
Gridspace, TalkIQ, nexidia, twilio, CAPIO, Expect Labs, Clover, Mobvoi, Qurious.AI, popup archive

SENSOR
PREDIX, C3 IoT, MAANA, Sentenai, PLANET OS, UPTAKE, IMUBIT, Preferred Networks, thingworx, KONUX, Alluvium

INTERNAL DATA
PRIMER, IBM WATSON, Cycorp, Palantir, ARIMO, Alation, sapho, Outlier, Digital Reasoning

MARKET
mattermark, Quid, DataFox, PREMISE, Bottlenose, MOTIVA, enigma, CB INSIGHTS, Tracxn, predata

ENTERPRISE FUNCTIONS

CUSTOMER SUPPORT
DigitalGenius, Kasisto, ELOQUENT, Wisedo, ACTIONIQ, zendesk, Preact, CLARABRIDGE

SALES
collective[i], 6sense, fuse|machines, AVISO, salesforce, INSIDE SALES.COM, clari, Zensight

MARKETING
MINTIGO, Lattice, RADIUS, LiftIgniter, [PERSADO], brightfunnel, retention SCIENCE, COGNICOR, AIRPR, msg.ai

SECURITY
CYLANCE, DARKTRACE, ZIMPERIUM, deepinstinct, Sentinel, DEMISTO, graphistry, drawbridge, SignalSense, AppZen

RECRUITING
textio, entelo, Wade & Wendy, hi, unitive, SpringRole, GIGSTER, HireVue

AUTONOMOUS SYSTEMS

GROUND NAVIGATION
drive.ai, AdasWorks, ZOOX, MOBILEYE, UBER, Google, TESLA, nuTonomy, Auro Robotics

AERIAL
SKYDIO, SHIELD AI, Airware, dji, LILY, DroneDeploy, pilot.ai, SKYCATCH

INDUSTRIAL
JAYBRIDGE, OSARO, CLEARPATH, fetch, KINDRED, HARVEST, rethink robotics

AGENTS

PERSONAL
amazon alexa, Cortana, Allo, facebook, Siri, Replika

PROFESSIONAL
butter.ai, pogo, SKIPFLAG, clara, x.ai, slack, talla, Zoom.ai, sudo

INDUSTRIES

AGRICULTURE
BLUE RIVER, mavrx, tule, TRACE GENOMICS, Pivot Bio, TerrAvion, AGRI-DATA, Descartes Labs, ubie, abundant ROBOTICS

EDUCATION
KNEWTON, volley, gradescope, CTI, coursera, UDACITY, altschool

INVESTMENT
Bloomberg, sentient, SENTIUM, KENSHO, alphasense, Dataminr, CEREBELLUM CAPITAL, Quandl

LEGAL
blueJ, BEAGLE, Everlaw, RAVEL, Sseal, ROSS, LEGAL ROBOT

LOGISTICS
NAUTO, Acerta, PRETECKT, Routific, clearmetal, MARBLE, PITSTOP

INDUSTRIES CONT'D

MATERIALS
zymergen, Citrine, Eigen Innovations, SIGHT MACHINE, GINKGO BIOWORKS, nanotronics, CALCULARIO

RETAIL FINANCE
TALA, zest finance, Lendo, earnest, affirm, MIRADOR, wealthfront, Betterment

HEALTHCARE

PATIENT
PULSE, CareSkore, ZEPHYR HEALTH, IBM Watson Health, Onc.ora, SENTRIAN, Atomwise, Numerate

IMAGE
BUTTERFLY, 3SCAN, ARTERYS, enlitic, BAYLABS, imagia, Google DeepMind

BIOLOGICAL
iCarbonX, color, GRAIL, deep genomics, RECURSION, LUMINIST, Numerate, Atomwise, verily, WHOLE BIOME

TECHNOLOGY STACK

AGENT ENABLERS
OCTANE.AI, howdy, MaluubA, KITT.AI, OpenAI Gym, Kasisto, AUTOMAT, semanticmachines

DATA SCIENCE
DOMINO, SPARKBEYOND, rapidminer, kaggle, DataRobot, ŷhat, AYASDI, data iku, seldon, yseop, bigml

MACHINE LEARNING
CognitiveScale, GoogleML, context relevant, Cycorp, HyperScience, narralogics, minds.ai, H_2O.ai, SCALED INFERENCE, sparkcognition, Loop, GEOMETRIC INTELLIGENCE, deepsense.io, reactive, skymind, bonsai

NATURAL LANGUAGE
agolo, AYLIEN, LEXALYTICS, Narrative Science, loop.ai Labs, spaCy, LUMINOSO, cortical.io, MonkeyLearn

DEVELOPMENT
SIGOPT, HyperOpt, fuzzyio, pkite, rainforest, lobe, Anodot, Signifai, LAYER 6 AI, bonsai

DATA CAPTURE
CrowdFlower, diffbot, CrowdAI, import.io, Paxata, DATASIFT, amazon mechanical turk, enigma, WorkFusion, DATALOGUE, TRIFACTA, parsehub

OPEN SOURCE LIBRARIES
Keras, Chainer, CNTK, TensorFlow, Caffe, H2O, DEEPLEARNING4J, theano, torch, DSSTNE, Scikit-learn, AzureML, neon, MXNet, DMTK, Spark, PaddlePaddle, WEKA

HARDWARE
KNUPATH, TENSTORRENT, Cirrascale, NVIDIA, intel nervana, Movidius, tensilica, GoogleTPU, 10^{26} Labs, Qualcomm, Cerebras, Isosemi

RESEARCH
OpenAI, maisense, ELEMENT AI, vicarious, KNOGGIN, Numenta, Kimera Systems, Cogitai

shivonzilis.com/MACHINEINTELLIGENCE · Bloomberg BETA

Historical themes

- Boom and bust cycles
  - Periods of (unjustified) optimism followed by periods of disillusionment and reduced funding
- Silver bulletism (Levesque, 2013):
  - *"The tendency to believe in a silver bullet for AI, coupled with the belief that previous beliefs about silver bullets were hopelessly naïve"*
- Image problems
  - AI effect: As soon as a machine gets good at performing some task, the task is no longer considered to require much intelligence
  - AI as a threat?

Will robots take our jobs? Experts can't decide

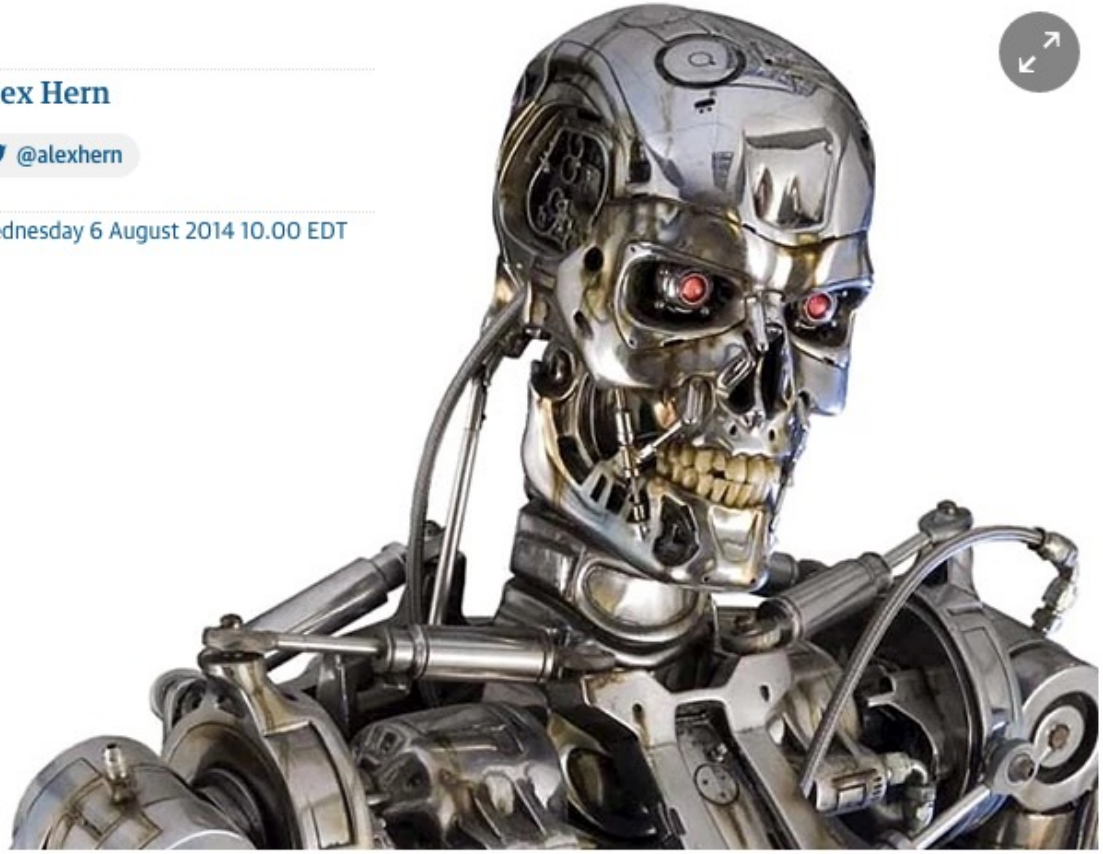
theguardian

A new report from Pew Research brings together almost 2,000 experts to comprehensively assess the effect of robots on the workplace

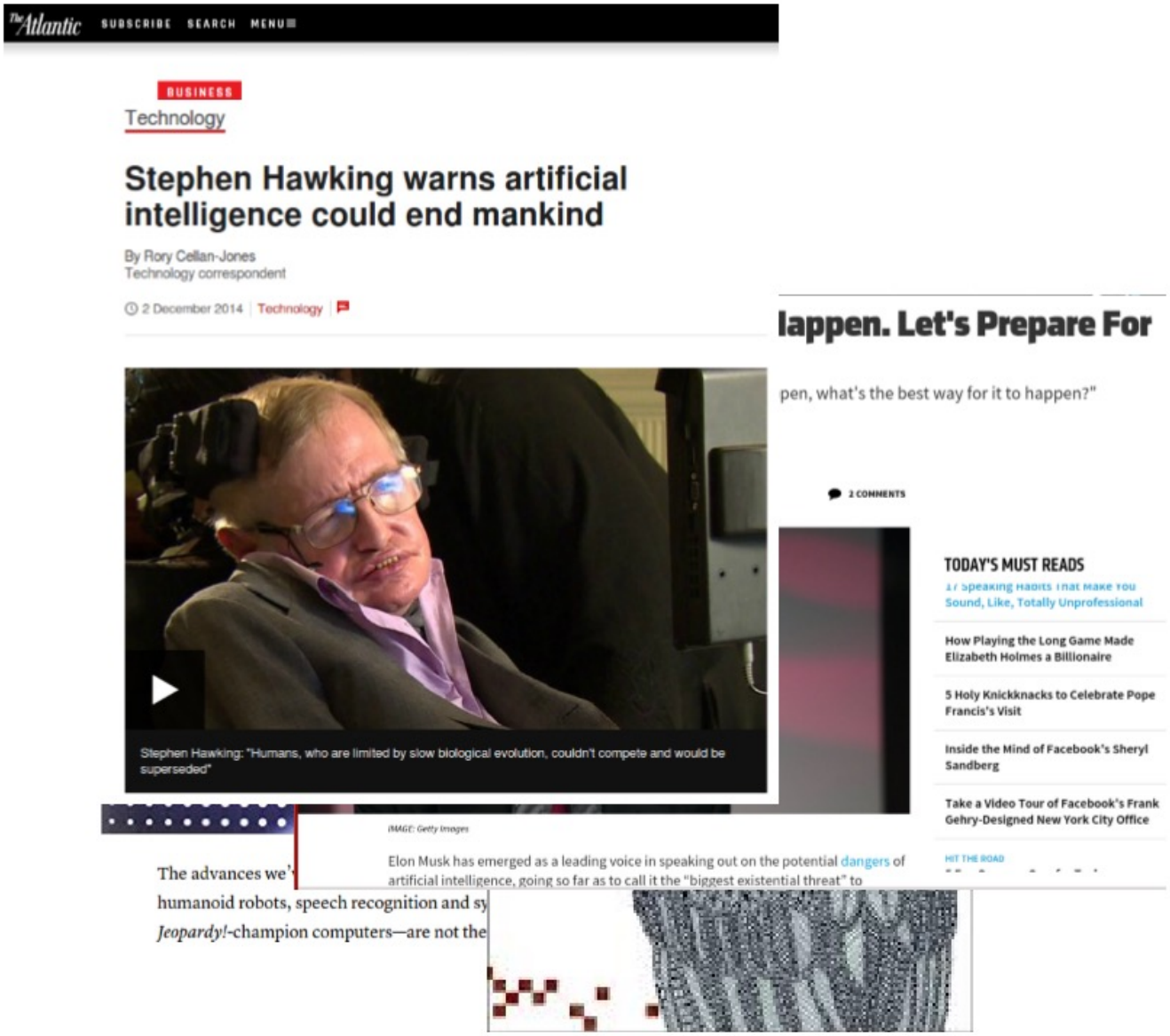
Alex Hern

@alexhern

Wednesday 6 August 2014 10.00 EDT



http://www.theguardian.com/technology/2014/aug/06/robots-jobs-artificial-intelligence-pew



According to many articles and popular books, it seems like human-level AI is right around the corner, for better or for worse.

AI weapons are a threat to humanity, warn Hawking, Musk and Wozniak

by Jason Murdock 28 Jul 2015

The rush to develop autonomous weapons will cause a global arms race, according to an open letter signed by over 1,000 artificial intelligence (AI) researchers, academics and computer scientists.

The letter has been signed by high-profile figures including physicist Stephen Hawking, Tesla chief executive Elon Musk and Apple co-founder Steve Wosniak, and argues AI has reached a point where deployment of robotic weapons is feasible within years.

Autonomous weapons are described in the letter as those that "select and engage targets without human intervention".

This includes, for example, armed quadcopters searching and eliminating targets that meet pre-defined criteria, but not remote controlled missiles or piloted drones that still have human involvement.

The letter was presented at this year's International Joint Conferences on AI in Buenos Aires, and argues that there are advantages to replacing human soldiers with machines but that doing so would "lower the threshold" for warfare.

http://www.v3.co.uk/v3-uk/news/2419567/ai-weapons-are-a-threat-to-humanity-warn-hawking-musk-and-wozniak

https://deepmind.com/research/alphago/

Videos

- http://www.analyticsvidhya.com/blog/2015/11/7-watch-documentaries-statistics-machine-learning/
- https://dotsub.com/view/24206765-772f-4f6d-a040-45477beb4b9c
- https://www.youtube.com/watch?v=VBceREwF7SA
- https://www.youtube.com/watch?v=J71XWkh80nc
- https://www.youtube.com/watch?v=ysU56JzBjTY&list=PLD261577512C9F720&index=1

Reading Assignments

- Alan Turing, Computing Machinery and Intelligence, (1950).
- Herbert A. Simon, The Arhitecture of Complexity, In Proc. The American Philosophical Society, 196(6), (1962).
- David Marr, Artificial Intelligence -- A Personal View, MIT AIM 355, (1976).
- Rodney Brooks, Intelligence without representation, Artificial Intelligence, 47 (1-3): 139–159, (1991).
- Randall Davis, Howard Shrobe, Peter Szolovits, What Is a Knowledge Representation?, AI Magazine, 14(1):17-33, (1993).