

NATIONAL ACADEMY  
OF SCIENCES

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

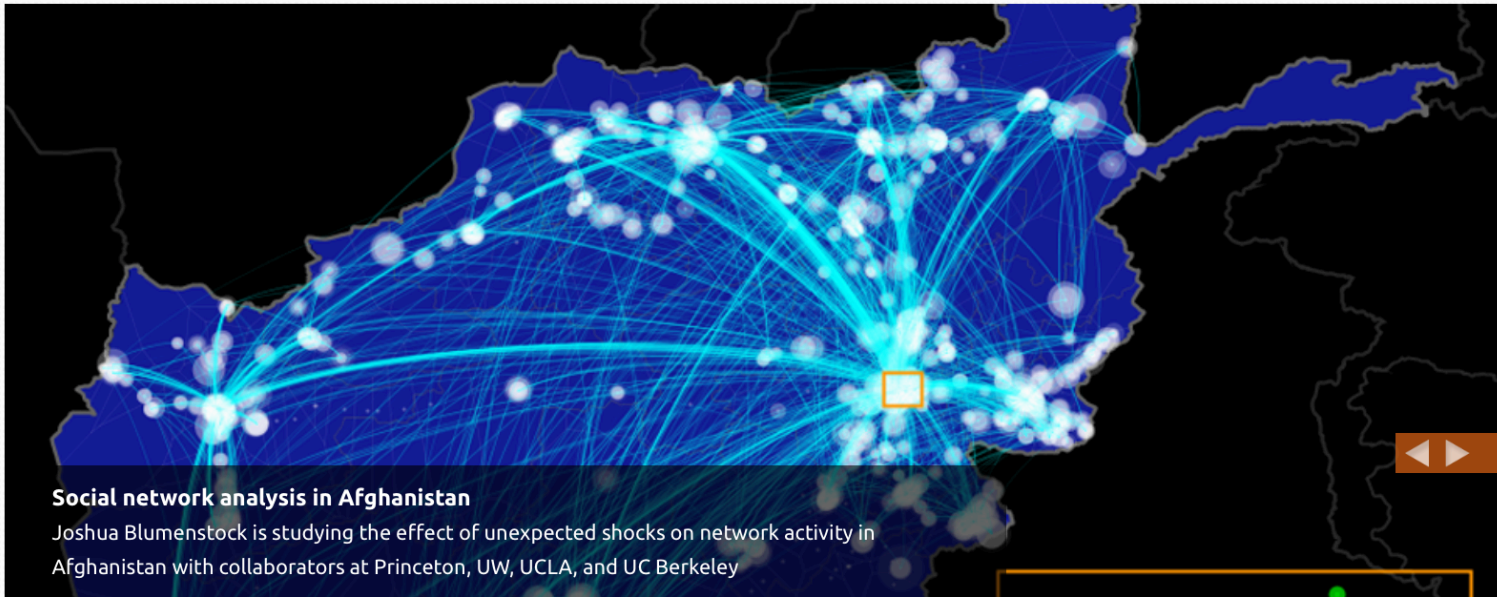
<http://callingbullshit.org>



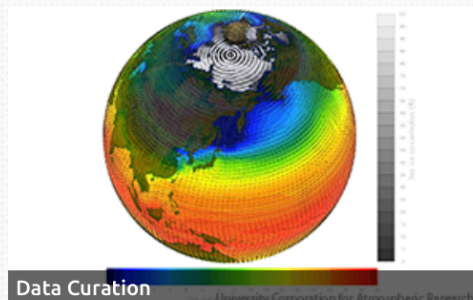
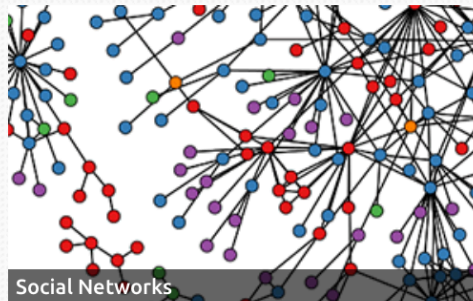
@callin\_bull

National Academy of Sciences

Dec. 8, 2017



### Research Focus Areas





Find the Jacobian of the transformation :

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

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

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

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

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

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

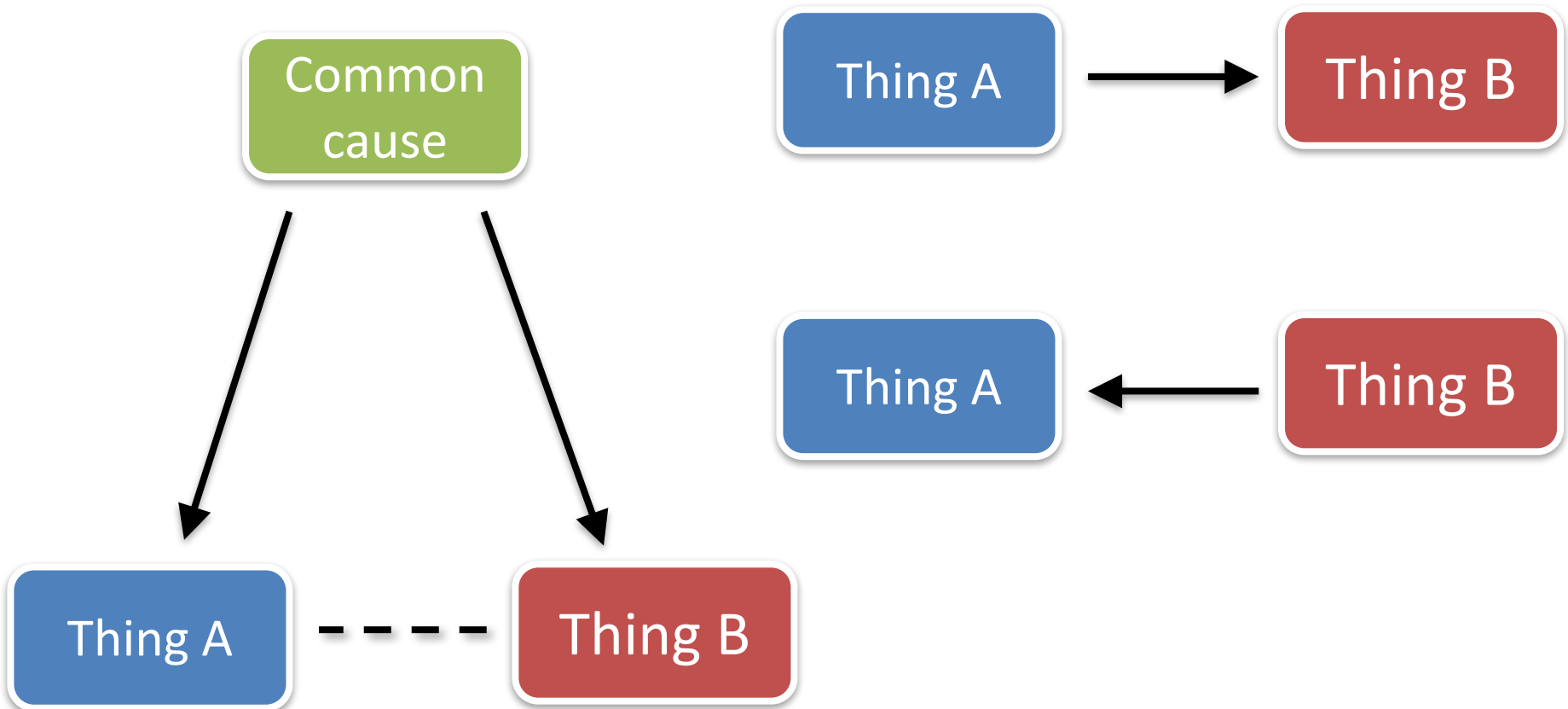
$$\frac{\partial y}{\partial v} = 2v$$

# MACBETH





# Manipulative experiments





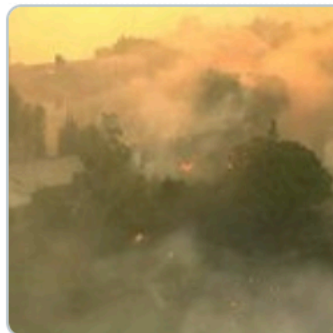
**Joel Rubin** ✓

@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](https://www.latimes.com)

5:04 PM - 6 Dec 2017

1,881 Retweets 1,718 Likes



55



1.9K



1.7K







do vaccinations cause shaken baby syndrome?



All

Videos

News

Images

Shopping

More

Settings

Tools

About 771,000 results (0.74 seconds)

### When is 'Shaken Baby' Syndrome Possibly Vaccine Injury Instead ...

[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

[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/> ▼

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 ...

[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

O bir doktor. O bir hemsire.

30/5000

English Spanish Arabic Translate

He is a doctor. She is a nurse. ✓

☆ 📄 🔊 Suggest an edit

Google

Translate Turn off instant translation

English Spanish Turkish Detect language

O bir doktor. O bir hemsire.

30/5000

English Spanish Arabic Translate

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%**

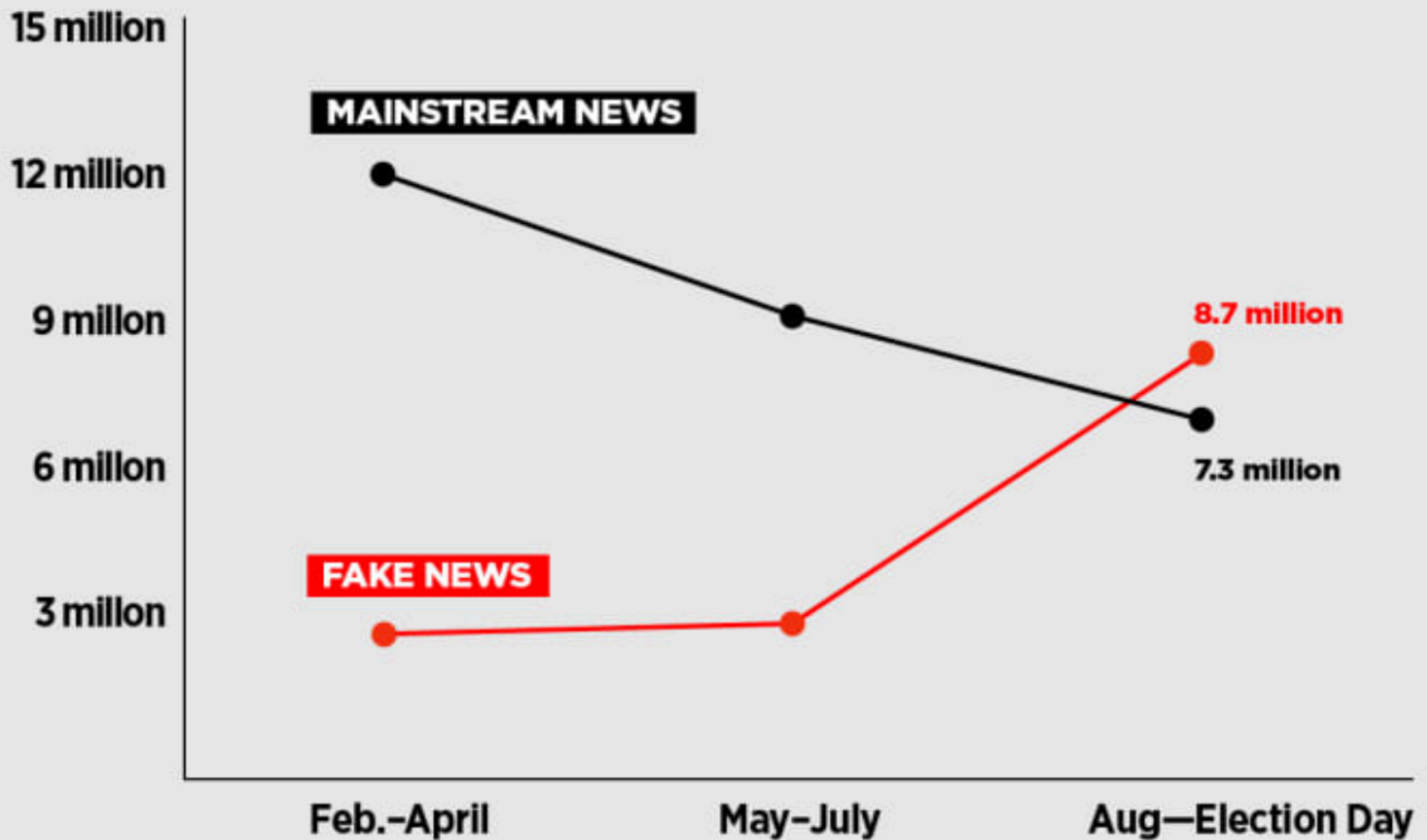
Kay, Matthew, Cynthia Matuszek, and Sean A. Munson. "Unequal representation and gender stereotypes in image search results for occupations." *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*. ACM, 2015.





we are **drowning** in bullshit

# Total Facebook Engagements for Top 20 Election Stories

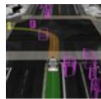


ENGAGEMENT REFERS TO THE TOTAL NUMBER OF SHARES, REACTIONS, AND COMMENTS FOR A PIECE OF CONTENT ON FACEBOOK SOURCE: FACEBOOK DATA VIA BUZZSUMO

Russian 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 Facebook Asked 9 Experts

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

24 Dec

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



**Ministry of Defense**

@Israel\_MOD

[Follow](#)

@KhawajaMArif 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 (@KhawajaMArif) 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.”





**Will Sommer** ✓

@willsommer



**Follow**

This family of 5 wore matching Pizzagate outfits.

9:07 AM - 25 Mar 2017



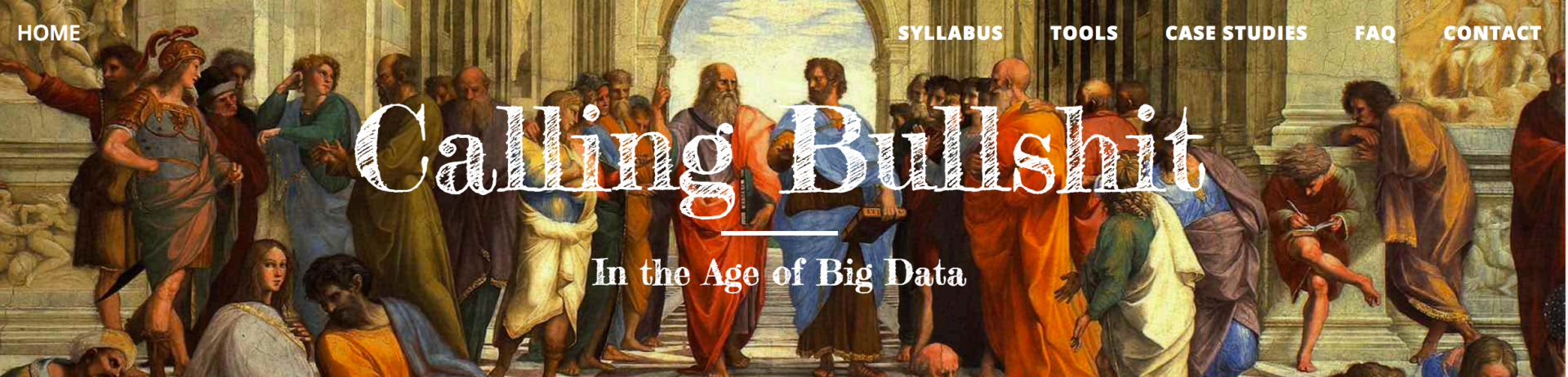
1,279



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*.



**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

**Inc.**

January 31, 2017

**boingboing**

January 12, 2017

THE CHRONICLE  
of Higher Education

January 16, 2017



Co.DESIGN

January 19, 2017

*The Seattle Times*

January 28, 2017



January 28, 2017

THE  
NEW YORKER

**Forbes**



The  
Boston  
Globe

VANITY FAIR

*NEW YORK*  
MAGAZINE

*Le Monde*



THE  TIMES

THE AUSTRALIAN 

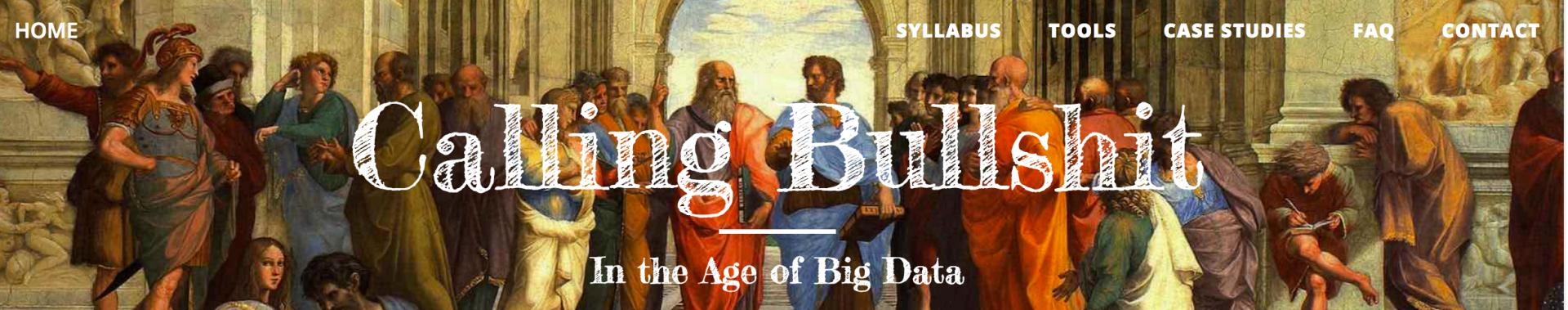
GeekWire  PUBLISHERS  
WEEKLY

Columbia  
Journalism  
Review.



FINANCIAL TIMES





# Calling Bullshit

## In the Age of Big Data



Old School Bullshit

New School Bullshit

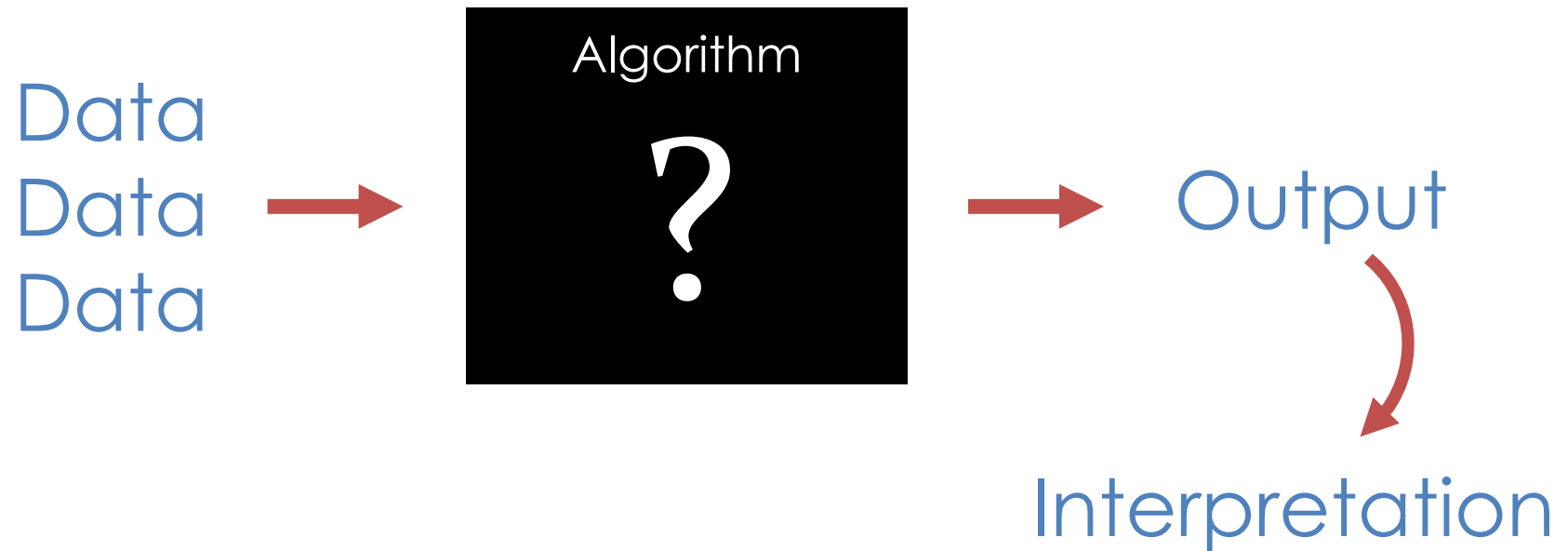
“Our collective mission is to refunctionalize customer-driven solutions for leveraging underutilized portfolio opportunities.”

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.”





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)



1. Cola di Rienzi.



2. Marat.



3. Louis Riel.



4. Allix.



5. Cavalier.



6. Louis Michel.



7. Pissinardi.



8. Mazzarini.



9. Carrier.



10. Jordan.



11. Fieschi.



12. Vass.



13. Gargot.



14. Steinacher.



15. Hammer.



16. Reimann.



17. Hoedel.



18. Brady.



19. Hanlon.



20. Fitzhugh.

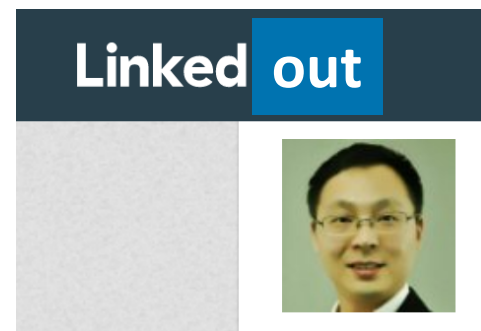


(a) Three samples in criminal ID photo set  $S_c$ .





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



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

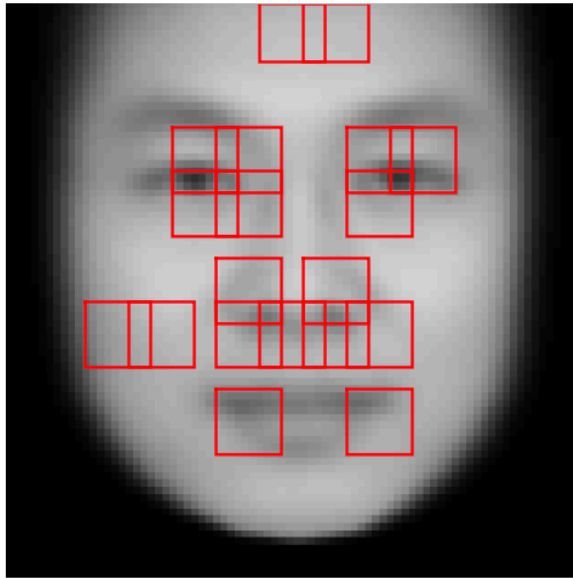
“Unlike a human examiner/judge, a computer vision algorithm or classifier has absolutely no subjective baggages [sic], having no emotions, no biases whatsoever due to past experience, race, religion, political doctrine, gender, age, etc., no mental fatigue, no preconditioning of a bad sleep or meal.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

—Wu & Zhang(2017)

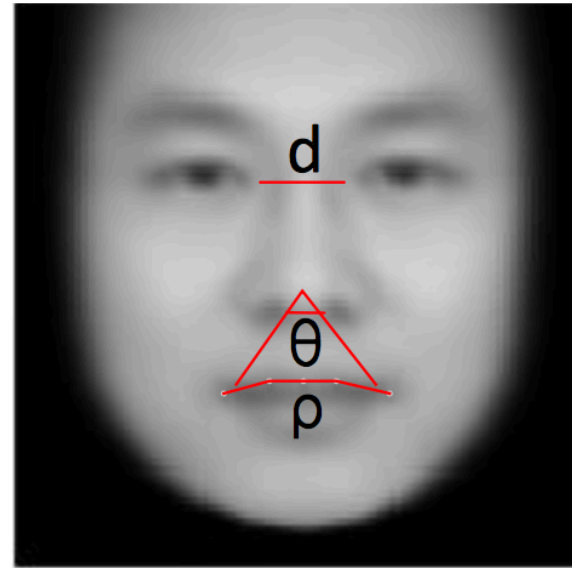
“Unlike a human examiner/judge, a computer vision algorithm or classifier has absolutely no subjective baggages [sic], having no emotions, no biases whatsoever due to past experience, race, religion, political doctrine, gender, age, etc., no mental fatigue, no preconception of a bad sleep or meal. The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

—Wu & Zhang(2017)

Criminals have smaller angle  $\theta$ , larger curvature  $\rho$  than non-criminals.



(a)



(b)

Figure 8. (a) FGM results; (b) Three discriminative features  $\rho$ ,  $d$  and  $\theta$ .



“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

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# theguardian

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## Artificial intelligence (AI)

# 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



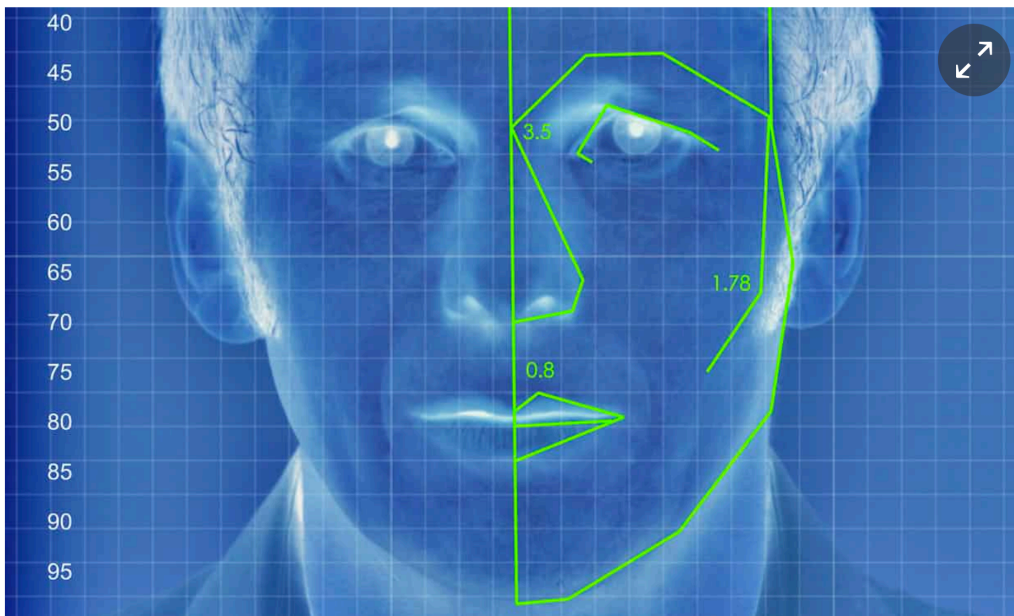
58k

**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...*

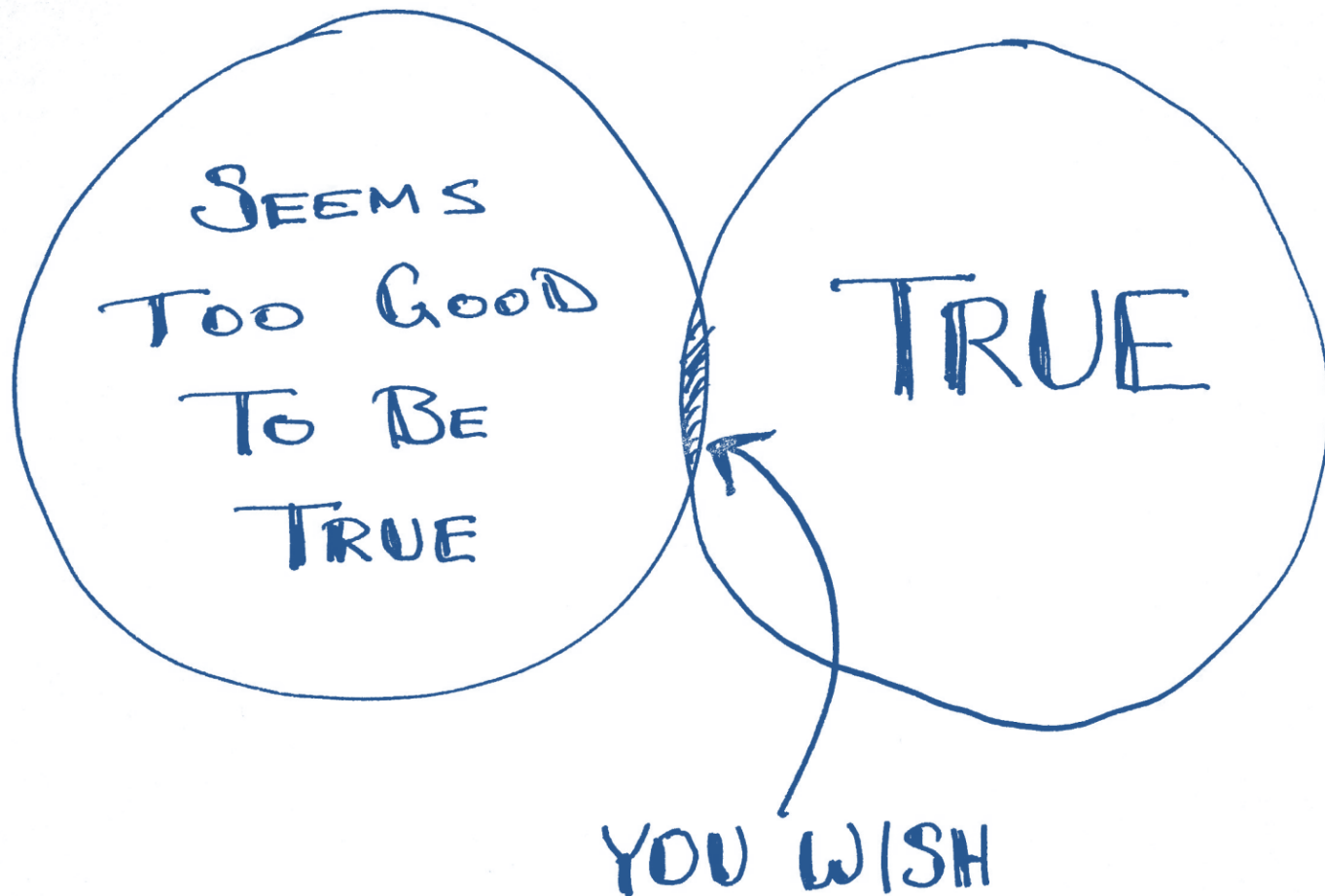
*Beware of confirmation bias!*

*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.

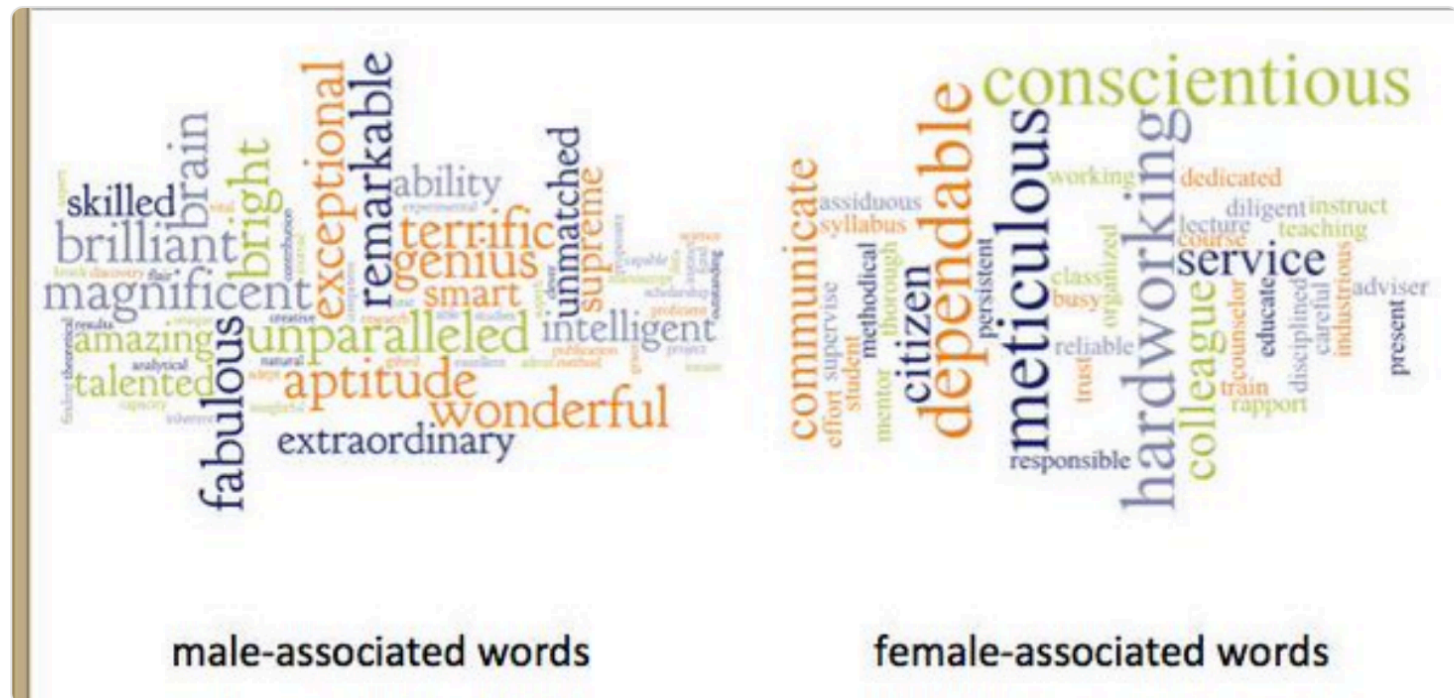




 **Follow**



Shocked by difference in words 4 male vs female recommendation letters for faculty positions: [ncbi.nlm.nih.gov/pmc/articles/P...](https://ncbi.nlm.nih.gov/pmc/articles/PMC6111111/)



## 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.



Fresh



21 people

From Concentrate



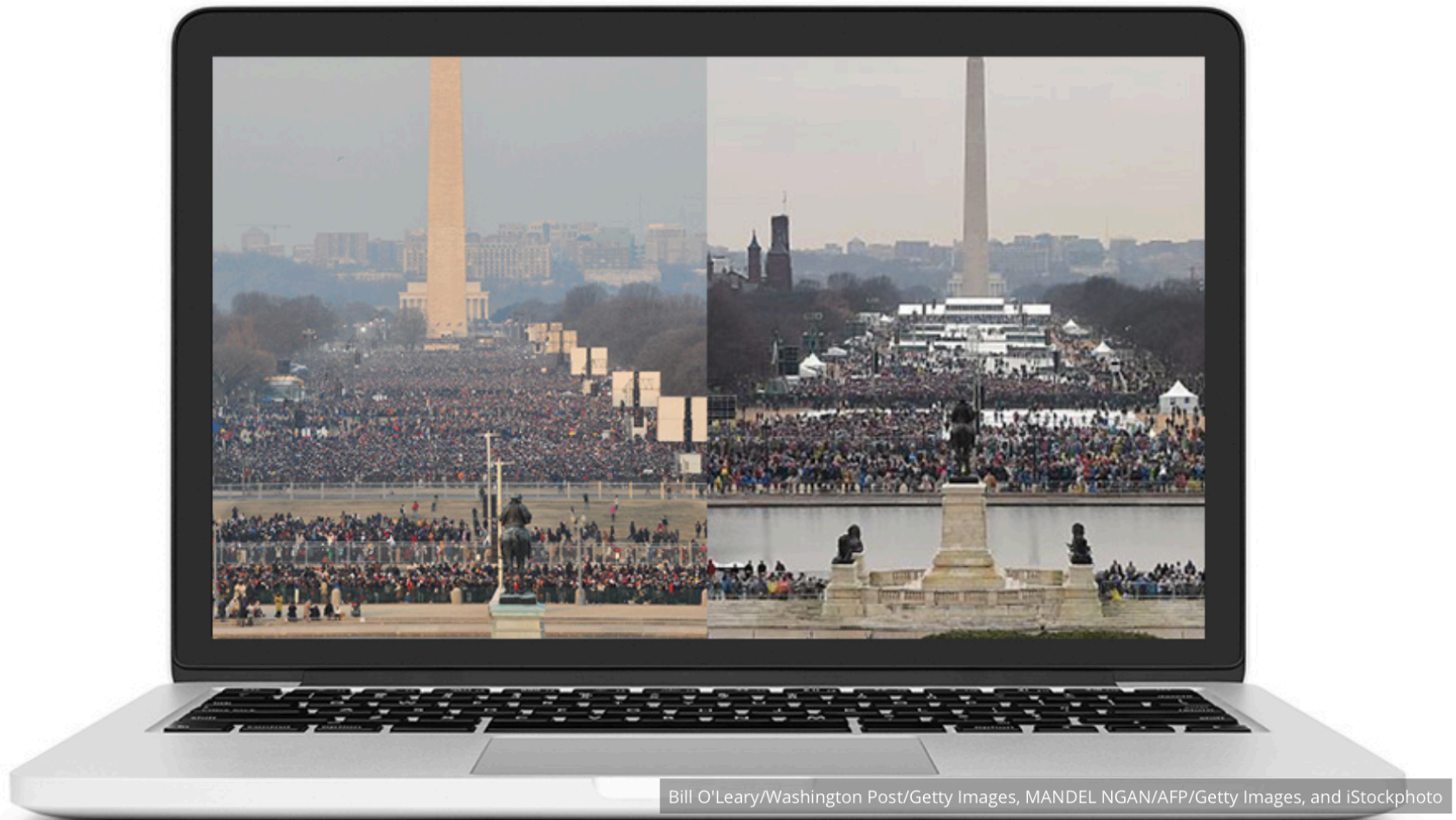
4 people

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

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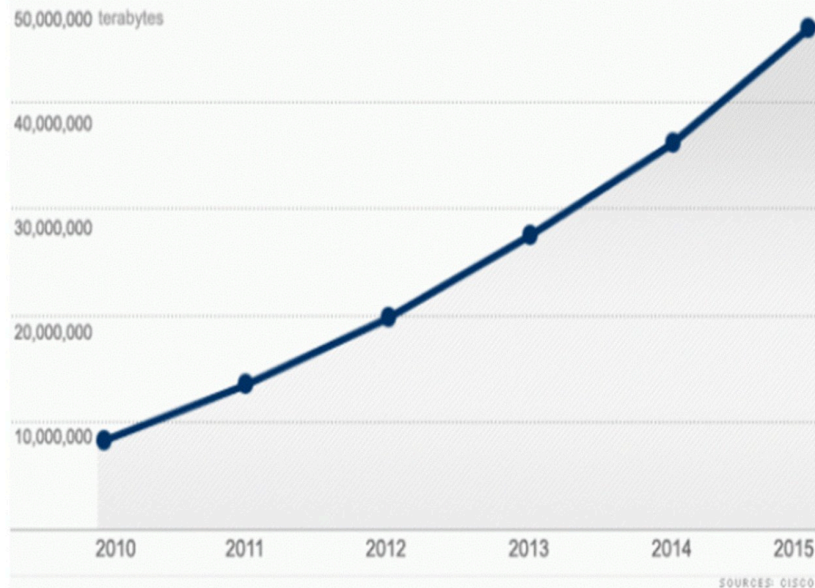
# The Media Play the Numbers Game, and Somehow Conservatives Always Lose

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



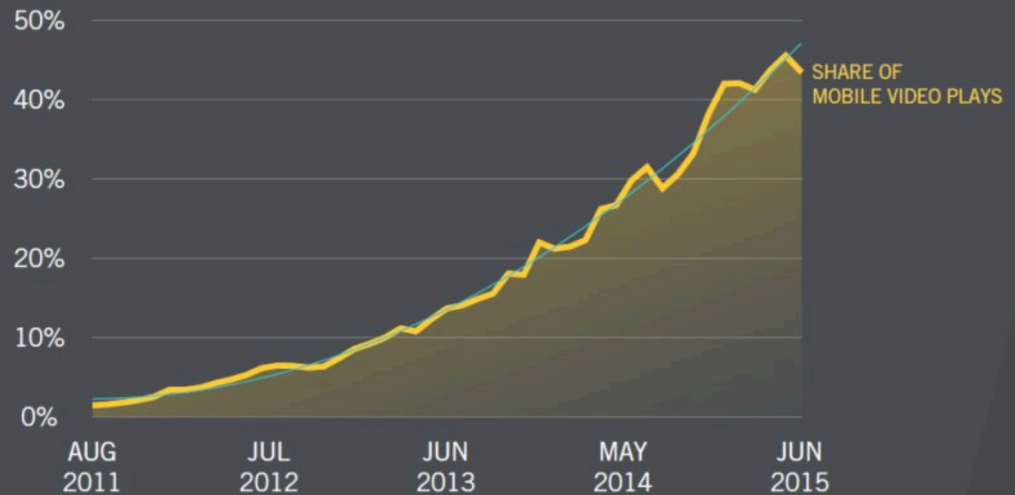


## VIDEO GROWTH

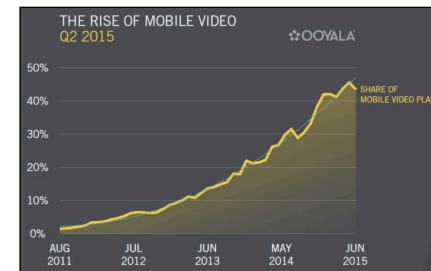


## THE RISE OF MOBILE VIDEO Q2 2015

OOYALA



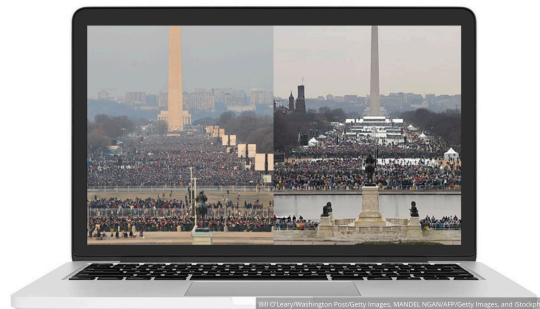
“ But the press left out some important differences. Most important, millions watched the inauguration on TV and streaming media — probably millions in Russia alone.”



Trump's  
popularity

Availability of  
streaming video

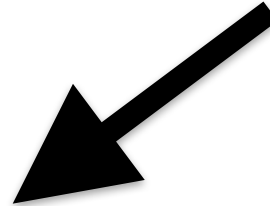
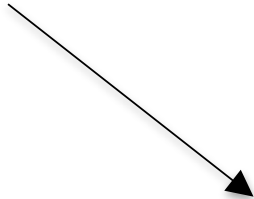
Trump has 8x as  
many streaming  
viewers



One cause

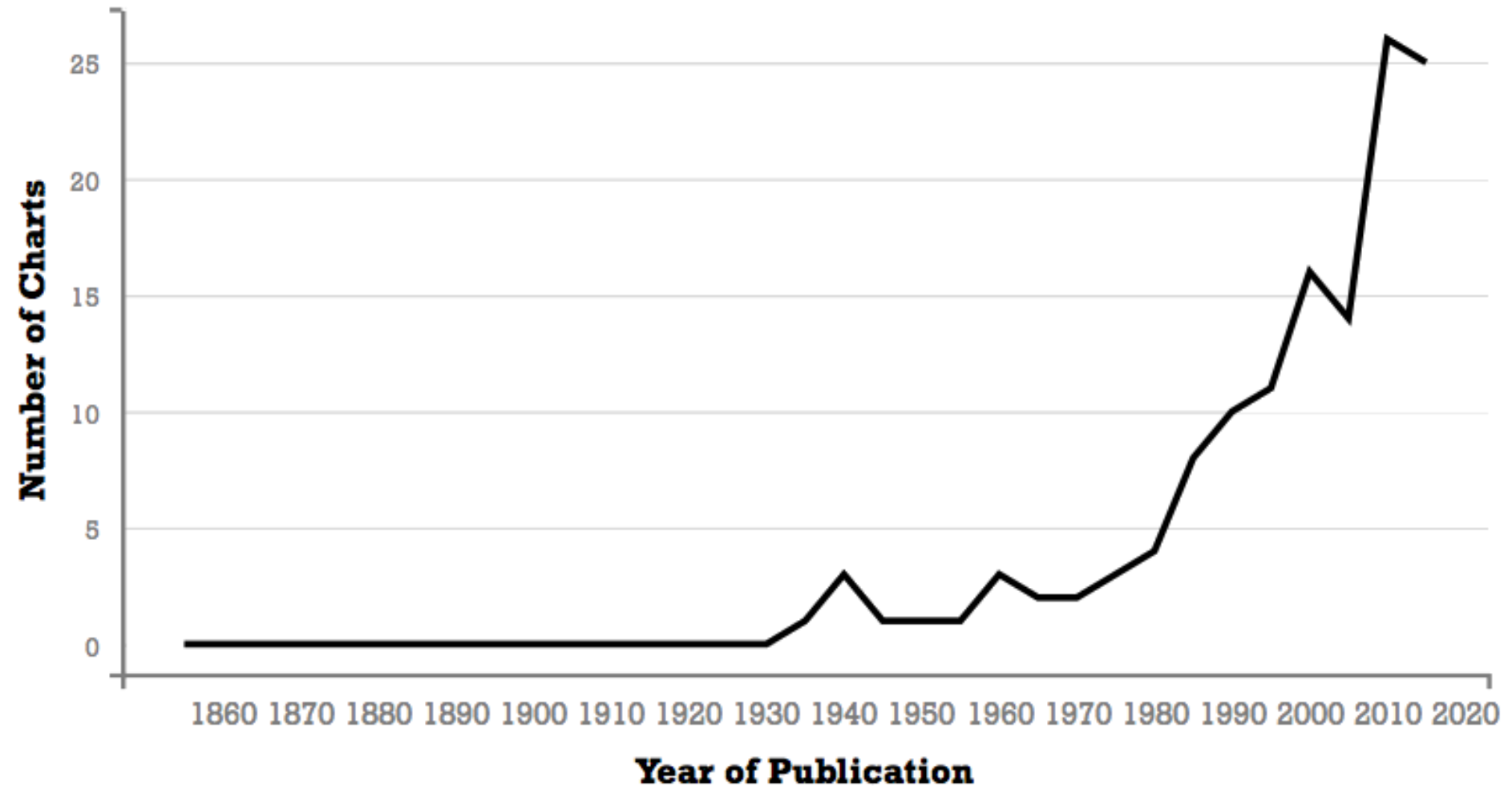
Another cause

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)



from *When did charts become popular*, at [priceonomics.com](http://priceonomics.com)



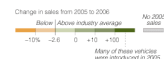
# The New York Times

## 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 trucks and SUVs in 2006, Chrysler continued to churn out big vehicles, which are now sitting around at dealerships across the country.

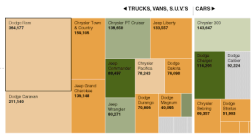
### READING THE CHART

Sizes are scaled proportionally according to number of cars sold in 2006.



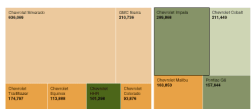
### Chrysler Group

**-7.0%**  
Trucks/SUVs 1.6 million  
Cars 0.5 million  
Pickups, minivans and SUVs made up 76 percent of Chrysler's sales, which hurt it as consumers shifted to cars.



### General Motors

**-8.7%**  
Trucks/SUVs 2.5 million  
Cars 1.6 million  
GM introduced new versions of its large SUVs in late 2005, hoping they would boost sales. Instead, sales of big vehicles were hurt when gas prices climbed. One of the few standouts was the Chevrolet HHR, new in 2005.



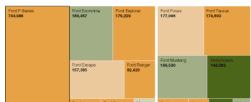
### Chrysler

The Chevrolet Impala, with or without styling hints, cut well in 2006, when a redesign came out.



### Ford

**-8.3%**  
Trucks/SUVs 1.8 million  
Cars 1.1 million  
Even the country's best-selling vehicles, the F-Series, slumped in 2006, with sales dropping 13 percent. One of Ford's bright spots was the new Fusion sedan, which made its debut in late 2005 and sold well in its first full year.



### Toyota

**+12.5%**  
Trucks/SUVs 1.1 million  
Cars 1.0 million  
Toyota rolled out a new version of the Camry, and once again it was the country's best-selling car.

### Honda

**+3.2%**  
Trucks/SUVs 0.7 million  
Cars 0.6 million  
Like the Corolla, the small Honda Civic did well. But the Accord sedan, Honda's E-segment, is waiting for the new version to be released this year.

### Nissan

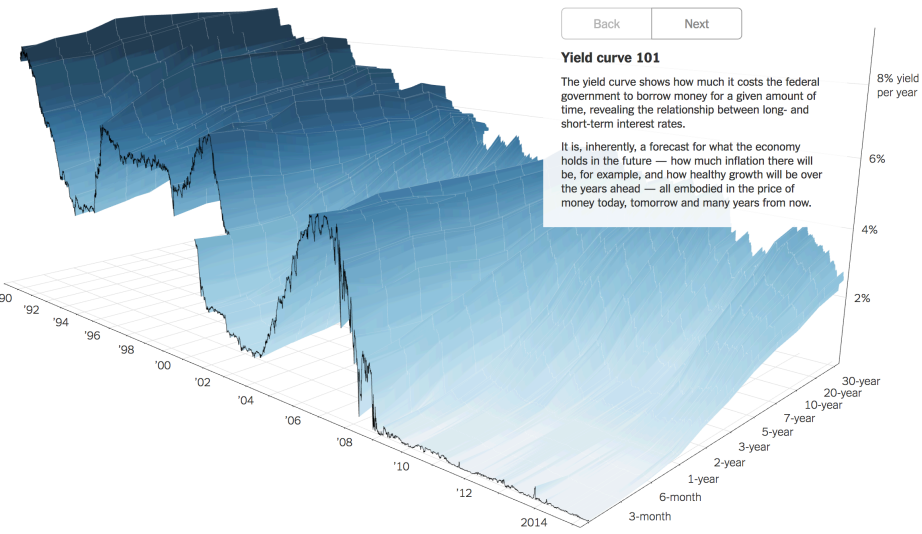
**-8.3%**  
Trucks/SUVs 0.5 million  
Cars 0.6 million

### BMW

**+2.1%**  
Trucks/SUVs 0.1 million  
Cars 0.3 million

### Mercedes-Benz

**+10.3%**  
Trucks/SUVs 0.1 million  
Cars 0.2 million  
Mercedes-Benz, owned by DaimlerChrysler, had a comeback in 2006, thanks to a new version of its flagship S-Class. BMW sales were helped by a new version of its 3 Series sport sedan.



## Yield curve 101

The yield curve shows how much it costs the federal government to borrow money for a given amount of time, revealing the relationship between long- and short-term interest rates.

It is, inherently, a forecast for what the economy holds in the future — how much inflation there will be, for example, and how healthy growth will be over the years ahead — all embodied in the price of money today, tomorrow and many years from now.

## THE CLUBS THAT CONNECT THE WORLD CUP

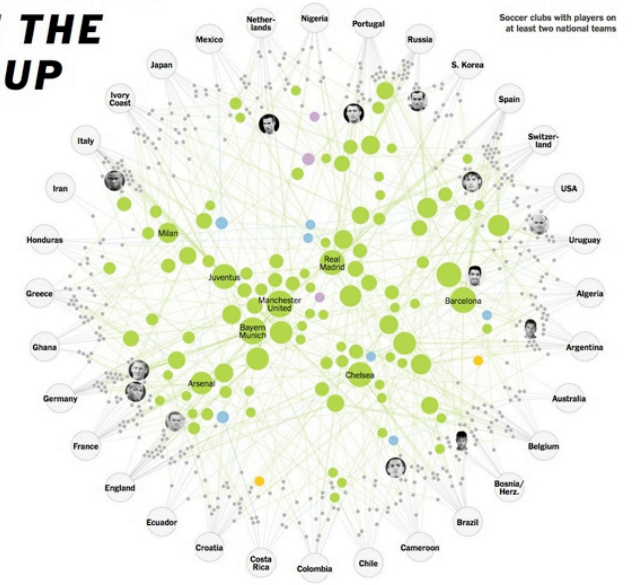
By GREGOR AISCH JUNE 20, 2014

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.

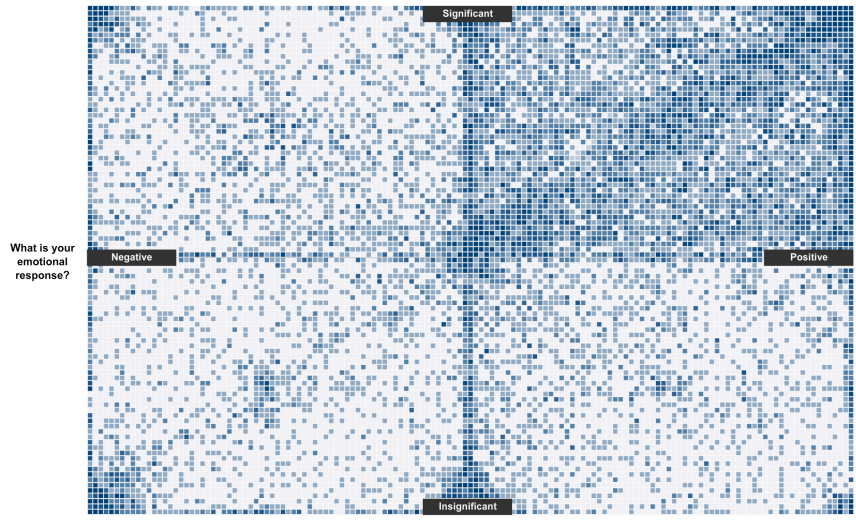
● Europe ● Africa ● Asia  
● South America ● North America

### 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.



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





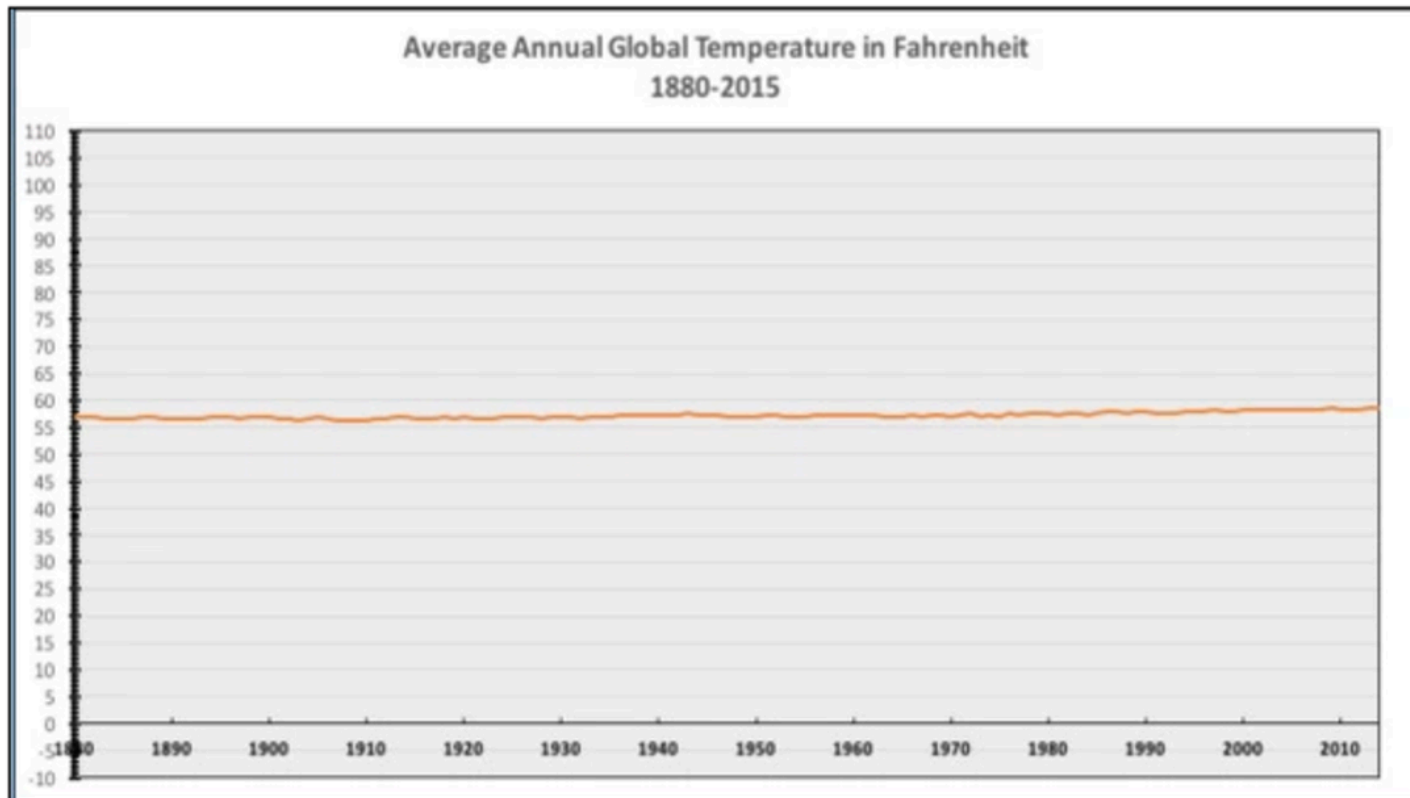
**National Review** ✓  
@NRO

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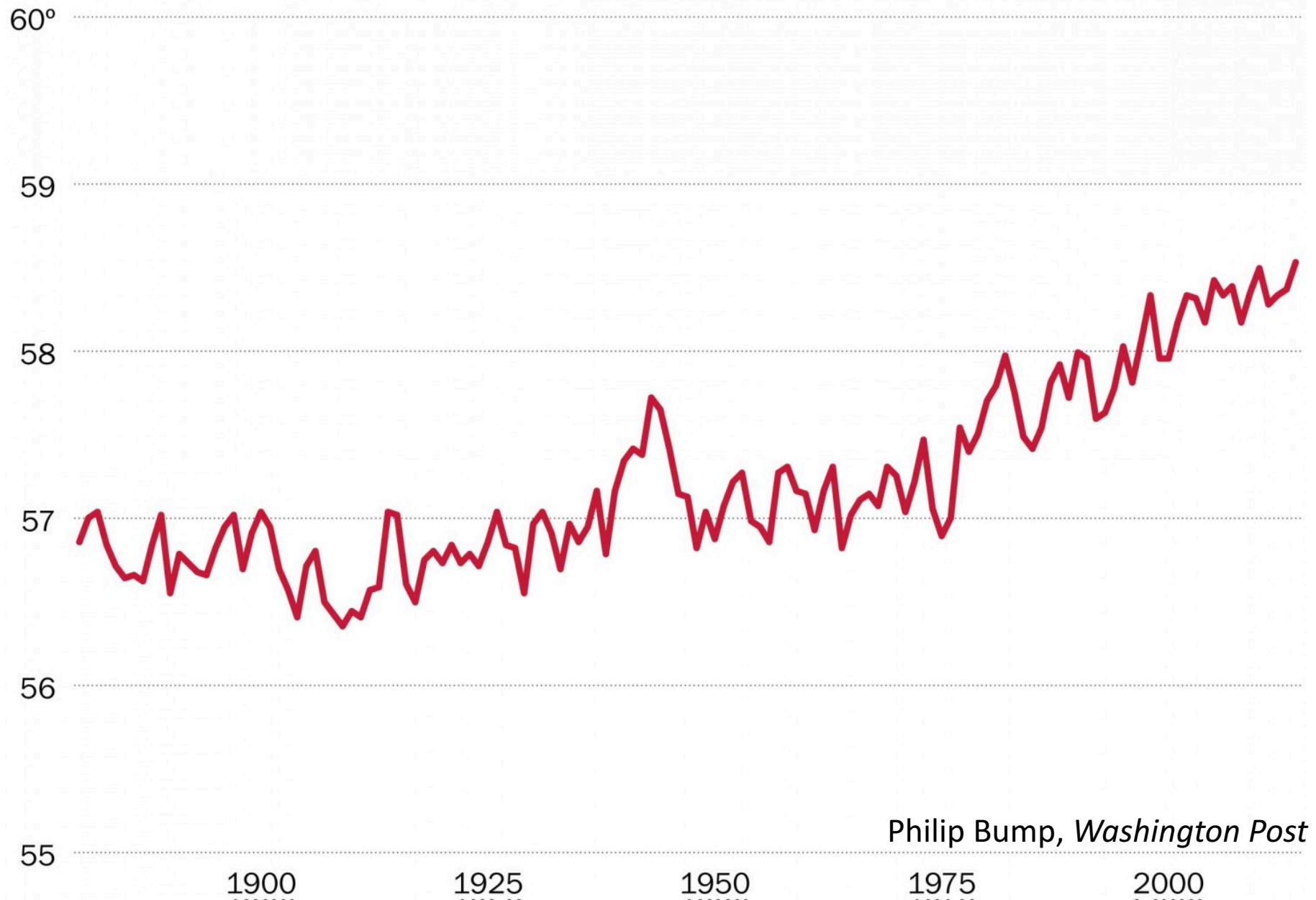
The only [#climatechange](#) chart you need to see.  
[natl.re/wPKpro](http://natl.re/wPKpro)

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

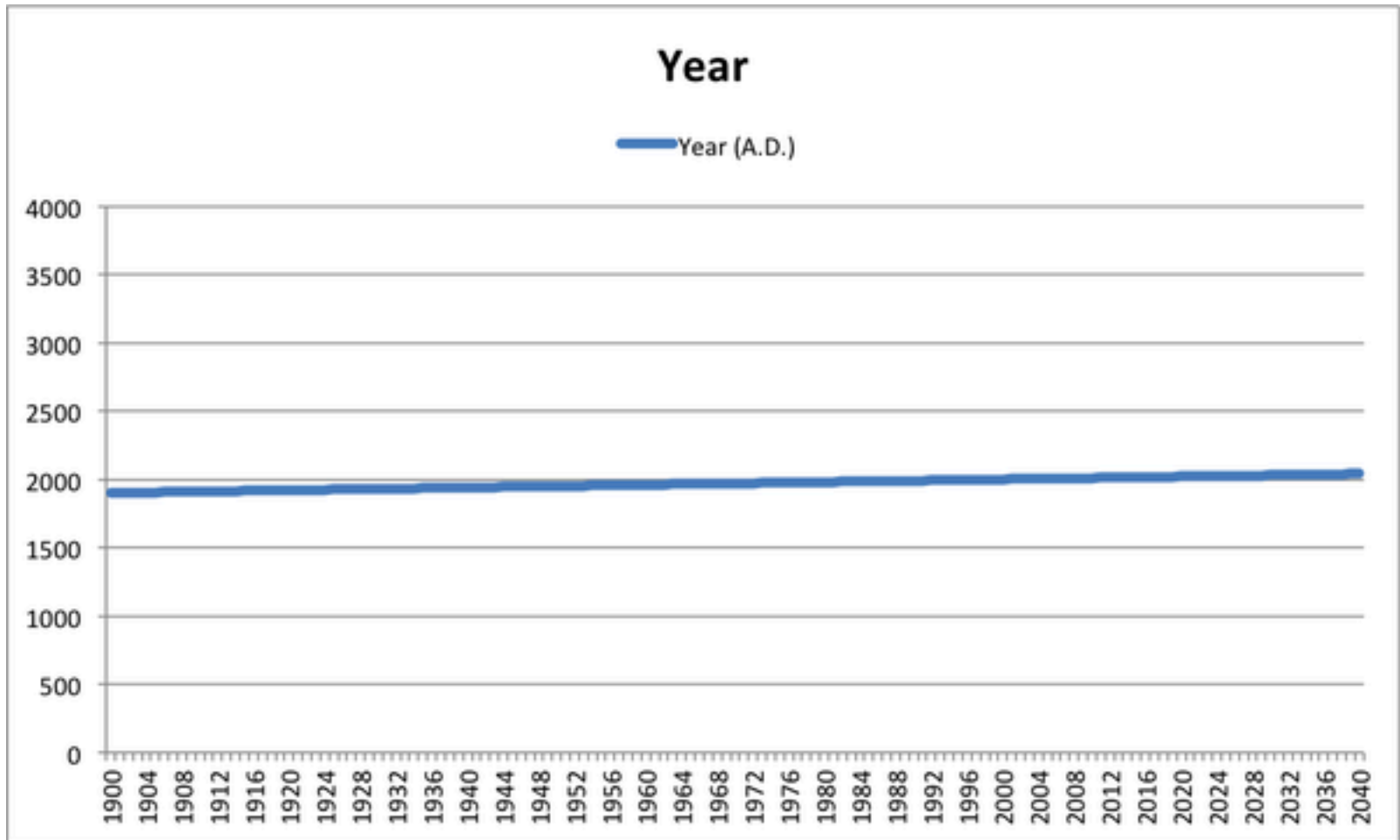


# Average global temperature by year

Data from NASA/GISS.



Philip Bump, *Washington Post*



Bloomberg's *Business Week*

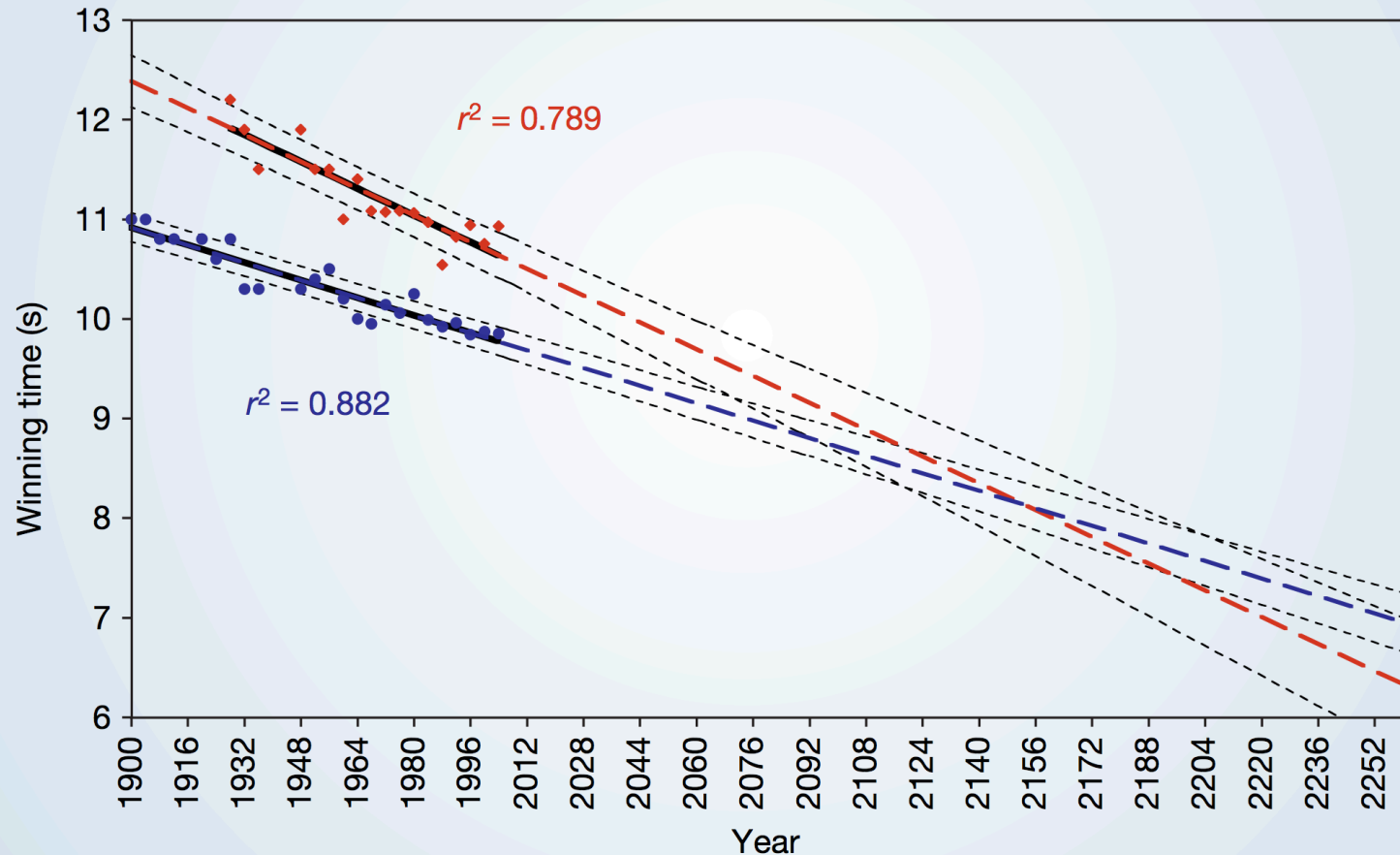


## **Method:** *Reductio ad absurdum*

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.

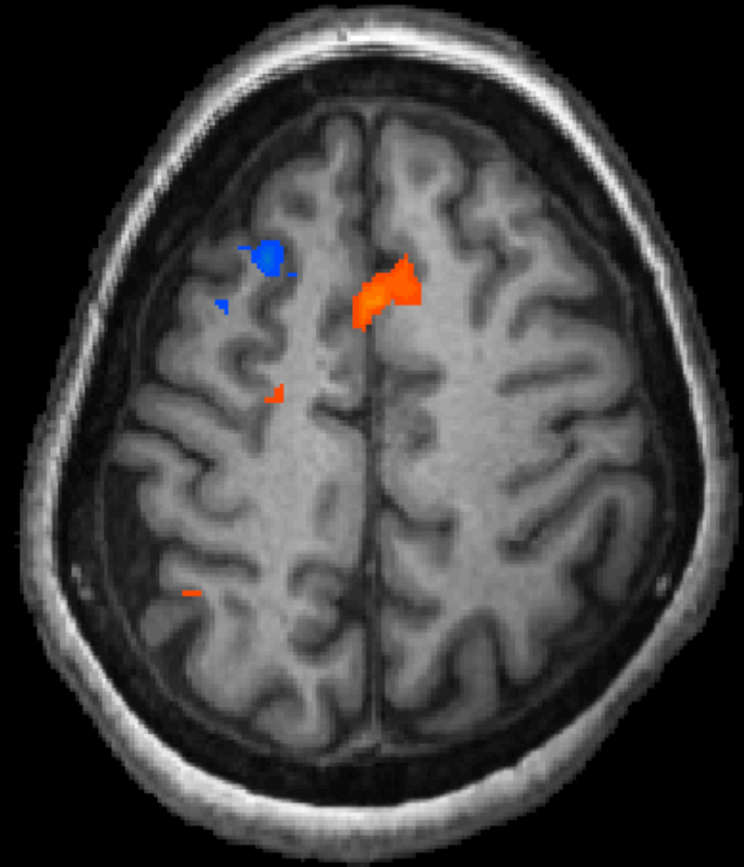


$z = 39$

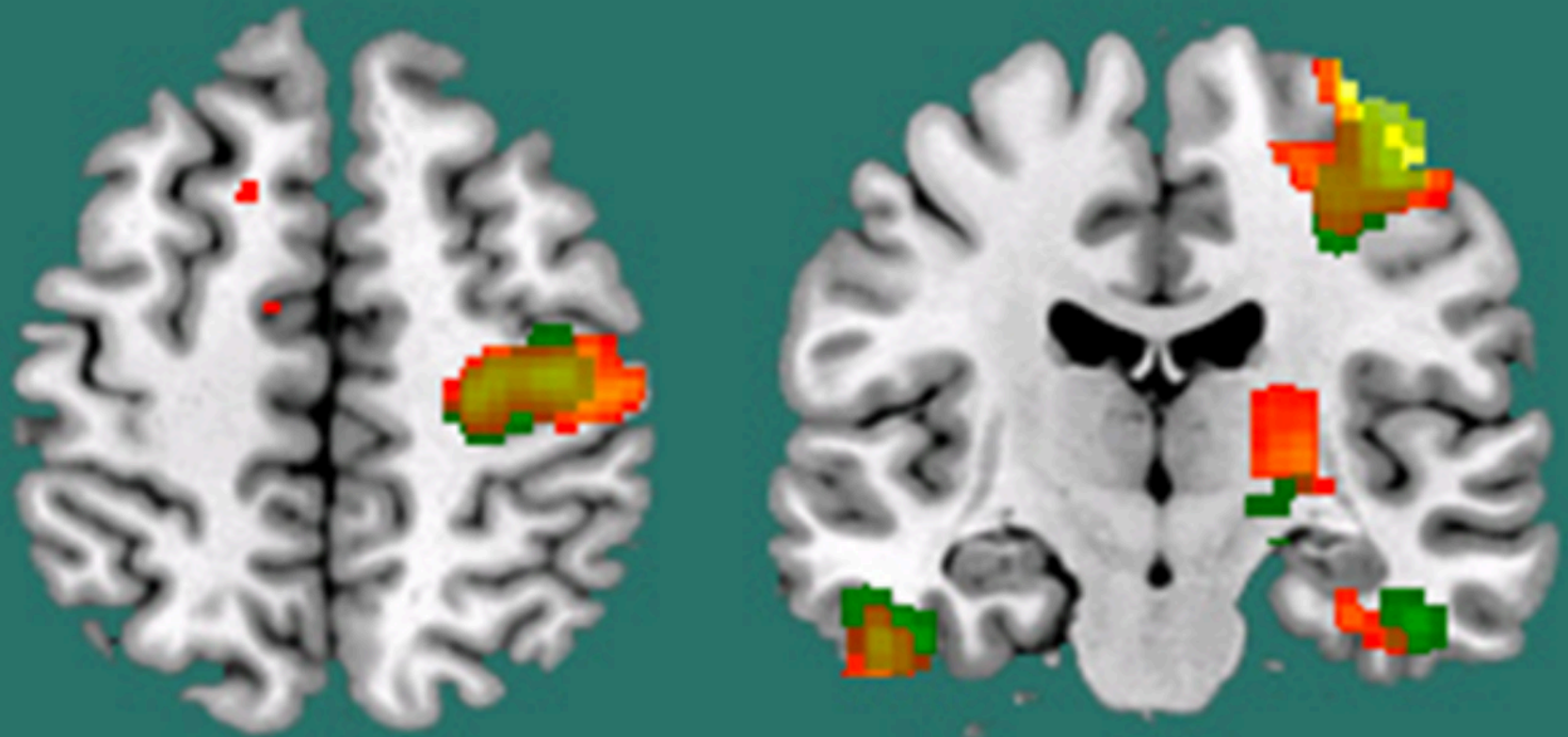


$z = 30$

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

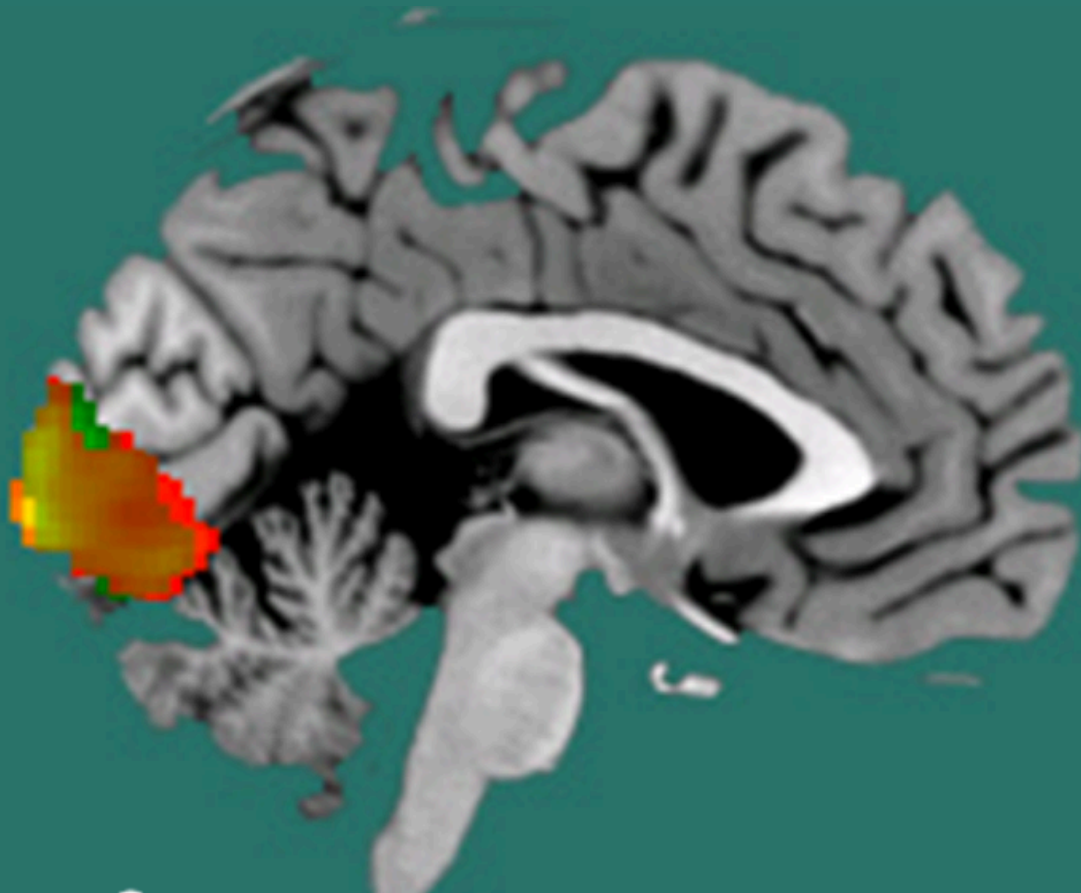


**Consequence:** many claims regarding localization of brain activity may be bullshit.





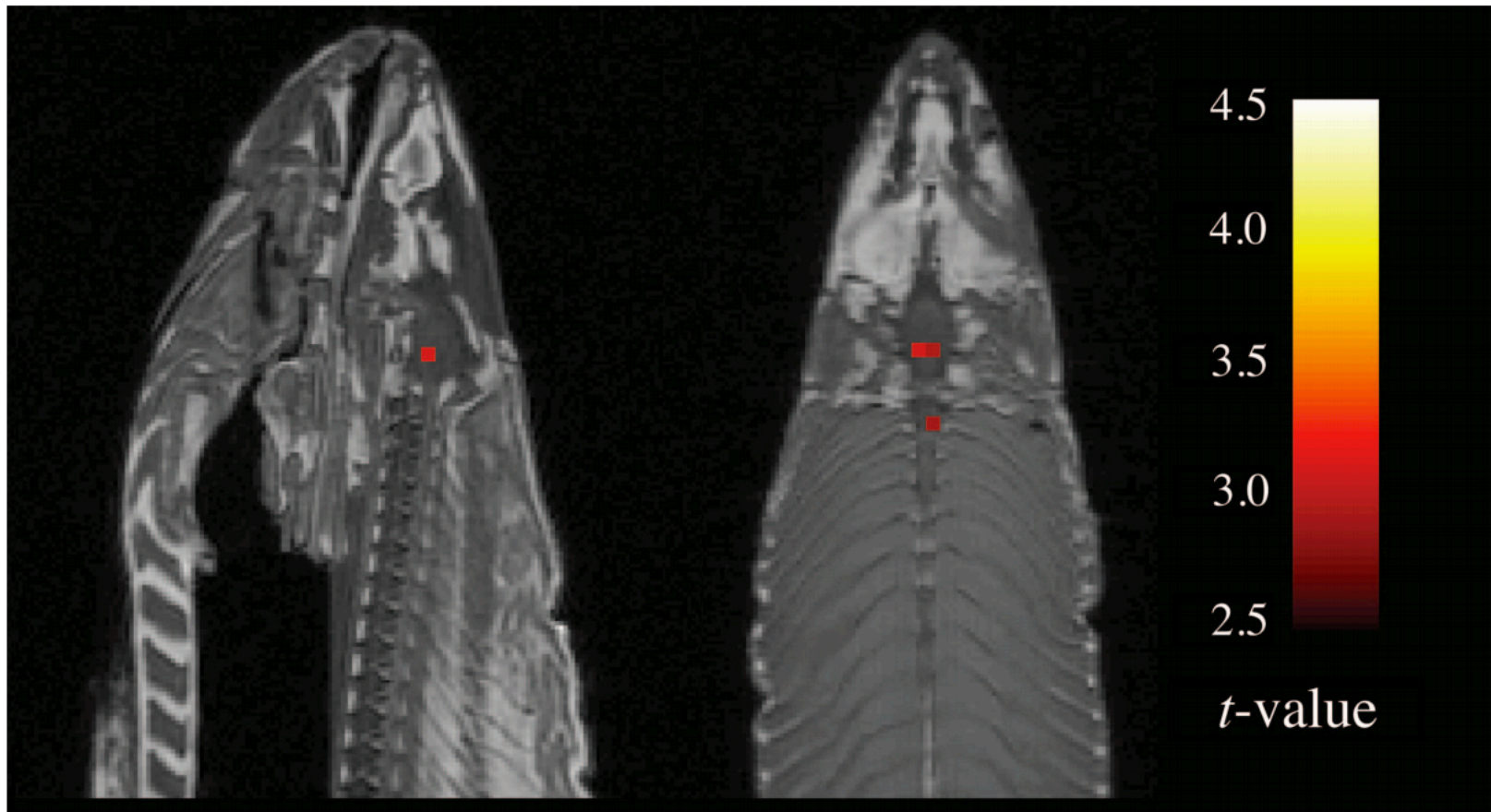
How does one make a convincing argument of that this is a problem?







“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.



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



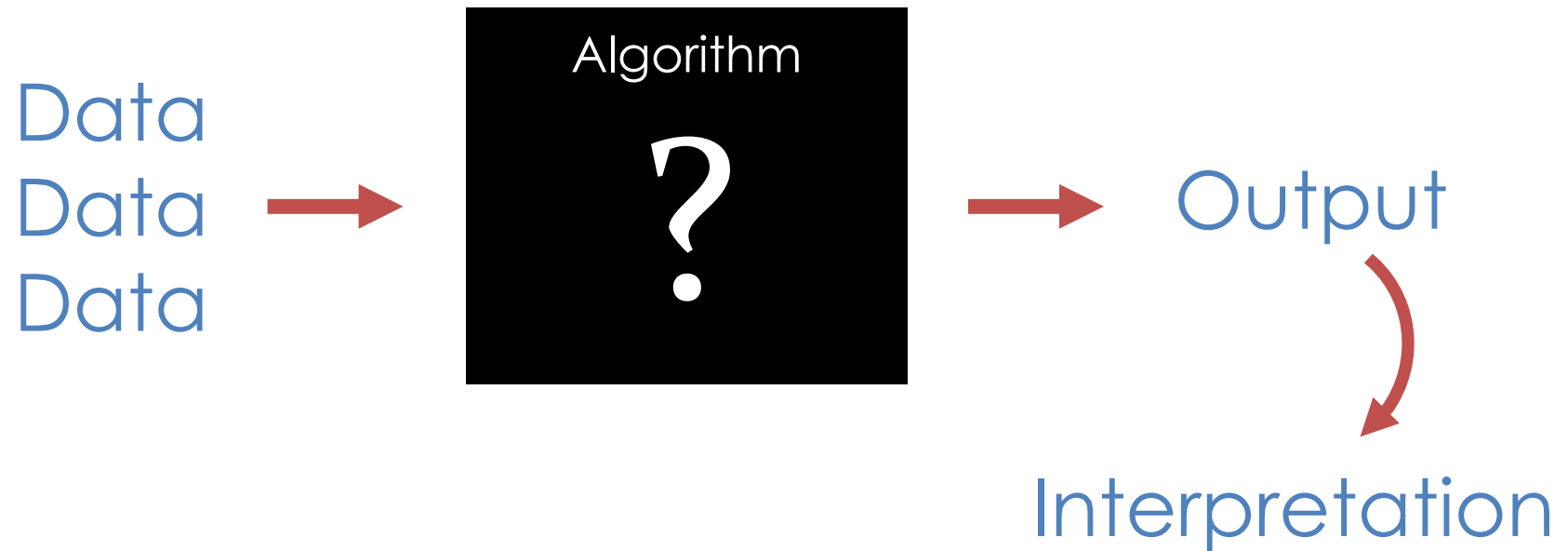


“What about trees?”









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!



Callin\_bull



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@callin\_bull

<http://callingbullshit.org>