we are drowning in bullshit
Old School Bullshit

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

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“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.”
Conference | Truth in Numbers: The role of data in a world of fact, fiction and everything in between
Numbers appear to carry authority.
This is why 37% of PARiS2! talks include made-up statistics.
Words are human constructs.

Numbers seem to come directly from nature.
"You think the countries are giving us their best people? No....They give us their worst people..."
"You think the countries are giving us their best people? No....They give us their worst people..."

2,139 DACA recipients convicted or accused of crimes against Americans
Numbers should be presented in context.

That means they have to allow us to make comparisons.
This is 0.3% of DACA recipients!

Compare 8.6% Americans with a felony conviction.
Price drops from 19,200 to 12,600.

Bitcoin loses 34% of its value in 13 days, or...

...Bitcoin was overpriced by 52% on Dec 12th.
The flu shot’s ineffectiveness is not limited to years of mis-match: the Cochrane Register of Controlled Trials reviewed 50 reports, involving more than 70,000 people, and observed:

- In the “relatively uncommon” case where the vaccine matched the annual flu variety, the rate of influenza was 4% for the unvaccinated and 1% for the vaccinated, so 3 less people out of every 100 would become ill.
- In the more common scenario of vaccine/flu mis-match the corresponding numbers were 2% sick among unvaccinated for 1% of the vaccinated, thus 1 less person per 100.
- Most remarkably and contrary to every source that recommends vaccines, *vaccination had a modest effect on time off work and had no effect on hospital admissions or complication rates.*

I have a new “health tonic” this year which I will try out if I feel some illness approaching and let you know it works. For now, however, I will stick with my tried and true methods for avoiding the flu and recovering from illness should it strike you!
Seat belts "only" drop annual risk of injury from about 2% to 1%.

Should we avoid those too?
We are not teaching our students to question numbers.
Social network analysis in Afghanistan
Joshua Blumenstock is studying the effect of unexpected shocks on network activity in Afghanistan with collaborators at Princeton, UW, UCLA, and UC Berkeley
Find the Jacobian of the transformation:

\[ x = u^2 - v^2, \quad y = u^2 + v^2 \]

\[
\begin{vmatrix}
\frac{dx}{du} & \frac{dx}{dv} \\
\frac{dy}{du} & \frac{dy}{dv}
\end{vmatrix}
\]

\[ \frac{dx}{du} = 2u, \quad \frac{dy}{du} = 2u \]

\[ \frac{dx}{dv} = -2v, \quad \frac{dy}{dv} = 2v \]
MACBETH
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
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
THE WALL STREET JOURNAL

The Boston Globe

THE NEW YORKER

Forbes

BBC

THE TIMES

THE AUSTRALIAN

VANITY FAIR

GeekWire

NEW YORK MAGAZINE

Columbia Journalism Review.

Le Monde

INSIDE HIGHER ED

FINANCIAL TIMES

BUSINESS INSIDER

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

npr

January 28, 2017
Tips for spotting quantitative bullshit

1. Question the source
2. Consider the different ways numbers can be presented
3. Watch out for graphic manipulation
4. Don’t be intimidated by the black box
5. If a claim seems too good to be true...
6. Avoid confirmation bias.
8. Think in orders of magnitude.
1. Who is telling me this?
2. How do they know it?
3. What’s in it for them?
"The rich, in short, aren't nearly rich enough to finance Mr. Obama's entitlement state ambitions—even before his health-care plan kicks in.

So who else is there to tax? Well, in 2008, there was about $5.65 trillion in total taxable income from all individual taxpayers, and most of that came from middle income earners. The nearby chart shows the distribution, and the big hump in the center is where Democrats are inevitably headed for the same reason that Willie Sutton robbed banks."

-The Wall Street Journal
April 17, 2011
Bins differ widely in size!
The Middle Class Tax Target

The amount of total taxable income (left scale) for all filers by adjusted gross income level for 2008

$1.4 trillion

Source: IRS

The Wall Street Journal

Ken Schultz via Brendan Nyhan
Simplistic data graphics only

The New York Times (1920)

Albert Stevens (1920)
Cyclopedia of Fraternities
Multiple Perspectives on the Multiple Comparisons Problem in Visual Analysis

The more visual comparisons an analyst makes, the more likely they are to find spurious patterns—a version of the Multiple Comparisons Problem (MCP) well known in statistical hypothesis testing. We discuss recent research from Zgraggen, Zhao, Zeleznik & Kraska (CHI 2018) that investigates this problem through a careful study of how a group of students identify insights in data using a visualization tool. We describe why studying MCP is exciting in its implications for work at the intersection of visualization, human-computer interaction, and statistics. However, we also question several assumptions made in studying MCP as a visualization process so far. At stake is the integrity of visualization tools for supporting exploratory data analysis (EDA) in ways that align with organizational values for data analysis, and our understanding of what it means to do “good” versus “biased” data analysis.
Carbon dioxide emissions from global fossil fuel combustion and industrial processes from 1751 to 2016 (in million metric tons)*

The statistic represents the global carbon dioxide emissions from fossil-fuel burning, cement manufacture, and gas flaring between 1751 and 2016. Globally, about 36.2 billion metric tons of carbon dioxide were emitted in 2016. Over the past few years, carbon dioxide emissions worldwide had stabilized relative to previous decades. Regarding greenhouse gas emissions by country, China topped the list in 2016.
**Momentous sprint at the 2156 Olympics?**

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

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Tatem et al. (2004) *Nature*
Method: *Reductio ad absurdum*

Show that an argument’s methods or assumptions lead to ridiculous conclusions.
Sir — A. J. Tatem and colleagues calculate that women may out-sprint men by the middle of the twenty-second century (Nature 431, 525; 2004). They omit to mention, however, that (according to their analysis) a far more interesting race should occur in about 2636, when times of less than zero seconds will be recorded.

In the intervening 600 years, the authors may wish to address the obvious challenges raised for both time-keeping and the teaching of basic statistics.”

— Kenneth Rice
The only #climatechange chart you need to see.
natl.re/wPKpro

(h/t @powerlineUS)
Average global temperature by year

Data from NASA/GISS.

Philip Bump, Washington Post
Bloomberg's Business Week
Gun deaths in Florida

Number of murders committed using firearms

2005
Florida enacted its ‘Stand Your Ground’ law

Source: Florida Department of Law Enforcement
C. Chan 16/02/2014

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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

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Shanghai Jiao Tong University
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Cesare Lombroso
Criminal Man (1876)
(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 one variable of meta-accuracy (the competence of the human judge/examiner) all together.”

—Wu & Zhang (2017)
Criminals have smaller angle $\theta$, larger curvature $\rho$ than non-criminals.

Figure 8. (a) FGM results; (b) Three discriminative features $\rho$, $d$ and $\theta$. 
(a) Three samples in criminal ID photo set $S_c$.

(b) Three samples in non-criminal ID photo set $S_n$. 
Criminal and non-criminal “subtypes”

Criminal

(a) -0.98  (b) -0.68  (c) -0.28  (d) -0.38

Non-criminal

(e) 0.76  (f) 0.98  (g) 0.66
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

Sam Levin in San Francisco

An illustrated depiction of facial analysis technology similar to that used in the experiment. Illustration: Alamy
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.
Big Data (n)

The idea that a sufficiently large pile of horseshit will, with probability one, somewhere contain a pony.
If a claim seems too good (or too bad) to be true, it probably is.
OMG!!
Gonna make my girl quit her metal band!! 😞😞😞
“It's a cautionary tale to some degree,” Kenny told the Washington Post.

“People who go into rap music or hip hop or punk, they're in a much more occupational hazard profession compared to war. We don't lose half our army in a battle.”

Justin Moyer, *Tampa Bay Times*

The deadliest profession: hip-hop artist.
Data censoring
Right censoring
Right censoring
Numark DJ Controller
BC Rich Warlock Guitar
Epiphone Dobro
Yamaha Yas61lii sax
“Many musicians from younger genres – rock, electronic, punk, metal, rap, and hip hop – appear unlikely to live long enough to acquire the illnesses of middle and old age.”

— Kearney (2015)
Many musicians from younger genres – rock, electronic, punk, metal, rap, and hip hop – appear unlikely to live long enough to acquire the illnesses of middle and old age.”

— Kearney (2015)
A game of telephone

Scholarly article

Popular article

Dataviz

Twitter meme

Washington Post
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Shocked by difference in words 4 male vs female recommendation letters for faculty positions: ncbi.nlm.nih.gov/pmc/articles/P...
“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
Tips for spotting quantitative bullshit

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Is fresh juice sweeter than juice from concentrate?
Fresh juice is sweeter!

21 people

4 people

Conclusion: Fresh juice is sweeter!

$p < 0.01$ (exact binomial test)
I am comparing apples and oranges!
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
"But the press left out some important differences. Most important, millions watched the inauguration on TV and streaming media — probably millions in Russia alone."
Tips for spotting quantitative bullshit

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Food stamp fraud is at an all-time high, with cases this year including a state lawmaker and even a millionaire.

According to the USDA, $70 million of taxpayer money was wasted in 2016 due to food stamp fraud.
$70 million sounds like a lot of cash.

But how much is it in the context of the entire food stamp program?
What fraction of Americans receive food stamps?

1% 10% 100%
What fraction of Americans receive food stamps?

1%  10%  100%
How much does the average food stamp recipient receive annually?

$100  $1,000  $10,000
How much does the average food stamp recipient receive annually?

$100  $1,000  $10,000
How many people are there in the United States?
How many people are there in the United States?

About 300,000,000
Thus total expenditures on the food stamp program (not counting administration costs) are about

\[ 300,000,000 \times 0.1 \times $1000 = $30,000,000,000 \]
The fraction lost to fraud is thus

\[
\frac{70,000,000}{30,000,000,000,000} = 0.2\% \text{ of expenditures}
\]

Typical losses in retail would be on the order of 1.5% to 3%. 
Agriculture Department seeks correction from Fox News on food-stamp fraud report
UPDATE: Fox & Friends Corrects Report About Food Stamp Fraud

Dec 27, 2016 // 3:08pm

CORRECTION

The statistics reported Tuesday in a "Fox & Friends" segment about 2016 food stamp fraud were incorrect.

The latest USDA information, from 2009 to 2011, showed $853 million in fraud, or 1.3% in those three years. Nationally, food stamp trafficking is on the decline.
“Falsehood flies, and the Truth comes limping after it.”

—Jonathan Swift (1710)
Tips for spotting quantitative bullshit

1. Think about how numbers are presented.
2. Don’t be fooled by visualization.
3. Question the source.
4. Don’t be intimidated.
5. If a claim seems too good to be true...
6. Avoid confirmation bias.
8. Think in orders of magnitude.
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.
Neil Postman’s Third Law

“At any given time, the chief source of bullshit with which you have to contend is yourself.”
Thank you!

Callin_bull

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@callin_bull, @jevinwest

http://callingbullshit.org