

Calling Bullshit

Data Reasoning for the Digital Age



NATIONAL ACADEMY
OF SCIENCES

Jevin D. West and Carl T. Bergstrom
iSchool, University of Washington

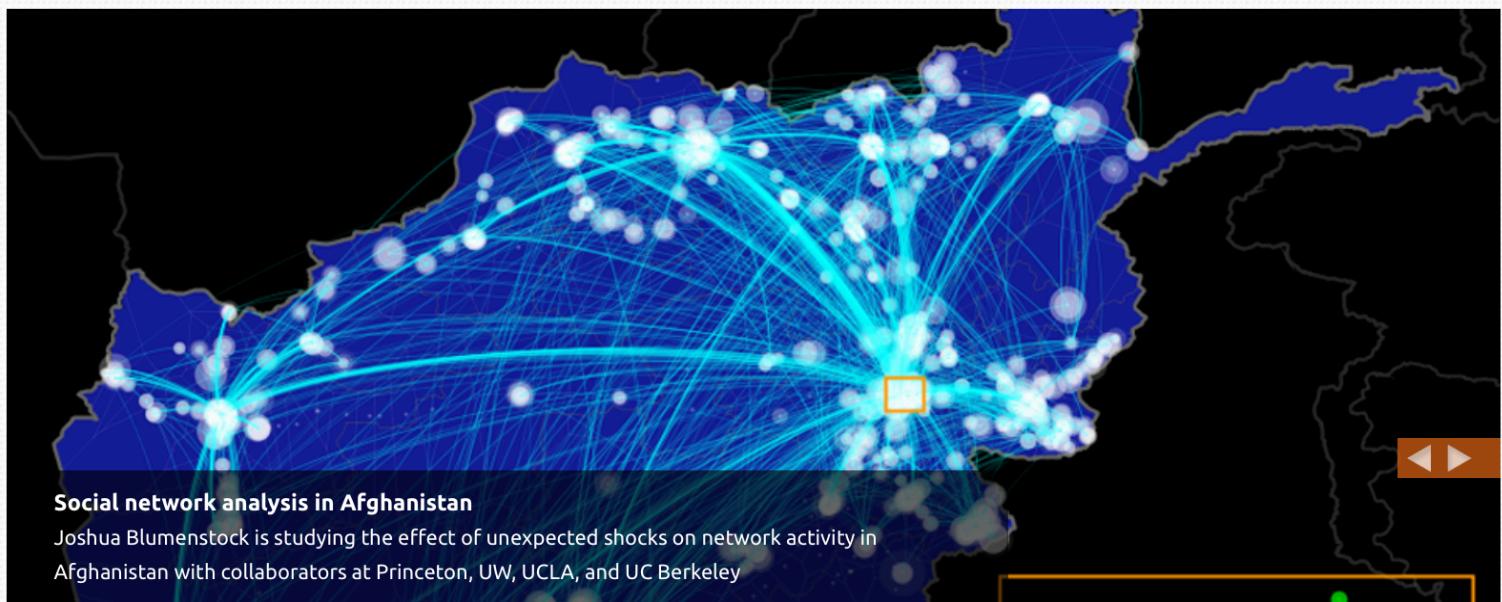
<http://callingbullshit.org>



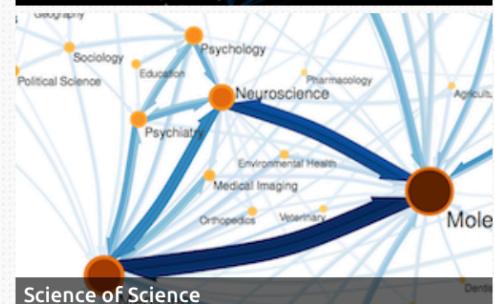
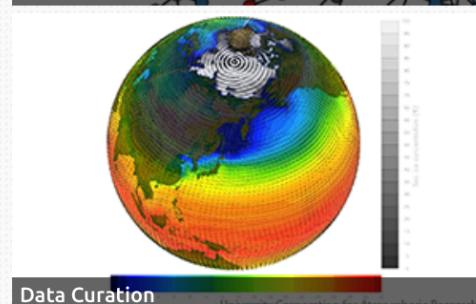
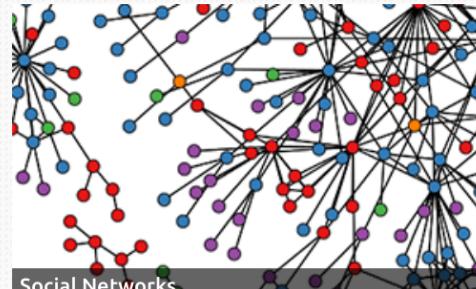
@callin_bull

National Academy of Sciences

Dec. 8, 2017



Research Focus Areas



Find the Jacobian of the transformation :

$$x = u^2 - v^2$$

$$y = u^2 + v^2$$

$$\begin{vmatrix} \frac{\partial x}{\partial u} & \frac{\partial x}{\partial v} \\ \frac{\partial y}{\partial u} & \frac{\partial y}{\partial v} \end{vmatrix}$$

$$\frac{\partial x}{\partial u} = 2u$$

$$\frac{\partial x}{\partial v} = -2v$$

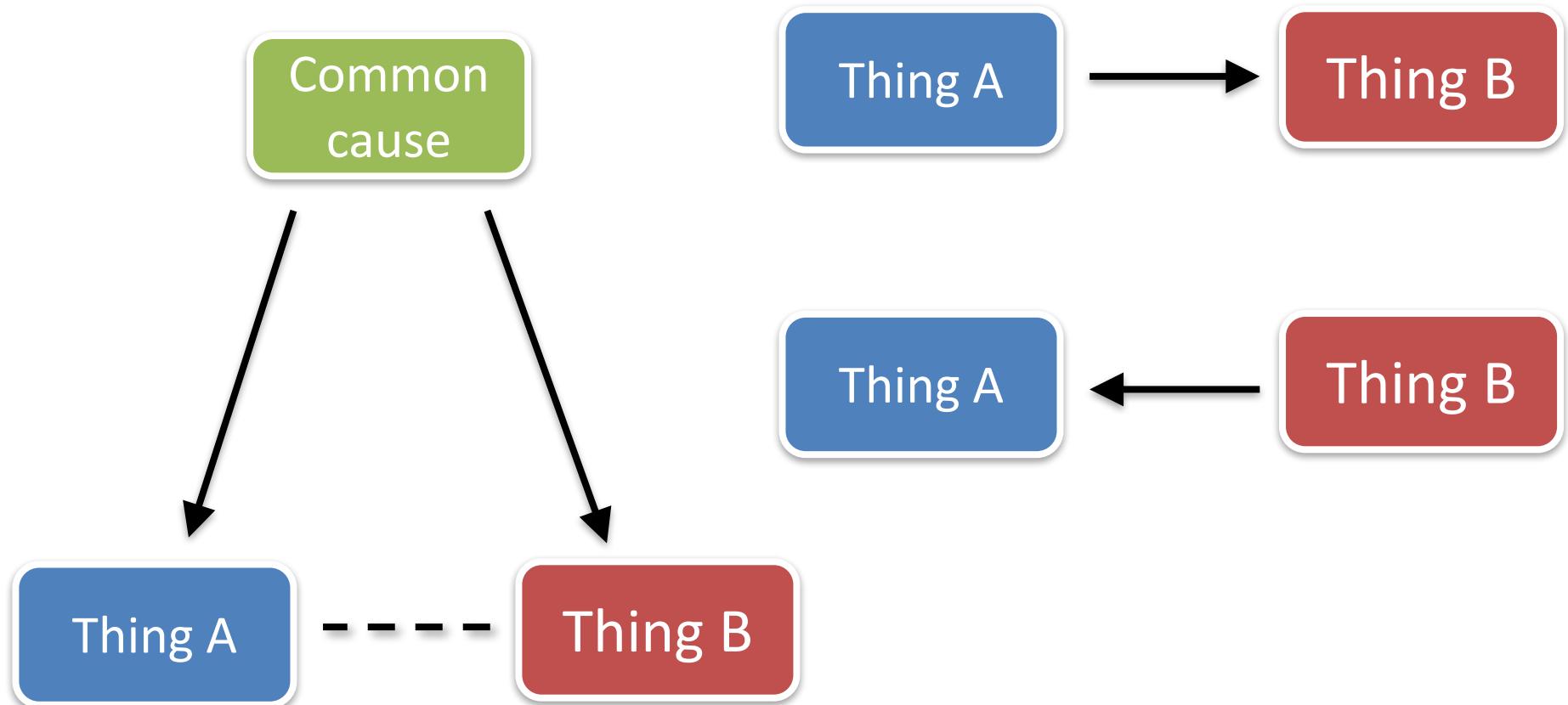
$$\frac{\partial y}{\partial u} = 2u$$

$$\frac{\partial y}{\partial v}$$

MACBETH



Manipulative experiments





Joel Rubin

@joelrubin

Follow



"The Los Angeles Police Department asked drivers to avoid navigation apps, which are steering users onto more open routes — in this case, streets in the neighborhoods that are on fire."



Firefighters attempt to contain Bel-Air blaze ahead of the st...

Firefighters scrambled Wednesday afternoon to make progress against the Skirball fire burning in Bel-Air before the return of strong wi...

latimes.com

5:04 PM - 6 Dec 2017

1,881 Retweets 1,718 Likes



55

1.9K



1.7K



About 771,000 results (0.74 seconds)

[When is 'Shaken Baby' Syndrome Possibly Vaccine Injury Instead ...](http://www.ageofautism.com/.../when-is-shaken-baby-syndrome-possibly-vaccine-injury-in...)

[www.ageofautism.com/.../when-is-shaken-baby-syndrome-possibly-vaccine-injury-in... ▾](http://www.ageofautism.com/.../when-is-shaken-baby-syndrome-possibly-vaccine-injury-in...)

Jun 17, 2015 - So when a seeming rash of 'shaken baby' syndrome stories began to ... brain edema, and the effects of endotoxin in causing vascular inflammation and how bruises would have anything to do with vaccine injury or autism.

[Shaken Baby Syndrome – National Vaccine Information Center](http://www.nvic.org/Doctors-Corner/Shaken-Baby-Syndrome.aspx)

[www.nvic.org/Doctors-Corner/Shaken-Baby-Syndrome.aspx ▾](http://www.nvic.org/Doctors-Corner/Shaken-Baby-Syndrome.aspx)

Multiple Vaccinations and the Shaken Baby Syndrome ... For the purpose of this report, they will not be further identified because they differ ever so ... on any adverse event following vaccination, be it coincidental or truly caused by a vaccine.

[Dangerous Vaccines Found to Cause Symptoms of Shaken Baby ...](https://vactruth.com/2013/06/22/shaken-baby-syndrome/)

[https://vactruth.com/2013/06/22/shaken-baby-syndrome/ ▾](https://vactruth.com/2013/06/22/shaken-baby-syndrome/)

Jun 22, 2013 - At this stage, the detective will pretend to be the suspect's ally. ... Professionals are recognizing that Shaken Baby Syndrome is an unsafe ... needs to examine the real causes of Shaken Baby Syndrome, especially vaccination, ...

[Shaken Baby Syndrome often caused by vaccines, not parents ...](http://www.naturalnews.com/041719_Shaken_Baby_Syndrome_vaccines_side_effects.html)

[www.naturalnews.com/041719_Shaken_Baby_Syndrome_vaccines_side_effects.html ▾](http://www.naturalnews.com/041719_Shaken_Baby_Syndrome_vaccines_side_effects.html)

Aug 21, 2013 - Shaken Baby Syndrome often caused by vaccines, not parents. ... published back in the 1990s and even earlier have identified vaccines as a probable cause of SBS. Do you want the big guns used to keep the baby alive?

Translation Bias

Google

Translate

Turn off instant translation



English Spanish Turkish Detect language ▾



English Spanish Arabic ▾

Translate

O bir doktor. O bir hems,ire.



30/5000

He is a doctor. She is a nurse.

☆ □ 🔍

Suggest an edit

Google

Translate

Turn off instant translation



English Spanish Turkish Detect language ▾



English Spanish Arabic ▾

Translate

O bir doktor. O bir hems,ire.



30/5000

Es un doctor. Es un hámster IRA.

☆ □ 🔍

Suggest an edit

Caliskan, Aylin, Joanna J. Bryson, and Arvind Narayanan. "Semantics derived automatically from language corpora contain human-like biases." *Science* 356.6334 (2017): 183-186.

Gender Bias



Percentage of women in top 100 Google image search results for CEO: 11%

Percentage of U.S. CEOs who are women: 27%

Kay, Matthew, Cynthia Matuszek, and Sean A. Munson. "Unequal representation and gender stereotypes in image search results for occupations." *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*. ACM, 2015.

we are drowning in bullshit

Total Facebook Engagements for Top 20 Election Stories



ENGAGEMENT REFERS TO THE TOTAL NUMBER OF SHARES, REACTIONS, AND COMMENTS FOR A PIECE OF CONTENT ON FACEBOOK SOURCE: FACEBOOK DATA VIA BUZZSUMO

ussian Influence
reached 126 Million
through Facebook Alone



Mark Warner: Tech
Millionaire Who Became
Tech's Critic in Congress



What Virtual Reality Can
Teach a Driverless Car



TECH FIX
The iPhone X Arrives
Friday. Here's What You
Need to Know.



Samsung Unveils New
Management to Quell
Leadership Crisis



How to Fix F
Asked 9 Exp

TECHNOLOGY

Russian Influence Reached 126 Million Through Facebook Alone

By MIKE ISAAC and DAISUKE WAKABAYASHI OCT. 30, 2017



Facebook and Google have faced pressure from lawmakers after disclosures of Russia-linked interference on their platforms last year. Senators Amy Klobuchar and Mark Warner spoke about online political ads and preventing foreign interference in elections this month. Al Drago for The New York Times

RELATED COVERAGE



At Facebook, Hand-Wringing Over a Fix for
Fake Content OCT. 27, 2017



Russia's Favored Outlet Is an Online News
Giant. YouTube Helped. OCT. 23, 2017



Tech Giants, Once Seen as Saviors, Are
Now Viewed as Threats OCT. 12, 2017



Twitter, With Accounts Linked to Russia, to
Face Congress Over Role in Election
SEPT. 27, 2017



Latest News Targeting capitals of "Resolve Storm" is part of managing the war on Yemen | Yemen missile Force unveils Gaher "M-2" ballistic missile System | Saudi Arabia deploying

Israeli Defense Minister: If Pakistan sends ground troops into Syria on any pretext, we will destroy this country with a nuclear attack

 Political 20 December 2016

The former Israeli Defence Minister has threatened to "destroy" Pakistan-after Pakistan said on Thursday it will send Sunni fighters to Syria

Pakistan said on Thursday it was ready to send ground troops to Syria as part of an international coalition to fight against Islamic State.

"We have been frustrated at the slow pace of confronting Daesh," said Tariq Fatemi, Minister of State for Foreign Affairs of Pakistan, referring to Islamic State by its Arabic acronym.

Following this Statement, Israel has said it will act if Pakistan send ground troops into Syria on the pretext of fighting against ISIS.

The Latest



3rd year of US-Saudi aggression .. Targeting capit...

Wednesday, 29 March 2017 11:45



Yemen missile Force unveils Gaher "M-2" ballistic ...

Wednesday, 29 March 2017 11:45



Saudi Arabia deploying mines to target ships passi...

Wednesday, 29 March 2017 11:45



Russia Threatens to Leak Things Obama Asked Moscow...

Wednesday, 29 March 2017 11:45



UN recognizes Saudi crimes in Yemen ... 1,400 Yemeni...

Wednesday, 29 March 2017 11:45

Nuclear Fake News



Ministry of Defense @Israel_MOD

@KhawajaMASif The statement attributed to fmr Def Min Yaalon re Pakistan was never said

24 Dec



Ministry of Defense
@Israel_MOD

[Follow](#)

@KhawajaMASif reports referred to by the Pakistani Def Min are entirely false

6:14 AM - 24 Dec 2016



97

79

“Israeli def min threatens nuclear retaliation presuming pak role in Syria against Daesh,” the minister wrote on his official Twitter account, using an Arabic acronym for the Islamic State. “Israel forgets Pakistan is a Nuclear state too.” — Khawaja M. Asif (@KhawajaMASif) Dec. 23, 2016

Alberto Brandolini's Bullshit Asymmetry Principle

“The amount of energy necessary to refute bullshit is an order of magnitude bigger than to produce it.”



[View image on Twitter](#)



Will Sommer 

@willsommer



Follow

This family of 5 wore matching Pizzagate outfits.

9:07 AM - 25 Mar 2017

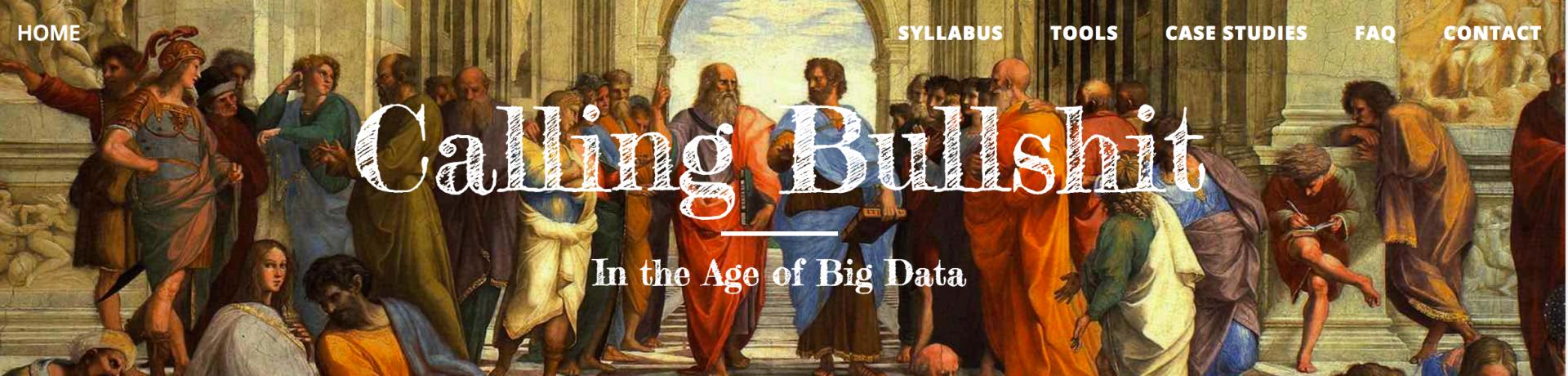


1,279

2,440

“Instead of trying to combat each leak directly, the United States government should teach the public to tell when they are being manipulated. Via schools and nongovernmental organizations and public service campaigns, Americans should be taught the basic skills necessary to be savvy media consumers, from how to fact-check news articles to how pictures can lie.”

—Mark Galotti, (Dec. 2016) *NY Times*.



Calling Bullshit

In the Age of Big Data

The world is awash in bullshit. Politicians are unconstrained by facts. Science is conducted by press release. Higher education rewards bullshit over analytic thought. Startup culture elevates bullshit to high art. Advertisers wink conspiratorially and invite us to join them in seeing through all the bullshit — and take advantage of our lowered guard to bombard us with bullshit of the second order. The majority of administrative activity, whether in private business or the public sphere, seems to be little more than a sophisticated exercise in the combinatorial reassembly of bullshit.

We're sick of it. It's time to do something, and as educators, one constructive thing we know how to do is to teach people. So, the aim of this course is to help students navigate the bullshit-rich modern environment by identifying bullshit, seeing through it, and combating it with effective analysis and argument.

<http://callingbullshit.org>



Syllabus

With links to readings

Learning Objectives

- Remain vigilant for bullshit contaminating your information diet.
- Recognize said bullshit whenever and wherever you encounter.
- Figure out for yourself precisely why a particular bit of bullshit is bullshit.
- Provide a statistician or fellow scientist with a technical explanation of why a claim is bullshit.
- Provide your crystals-and-homeopathy aunt or causally racist uncle with an accessible and persuasive explanation of why a claim is bullshit.

We will be astonished if these skills do not turn out to be among the most useful and most broadly applicable of those that you acquire during the course of your college education.



Syllabus

With links to readings

1. Introduction to bullshit
2. Spotting bullshit
3. Causality
4. Statistical traps and trickery
5. Data Visualization
6. Big Data bullshit
7. Publication bias
8. Predatory publishing and scientific misconduct
9. Natural ecology of fake news and other bullshit
10. Refuting bullshit



February 17, 2017



January 31, 2017



January 12, 2017



January 16, 2017



January 19, 2017



January 28, 2017



January 28, 2017



PUBLISHERS
WEEKLY



Calling Bullshit

In the Age of Big Data



IT University
of Copenhagen



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UNIVERSITY



FRIEDRICH-ALEXANDER
UNIVERSITÄT
ERLANGEN-NÜRNBERG



Mount Wachusett
Community College



UMASS
AMHERST



UNIVERSITY OF
OXFORD



UCLA



UNIVERSITY
of ALASKA
ANCHORAGE



uOttawa



OLD DOMINION
UNIVERSITY

HE HAGUE
UNIVERSITY OF
APPLIED SCIENCE



WESTERN STATE
COLORADO UNIVERSITY
Learning. Elevated.



Northeastern
Illinois
University



SWPS
UNIVERSITY OF SOCIAL SCIENCES
AND HUMANITIES



The University of
Montana

Old School Bullshit

New School Bullshit

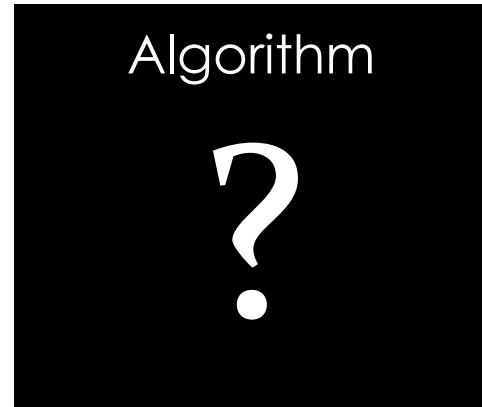
“Our collective mission is to refunctionalize customer-driven solutions for leveraging underutilized portfolio opportunities.”

New School Bullshit

“Our collective mission is to refunctionalize customer-driven solutions for leveraging underutilized portfolio opportunities.”

“While short of statistical significance after Bonferroni correction ($p=0.13$), our results underscore a clinically important effect size (relative odds of survival at 5 years=1.2) that challenges the current therapeutic paradigm.”

Data
Data
Data



Output



Interpretation

Even when you don't know how an algorithm or statistical test works, you can spot bullshit by looking carefully at what goes in and what comes out.

Automated Inference on Criminality using Face Images

Xiaolin Wu

McMaster University
Shanghai Jiao Tong University

xwu510@gmail.com

Xi Zhang

Shanghai Jiao Tong University
zhangxi_19930818@sjtu.edu.cn

Cesare Lombroso

Criminal Man (1876)





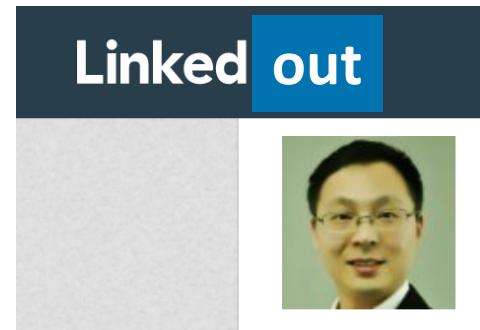
(a) Three samples in criminal ID photo set S_c .



(a) Three samples in criminal ID photo set S_c .



(b) Three samples in non-criminal ID photo set S_n



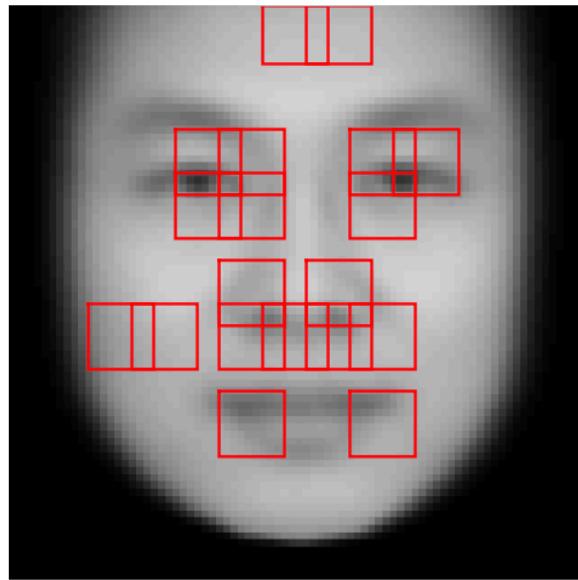
“Unlike a human examiner/judge, a computer vision algorithm or classifier has absolutely no subjective baggages [sic], having no emotions, no biases whatsoever due to past experience, race, religion, political doctrine, gender, age, etc., no mental fatigue, no preconditioning of a bad sleep or meal. The automated inference on criminality eliminates the variable of meta-accuracy (the competence of the human judge/examiner) all together.”

—Wu & Zhang(2017)

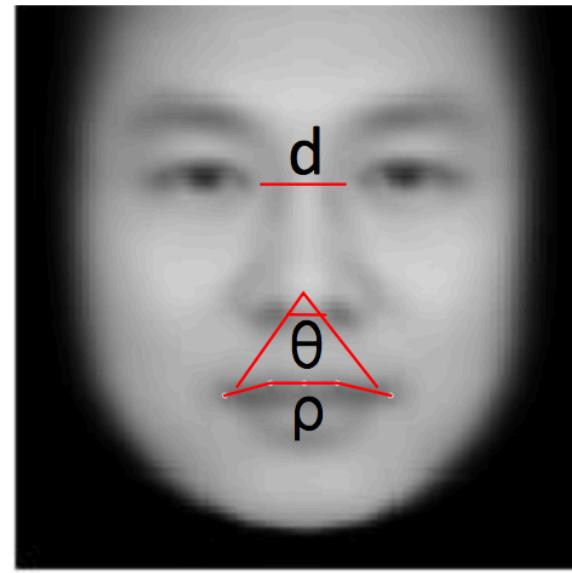
“Unlike a human examiner/judge, a computer vision algorithm or classifier has absolutely no subjective baggages [sic], having no emotions, no biases whatsoever due to past experience, race, religion, politics, ideology, gender, age, etc., no mental fatigue, no second coming of a bad sleep or meal. The automated influence on criminality eliminates the variable of meta-accuracy (the computer beats the human judge/examiner) all together.”

—Wu & Zhang(2017)

Criminals have smaller angle θ , larger curvature ρ than non-criminals.



(a)



(b)

Figure 8. (a) FGM results; (b) Three discriminative features ρ , d and θ .

“Although the antithesis of criminals and non-criminals is very strong, conventionally-defined average faces of the two populations...appear hardly distinguishable...”

Criminal



(a) -0.98

(b) -0.68

(c) -0.28

(d) -0.38

Non-criminal



(e) 0.76

(f) 0.98

(g) 0.66

Extraordinary claims,
require **extraordinary** evidence

New AI can guess whether you're gay or straight from a photograph

An algorithm deduced the sexuality of people on a dating site with up to 91% accuracy, raising tricky ethical questions

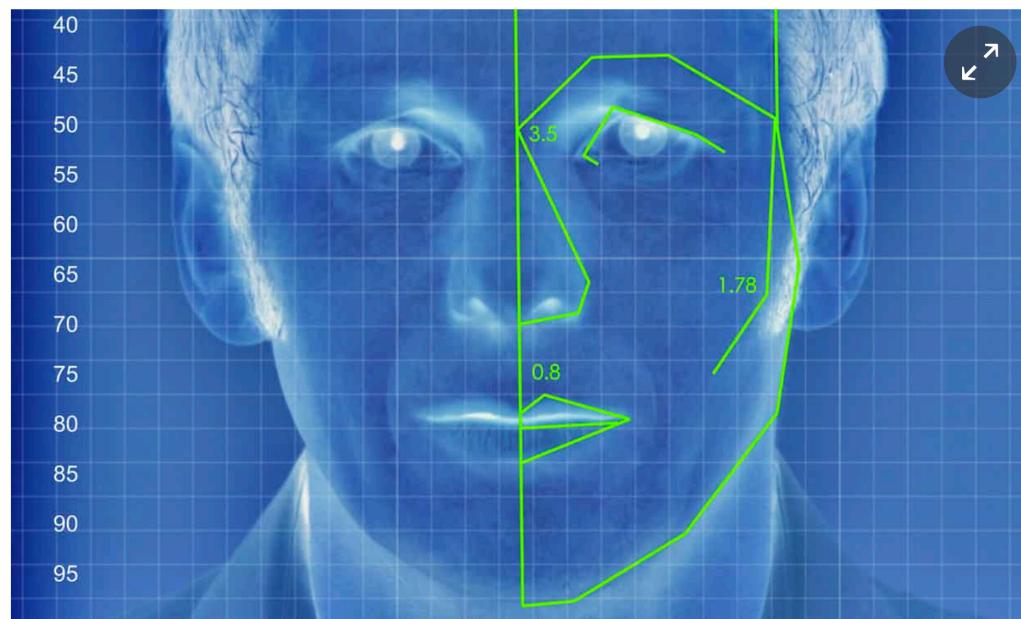


58k

Sam Levin in San Francisco

@SamTLevin
 email

Thursday 7 September
2017 19.46 EDT



An illustrated depiction of facial analysis technology similar to that used in the experiment. Illustration: Alamy

Big Data (n)



The idea that a sufficiently large pile of horseshit will, with probability one, somewhere contain a pony.

— Marc Lipsitch

Tips for spotting bullshit

If a claim seems too good to be true...

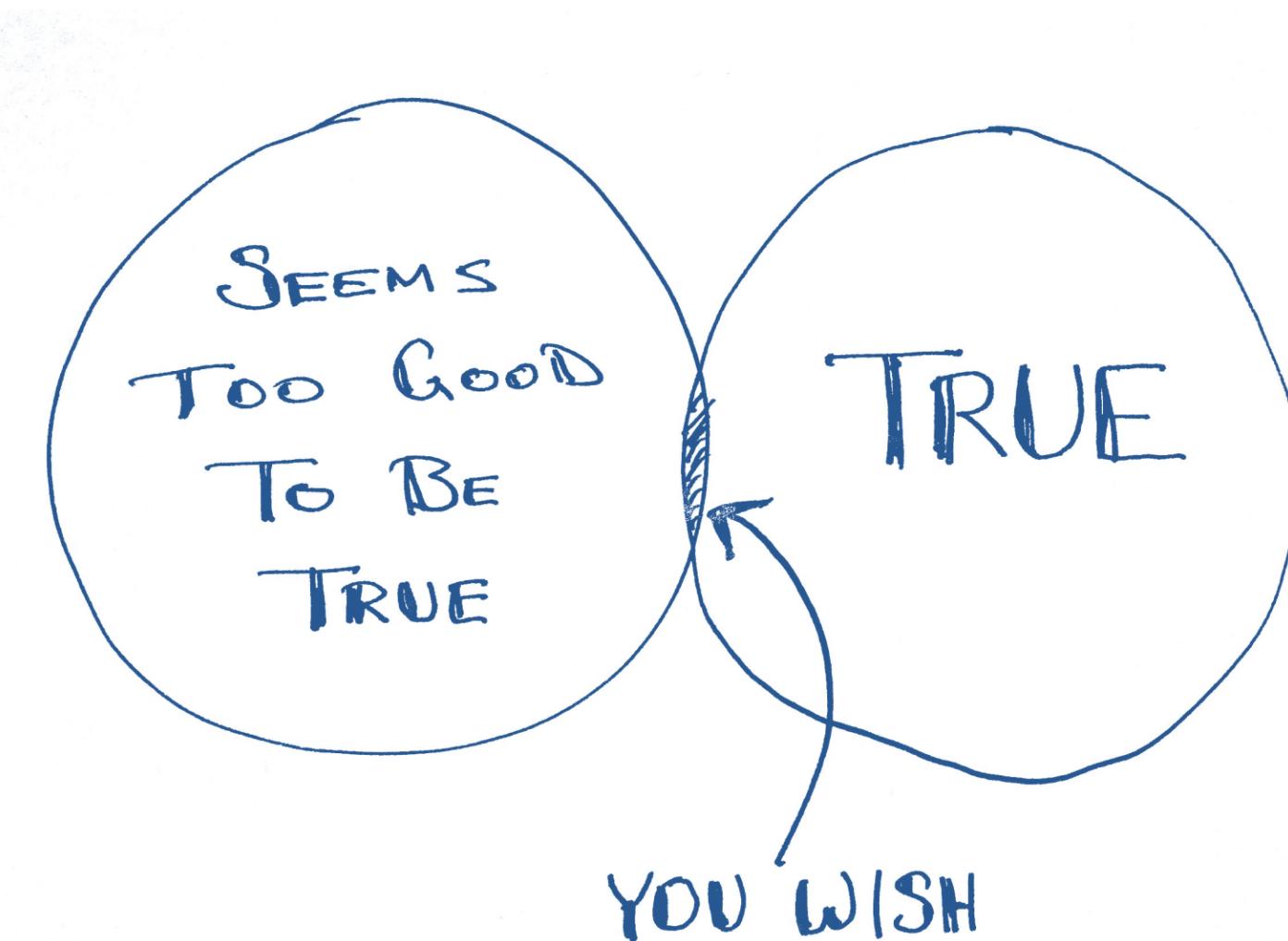
Beware of confirmation bias!

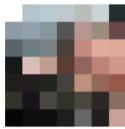
Multiple working hypotheses

Think about orders of magnitude

Beware of unfair comparisons

If a claim seems too good (or too bad)
to be true, it probably is.



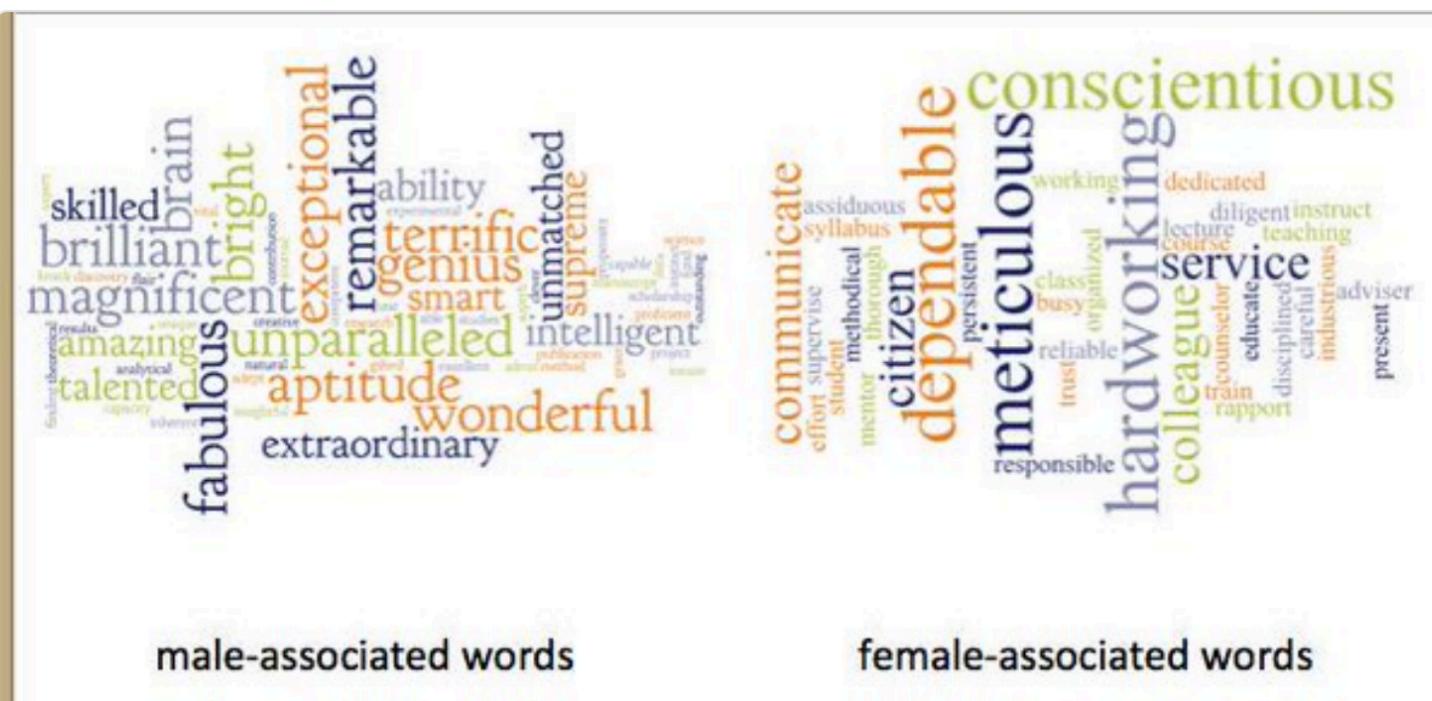


RECOMMENDED BY

Follow



Shocked by difference in words 4 male vs female recommendation letters for faculty positions: ncbi.nlm.nih.gov/pmc/articles/P...



RETWEETS
2,075

LIKES
970



9:58 PM - 24 Mar 2015

T. Schmader, J. Whitehead, and V. Wysocki. (2008) A linguistic comparison of letters of recommendation for male and female chemistry and biochemistry job applications. *Sex Roles* 57: 509-514

“Overall, the results of the current study revealed more similarity in the letters written for male and female job candidates than differences....

Letters written for women included language that was just as positive and placed equivalent emphasis on ability, achievement, and research.”

The image my friend tweeted illustrates the hypothesis, not the results.



“standout” words



“grindstone” words

Fresh From Concentrate



21 people

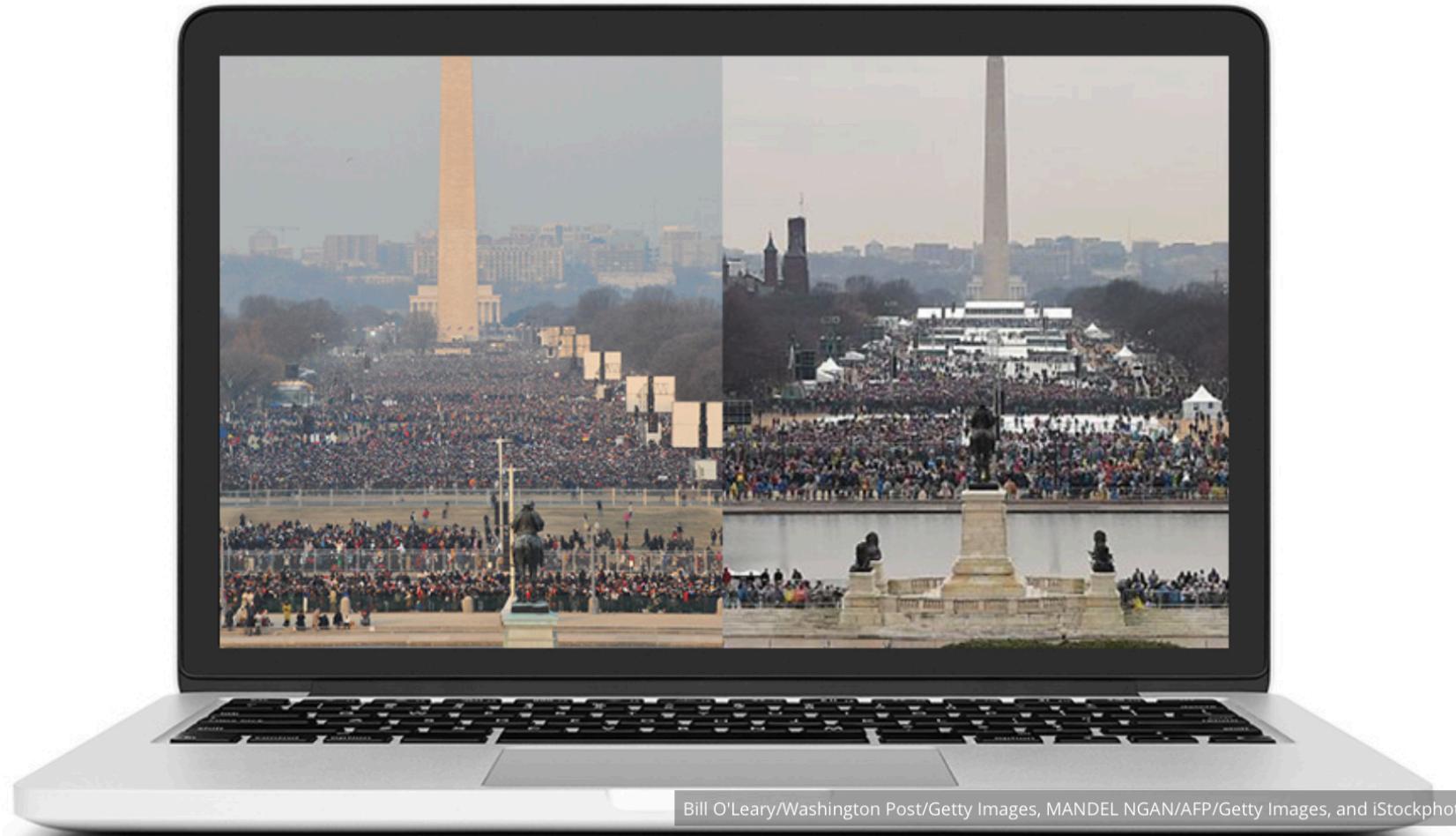


4 people

Conclusion: Fresh juice is sweeter!
 $p < 0.01$ (exact binomial test)

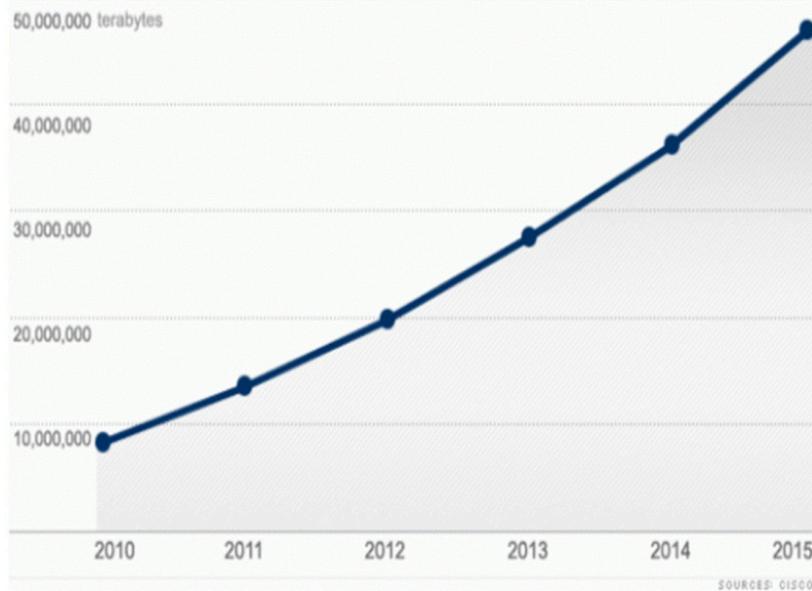
The Media Play the Numbers Game, and Somehow Conservatives Always Lose

The mainstream media has ignored the fact that **eight times more people** watched Trump's Inauguration over streaming video than Obama's



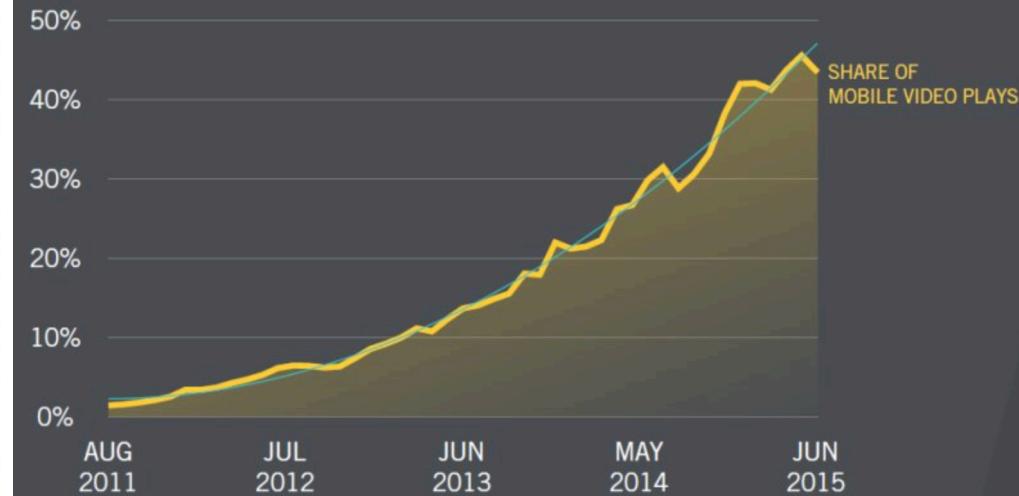
Bill O'Leary/Washington Post/Getty Images, MANDEL NGAN/AFP/Getty Images, and iStockphoto

VIDEO GROWTH



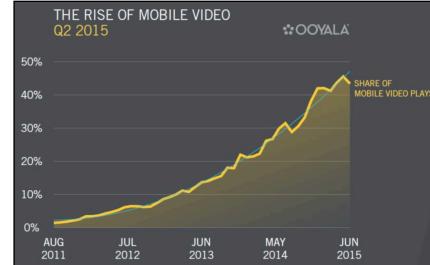
THE RISE OF MOBILE VIDEO Q2 2015

OOYALA



“

But the press left out some important differences. Most important, millions watched the inauguration on TV and streaming media — probably millions in Russia alone.”



Trump's
popularity

Availability of
streaming video

Trump has 8x as
many streaming
viewers



BILL O'LEARY/WASHINGTON POST/GETTY IMAGES, MANDEL NGAN/AFP/Getty Images, and iStockphoto

One cause

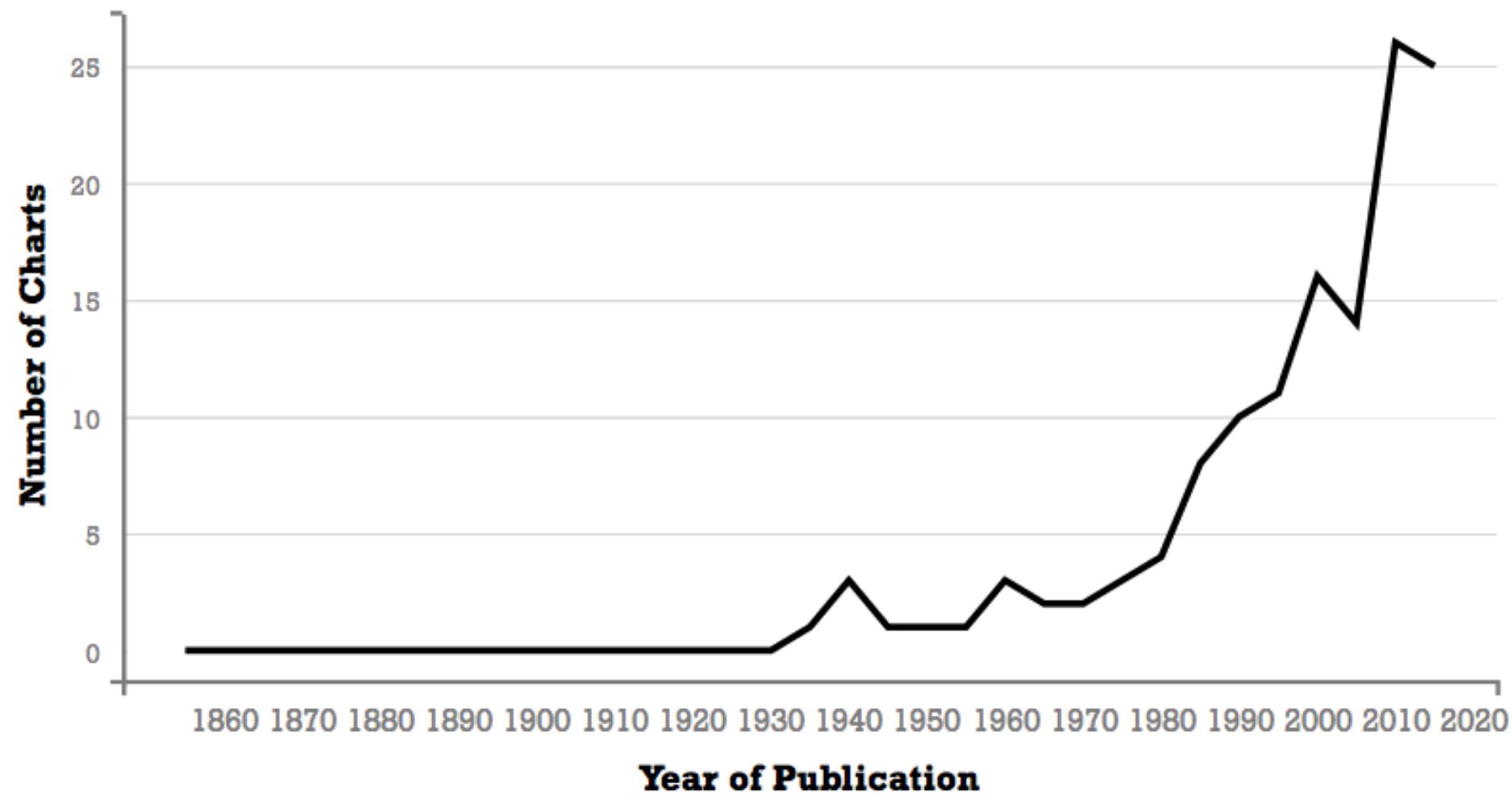
Another cause

Effect



The Rise of the Chart in the Newspaper

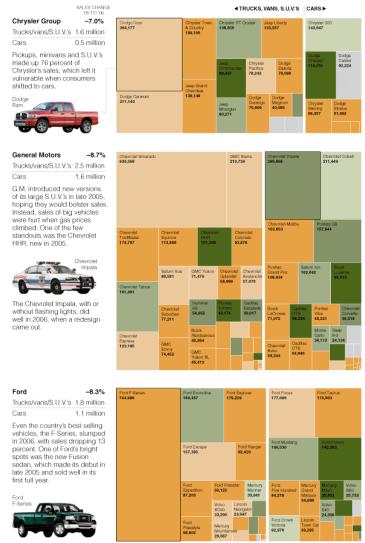
The # of Charts in a September Issue of the New York Times (Checked Every Five Years)



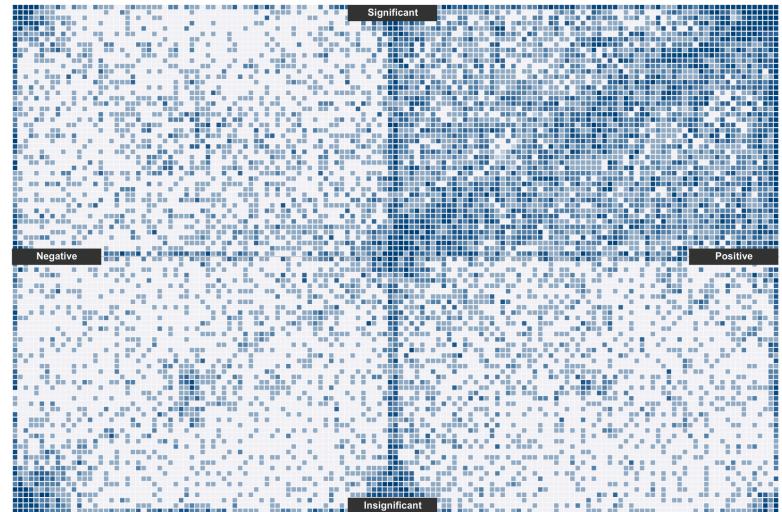
The New York Times

Truck Sales Slip, Tripping Up Chrysler

Over the past few years, Chrysler executives said they were following the lead of Toyota and Honda, focusing on vehicles that met the needs of their customers. But as American consumers turned away from large SUVs, the company's sales slipped. Now Chrysler continued to churn out big vehicles, which are now sitting unsold at dealerships across the country.



How much of a turning point in the war on terror will Bin Laden's death represent?



READING THE CHART

Boxes are scaled according to the number sold in 2006

Change in sales from 2006 to 2008

Below: Above industry average
No: 2005
Sales
10% -4% 0 +4% +10% +14%

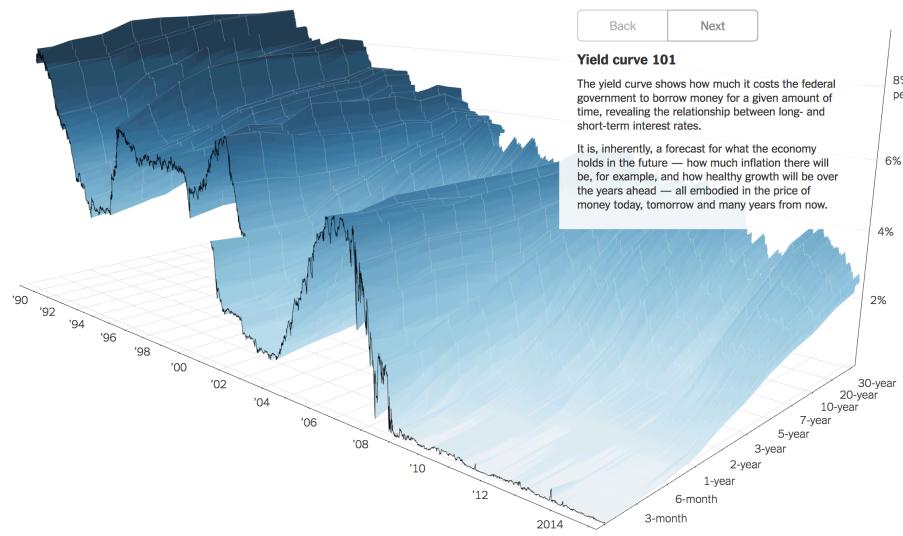
Many of these vehicles were introduced in 2005

TRUCKS, VANS, S.U.V'S / CARS

CARS

TRUCKS, VANS, S.U.V'S

CARS



THE CLUBS THAT CONNECT THE WORLD CUP

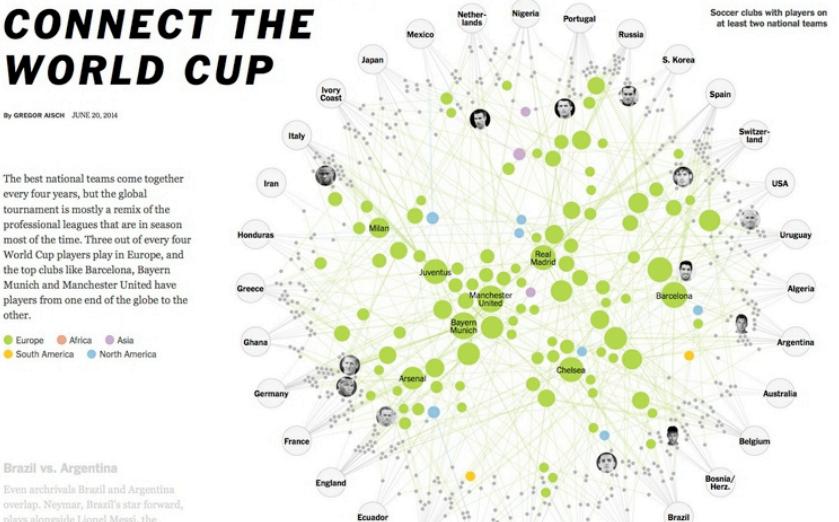
By GREGOR AISCH JUNE 20, 2014

The best national teams come together every four years, but the global tournament is mostly a remix of the professional leagues that are in season most of the time. Three out of every four World Cup players play in Europe, and the top clubs like Barcelona, Bayern Munich and Manchester United have players from one end of the globe to the other.

● Europe ● Africa ● Asia
● South America ● North America

Brazil vs. Argentina

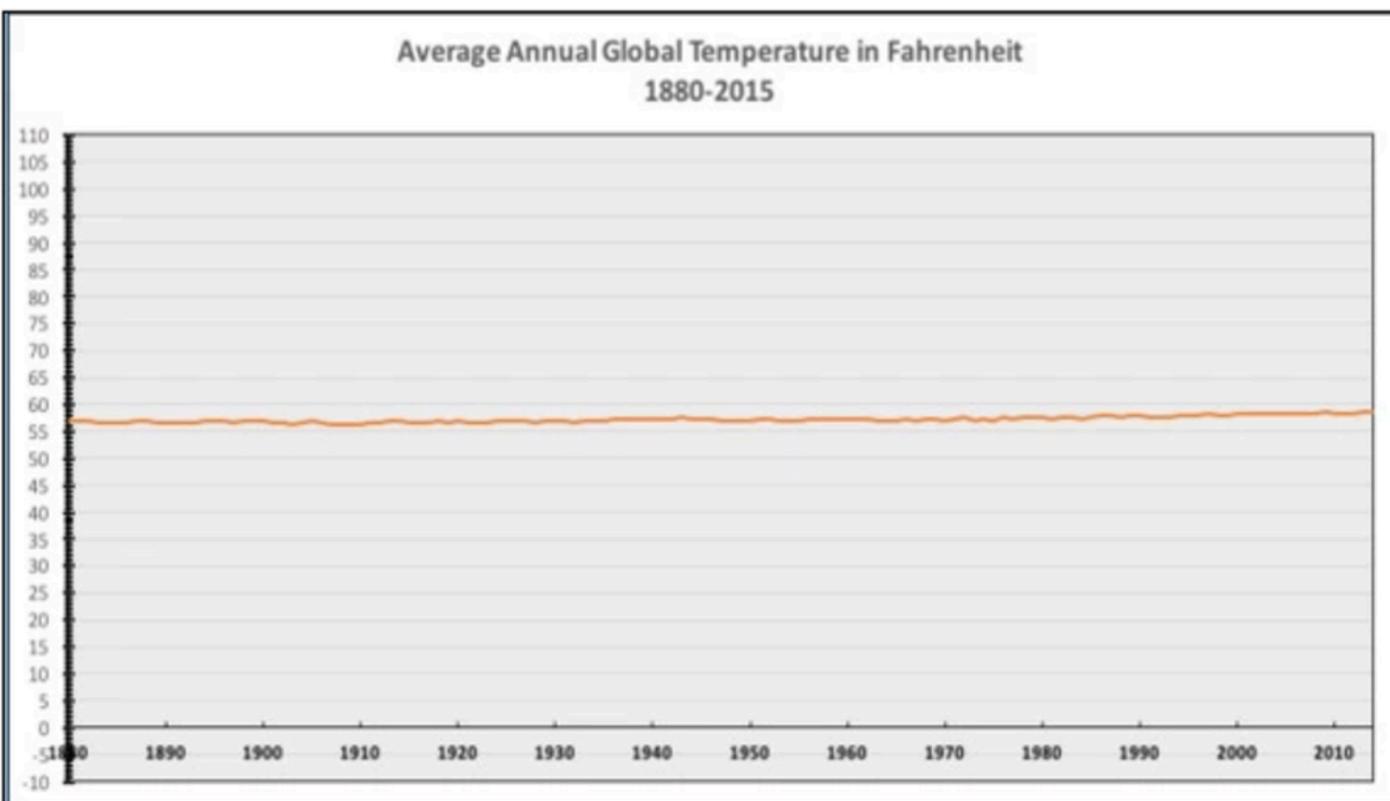
Even archrivals Brazil and Argentina overlap. Neymar, Brazil's star forward, plays alongside Lionel Messi, the Argentine captain, on powerhouse Barcelona. In all, eight Brazilians and 12 Argentines play together on European club teams.





The only [#climatechange](#) chart you need to see.
natl.re/wPKpro

(h/t [@powerlineUS](#))



Average global temperature by year

Data from NASA/GISS.

60°

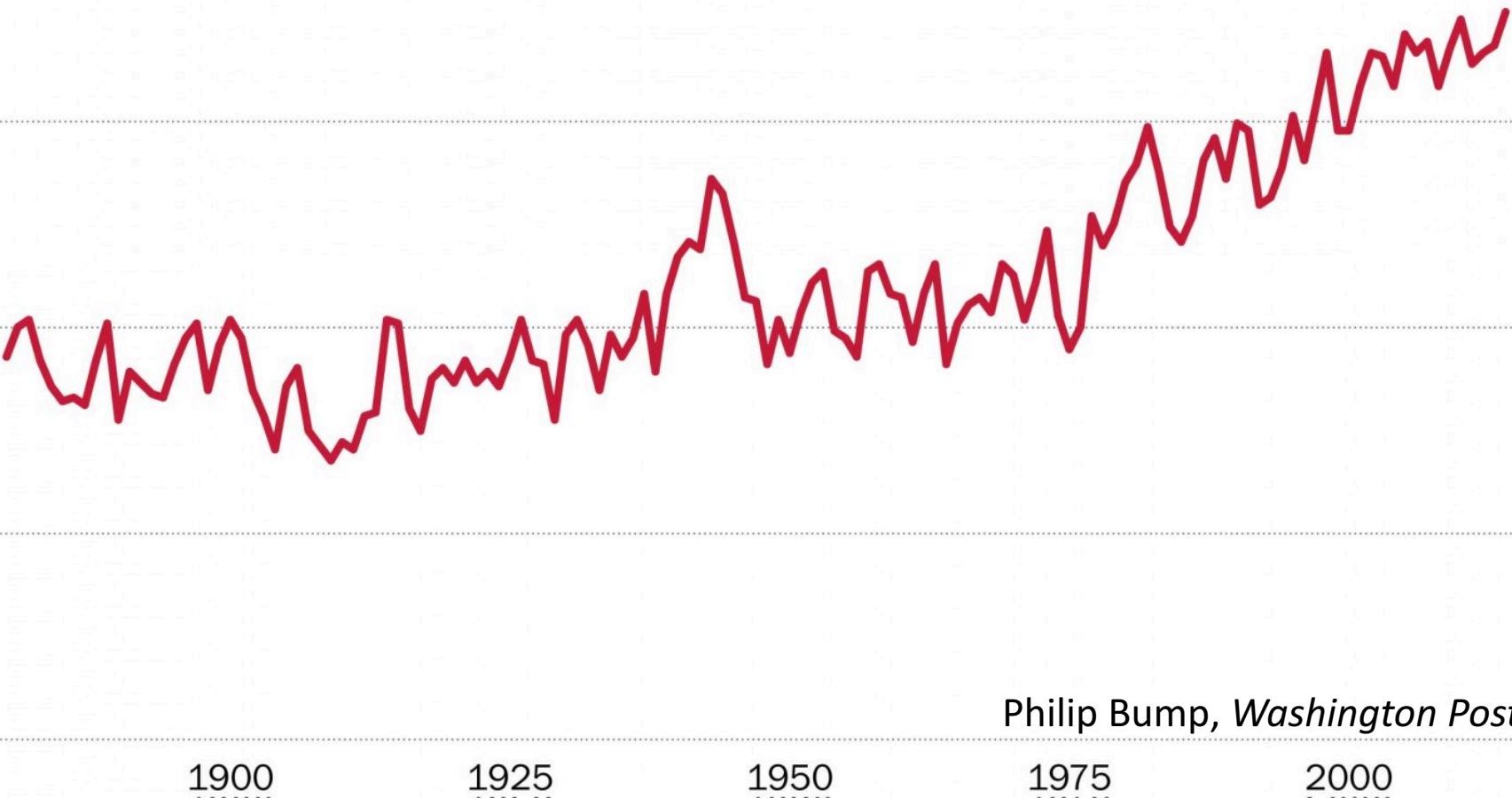
59

58

57

56

55



Philip Bump, *Washington Post*

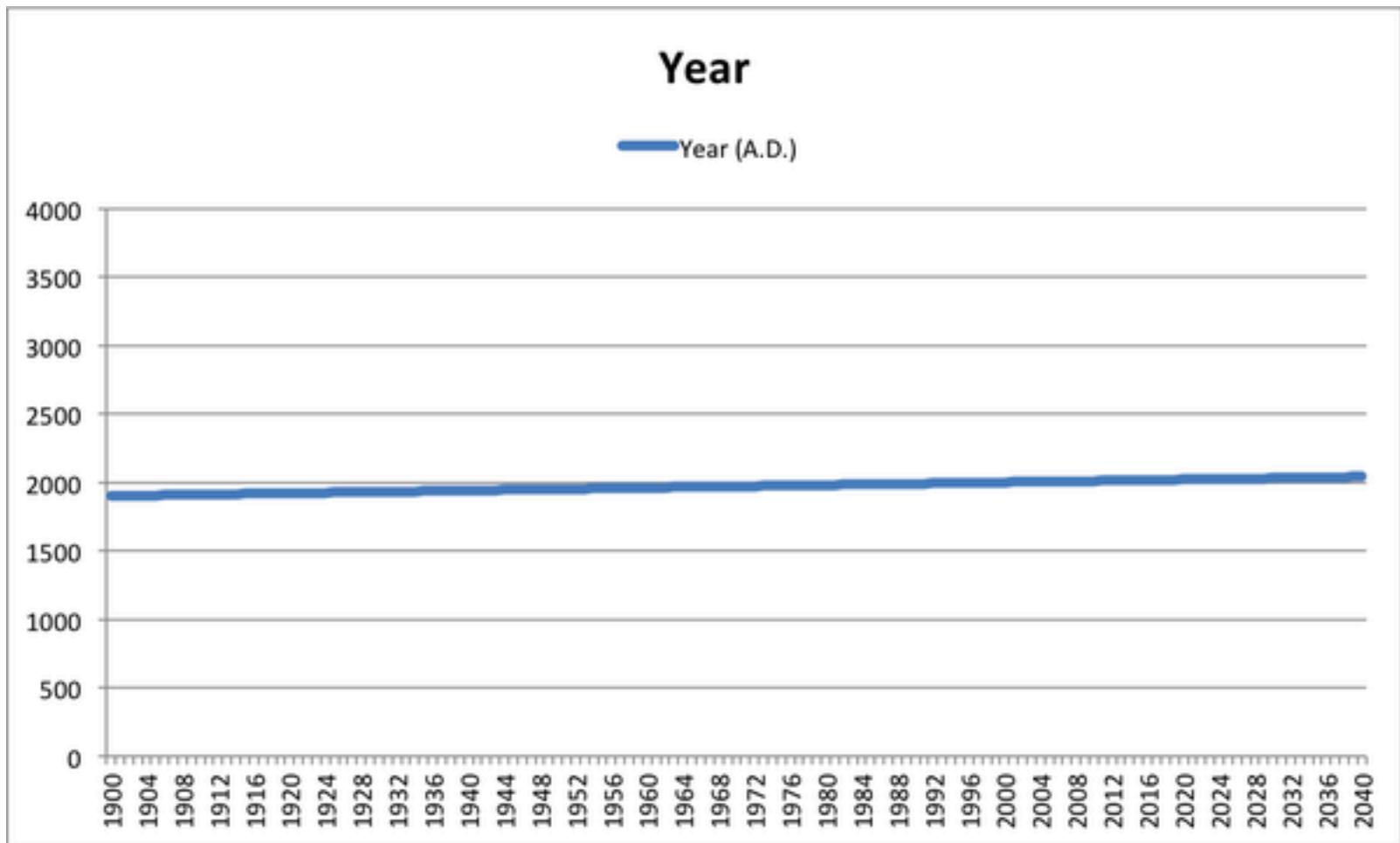
1900

1925

1950

1975

2000

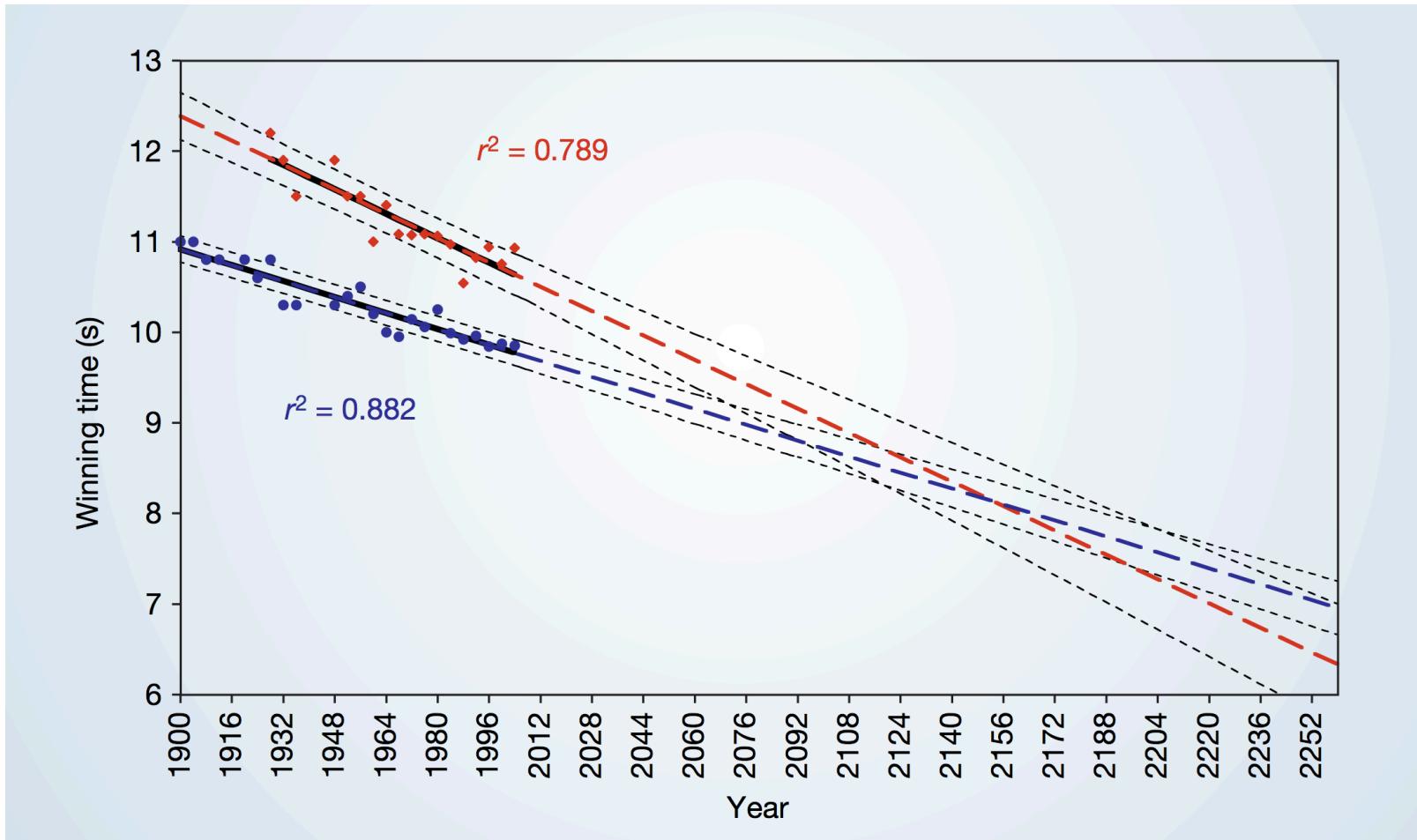


Method: *Reductio ad absurdum*

Show that an argument's methods or assumptions lead to ridiculous conclusions.

Momentous sprint at the 2156 Olympics?

Women sprinters are closing the gap on men and may one day overtake them.



fMRI is used to infer areas of unusually high neuronal activity during specific tasks.

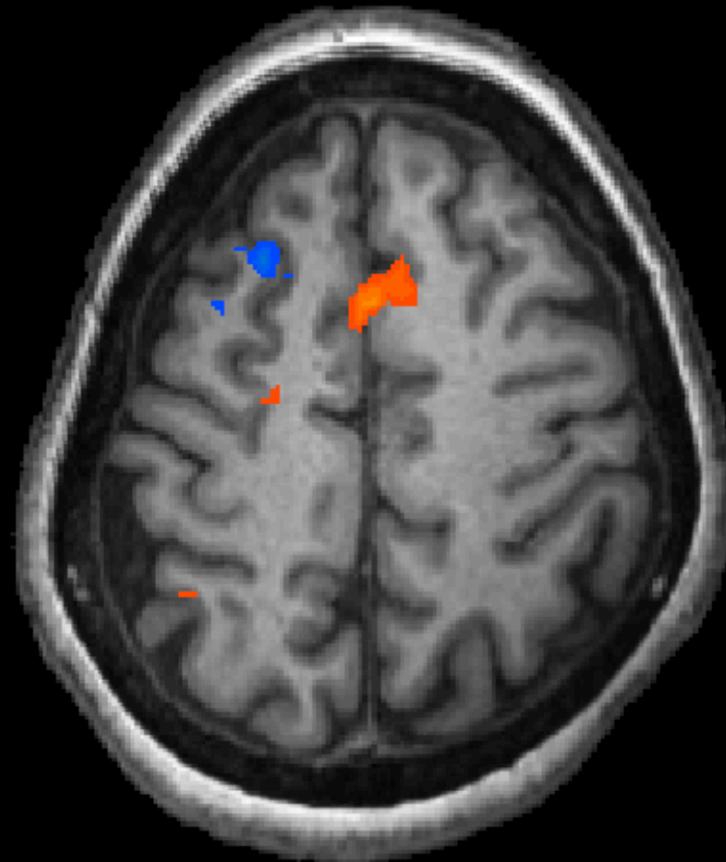


$z = 39$

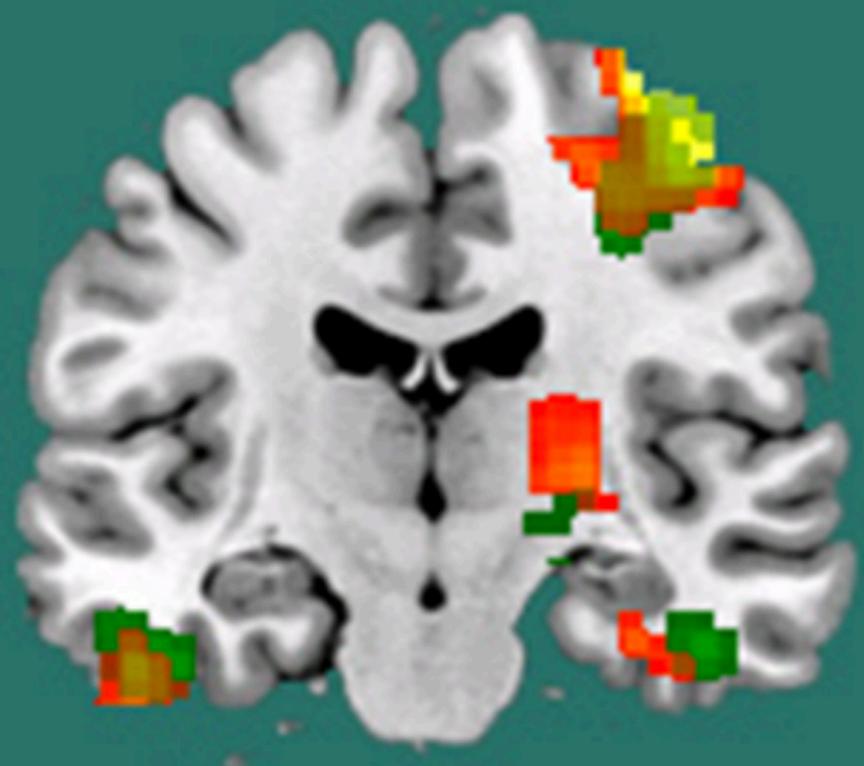
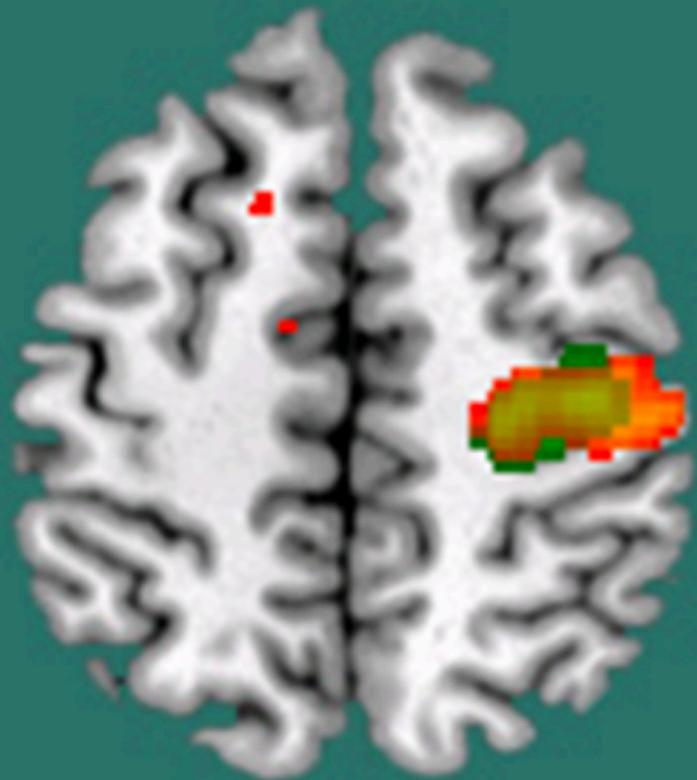


$z = 30$

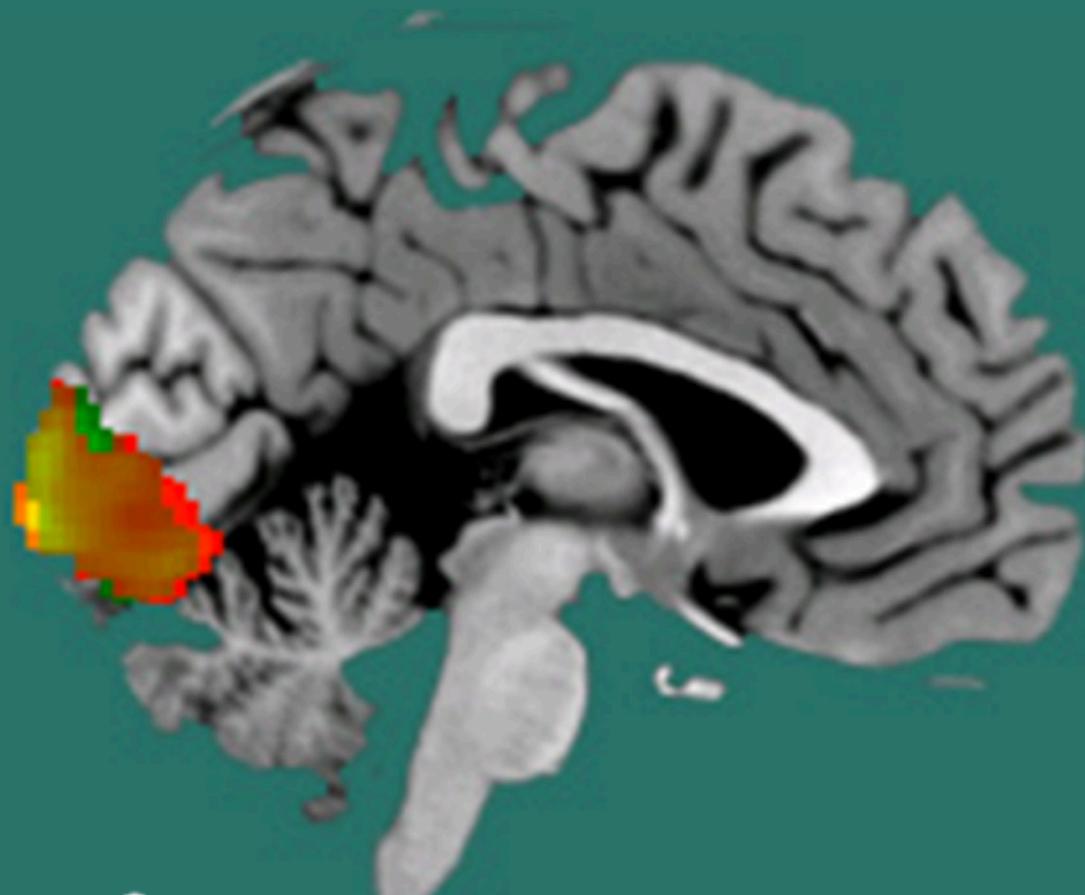
Problem:
algorithms used
to infer these
patterns often
generate high
rates of false
positives.



Consequence: many claims regarding localization of brain activity may be bullshit.



How does one make a convincing argument of that this is a problem?





“The salmon was shown a series of photographs depicting human individuals in social situations with a specified emotional valence, either socially inclusive or socially exclusive. The salmon was asked to determine which emotion the individual in the photo must have been experiencing.”

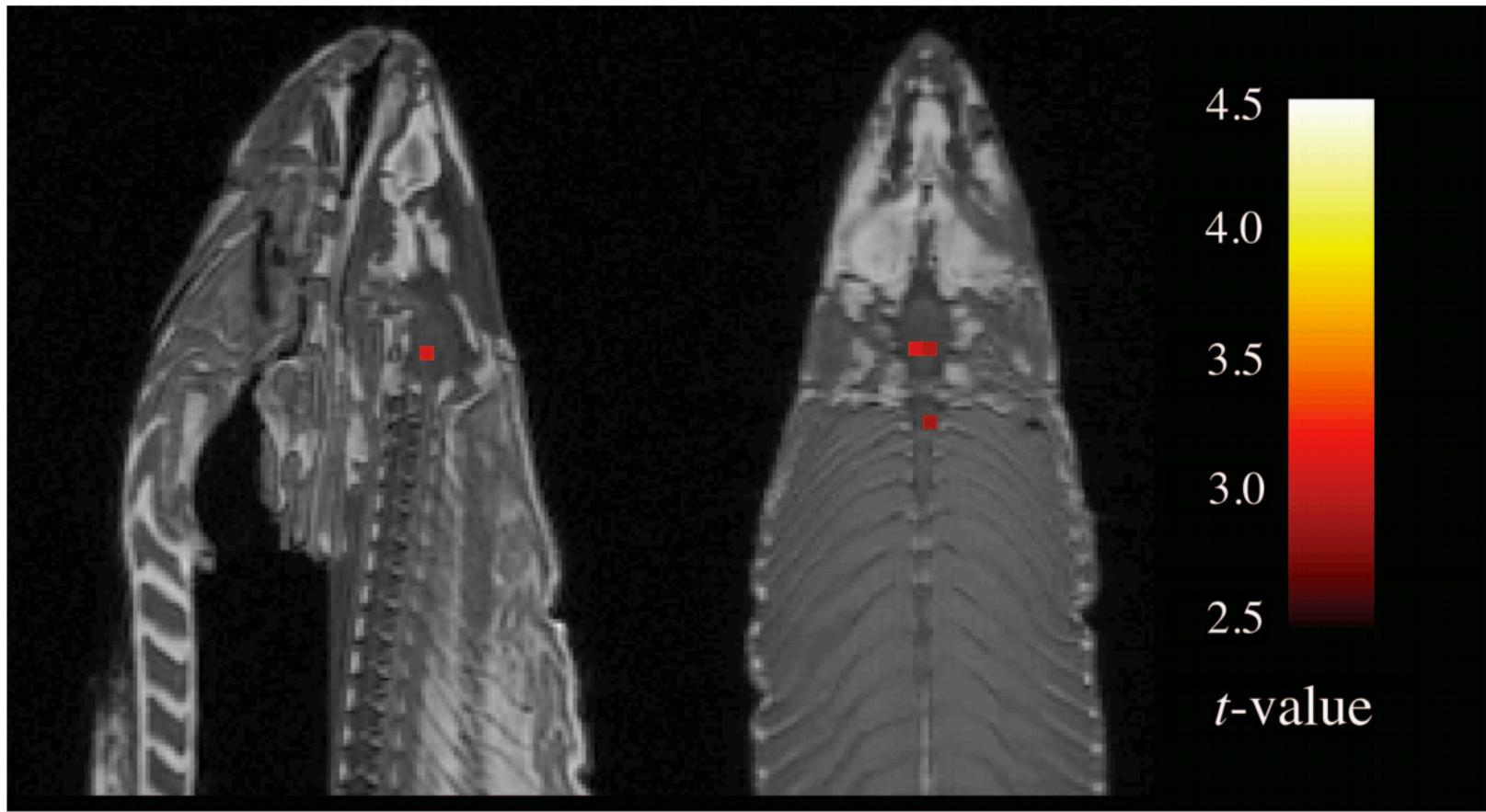


Fig. 1. Sagittal and axial images of significant brain voxels in the task > rest contrast. The parameters for this comparison were $t(131) > 3.15$, $p(\text{uncorrected}) < 0.001$, 3 voxel extent threshold. Two clusters were observed in the salmon central nervous system. One cluster was observed in the medial brain cavity and another was observed in the upper spinal column.

“Either we have stumbled onto a rather amazing discovery in terms of post-mortem ichthyological cognition, or there is something a bit off with regard to our uncorrected statistical approach.”

Method: Counterexample

If someone claims that A implies B, find a case in which A is true but B is not.



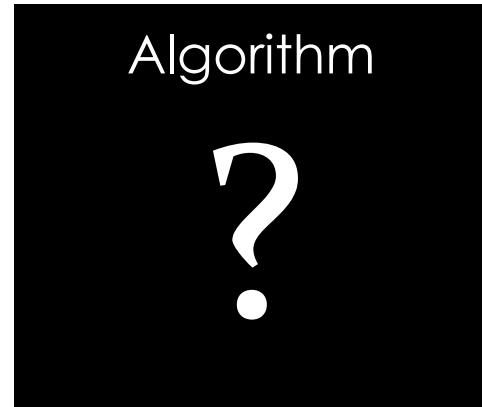
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Claim: many of the features of our immune system are essential for any large, long-lived multicellular creature.



“What about trees?”

Data
Data
Data



→ Output



Interpretation

Even when you don't know how an algorithm or statistical test works, you can spot bullshit by looking carefully at what goes in and what comes out.



Thank you!



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