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EVENT



FOR BETTER OR
WORSE, YOU ARE
LIVING IN THE
AGE OF AI

David Conner

ASSOCIATE PROFESSOR PHYSICS, COMPUTER SCIENCE & ENGINEERING

TRIBBLE LIBRARY THEATER
TUESDAY, FEBRUARY 21
12:20 PM - 1:20 PM

For better or worse,
you are living in
the age of AI

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Christopher Newport University

- Phd in Robotics, Carnegie Mellon (2008)
- CNU Computer Science Faculty – Fall 2015
 - Introductory Programming
 - Introduction to Robotics
 - Artificial Intelligence



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Questions

- How many of you were manipulated to do something against your best interest today?
- How many of you have a “smart phone” with “social media” apps?
- How many of you were manipulated to do something against your best interest today?

How China Got Our Kids Hooked on ‘Digital Fentanyl’

TikTok is a national security threat



Geoffrey Cain
Nov 16

603

416



“China” = The CCP
The Chinese Communist Party

(Not our beloved
Center for Career Planning)

<https://www.commonsense.news/p/how-china-got-our-kids-hooked-on/comments>

The Social (Media) Dilemma



Overview

- AI is **rapidly** transforming the world we live in
- AI brings benefits and risks
- AI brings excitement and uncertainty to our future

Can you suggest 3 bullet points for a slide introducing a talk called "For better or worse, you're living in the age of AI"



Certainly, here are three bullet points that could be used to introduce a talk called "For better or worse, you're living in the age of AI":



1. AI is rapidly transforming the world we live in: Artificial Intelligence (AI) is changing the way we live and work, from chatbots and virtual assistants to predictive analytics and autonomous vehicles. It's already impacting every industry, including healthcare, finance, transportation, and education.
2. Benefits and Risks: AI brings many benefits, such as increased productivity, improved decision-making, and enhanced customer experiences. But it also carries risks, including job displacement, privacy concerns, and bias in decision-making.
3. The future of AI is both exciting and uncertain: The potential of AI is enormous, and its development is advancing rapidly. However, the future

DA

Write a 1 page summary on a talk about "For better or worse, we are living in the age of AI" at the level of a college sophomore honors student

DA

re-write it at the level of a C- high school sophomore



The talk titled "For better or worse, we are living in the age of AI" presented a broad overview of the impact of Artificial Intelligence (AI) on society today. The speaker discussed how AI is transforming the way we live and work, both positively and negatively.

The speaker highlighted the many benefits of AI, including increased productivity, improved decision-making, and enhanced customer experiences. For example, chatbots and virtual assistants are making it easier for customers to get information and support around the clock. AI-powered predictive analytics are helping businesses make better decisions by analyzing vast amounts of data quickly and accurately.

However, the speaker also noted the potential risks of AI, such as job displacement, privacy concerns, and bias in decision-making. The rise of automation and robotics has led to job losses in some industries, and there are concerns that AI could replace even more jobs in the future. There are also concerns about privacy violations, as AI systems collect and analyze vast amounts of personal data. Additionally, there is the risk that AI algorithms can perpetuate ↻ Regenerate response if they are not designed and trained appropriately



The talk was about how Artificial Intelligence (AI) is changing our world in both good and bad ways. The speaker said that AI is making things better by helping us work faster, make better choices, and have better experiences. For example, chatbots and virtual assistants make it easier to get help anytime you need it. Also, AI can analyze lots of information quickly to help companies make better decisions.



But, the speaker also talked about some problems with AI. Some jobs might go away because of automation and robots. Also, AI can collect a lot of our personal information, and that's not always good. Plus, if the AI is not designed correctly, it can be biased or unfair.

The speaker said that AI is exciting, but it's not easy to know what will happen in the future. The speaker told us to think about how we can use AI in the right way so it won't hurt anyone.

Overall, the talk was saying that AI is here to stay, and it's essential to think about how we can use it so that it helps everyone and not just a few people.

↻ Regenerate response

DA

Write a Python function to calculate the value of element in Fibonacci sequence given indext



Sure! Here's a Python function that calculates the value of an element in the Fibonacci sequence, given its index:



```
python                                         Copy code
def fibonacci(n):
    if n <= 1:
        return n
    else:
        return fibonacci(n-1) + fibonacci(n-2)
```

You can call this function by passing in the index of the element you want to calculate, like so:

```
python                                         Copy code
# Calculate the 10th element in the Fibonacci sequence
fibonacci(10) # Returns 55
```

Note that this function uses recursion to calculate the value of the element, which can be slow for large values of n. If you need to calculate multiple elements in the sequence, it may be more efficient to use a loop or a caching mechanism to avoid recalculating values.

DA

Can you re-do using a loop



Sure, here's a Python function that calculates the value of an element in the Fibonacci sequence using a loop instead of recursion:



```
python                                         Copy code
def fibonacci(n):
    if n <= 1:
        return n
    else:
        a, b = 0, 1
        for _ in range(2, n+1):
            c = a + b
            a = b
            b = c
        return b
```

In this version, we initialize `a` and `b` to 0 and 1, respectively, and then use a loop to calculate the value of the nth element in the sequence by repeatedly adding `a` and `b` and updating their values until we reach the desired index. We return the final value of `b`, which represents the nth element in the sequence.

Calculators → ?

Multiplication → Algebra → Calculus

AI: Looking for love in all the wrong places?



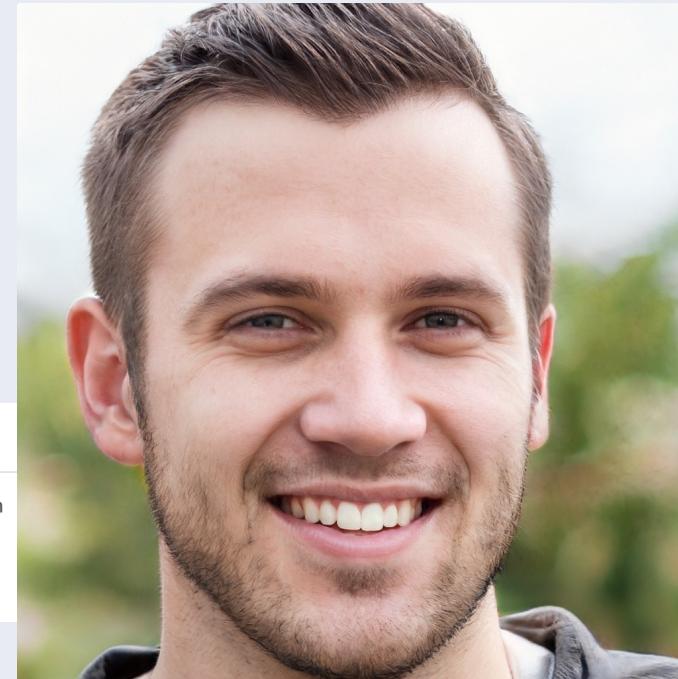
AI: Looking for love in all the wrong places?

<https://twitter.com/wedontexisthere>



Linzer torte

The Linzer torte is a traditional Austrian pastry, a form of shortbread topped with fruit preserves and sliced nuts with a lattice design on top. It is named after the city of Linz, Austria. [Wikipedia](#)



Theresia Lucas
(23 years), Pisa (Italy). Goes weak for linzer torte.

Marc Ibanez
(28 years), Santa Barbara (Guatemala).
Fancies linzer torte.

<https://www.unite.ai/sofgan-a-gan-face-generator-that-offers-greater-control/>

Trigger Warning:
This next photo may be horrifying



Dall-E 2 with prompt “Group of CNU honors students”

Overview

- What is “AI”?
- How does AI work?
- What is the importance of “data” ?
- What are (some of) the risks of AI?

Artificial Intelligence

Machine Learning

Deep Learning

The subset of machine learning composed of algorithms that permit software to train itself to perform tasks, like speech and image recognition, by exposing multilayered neural networks to vast amounts of data.

A subset of AI that includes abstruse statistical techniques that enable machines to improve at tasks with experience. The category includes deep learning

Any technique that enables computers to mimic human intelligence, using logic, if-then rules, decision trees, and machine learning (including deep learning)

Dictionary

Search for a word



ab·struse

/əb' stroōs, əb' stroōs/

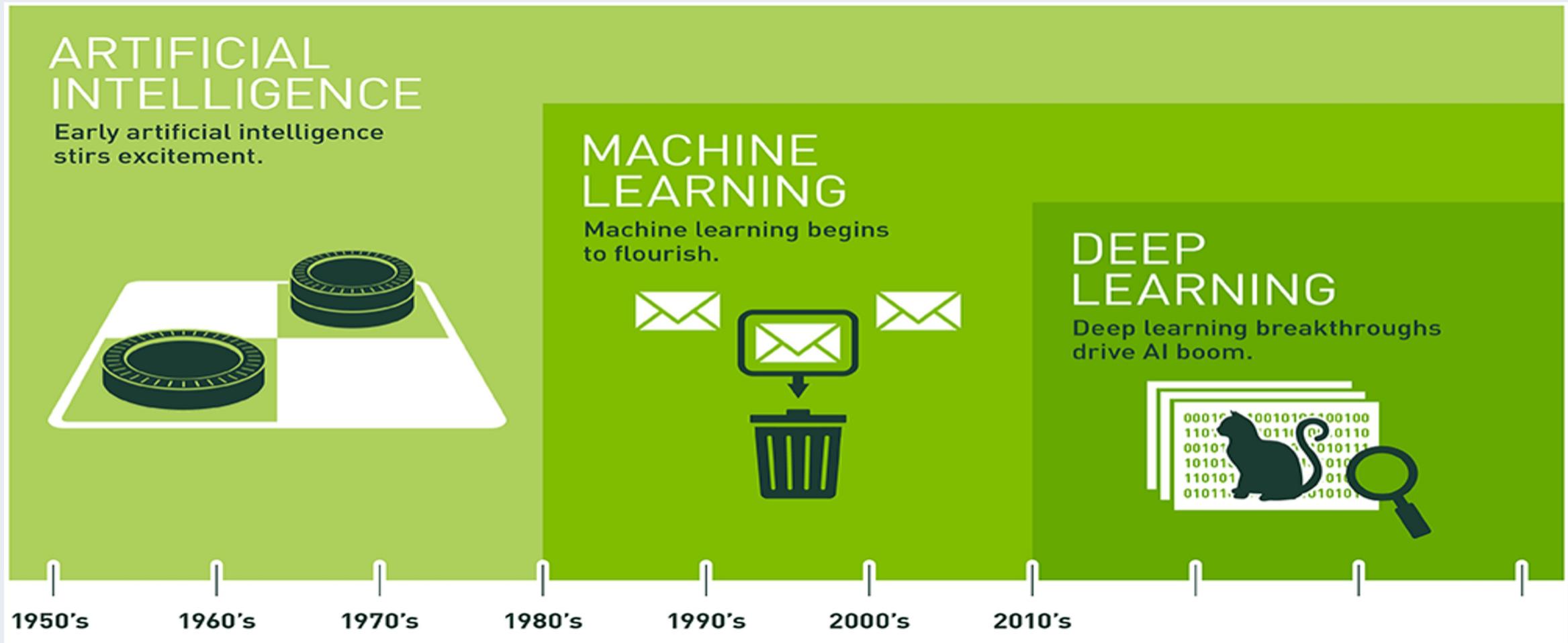
adjective

difficult to understand; obscure.

"an abstruse philosophical inquiry"

synonyms: **obscure**, **arcane**, **esoteric**, little known, **recherché**, rarefied, recondite, difficult, hard, puzzling, perplexing, enigmatic, inscrutable, cryptic, Delphic, complex, complicated, involved, over/above one's head, incomprehensible, unfathomable, impenetrable, mysterious; More

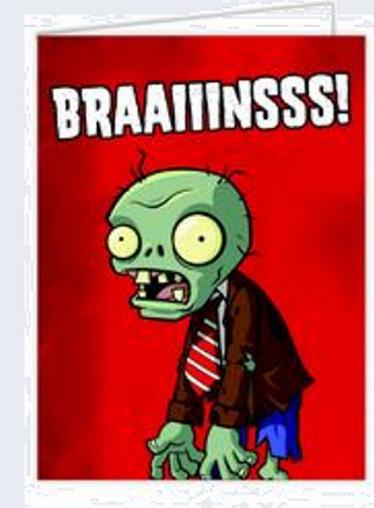
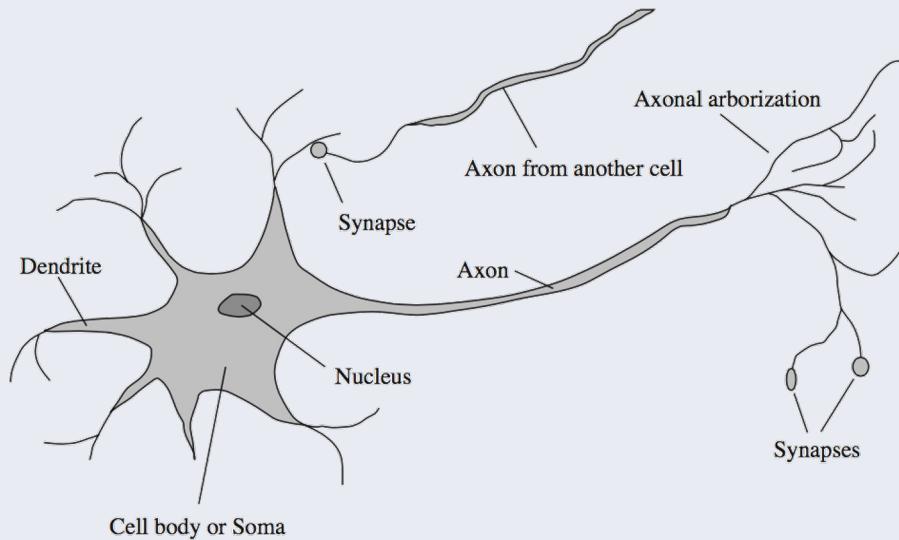
ACCOMPLISHING COMPLEX GOALS



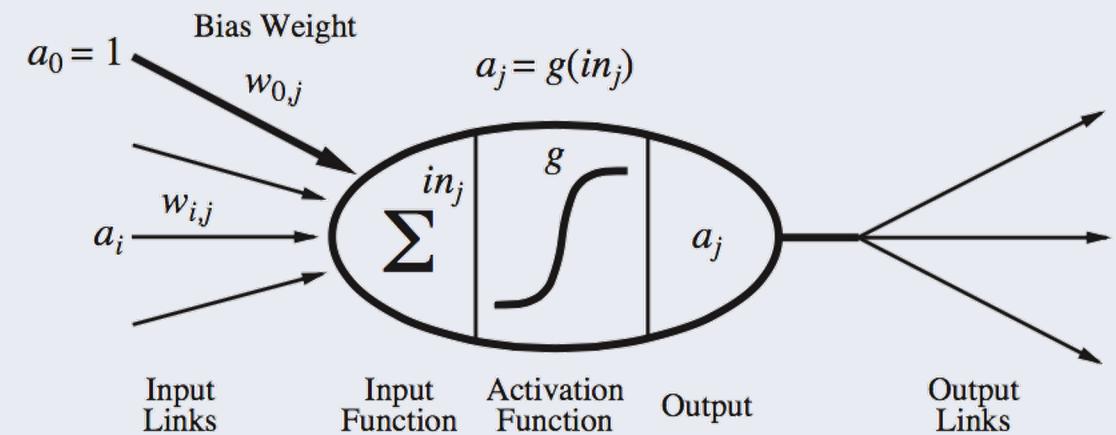
NVIDIA DeepLearning Institute

Artificial Neural Networks

- Neurons (“fundamental building block of brain”)

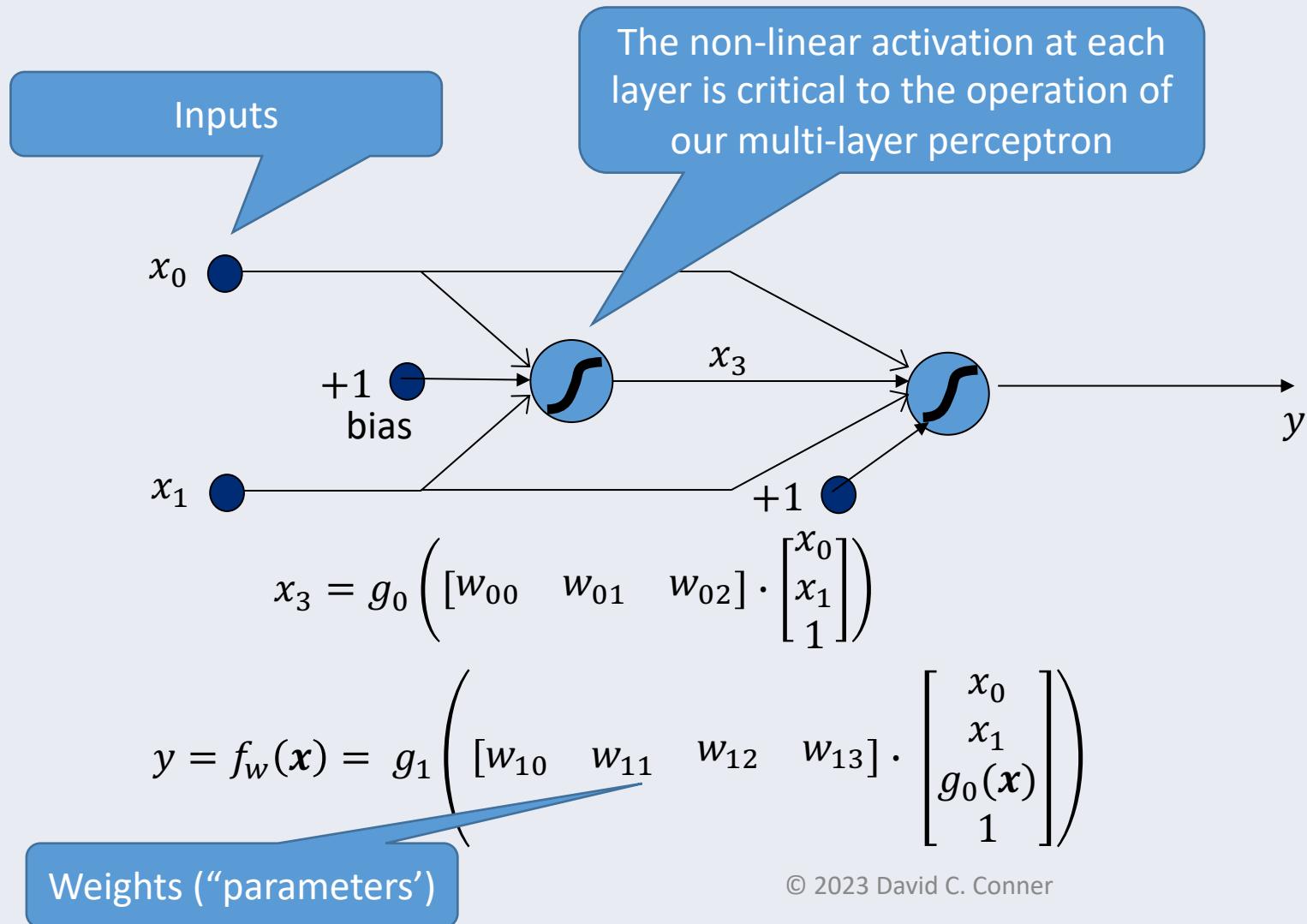


Model of Neuron (1943)



“OMG, we’ve solved the AI problem!”

Multi-layer perceptron



Connections per Neuron

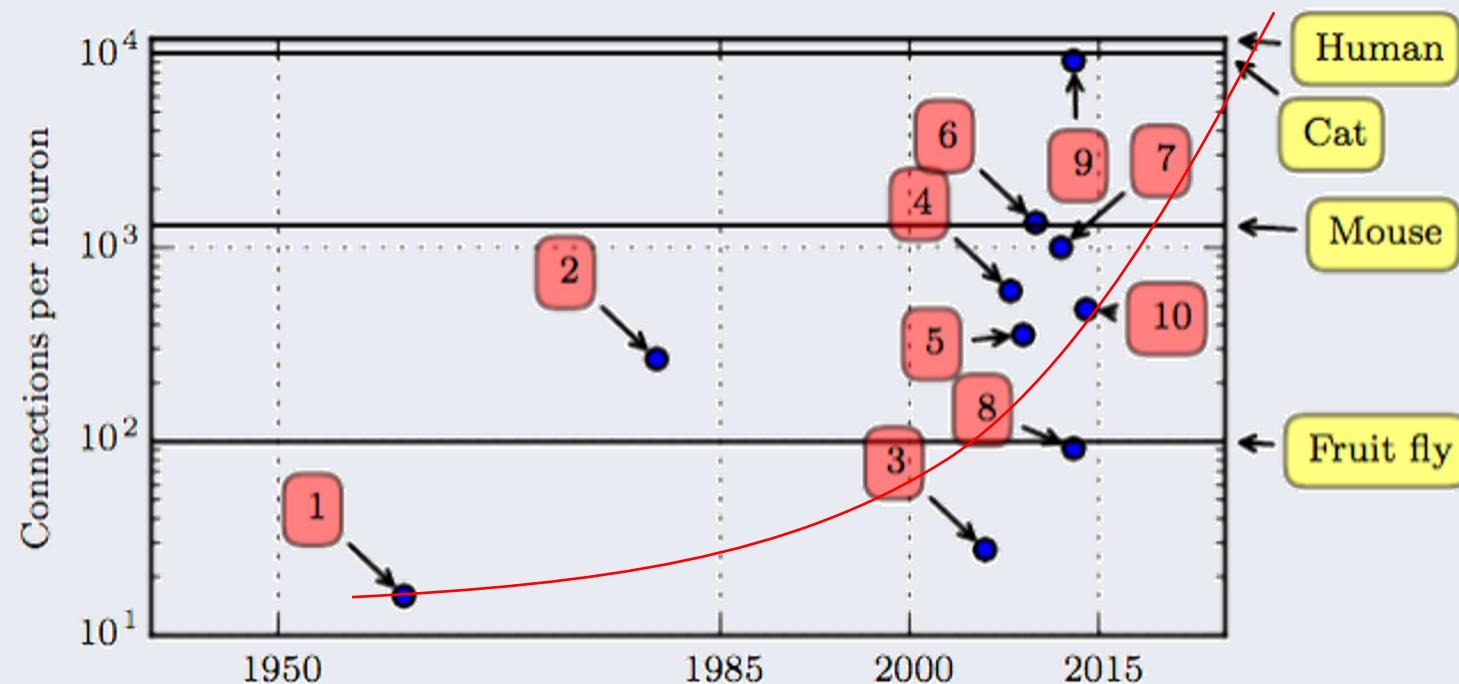
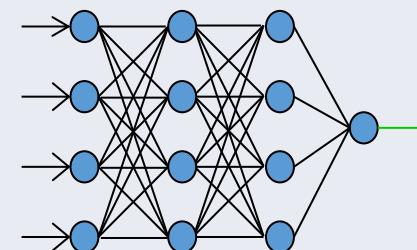


Figure 1.10: Number of connections per neuron over time. Initially, the number of connections between neurons in artificial neural networks was limited by hardware capabilities. Today, the number of connections between neurons is mostly a design consideration. Some artificial neural networks have nearly as many connections per neuron as a cat, and it is quite common for other neural networks to have as many connections per neuron as smaller mammals like mice. Even the human brain does not have an exorbitant amount of connections per neuron. Biological neural network sizes from <http://www.deeplearningbook.org> of connections per neuron. Biological neural network sizes from [Wikipedia \(2015\)](#).

- **Connections** = inputs to each activation function or connections from output to other neuron inputs
- **Neuron** = 1 activation function output



Neural Network Size

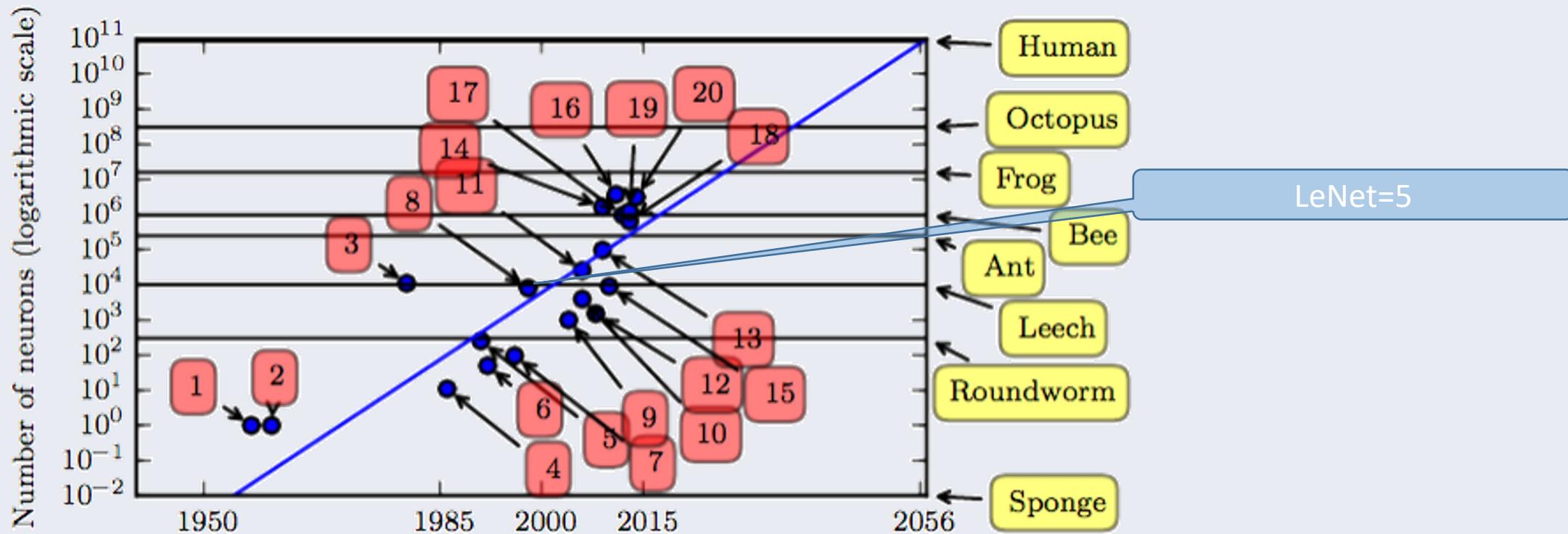
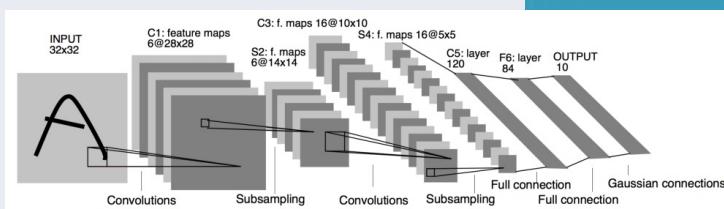
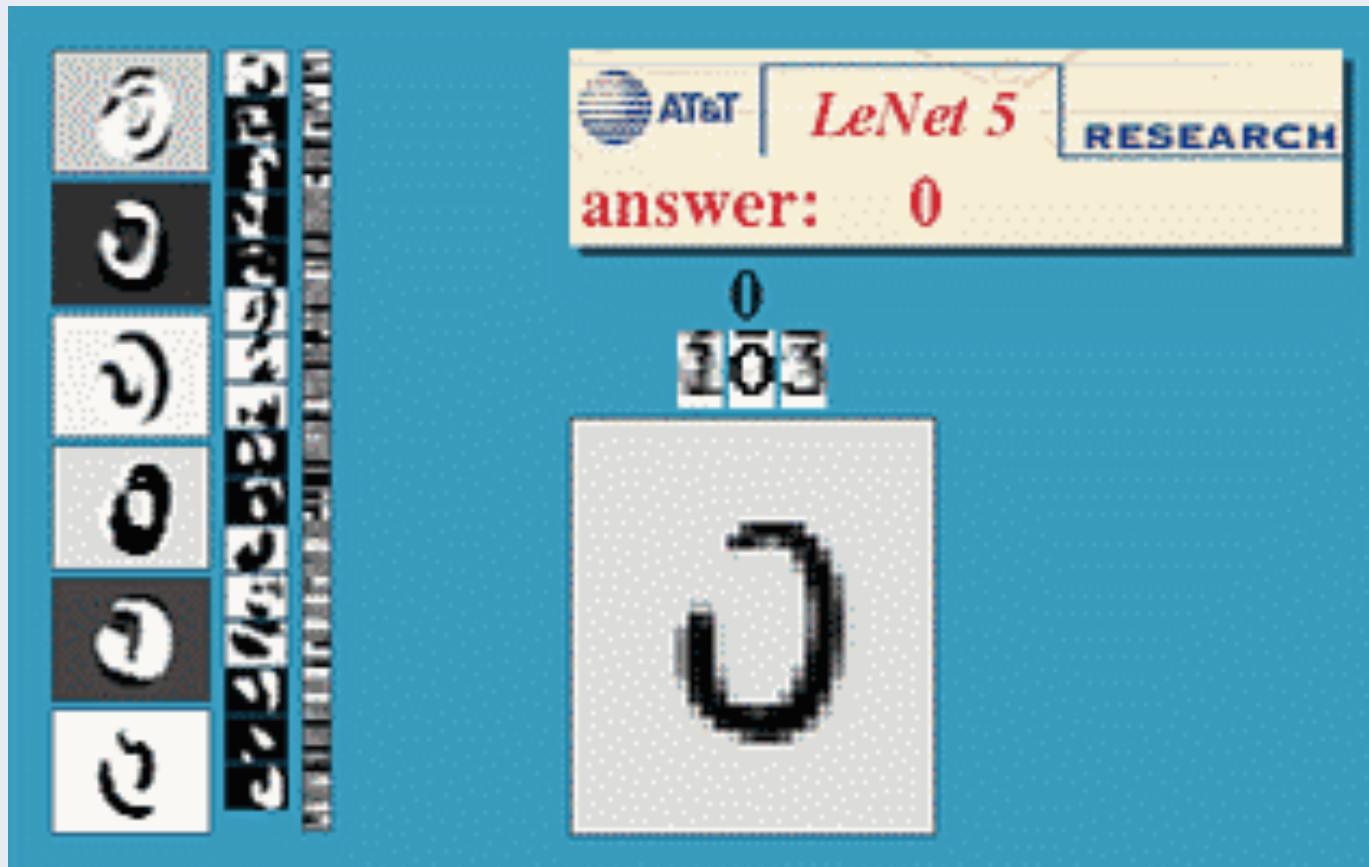


Figure 1.11: Increasing neural network size over time. Since the introduction of hidden units, artificial neural networks have doubled in size roughly every 2.4 years. Biological neural network sizes from [Wikipedia \(2015\)](#).

<http://www.deeplearningbook.org>

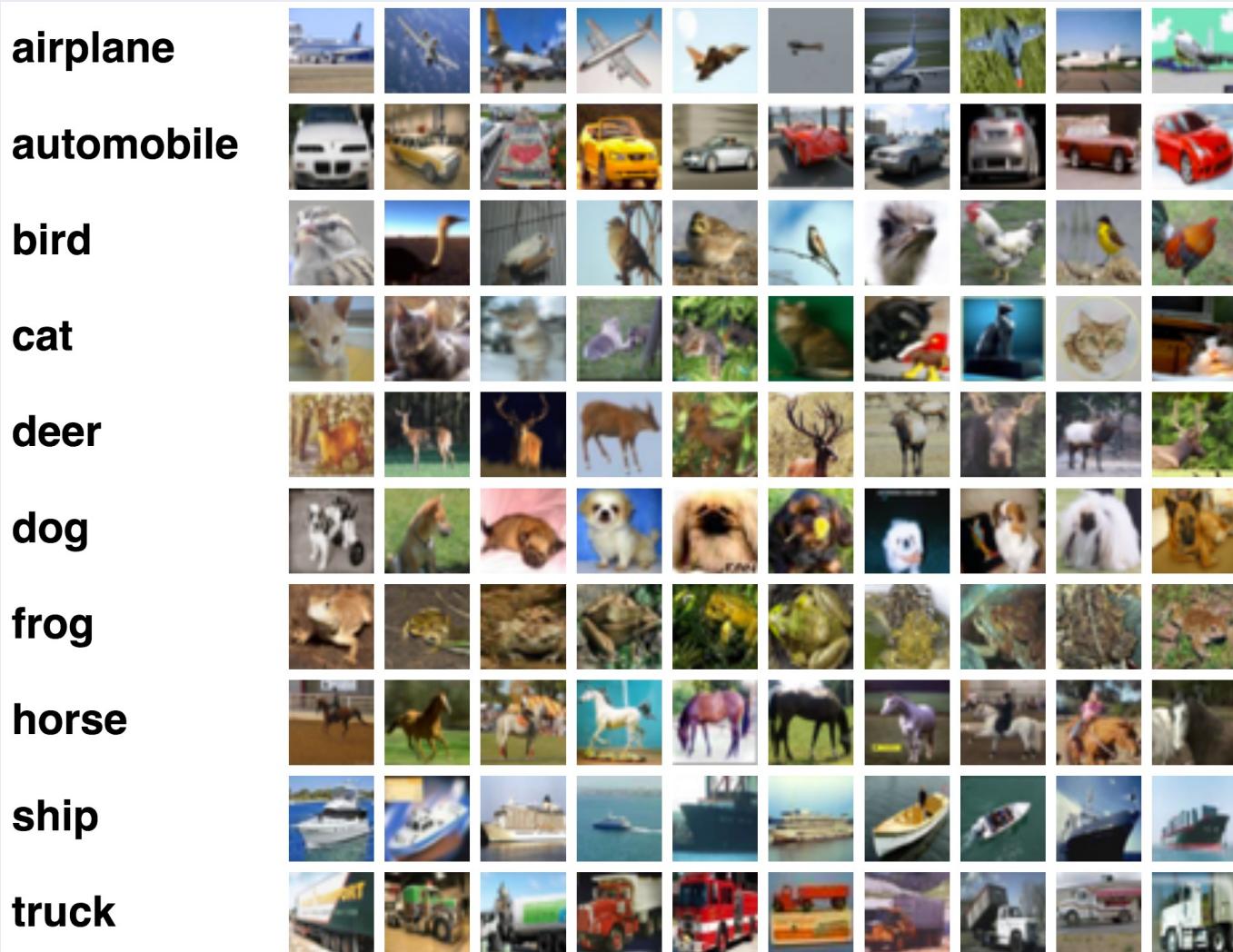
LeNet (Yann Lecun, late 90's) CNN



<http://yann.lecun.com/exdb/lenet/>

Imagenet

14 million images in 1000 categories



<http://image-net.org>

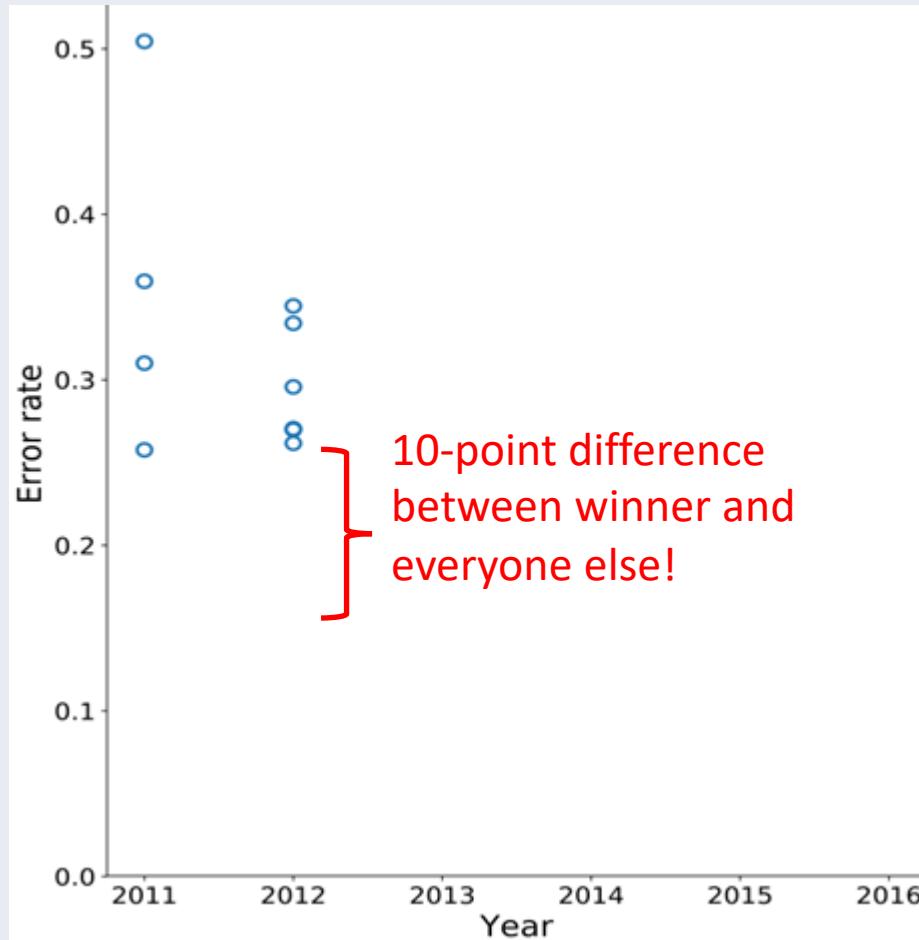
1 million also have
bounding box data
which frames object



J. Deng, W. Dong, R. Socher,
L.-J. Li, K. Li and L. Fei-
Fei, **ImageNet: A Large-
Scale Hierarchical Image
Database.** *IEEE Computer
Vision and Pattern
Recognition (CVPR), 2009.*

ImageNet Large Scale Visual Recognition Challenge

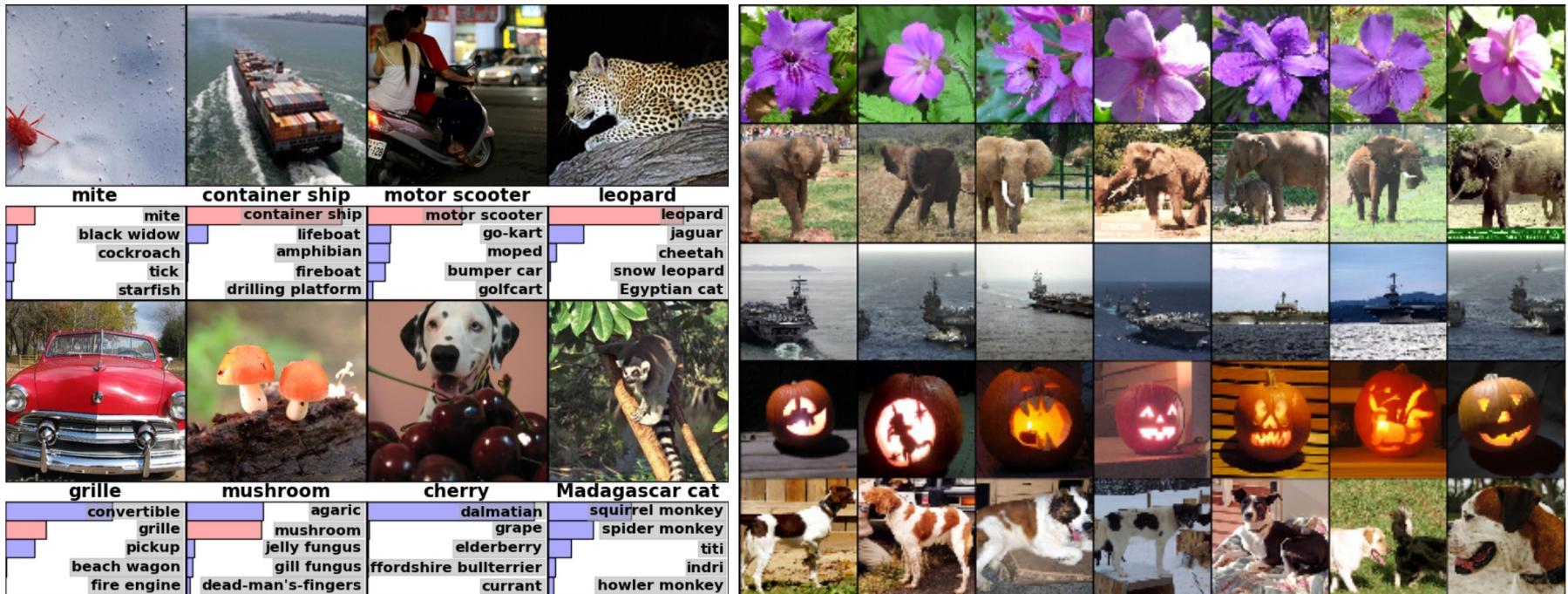
<http://image-net.org/challenges/LSVRC/>



<https://en.wikipedia.org/wiki/ImageNet>
Based on slide courtesy of Keith Perkins (CNU)

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ImageNet Classification with Deep Convolutional Neural Networks (Krizhevsky, Sutskever, Hinton, 2012)



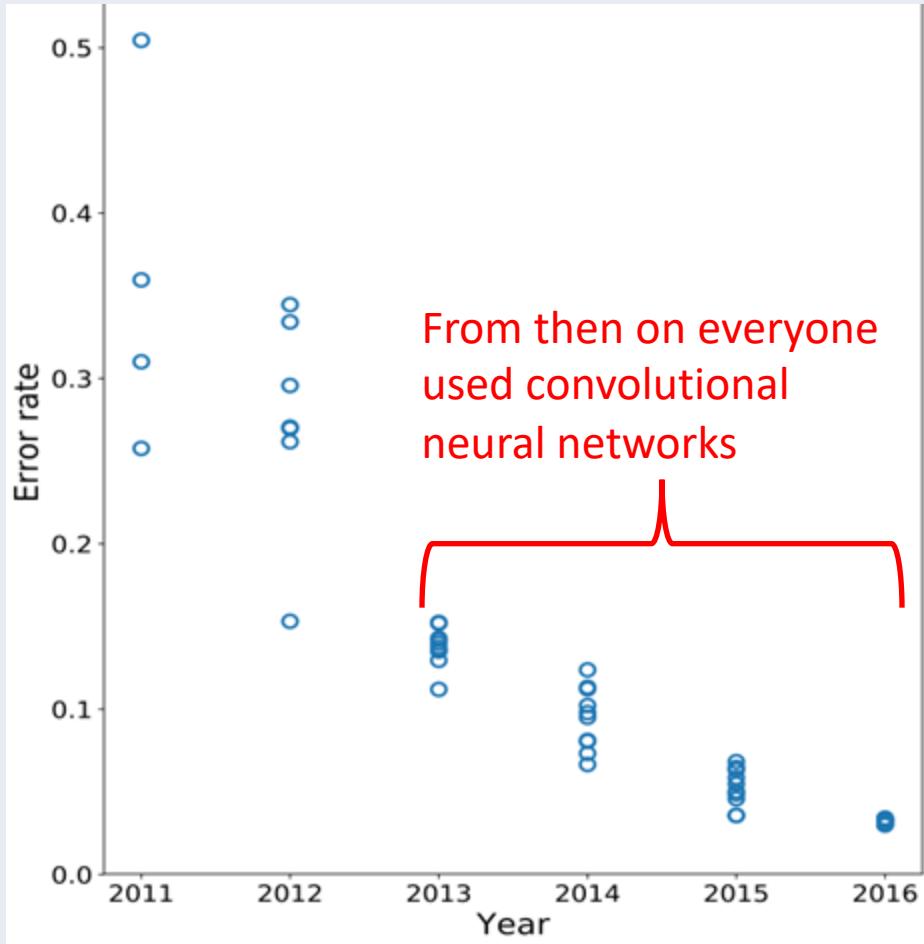
60 million parameters
650,000 neurons

Figure 4: (Left) Eight ILSVRC-2010 test images and the five labels considered most probable by our model. The correct label is written under each image, and the probability assigned to the correct label is also shown with a red bar (if it happens to be in the top 5). (Right) Five ILSVRC-2010 test images in the first column. The remaining columns show the six training images that produce feature vectors in the last hidden layer with the smallest Euclidean distance from the feature vector for the test image.

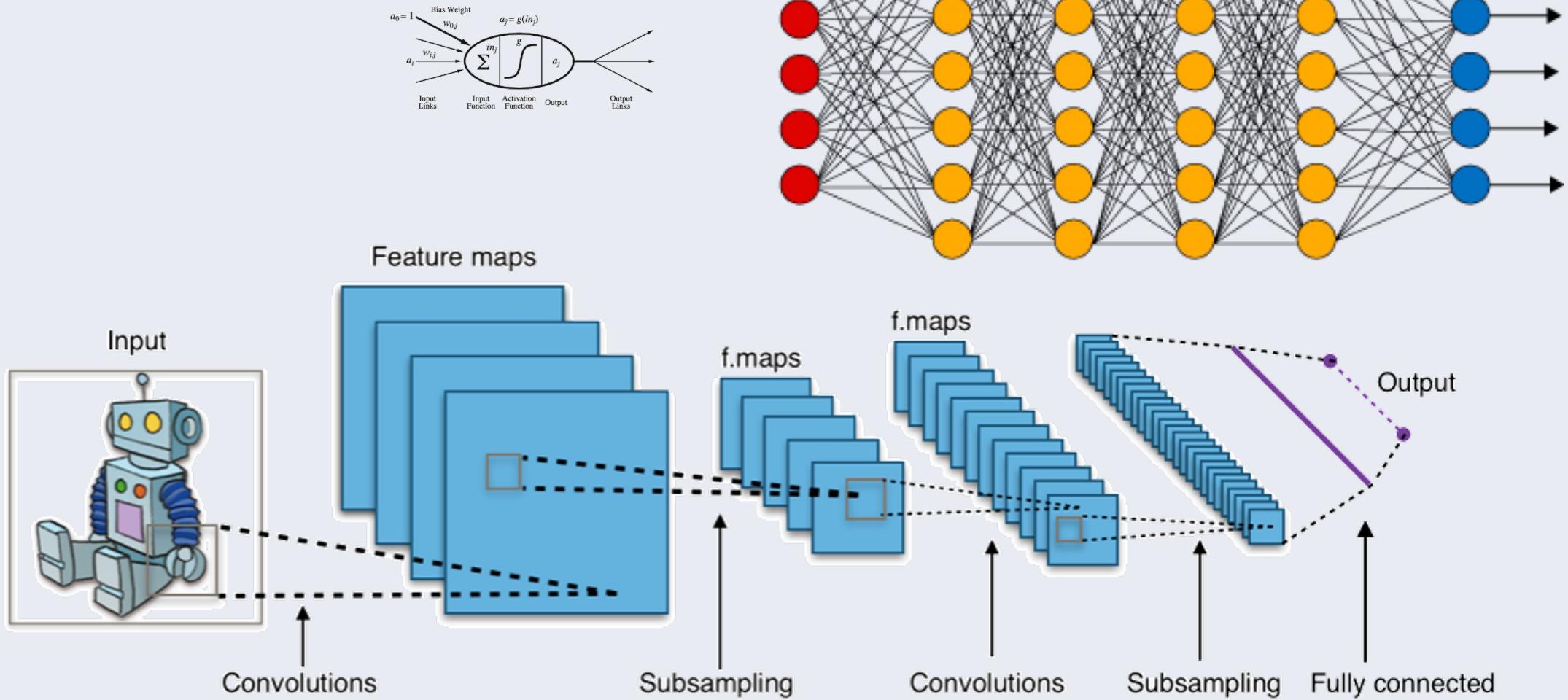
<http://image-net.org/challenges/LSVRC/2012/results.html>

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ImageNet Large Scale Visual Recognition Challenge



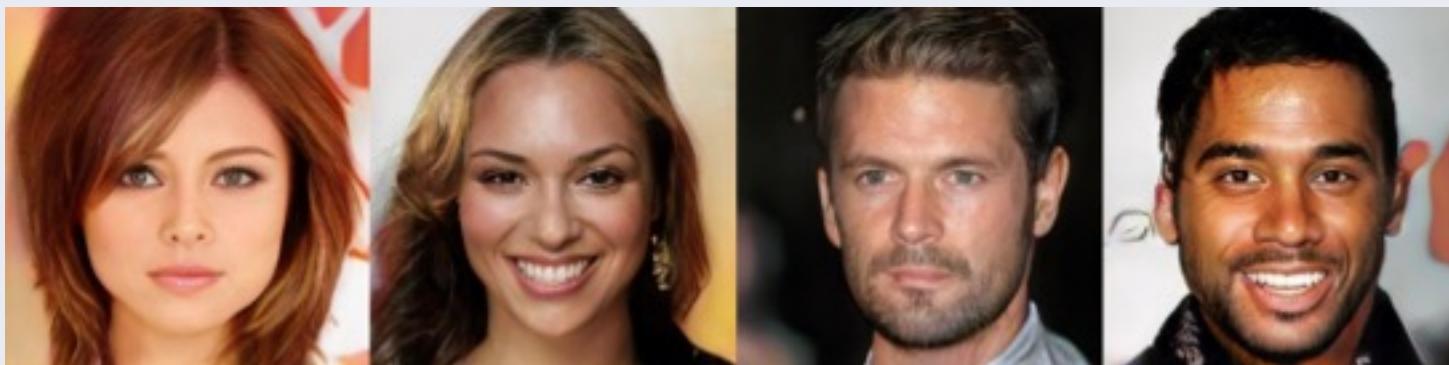
Deep Neural Networks



Convolutional Neural Network

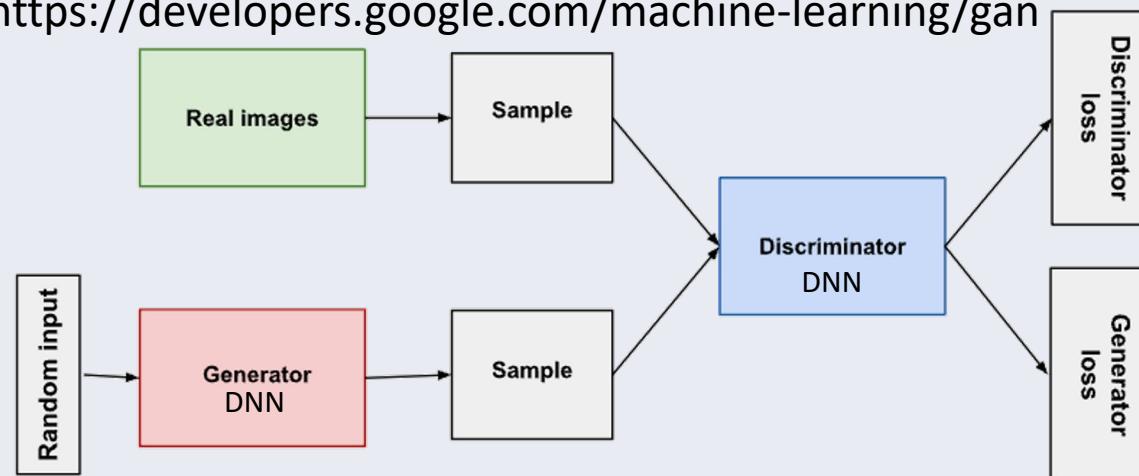
DNN Fight: Generative Adversarial Networks

- These people do not exist!



<https://developers.google.com/machine-learning/gan>

Can a DNN detect fake images better than a DNN can generate fake images?





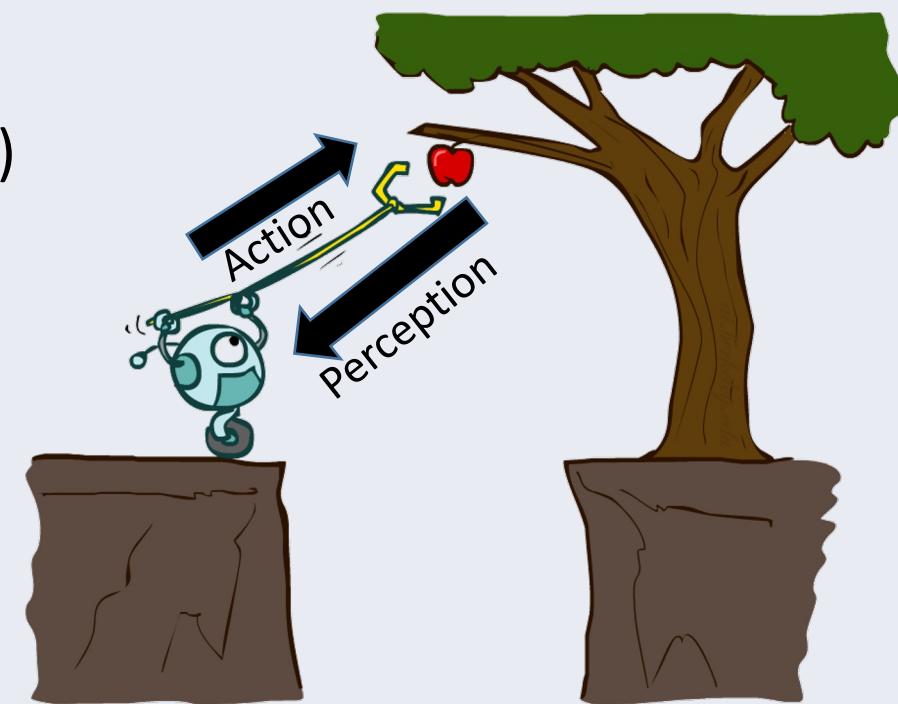
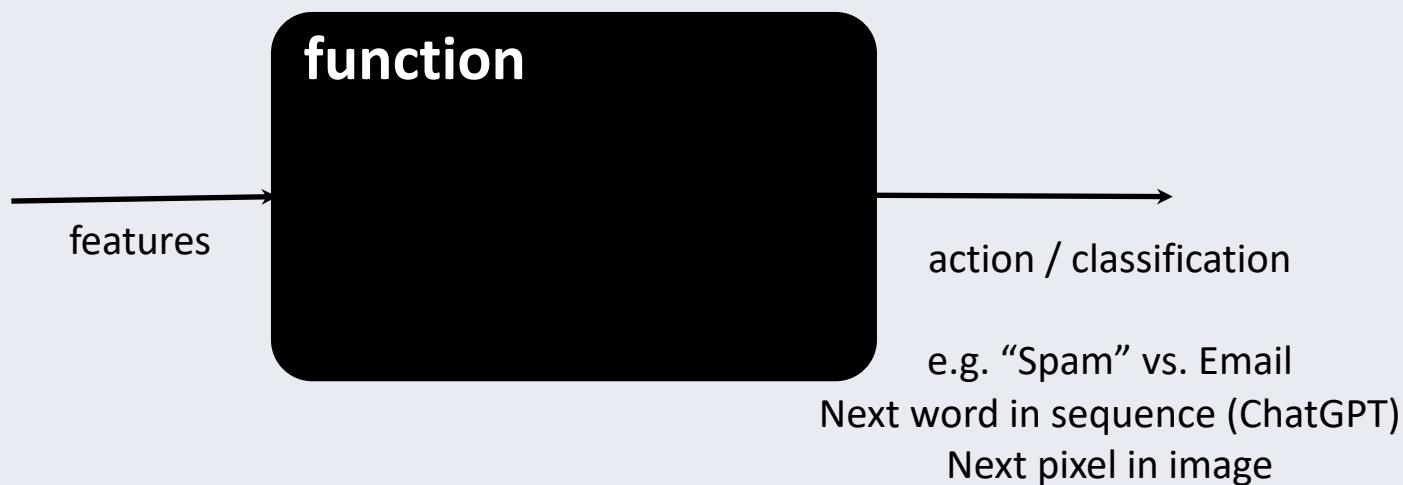
https://www.youtube.com/watch?v=Wrald_EZgDQ

How does “AI” or “Deep Learning” work?

- An entity that maps its perception of its environment to an action

$$f: P^* \rightarrow A$$

P^* - Precept history (collection of prior precepts)

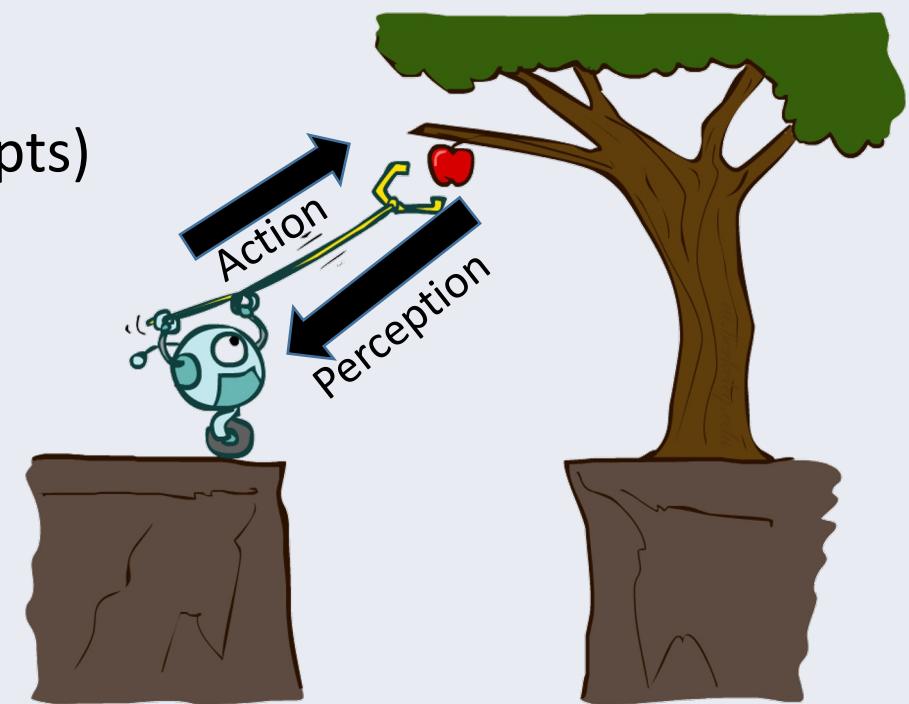
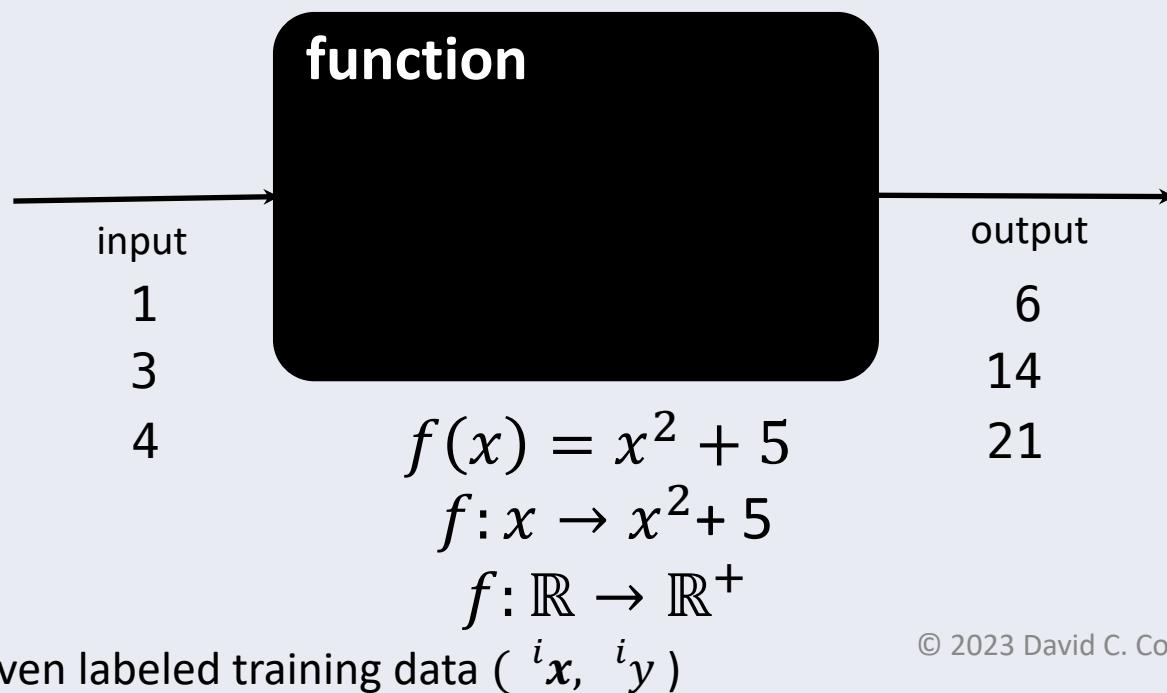


Function mapping: Inputs to outputs

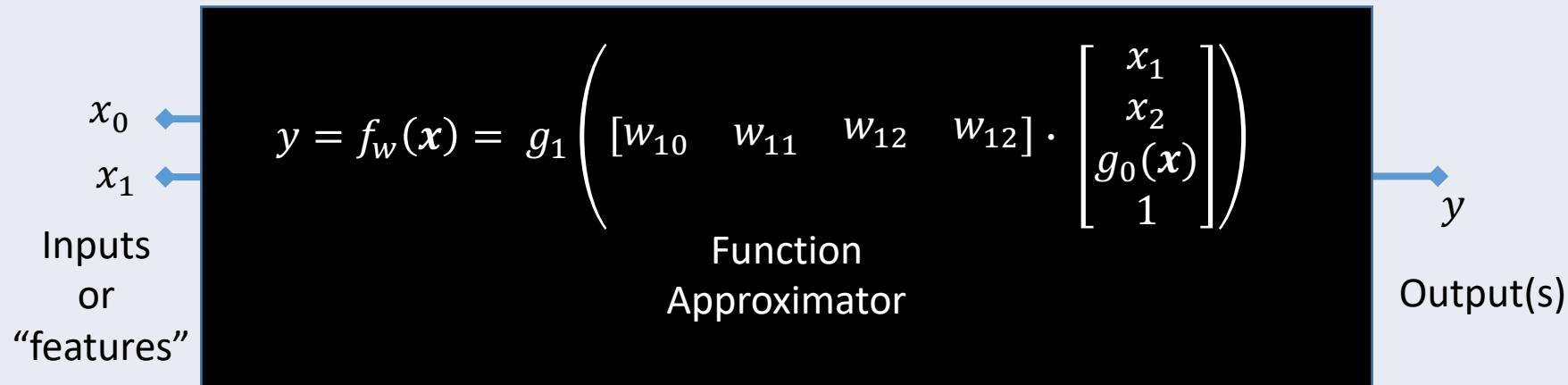
- An entity that maps its perception of its environment to an action

$$f: P^* \rightarrow A$$

P^* - Precept history (collection of prior precepts)



Two Neuron Example

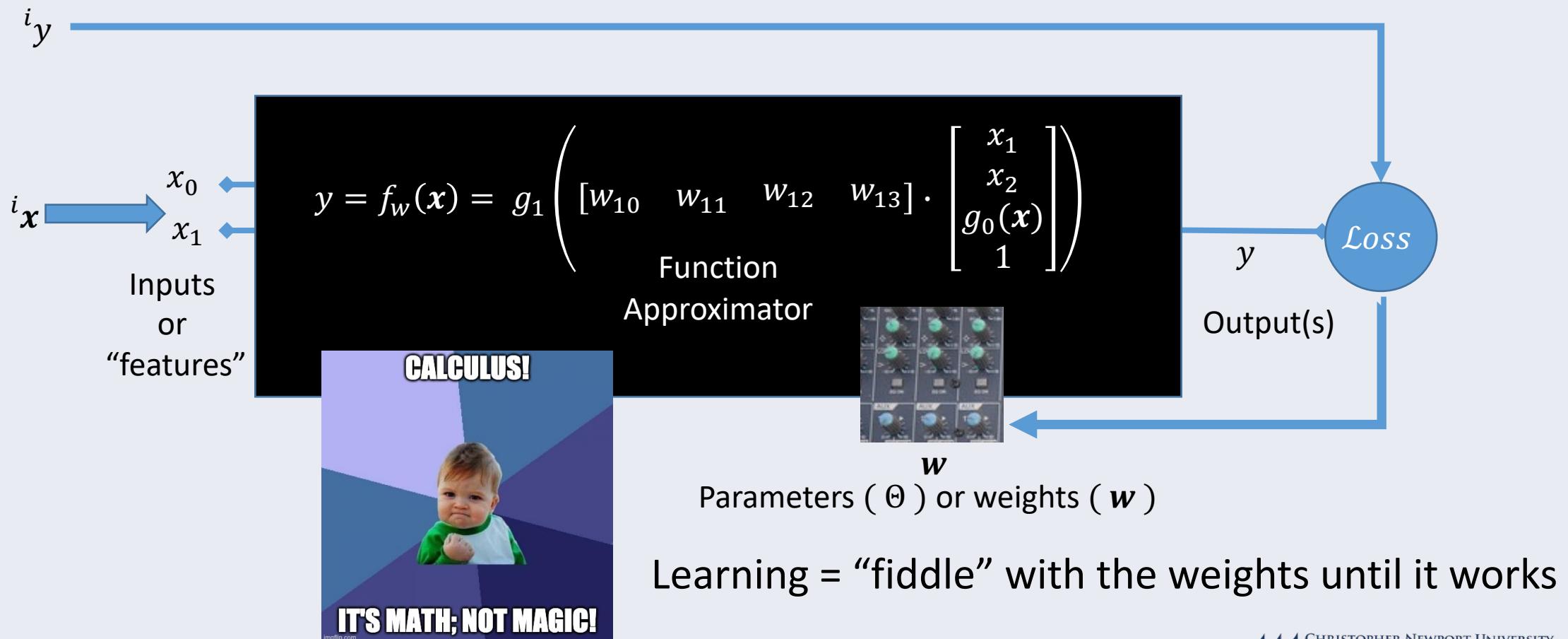


“hyper-parametric function approximation”

h/t Nicholas Roy (CMU/MIT)

Training Example

- Given labeled training data (${}^i\boldsymbol{x}$, ${}^i\boldsymbol{y}$)



What can we do with AI today?

- Answer questions
- Route phone calls
- “Siri, play ***Indie summer music*** playlist”
- Provide code examples
- Drive cars
- Write essays
- Recommend videos

The Social (Media) Dilemma

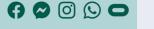
AI Action: “Maximize user engagement”
i.e., manipulate them to stay on the app longer

“There are only two industries that call their customers ‘users’: illegal drugs and software.”
Edward Tufte

The original quote is “There are only two industries which refer to their customers as users, drugs and computers,” from an interview report: Computer Literacy Bookshops Interview, 1994-1997.^[4] Netflix’s quote is: “There are only two industries that call their customers ‘users’: illegal drugs and software.”

<https://www.linkedin.com/pulse/drug-computer-industries-may-call-customers-users-media-yoram-reich>

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FACEBOOK


What ‘The Social Dilemma’ Gets Wrong

We should have conversations about the impact of social media on our lives. But ‘The Social Dilemma’ buries the substance in sensationalism.

Rather than offer a nuanced look at technology, it gives a distorted view of how social media platforms work to create a convenient scapegoat for what are difficult and complex societal problems. The film’s creators do not include insights from those *currently* working at the companies or any experts that take a different view to the narrative put forward by the film. They also don’t acknowledge—critically or otherwise—the efforts already taken by companies to address many of the issues they raise. Instead, they rely on commentary from those who haven’t been on the inside for many years. Here are the core points the film gets wrong.

<https://about.fb.com/wp-content/uploads/2020/10/What-The-Social-Dilemma-Gets-Wrong.pdf>

h/t: Emily Denton

Who is building AI and who is AI being built for?



Emily Denton
Research Scientist, Google Brain

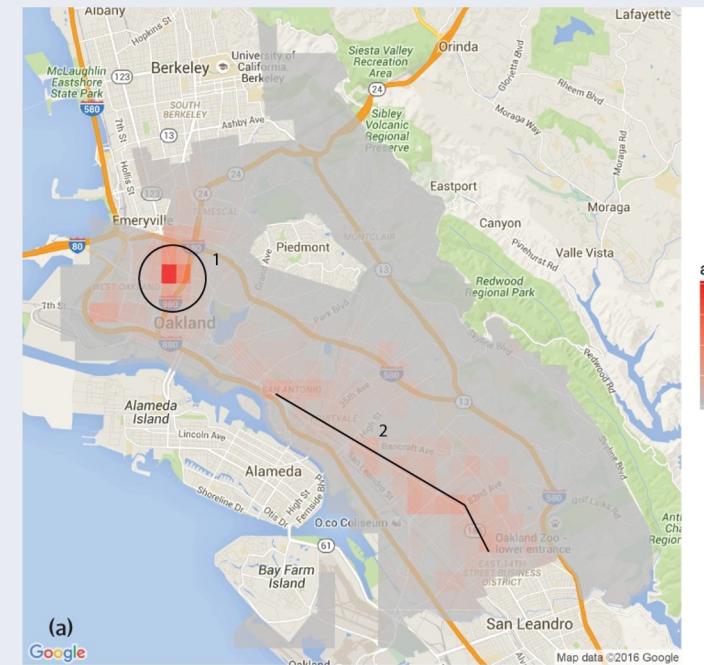
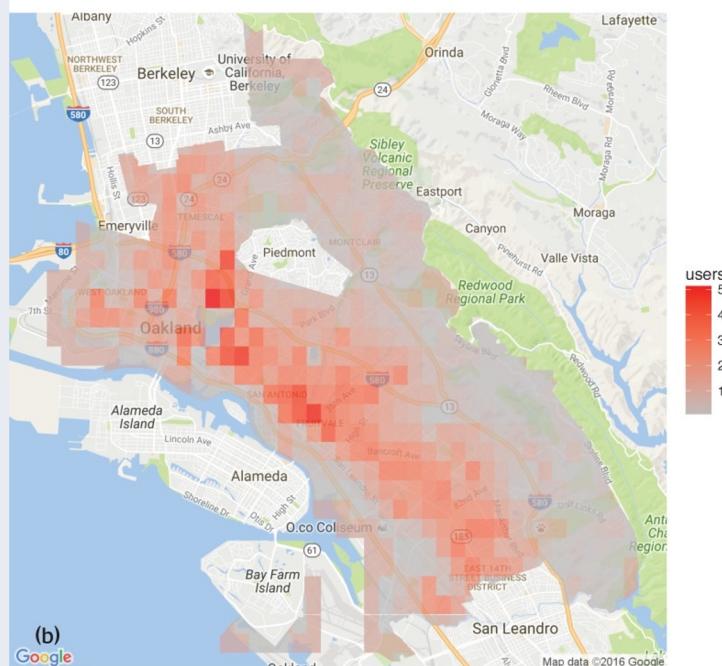
Policing and surveillance applications

Predictive policing tools predict “crime hotspots” based on policing data that reflects corrupt and racially discriminatory practices of policing and documentation

Lum & Isaac (2016). [To predict and serve?](#)

Richardson et al. (2019). [Dirty Data, Bad Predictions: How Civil Rights Violations Impact Police Data, Predictive Policing Systems, and Justice](#)

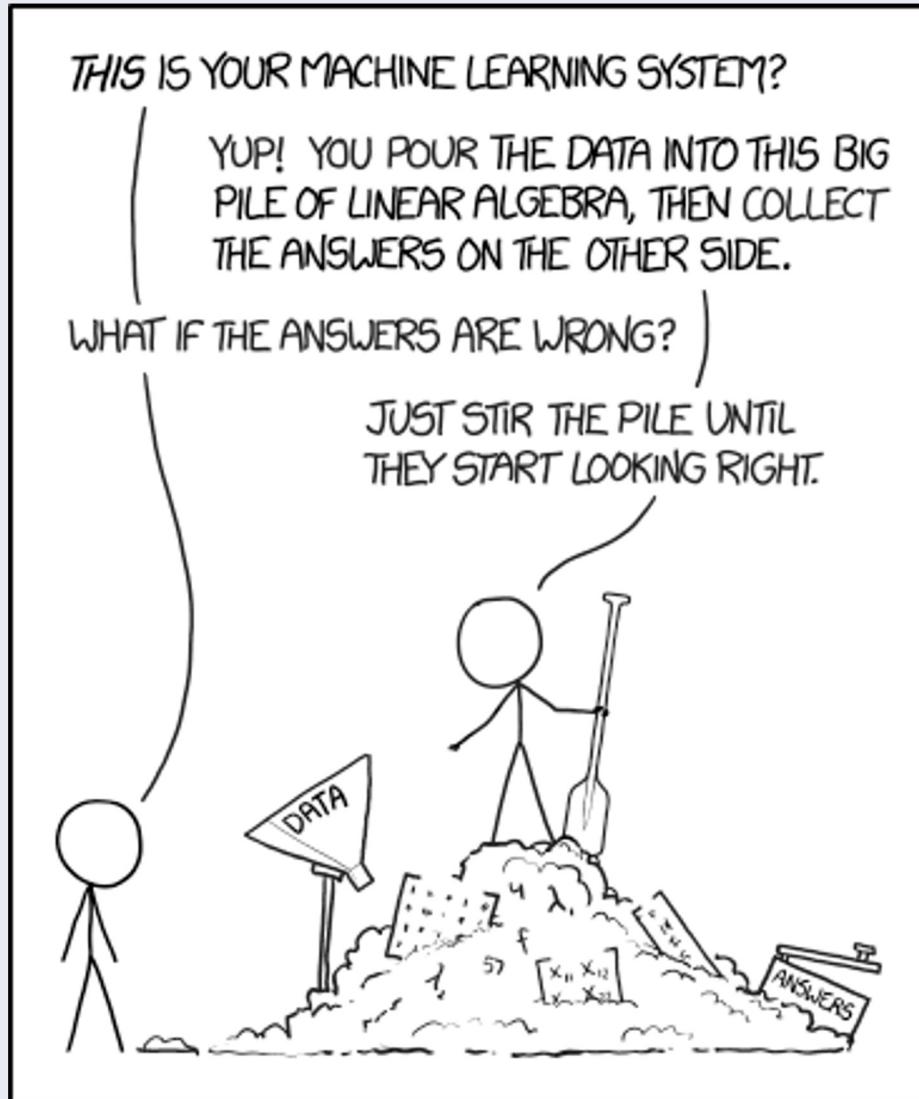
H/t Emily Denton, Google



Estimated number
of drug users,
based National
Survey on Drug
Use and Health

Drug arrests made
by Oakland, CA
police department

Relevant XKCD



<https://xkcd.com/1838/>

XKCD author Randall Monroe (PCSE '06) is currently CNU's most famous alumnus

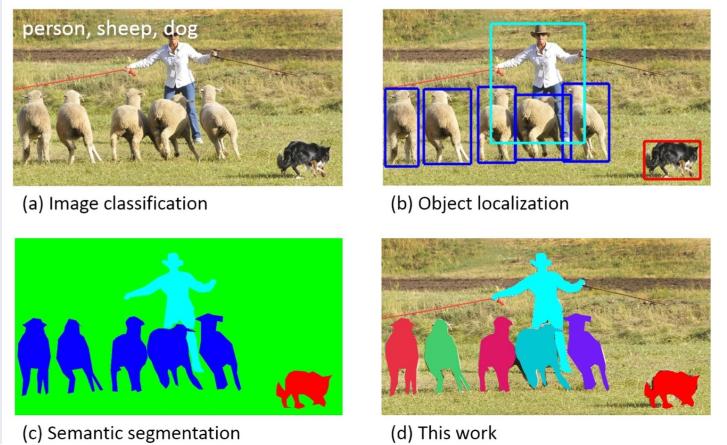
Labeled Datasets are used for training

| | | | | | | | | | | |
|-------------------|---|---|---|---|---|---|---|---|--|---|
| airplane |  |  |  |  |  |  |  |  |  |  |
| automobile |  |  |  |  |  |  |  |  |  |  |
| bird |  |  |  |  |  |  |  |  |  |  |
| cat |  |  |  |  |  |  |  |  |  |  |
| deer |  |  |  |  |  |  |  |  |  |  |
| dog |  |  |  |  |  |  |  |  |  |  |
| frog |  |  |  |  |  |  |  |  |  |  |
| horse |  |  |  |  |  |  |  |  |  |  |
| ship |  |  |  |  |  |  |  |  |  |  |
| truck |  |  |  |  |  |  |  |  |  |  |



<http://image-net.org>

14 million small images in 1000 noun categories
1 million with bounding boxes



Dataset examples



<https://cocodataset.org>

Common Objects in COntext



Object recognition

Object classification accuracy
dependent on geographical
location and household income

DeVries et al. (2019).
Does Object Recognition Work for Everyone?



Ground truth: Soap
Nepal, 288 \$ / month

Common machine
classifications: **food**,
cheese, food product, dish,
cooking



Ground truth: Soap
UK, 1890 \$ / month

Common classification:
soap dispenser, toiletry,
faucet, lotion

H/t Emily Denton, Google

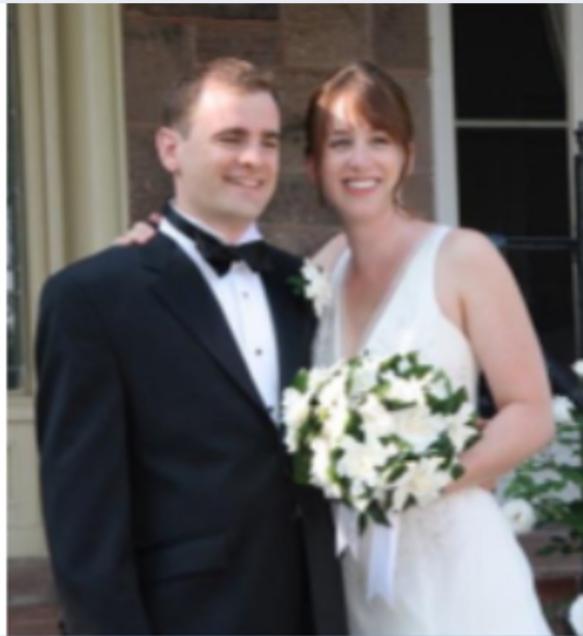
Patterns of exclusion: Image classification



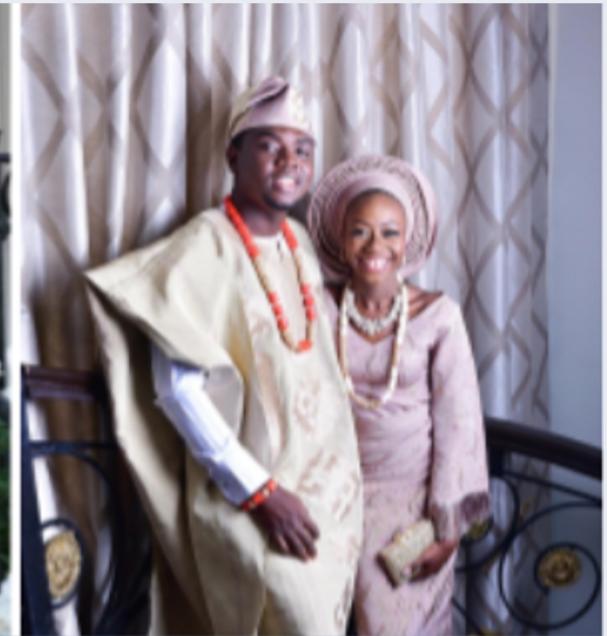
*ceremony,
wedding, bride,
man, groom,
woman, dress*



*bride,
ceremony,
wedding, dress,
woman*



*ceremony,
bride, wedding,
man, groom,
woman, dress*



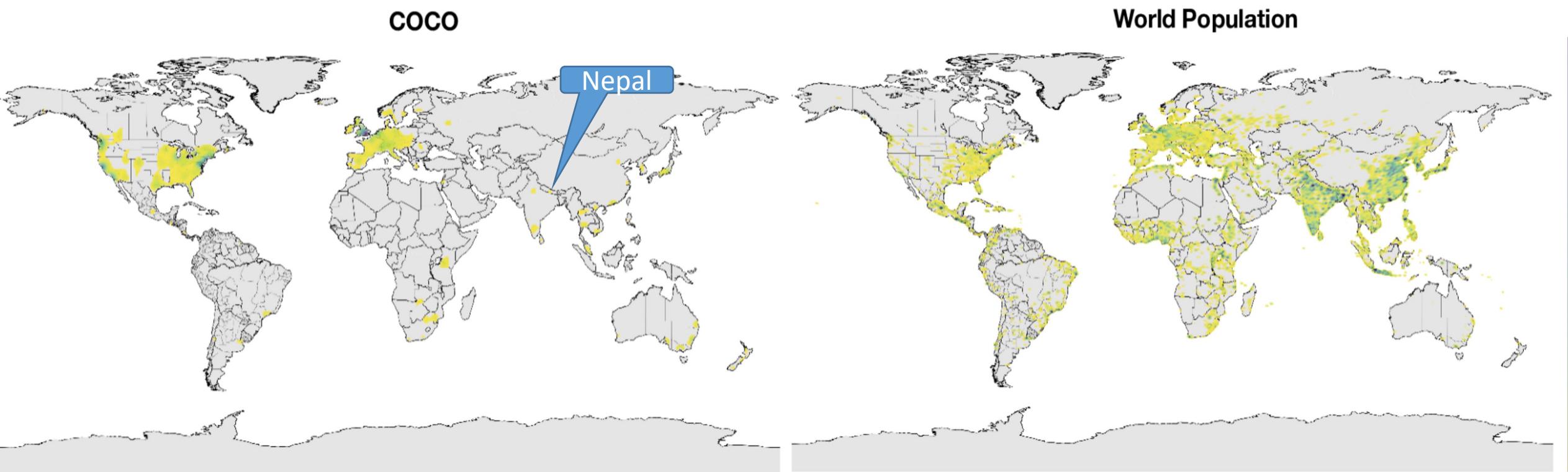
person, people

[Shankar et al. (2017). No Classification without Representation: Assessing Geodiversity Issues in Open Data Sets for the Developing World]

H/t Emily Denton, Google

Distributional skews within training and evaluation datasets

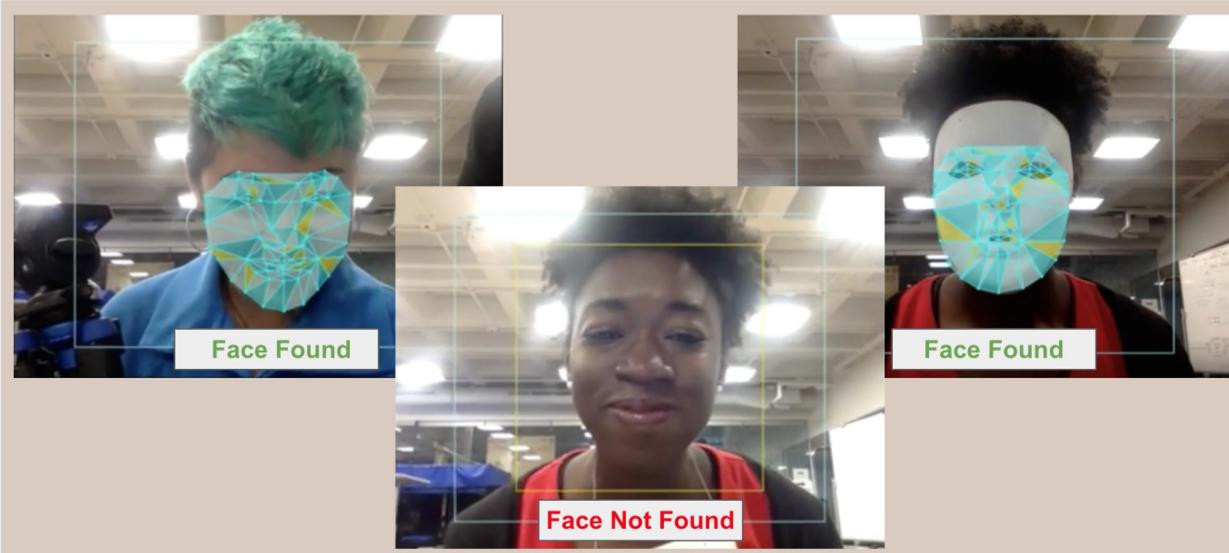
<https://cocodataset.org>



DeVries et al. (2019). Does Object Recognition Work for Everyone?

H/t Emily Denton, Google

Patterns of exclusion: Facial analysis



"Wearing a white mask worked better than using my actual face" -- Joy Buolamwini

The Coded Gaze: Unmasking Algorithmic Bias

H/t Emily Denton, Google

When the Robot Doesn't See Dark Skin

By Joy Buolamwini

Ms. Buolamwini is the founder of the Algorithmic Justice League.

June 21, 2018



Take measurement validity seriously

Crime patterns → Policing patterns

Illness → Health care costs

Successful job candidate → Hiring and retention patterns

Jacobs and Wallach (2018). Measurement and Fairness

H/t Emily Denton, Google

- <https://www.reuters.com/article/us-amazon-com-jobs-automation-insight/amazon-scraps-secret-ai-recruiting-tool-that-showed-bias-against-women-idUSKCN1MK08G>

RETAIL OCTOBER 10, 2018 / 7:04 PM / UPDATED 3 YEARS AGO

Amazon scraps secret AI recruiting tool that showed bias against women

Pattern detection: correlation vs. causation

Data is contingent, constructed, value-laden

Contingent → Datasets are contingent on the social conditions of creation

Constructed → Data is not objective; 'Ground truth' isn't truth

Value-laden → Datasets are shaped by patterns of inclusion and exclusion

Our data collection and data use practices should reflect this

Timnit, et al. (2018). [Datasheets for datasets](#)

Holland et al. (2018). [The Dataset Nutrition Label: A Framework To Drive Higher Data Quality Standards](#)

Bender and Friedman (2018). [Data Statements for NLP: Toward Mitigating System Bias and Enabling Better Science](#)

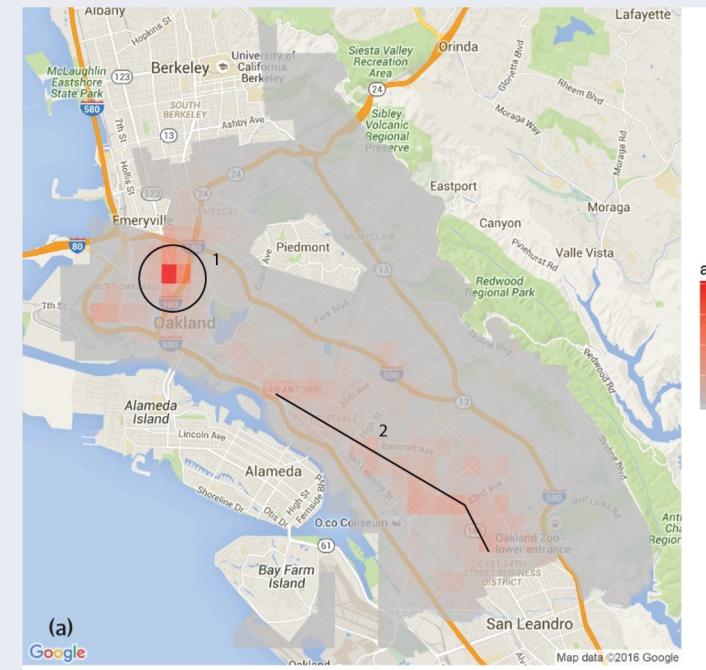
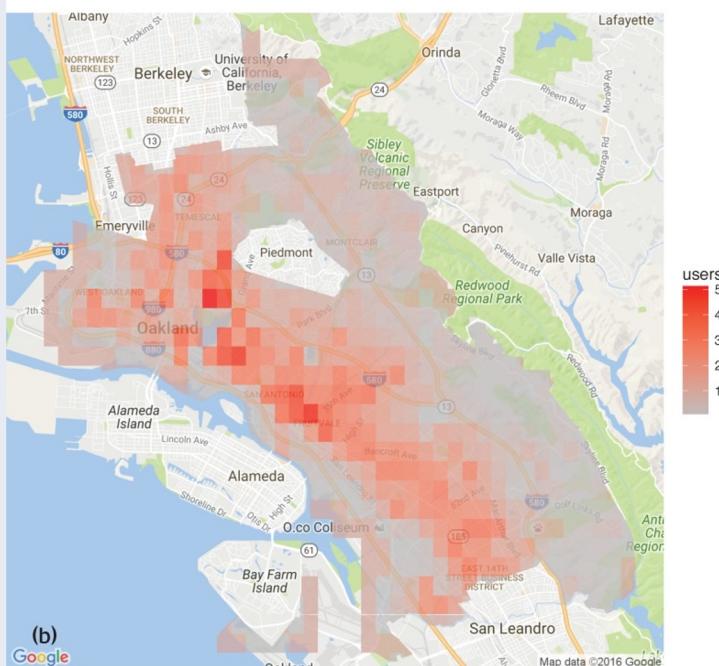
Policing and surveillance applications

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H/t Emily Denton, Google



Estimated number
of drug users,
based National
Survey on Drug
Use and Health

Drug arrests made
by Oakland, CA
police department

Fundamental Question: Who controls the data?

- Whoever controls the data, controls the AI
- Therefore, AI is ripe for political manipulation



"Dune" reference meme - "He who controls the spice controls the universe."

What does it mean to “follow the science”?



Eugenics?

Birth Control propaganda is thus the entering wedge for the Eugenic educator. In answering the needs of these thousands upon thousands of submerged mothers, it is possible to use this interest as the foundation for education in prophylaxis, sexual hygiene, and infant welfare. The potential mother is to be shown that maternity need not be slavery but the most effective avenue toward self-development and self-realization. Upon this basis only may we improve the quality of the race.

As an advocate of Birth Control, I wish to take advantage of the present opportunity to point out that the unbalance between the birth rate of the "unfit" and the "fit", admittedly the greatest present menace to civilization, can never be rectified by the inauguration of a cradle competition between these two classes. In this matter, the example of the inferior classes, the fertility of the feeble-minded, the mentally defective, the poverty-stricken classes, should not be held up for emulation to the mentally and physically fit though less fertile parents of the educated and well-to-do classes. On the contrary, the most urgent problem today is how to limit and discourage the over-fertility of the mentally and physically defective.

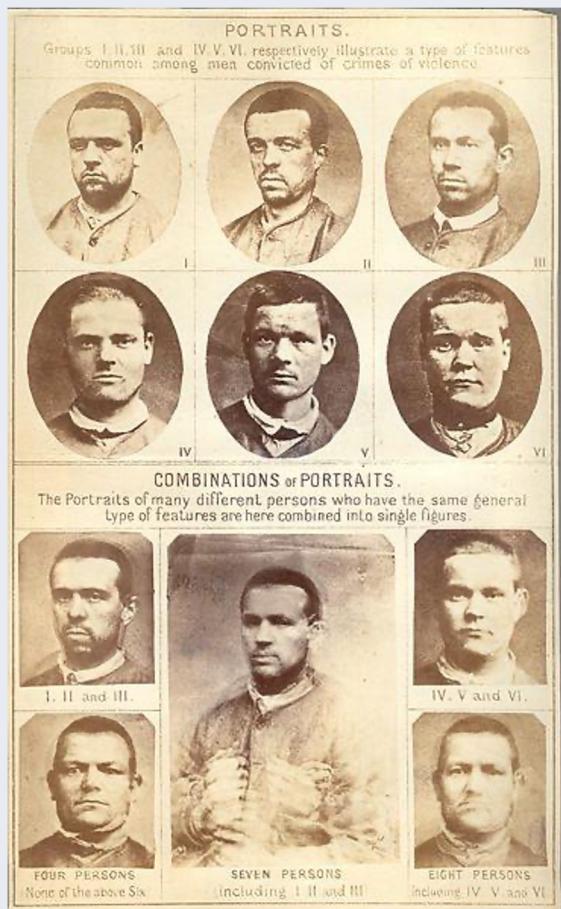
Birth Control is not advanced as a panacea by which past and present evils of dysgenic breeding can be magically eliminated. Possibly drastic and Spartan methods may be forced upon society if it continues complacently to encourage the chance and chaotic breeding that has resulted from our stupidly cruel sentimentalism.

Margaret Sanger, "The Eugenic Value of Birth Control Propaganda," Oct 1921.

<https://socialwelfare.library.vcu.edu/programs/health-nutrition/eugenic-value-birth-control-propaganda/>

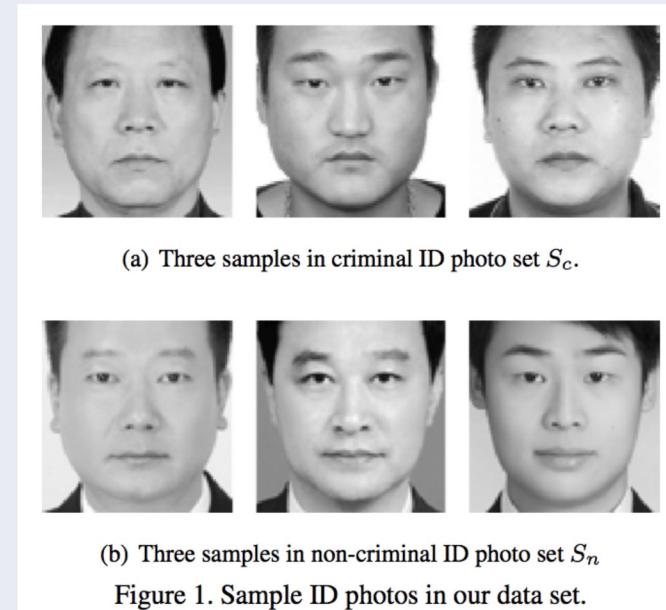
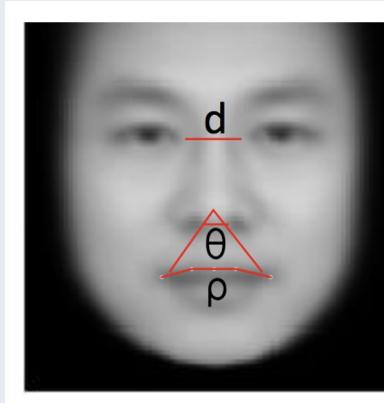
https://en.wikipedia.org/wiki/Virginia_Sterilization_Act_of_1924

Technologies of human classification: phrenology, physiognomy, and AI?



Francis Galton (1877). Composite portraits of human 'types'
Galton was a prominent eugenicist

H/t Emily Denton, Google



Wu and Zhang (2016).
Automated Inference on Criminality using Face Images

Claimed 90% accuracy using CNN to detect "criminals" based on photo ID

Machine learning does not distinguish between correlations that are causally meaningful and ones that are incidental.

<https://medium.com/@blaisea/physiognomys-new-clothes-f2d4b59fdd6a>

Artificial intelligence predicts patients' race from their medical images

- Study shows AI can identify self-reported race from medical images that contain no indications of race detectable by human experts.

“In our [own work](#), led by computer scientist Emma Pierson at Cornell, we show that algorithms that learn from patients' pain experiences can find new sources of knee pain in X-rays that disproportionately affect Black patients — and are disproportionately missed by radiologists. So just like any tool, algorithms can be a force for evil or a force for good — which one depends on us, and the choices we make when we build algorithms.”



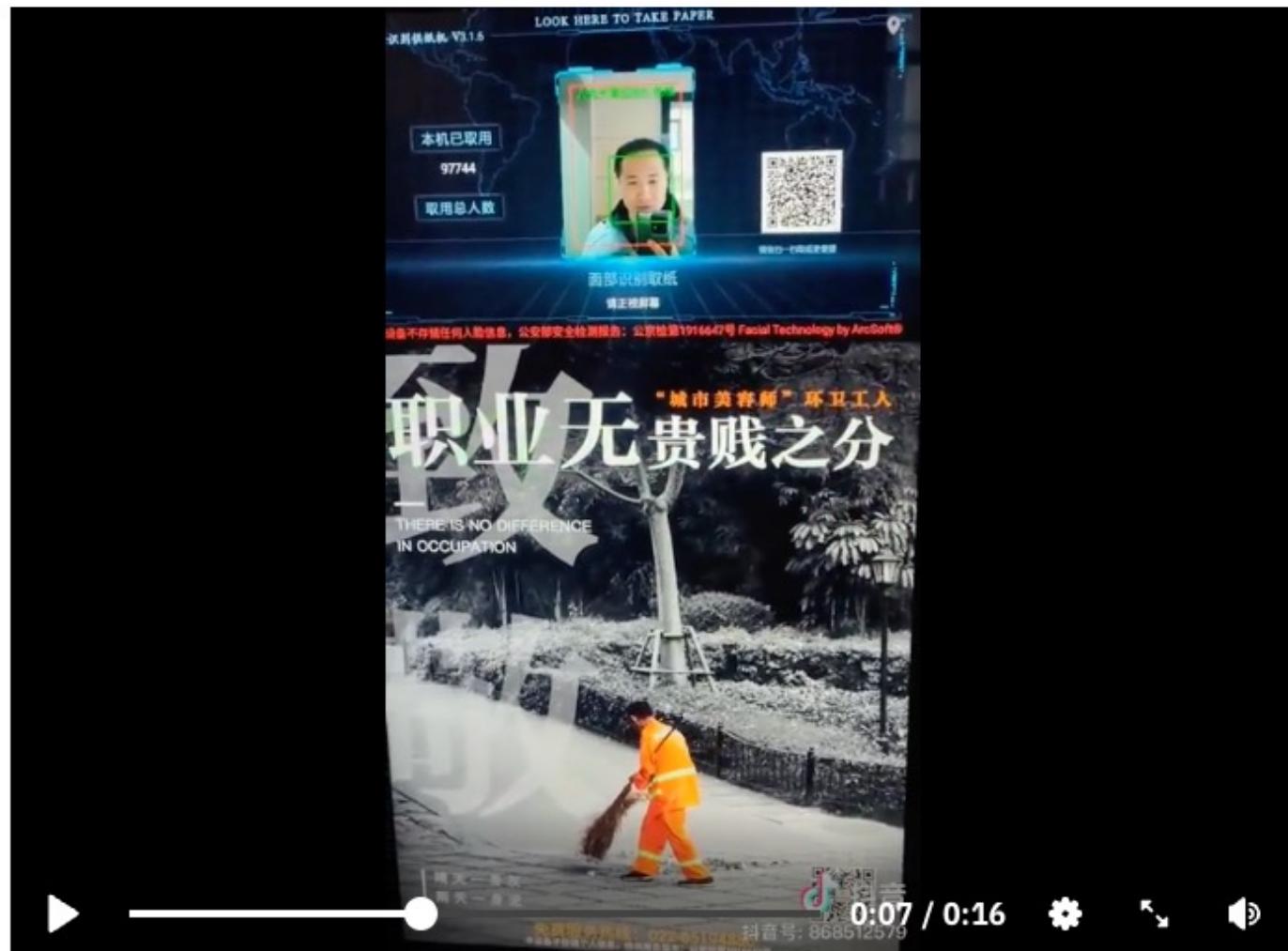
<https://news.mit.edu/2022/artificial-intelligence-predicts-patients-race-from-medical-images-0520>

Social credit?

- <https://www.wired.co.uk/article/china-social-credit-system-explained>
- “Liu Hu is a journalist in China, writing about censorship and government corruption. Because of his work, Liu has been arrested and fined — and blacklisted. Liu found he was named on a List of Dishonest Persons Subject to Enforcement by the Supreme People's Court as "*not qualified*" to buy a plane ticket, and banned from travelling some train lines, buying property, or taking out a loan.”

2.8k Public restrooms in China require a facescan in exchange for toiletpaper

↓ /r/ALL



“The potential of AI”

“Imagine for a moment that you’re in an office, hard at work.

But it’s **no ordinary office**. By observing cues like your posture, tone of voice, and breathing patterns, it can **sense your mood and tailor the lighting and sound accordingly**. Through gradual ambient shifts, the space around you **can take the edge off when you’re stressed, or boost your creativity when you hit a lull**. Imagine further that you’re a designer, using tools with equally perceptive abilities: at each step in the process, they riff on your ideas based on their knowledge of your own creative persona, contrasted with features from the best work of others.”

Potential for who?

Another future

"Someday you may have to work in an office where the lights are **carefully programmed and tested by your employer to hack your body's** natural production of melatonin through the use of blue light, eking out every drop of energy you have while you're on the clock, leaving you physically and emotionally drained when you leave work. Your eye movements may someday come under the **scrutiny of algorithms** unknown to you that **classifies you on dimensions such as "narcissism" and "psychopathy", determining your career and indeed your life prospects.**"

[Alkhatib (2019). "Anthropological/Artificial Intelligence & the HAI"]

Ethical and Policy Issues

- People may lose jobs to automation
 - One argument is that economic displacement opens new opportunities
 - Are the people displaced the best suited for the new opportunities?
- People might have too much/little leisure time
 - Are we bored or stressed due to new technologically induced pressure?
 - Will UBI impact self-worth and social stability?

Ethical and Policy Issues

- Who is accountable if AI goes rogue?
 - Owner, programmer, ...?
- Robots gonna kill us all!
 - Minimize human suffering by minimizing the number of humans
- People might use AI to undesirable ends
- Are we humans really all that special?

Issues with Military Use

- Some generally considered good
 - “Out front, in harms way”
 - IED disarming robots (currently remote-control robots)
 - IED detection/minesweepers
- Weaponized Autonomous Robots
 - <http://stopkillerrobots.org>
 - [Just War Justification](#)
 - Current systems keep a warfighter in the loop for fire control
 - E.g. drones in Afghanistan have “pilots” operating from Nevada
 - 2587 AI researchers signed a letter demanding banning autonomous weapons systems <http://www.stopkillerrobots.org/2015/07/aicall/>
 - <https://news.vice.com/story/russian-weapons-maker-kalashnikov-developing-killer-ai-robots> (2017)
 - “Dawn of the killer robots”
- Concerns
 - Accountability – who do we blame?
 - By lowering the causalities, you lower the cost to go to war, and thereby make going to war more likely

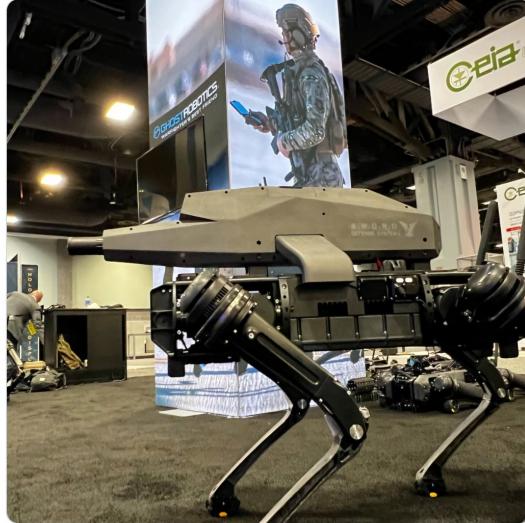


Military Robotics

 Ghost Robotics
@Ghost_Robotics



Latest lethality 6.5 #creedmoor sniper payload from @SWORDINT. Check out the latest partner payloads @AUSAorg Wash DC. Keeping US and allied #sof #warfighter equipped with the latest innovations. @USSOCOM #defense #defence #NationalSecurity #drone #robotics



7:02 PM · Oct 11, 2021

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Ghost Robotics strapped a gun to its robot dog

The company has previously made other machines for the military as well.

K. Holt
@krisholt

October 14th, 2021

In this article: q-ugv , robot dog, sword international, sword defense, news, gear, rifle, lockheed martin, drone, ghost robotics, digital force technologies, robots, gun, tomorrow



Sword International

<https://www.axios.com/2022/10/06/boston-dynamics-pledges-weaponize-robots>

<https://www.bostondynamics.com/open-letter-opposing-weaponization-general-purpose-robots>

Conclusion

- AI is here today
- AI is here to stay
- AI is a tool
 - Like hammers and nuclear power
- Who controls the algorithms and data is up for debate
 - This will likely have the greatest impact on your quality of life