AI and Machine Learning Demystified

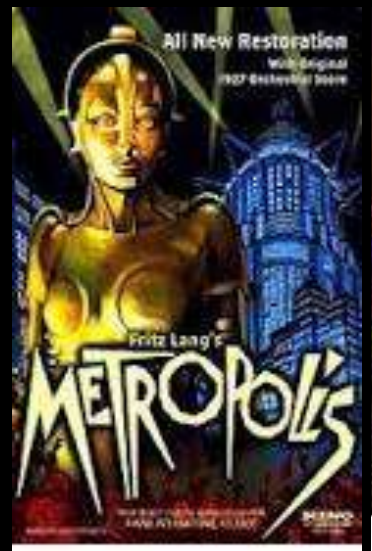
Carol Smith @carologic
Midwest UX 2017, Cincinnati, Ohio
October 13, 2017

AI is when Machines

- Exhibit intelligence
- Perceive their environment
- Take actions/make decision to maximize chance of success at a goal

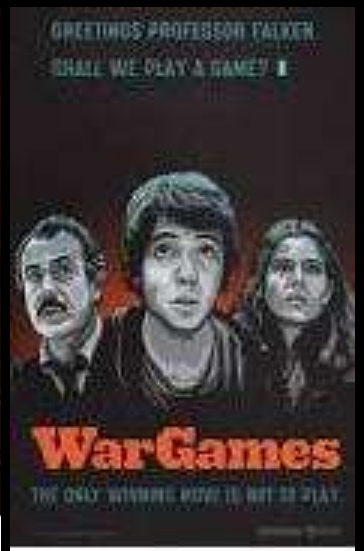
NAO’s New Job as “Connie” the concierge at Hilton Hotels
https://developer.softbankrobotics.com/us-en/showcase/nao-ibm-create-new-hilton-concierge

In the extreme…



Metropolis
1927

2001: A Space Odys…
1968



WarGames
1983

Blade Runner
1982

The Terminator
1984

The Matrix
1999

Ex Machina
2015

WIRED Technology | Science | Culture | Video | Reviews | Magazine

WIRED Opinion

Elon Musk is wrong. The AI singularity won't kill us all

"Most people working in AI have a healthy **skepticism for the idea of the singularity**.
We know how **hard it is to get even a little intelligence into a machine**, let alone enough to achieve recursive self-improvement."

—

Wednesday 20 September 2017

http://www.wired.co.uk/article/elon-musk-artificial-intelligence-scaremongering

Remember: “We can unplug the machines!”

Grady Booch, Scientist, philosopher, IBM’er https://www.ted.com/talks/grady_booch_don_t_fear_superintelligence

Cognitive computers are

- Made with algorithms
- Knowledgeable ONLY about what taught
- Control ONLY what we give them control of
- Aware of nuances and can continue to learn more

Cognitive computers (algorithms) can…

- Do very boring work for you
- Often make better, more consistent decisions than humans
- Be efficient, won't get tired

Q&A: Should artificial intelligence be legally required to explain itself?
By Matthew Hutson, May. 31, 2017. Interview with Sandra Wachter, data ethics researcher at Univ. of Oxford and Alan Turing Institute.
http://www.sciencemag.org/news/2017/05/qa-should-artificial-intelligence-be-legally-required-explain-itself

Exhibit intelligence
- transfer human concepts and relationships

Photo by sunlightfoundation
https://www.flickr.com/photos/sunlightfoundation/2385174105

Dependent on Experts

- Subject Matter Experts (SME's) Availability
  - Lawyers
  - Machinists
  - Insurance adjusters
  - Physicians
- Usually not experienced in machine learning
  - Need close collaboration with those making algorithms

Number Five “Needs Input”

Short Circuit (1986 film) - Ally Sheedy and Number Five
https://en.wikipedia.org/wiki/Short_Circuit_(1986_film)

Content is annotated by experts

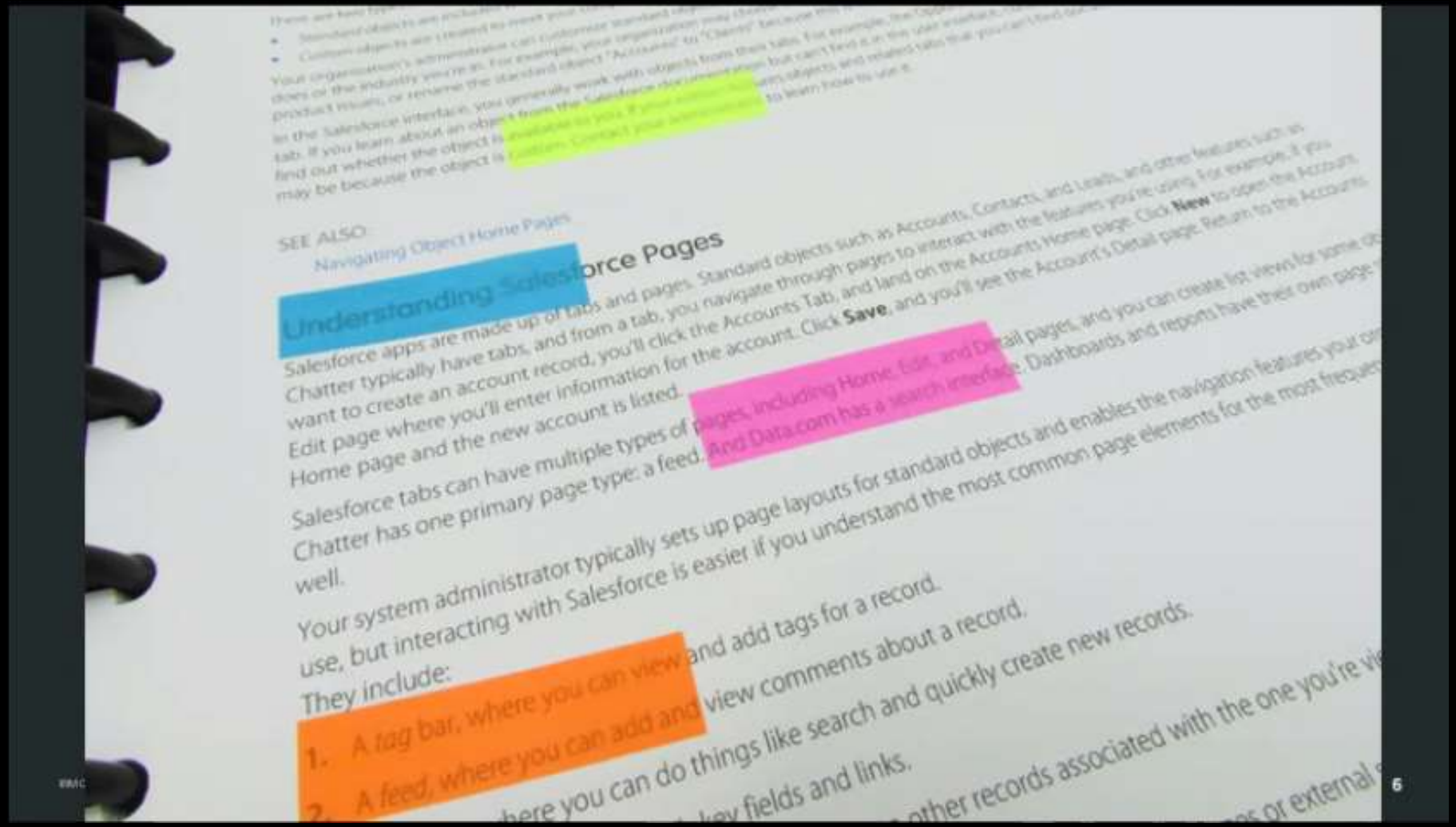


Image created by Angela Swindell,
Visual Designer, Watson Knowledge Studio

AI is taxonomies and ontologies coming to life (NOT like humans learn)

Photo: https://commons.wikimedia.org/wiki/File:Baby_Boy_Oliver.jpg

Enormous amount of work.

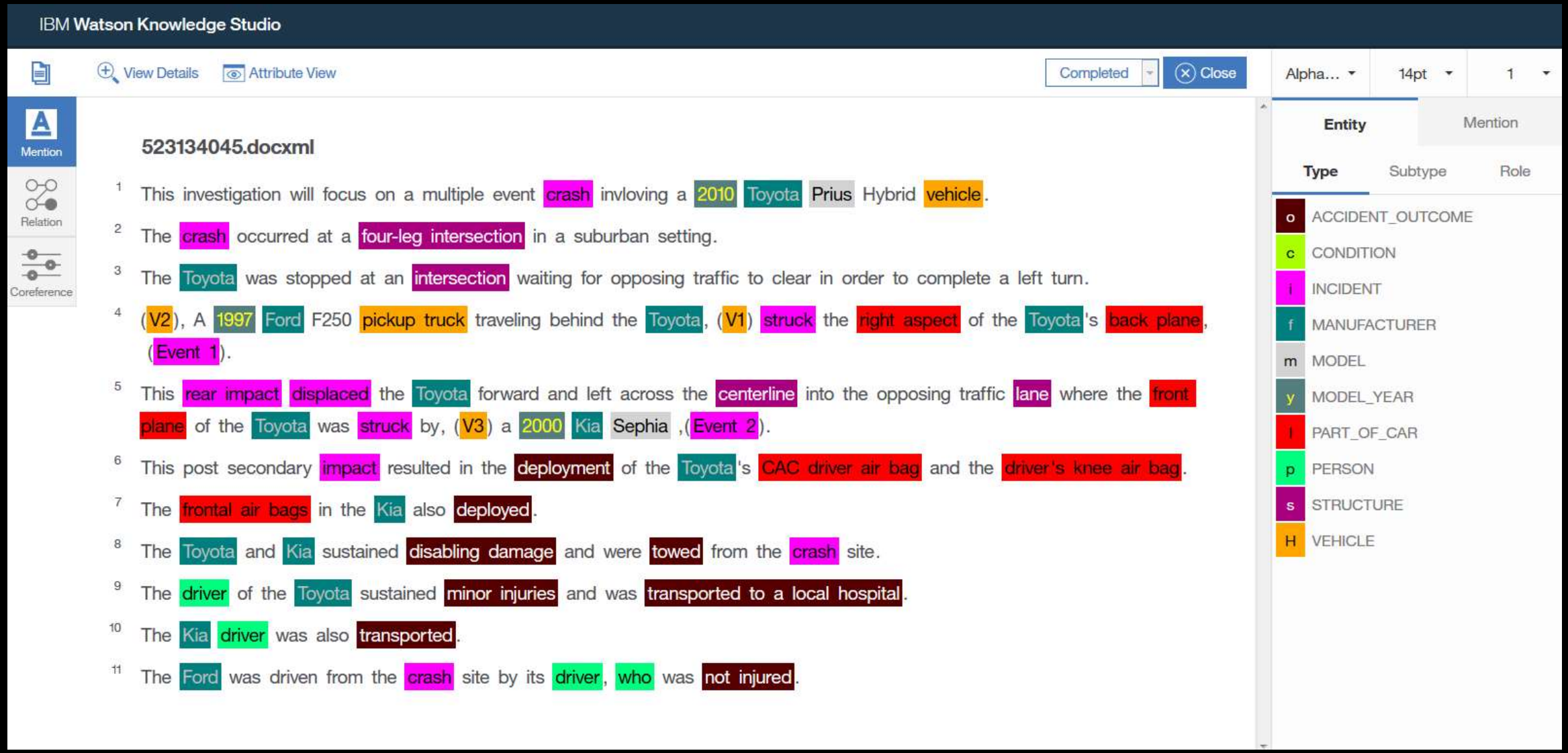
Only as good as data and time spent improving it

Biased based on what it taught

Creating an AI requires

- Algorithms
- Documents
- Ground truth (annotation)
- Teaching
- Iteration
- Repeat

Supervised (by a human) Machine Learning



Watson Knowledge Studio

https://www.ibm.com/us-en/marketplace/supervised-machine-learning

Knowledge and Accuracy

- How important is accuracy?
- Consider a reverse card sorting exercise

Image: Gerry Gaffney. (2000) What is Card Sorting? Usability Techniques Series, Information & Design. http://www.infodesign.com.au/usabilityresources/design/cardsorting.asp

Across industries – priority of accuracy varies

Goal is saving time

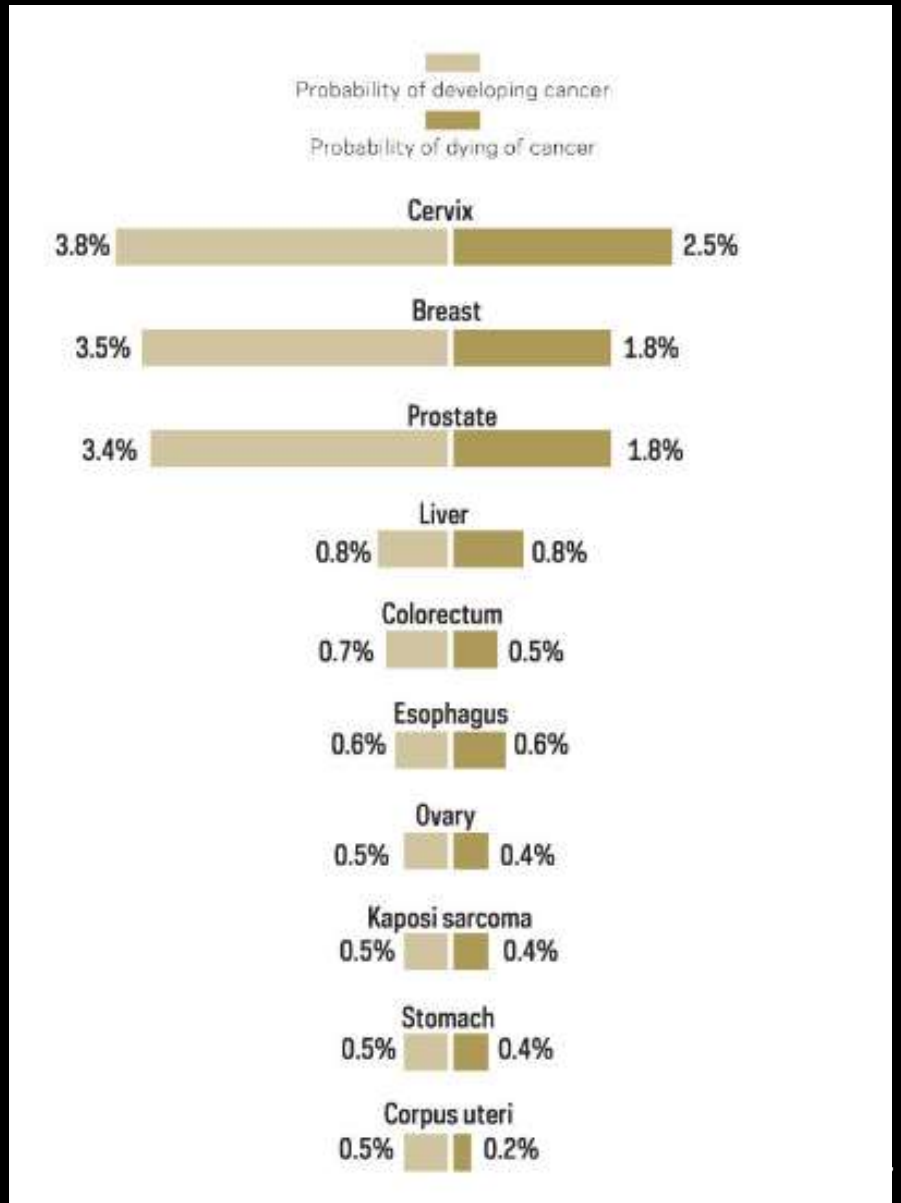
Machine learning creates more highly trained specialists

Not an “all knowing” being

Cancer Burden in Sub-Saharan Africa

Risk of getting cancer
and
Risk of Dying

~same



The Cancer Atlas http://canceratlas.cancer.org/the-burden/

What if we could reduce the burden?

- Bring taxonomies and ontologies to life
- Broaden access to evidence based medicine
- More informed treatment decisions

AI actions for success

- Example: Healthcare
  - AI analyzes data (treatment options, similar patients)
  - Goal: Provide quick, evidence based options
  - Physician selects treatment for patients based on situation

- AI success is helping physician (not replacing)

Examples of AI and Cognitive Computing

Consider for each example

- What intelligence does the system need?
- What is the AI perceiving in their environment?
- What actions are taken to maximize chance of success at goal?

Strategic Games

- 1997 Chess, IBM
- 2016 Go, Google

- Intelligence?
- Perception?
- Action/Decision?

Floor goban, 2007, By Goban1
https://commons.wikimedia.org/wiki/File:FloorGoban.JPG

Understanding human speech

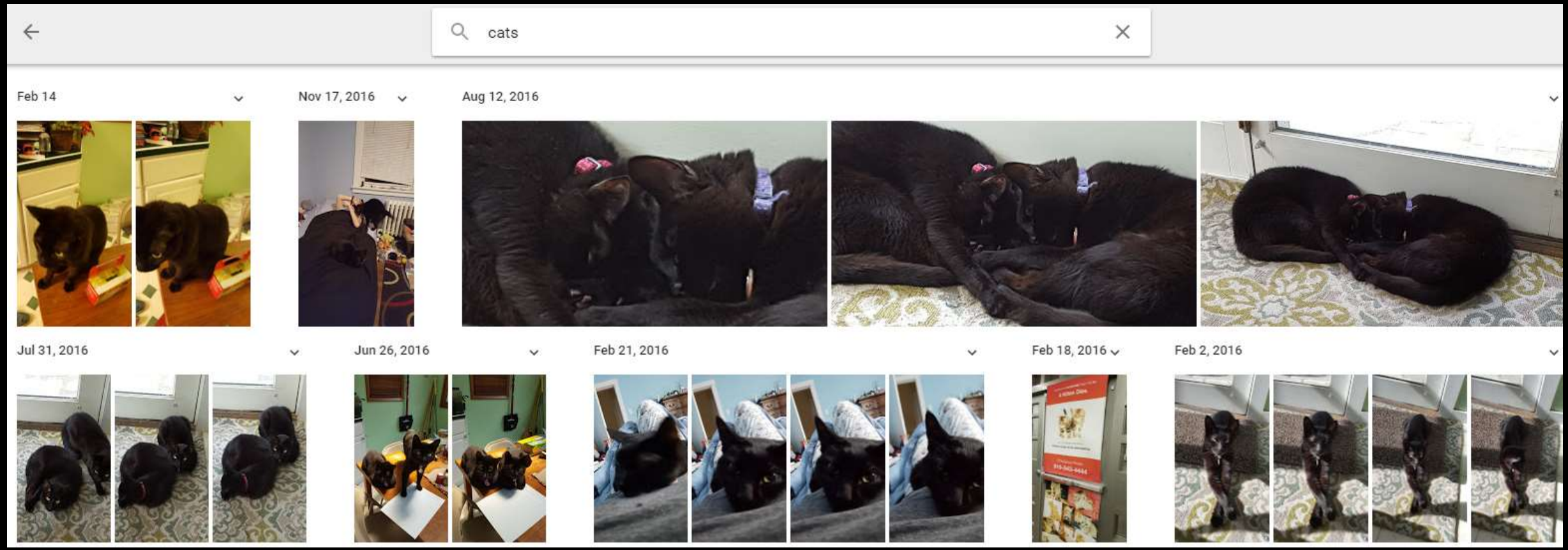
- Watson developed for quiz show Jeopardy!
- Won against champions in 2011 for $1 million

Video: “IBM's Watson Supercomputer Destroys Humans in Jeopardy! Engadget” https://www.youtube.com/watch?v=WFR3lOm_xhE
Watson definition: https://en.wikipedia.org/wiki/Watson_(computer)

Decision Making: Self Driving (autonomous) vehicles

Junior, a robotic Volkswagen Passat, in a parking lot at Stanford University
24 October 2009, By: Steve Jurvetson
https://en.wikipedia.org/wiki/File:Hands-free_Driving.jpg

Image Recognition – Google Photos

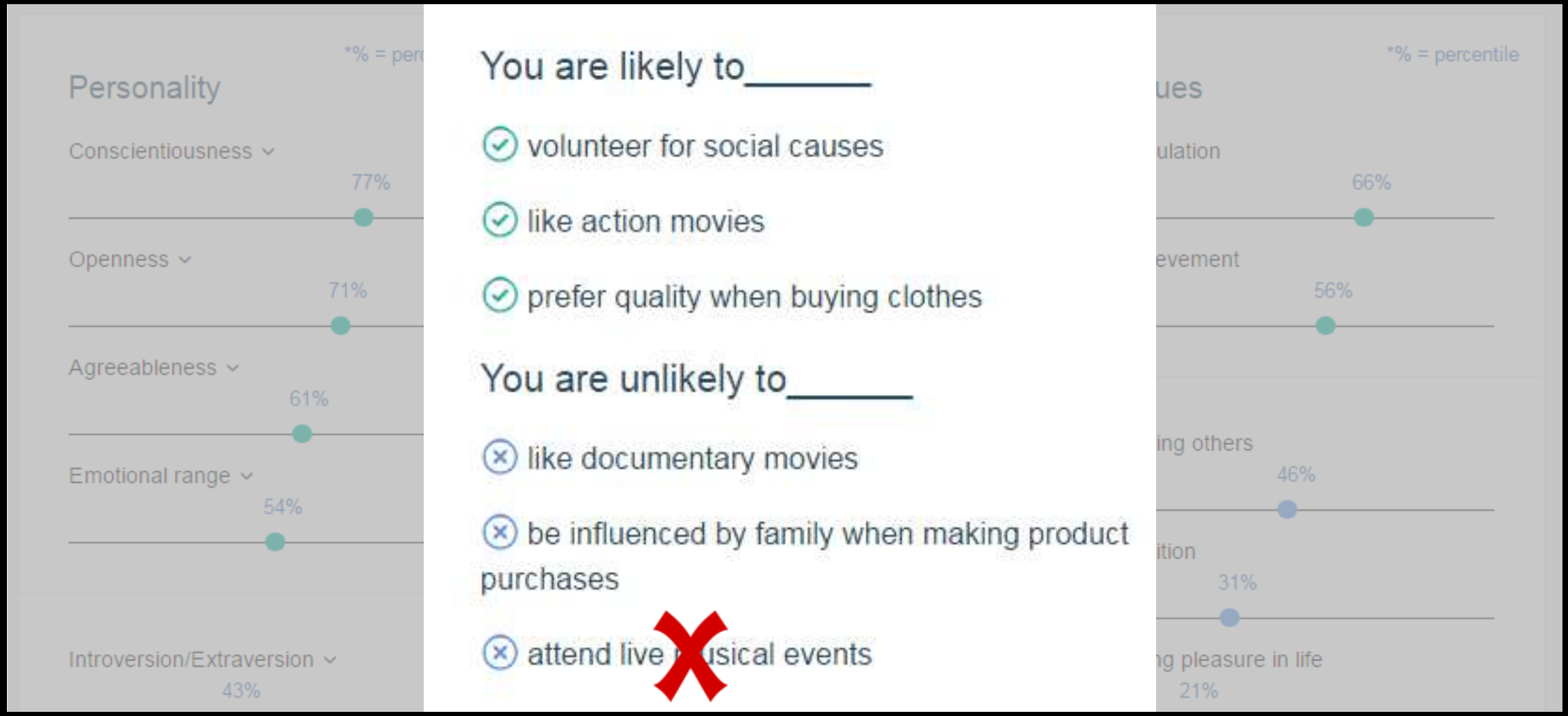


Carol's search for "cats" on her Google Photos account.

Sound recognition: Labeling of birdsongs

“Comparison of machine learning methods applied to birdsong element classification”
by David Nicholson. Proceedings of the 15th Python in Science Conference (SCIPY 2016).
http://conference.scipy.org/proceedings/scipy2016/pdfs/david_nicholson.pdf
Photo by Gallo71 (Own work) [Public domain], via Wikimedia Commons https://commons.wikimedia.org/wiki/File%3ARbruni.JPG

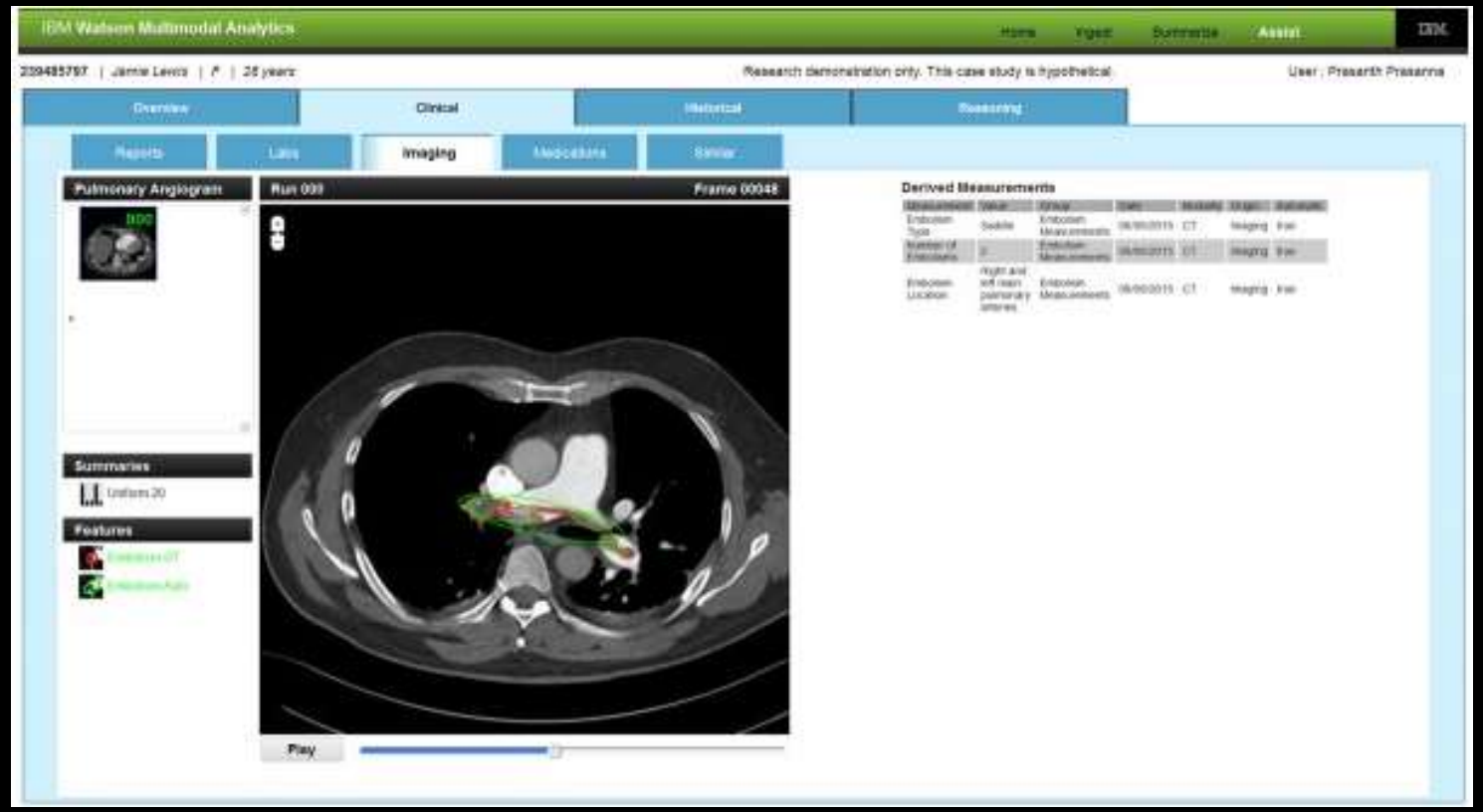
Analyzing Text: Personality of @carologic (not quite)



Personality Insights applied to @Carologic on Twitter
IBM Watson Developer Cloud: https://personality-insights-livedemo.mybluemix.net/

Automating Repetitive Work

- Automated Radiologist highlights possible issues
- Radiologist confirms



IBM's Automated Radiologist Can Read Images and Medical Records, MIT Technology Review
https://www.technologyreview.com/s/600706/ibms-automated-radiologist-can-read-images-and-medical-records/

88,000 retina images

- Watson knows what a healthy eye looks like
- Glaucoma is the second leading cause of blindness worldwide
  - –50% of cases go undetected

Seeing is preventing.
https://twitter.com/IBMWatson/status/844545761740292096

Chatbots for Easy ordering

- Order via text, email, Facebook Messenger or with a Slackbot
- Cognitive pieces:
  - –Speech-to-text
  - –Chat
  - –API’s in backend

Story: http://www.businesswire.com/news/home/20161025006273/en/Staples%E2%80%99-%E2%80%9CEasy-Button%E2%80%9D-Life-IBM-Watson
Photo: Easy Button from Staples: http://www.staples.com/Staples-Easy-Button/product_606396

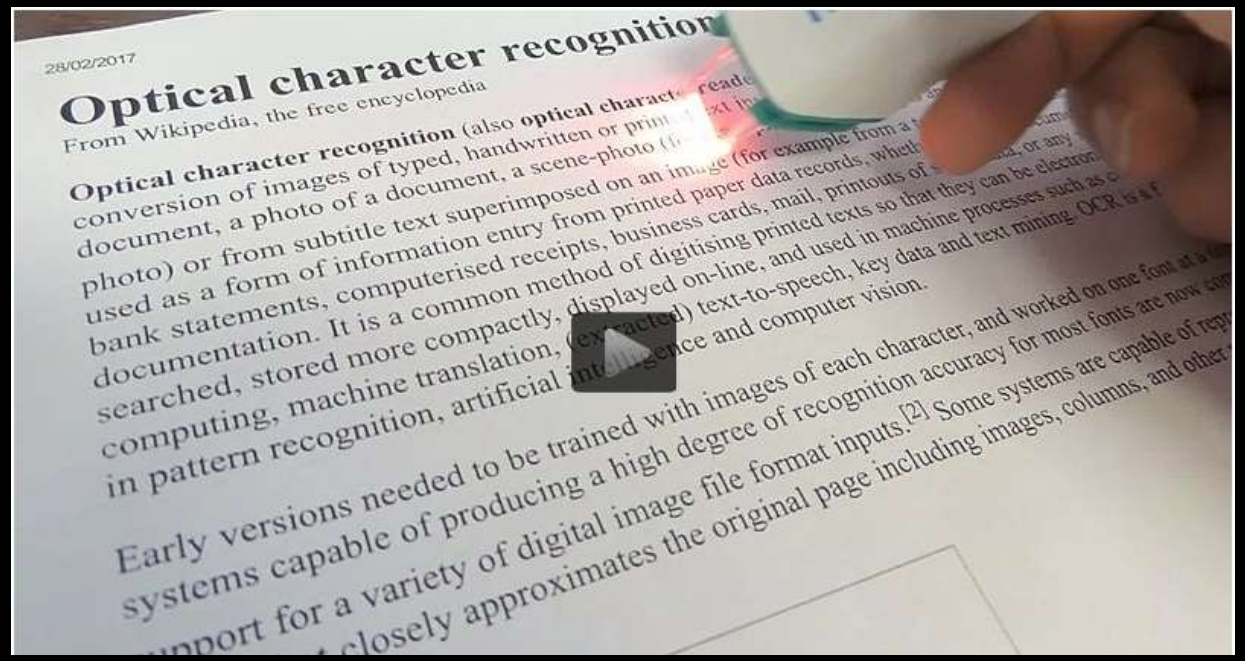
Chatbots – not really AI, yet

- Mapping Q & A
  - –Expected language
  - –Appropriate automated responses
  - –When to escalate to a human

Images: https://www.pexels.com/photo/close-up-of-mobile-phone-248512/
https://www.amazon.com/Amazon-Echo-Bluetooth-Speaker-with-WiFi-Alexa/dp/B00X4WHP5E
https://www.ibm.com/watson/developercloud/doc/conversation/index.html

Optical character recognition (OCR)

- Used to be AI
- Now considered routine computing



Portable scanner and OCR (video)
https://en.wikipedia.org/wiki/File:Portable_scanner_and_OCR_(video).webm

Ethics in Design for AI

Humans teach what we feel is important… teach them to share our values.
Super knowing - not super doing

Grady Booch, Scientist, philosopher, IBM'er https://www.ted.com/talks/grady_booch_don_t_fear_superintelligence

How might we…

- build systems that have ethical and moral foundation?’
- that are transparent to users?
- teach mercy and justice of law?
- extend and advance healthcare?
- increase safety in dangerous work?

Inspired by Grady Booch, Scientist, philosopher, IBM’er
https://www.ted.com/talks/grady_booch_don_t_fear_superintelligence

Trust machines just as much as a well-trained human?

Guiding Principles – Ethical AI

- Purpose
  - Aid humans, not replace them
  - Symbiotic relationship

“3 guiding principles for ethical AI, from IBM CEO Ginni Rometty”
by Alison DeNisco. January 17, 2017, Tech Republic http://www.techrepublic.com/article/3-guiding-principles-for-ethical-ai-from-ibm-ceo-ginni-rometty/

Transparency

- How was AI taught?
- What data was used?
- Humans remain in control of the system

“3 guiding principles for ethical AI, from IBM CEO Ginni Rometty”
by Alison DeNisco. January 17, 2017, Tech Republic http://www.techrepublic.com/article/3-guiding-principles-for-ethical-ai-from-ibm-ceo-ginni-rometty/

Skills

- Built with people in the industry
- Human workers trained
  how to use tools to their advantage

“3 guiding principles for ethical AI, from IBM CEO Ginni Rometty”
by Alison DeNisco. January 17, 2017, Tech Republic http://www.techrepublic.com/article/3-guiding-principles-for-ethical-ai-from-ibm-ceo-ginni-rometty/

Regulations

- Almost everyone agrees they are necessary
- Who will create regulations?
- Enforce?

“We often have no way of knowing when and why *people* are biased.”

- Sandra Wachter

Q&A: Should artificial intelligence be legally required to explain itself?
By Matthew Hutson, May. 31, 2017. Interview with Sandra Wachter, data ethics researcher at Univ. of Oxford and Alan Turing Institute.
http://www.sciencemag.org/news/2017/05/qa-should-artificial-intelligence-be-legally-required-explain-itself

IBM

The EU General Data Protection Regulation (GDPR)

- Framework for transparency rights
  and safeguards against automated decision-making

- **Right to contest a completely automated decision**
  if it has legal or other significant effects on them

Q&A: Should artificial intelligence be legally required to explain itself?
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http://www.sciencemag.org/news/2017/05/qa-should-artificial-intelligence-be-legally-required-explain-itself

Regulations take forever

- Humans and algorithms aren’t without bias
- ML has potential to make less biased decisions
- Algorithms trained with biased data
  pick up and replicate biases, and develop new ones

Q&A: Should artificial intelligence be legally required to explain itself?
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http://www.sciencemag.org/news/2017/05/qa-should-artificial-intelligence-be-legally-required-explain-itself

How do we evolve the practice of UX to deal with the new issues these technologies bring and the new information that is created?

Take Responsibility

- Create a code of conduct
  - What do you value?
  - What lines won’t your AI cross?
- Make your AI transparent
  - How was it made and what does it do?
  - How do you reduce bias?
- Keep humans in control

Don’t fear AI - Explore AI

Try the tools
Pair with others

IBM Watson Developer Tools (free trials):
https://console.ng.bluemix.net/catalog/?category=watson

Go forth and create ethical AI's

- Purpose: Intelligence and actions to maximize success
- Transparency: Code of Conduct
- Skills: How will humans learn to use it?

Contact Carol

LinkedIn: https://www.linkedin.com/in/caroljsmith

Twitter - @Carologic: https://twitter.com/carologic

Slides on Slideshare: https://www.slideshare.net/carologic

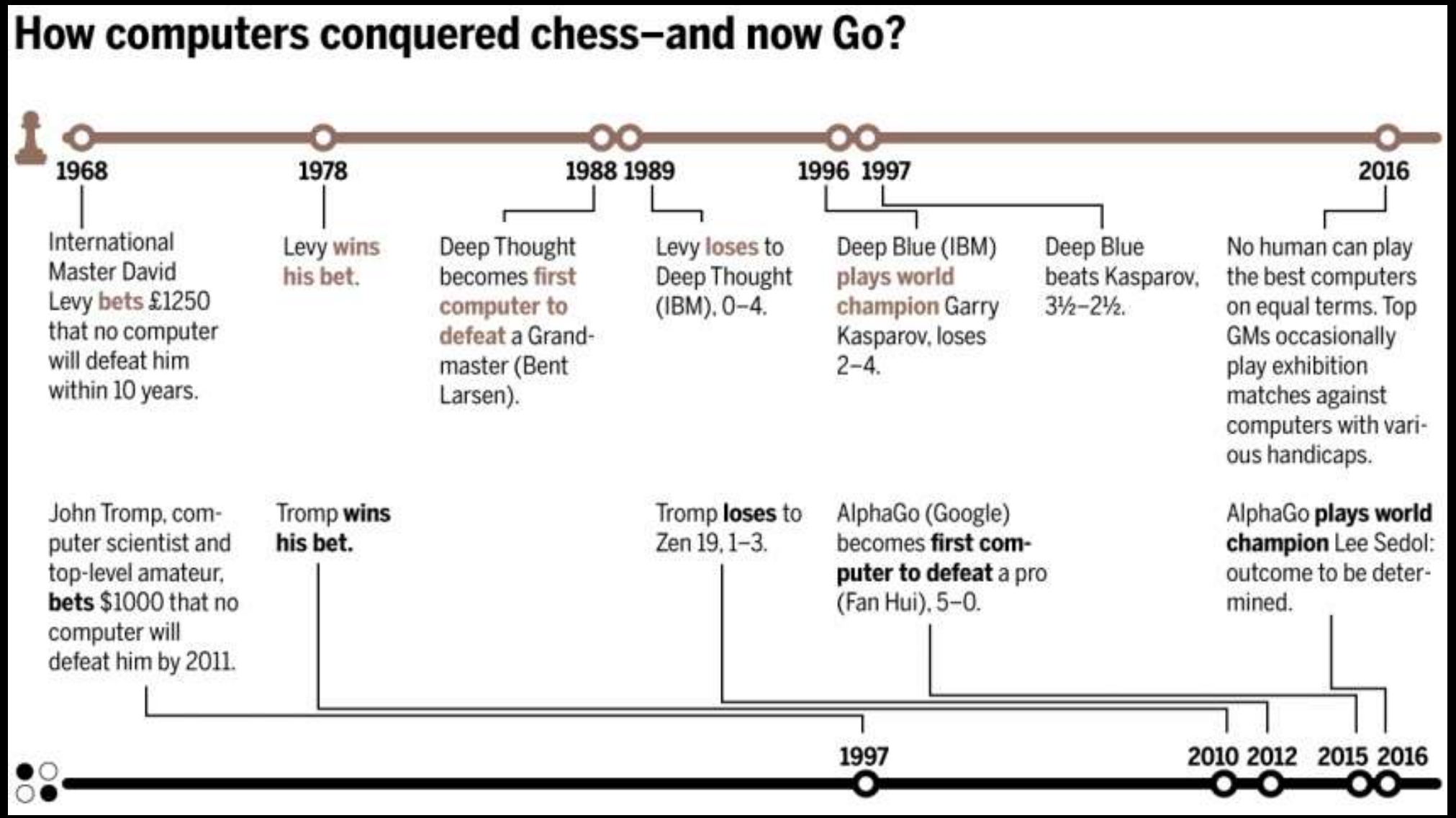
Additional Information and Resources

Watson is a cognitive technology that can think like a human.

- Understand
  - Analyze and interpret all kinds of data
  - Unstructured text, images, audio and video
- Reason
  - Understand the personality, tone, and emotion of content
- Learn
  - Grow the subject matter expertise in your apps and systems
- Interact
  - Create chat bots that can engage in dialog

https://www.ibm.com/watson/

More on Strategic Games



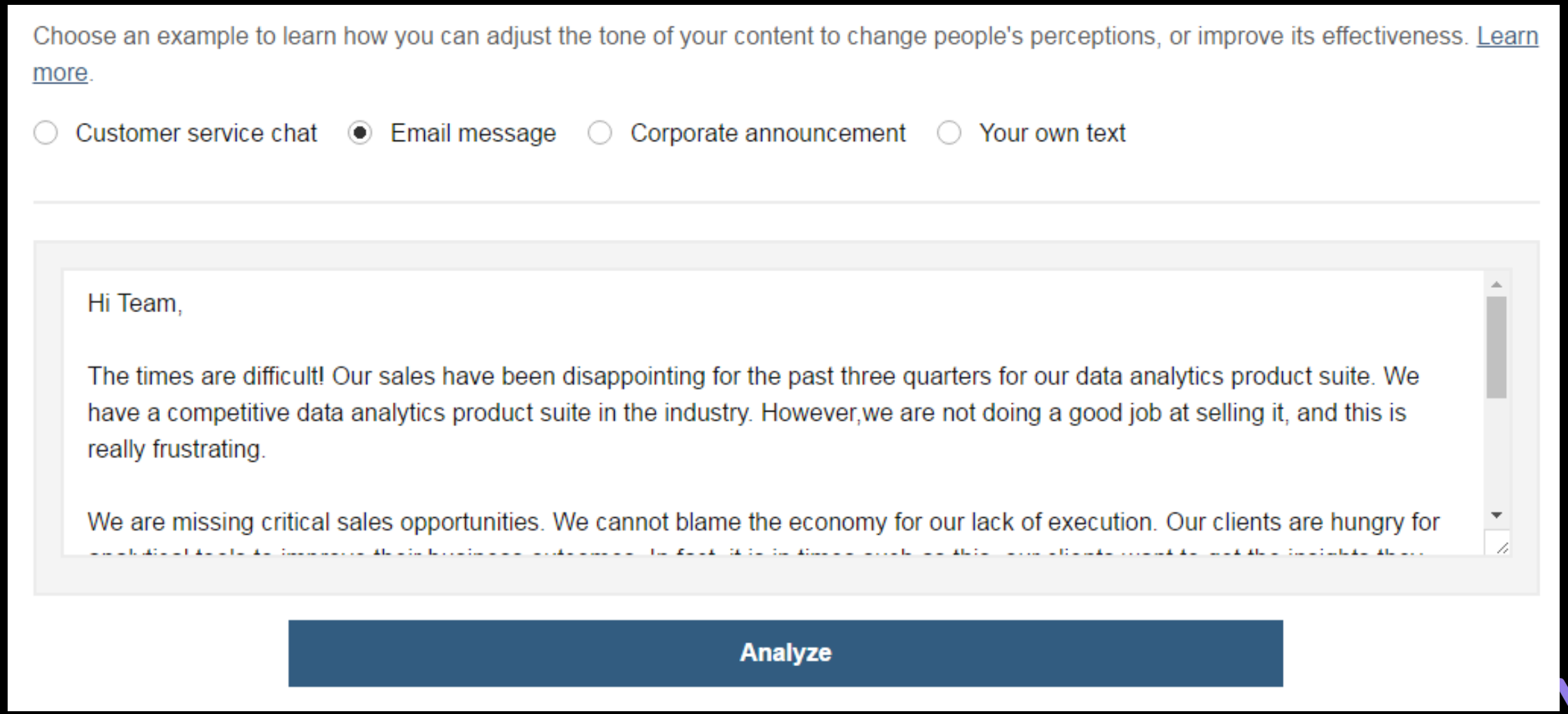
Graphic, Science Magazine: http://www.sciencemag.org/news/2016/03/update-why-week-s-man-versus-machine-go-match-doesn-t-matter-and-what-does

The Job Question

- Make new economies and opportunities – potentially:
  - –Create jobs
  - –Entire new fields
- Some jobs will be lost
  - –What can we do to mitigate this?

Jobs that no longer exist
The Lector http://www.ranker.com/list/jobs-that-no-longer-exist/coy-jandreau

Tone Analyzer - Watson



IBM Watson Developer Cloud, Tone Analyzer
https://tone-analyzer-demo.mybluemix.net/

Optimist’s guide to the robot apocalypse - @sarahfkessler

The optimist’s guide to the robot apocalypse

Machines, you may have heard, are coming for all the jobs. But don't head to your bunker quite yet.

qz.com

“The optimist’s guide to the robot apocalypse” by Sarah Kessler. March 09, 2017. QZ.
@sarahfkessler https://qz.com/904285/the-optimists-guide-to-the-robot-apocalypse/

Additional Resources

- “How IBM is Competing with Google in AI.” The Information. https://www.theinformation.com/how-ibm-is-competing-with-google-in-ai?eu=2zIDMNYNjDp7KqL4YqAXXA
- “The business case for augmented intelligence” https://medium.com/cognitivebusiness/the-business-case-for-augmented-intelligence-36afa64cd675
- “Comparison of machine learning methods applied to birdsong element classification” by David Nicholson. Proceedings of the 15th Python in Science Conference (SCIPY 2016). http://conference.scipy.org/proceedings/scipy2016/pdfs/david_nicholson.pdf

  Staples’ “Easy Button” Comes to Life with IBM Watson” in Business Wire, October 25, 2016. http://www.businesswire.com/news/home/20161025006273/en/Staples%E2%80%99-%E2%80%9CEasy-Button%E2%80%9D-Life-IBM-Watson
- “How Staples Is Making Its Easy Button Even Easier With A.I.” by Chris Cancialosi, Forbes. https://www.forbes.com/sites/chriscancialosi/2016/12/13/how-staples-is-making-its-easy-button-even-easier-with-a-i/#4ae66e8359ef
- “Inside Intel: The Race for Faster Machine Learning” http://www.intel.com/content/www/us/en/analytics/machine-learning/the-race-for-faster-machine-learning.html

More Resources

- “Update: Why this week’s man-versus-machine Go match doesn’t matter (and what does)” by Dana Mackenzie. Science Magazine. Mar. 15, 2016 http://www.sciencemag.org/news/2016/03/update-why-week-s-man-versus-machine-go-match-doesn-t-matter-and-what-does
- “For IBM’s CTO for Watson, not a lot of value in replicating the human mind in a computer.” by Frederic Lardinois (@fredericl), TechCrunch, Posted Feb 27, 2017. https://techcrunch.com/2017/02/27/for-ibms-cto-for-watson-not-a-lot-of-value-in-replicating-the-human-mind-in-a-computer/
- “Google and IBM: We Want Artificial Intelligence to Help You, Not Replace You” Most Powerful Women by Michelle Toh. Mar 02, 2017. Fortune. http://fortune.com/2017/03/02/google-ibm-artificial-intelligence/
- “Facebook scales back AI flagship after chatbots hit 70% f-AI-lure rate - 'The limitations of automation‘” by Andrew Orlowski. Feb 22, 2017. The Register https://www.theregister.co.uk/2017/02/22/facebook_ai_fail/
- “Microsoft is deleting its AI chatbot's incredibly racist tweets” by Rob Price. Mar. 24, 2016. Business Insider UK. http://www.businessinsider.com/microsoft-deletes-racist-genocidal-tweets-from-ai-chatbot-tay-2016-3

Special Thanks: Soundtrack to 'Run Lola Run', 1998 German thriller film written and directed by Tom Tykwer, and starring Franka Potente as Lola and Moritz Bleibtreu as Manni. Soundtrack by Tykwer, Johnny Klimek, and Reinhold Heil

Even More Resources

- “IBM’s Automated Radiologist Can Read Images and Medical Records” by Tom Simonite, February 4, 2016. Intelligent Machines, MIT Technology Review. https://www.technologyreview.com/s/600706/ibms-automated-radiologist-can-read-images-and-medical-records/
- “The IBM, Salesforce AI Mash-Up Could Be a Stroke of Genius” by Adam Lashinsky, Mar 07, 2017. Fortune. http://fortune.com/2017/03/07/data-sheet-ibm-salesforce/
- "Google can now tell you're not a robot with just one click" by Andy Greenberg. Dec. 3, 2014. Security: Wired. https://www.wired.com/2014/12/google-one-click-recaptcha/
- “Essentials of Machine Learning Algorithms (with Python and R Codes)” by Sunil Ray, August 10, 2015. Analytics Vidhya. https://www.analyticsvidhya.com/blog/2015/08/common-machine-learning-algorithms/
- IBM on Machine Learning https://www.ibm.com/analytics/us/en/technology/machine-learning/
- “At Davos, IBM CEO Ginni Rometty Downplays Fears of a Robot Takeover” by Claire Zillman, Jan 18, 2017. Fortune. http://fortune.com/2017/01/18/ibm-ceo-ginni-rometty-ai-davos/
- “Google and IBM: We Want Artificial Intelligence to Help You, Not Replace You” by Michelle Toh. Mar 02, 2017. Fortune. http://fortune.com/2017/03/02/google-ibm-artificial-intelligence/

Yes, even more resources

- Video: “IBM Watson Knowledge Studio: Teach Watson about your unstructured data” https://www.youtube.com/watch?v=caIdJjtvX1s&t=6s
- “The optimist’s guide to the robot apocalypse” by Sarah Kessler, @sarahfkessler. March 09, 2017. QZ. https://qz.com/904285/the-optimists-guide-to-the-robot-apocalypse/
- “AI Influencers 2017: Top 30 people in AI you should follow on Twitter" by Trips Reddy @tripsy, Senior Content Manager, IBM Watson . February 10, 2017 https://www.ibm.com/blogs/watson/2017/02/ai-influencers-2017-top-25-people-ai-follow-twitter/
- “3 guiding principles for ethical AI, from IBM CEO Ginni Rometty” by Alison DeNisco. January 17, 2017, Tech Republic http://www.techrepublic.com/article/3-guiding-principles-for-ethical-ai-from-ibm-ceo-ginni-rometty/
- "Transparency and Trust in the Cognitive Era" January 17, 2017 Written by: IBM THINK Blog https://www.ibm.com/blogs/think/2017/01/ibm-cognitive-principles/
- "Ethics and Artificial Intelligence: The Moral Compass of a Machine“ by Kris Hammond, April 13, 2016. Recode. http://www.recode.net/2016/4/13/11644890/ethics-and-artificial-intelligence-the-moral-compass-of-a-machine

Last bit: I promise

- "The importance of human innovation in A.I. ethics" by John C. Havens. Oct. 03, 2015 http://mashable.com/2015/10/03/ethics-artificial-intelligence/#yljsShvAFsqy
- "Me, Myself and AI" Fjordnet Limited 2017 - Accenture Digital. https://trends.fjordnet.com/trends/me-myself-ai
- "Testing AI concepts in user research" By Chris Butler, Mar 2, 2017. https://uxdesign.cc/testing-ai-concepts-in-user-research-b742a9a92e55#.58jtc7nzo
- "CMU prof says computers that can 'see' soon will permeate our lives“ by Aaron Aupperlee. March 16, 2017. http://triblive.com/news/adminpage/12080408-74/cmu-prof-says-computers-that-can-see-soon-will-permeate-our-lives
- “The business case for augmented intelligence” by Nancy Pearson, VP Marketing, IBM Cognitive. https://medium.com/cognitivebusiness/the-business-case-for-augmented-intelligence-36afa64cd675#.qqzvunakw

Definition: Artificial Intelligence

- Artificial intelligence (AI) is intelligence exhibited by machines.
- In computer science, an ideal "intelligent" machine is a flexible rational agent that perceives its environment and takes actions that maximize its chance of success at some goal.[1] Colloquially, the term "artificial intelligence" is applied when a machine mimics "cognitive" functions that humans associate with other human minds, such as "learning" and "problem solving".[2]
- Capabilities currently classified as AI include successfully understanding human speech,[4] competing at a high level in strategic game systems (such as Chess and Go[5]), self-driving cars, and interpreting complex data.

Wikipedia: https://en.wikipedia.org/wiki/Artificial_intelligence#cite_note-Intelligent_agents-1

Definition: The Singularity

- If research into Strong AI produced sufficiently intelligent software, it might be able to reprogram and improve itself. The improved software would be even better at improving itself, leading to recursive self-improvement.[245] The new intelligence could thus increase exponentially and dramatically surpass humans. Science fiction writer Vernor Vinge named this scenario "singularity".[246] Technological singularity is when accelerating progress in technologies will cause a runaway effect wherein artificial intelligence will exceed human intellectual capacity and control, thus radically changing or even ending civilization. Because the capabilities of such an intelligence may be impossible to comprehend, the technological singularity is an occurrence beyond which events are unpredictable or even unfathomable.[246]
- Ray Kurzweil has used Moore's law (which describes the relentless exponential improvement in digital technology) to calculate that desktop computers will have the same processing power as human brains by the year 2029, and predicts that the singularity will occur in 2045.[246]

Wikipedia: https://en.wikipedia.org/wiki/Artificial_intelligence#cite_note-Intelligent_agents-1

Definition: Machine Learning

- Ability for system to take basic knowledge (does not mean simple or non-complex) and apply that knowledge to new data
- Raises ability to discover new information. Find unknowns in data.
- https://en.wikipedia.org/wiki/Machine_learning

More Definitions:

- Algorithm: a process or set of rules to be followed in calculations or other problem-solving operations, especially by a computer.
  https://en.wikipedia.org/wiki/Algorithm
- Natural Language Processing (NLP):
  https://en.wikipedia.org/wiki/Natural_language_processing


IBM