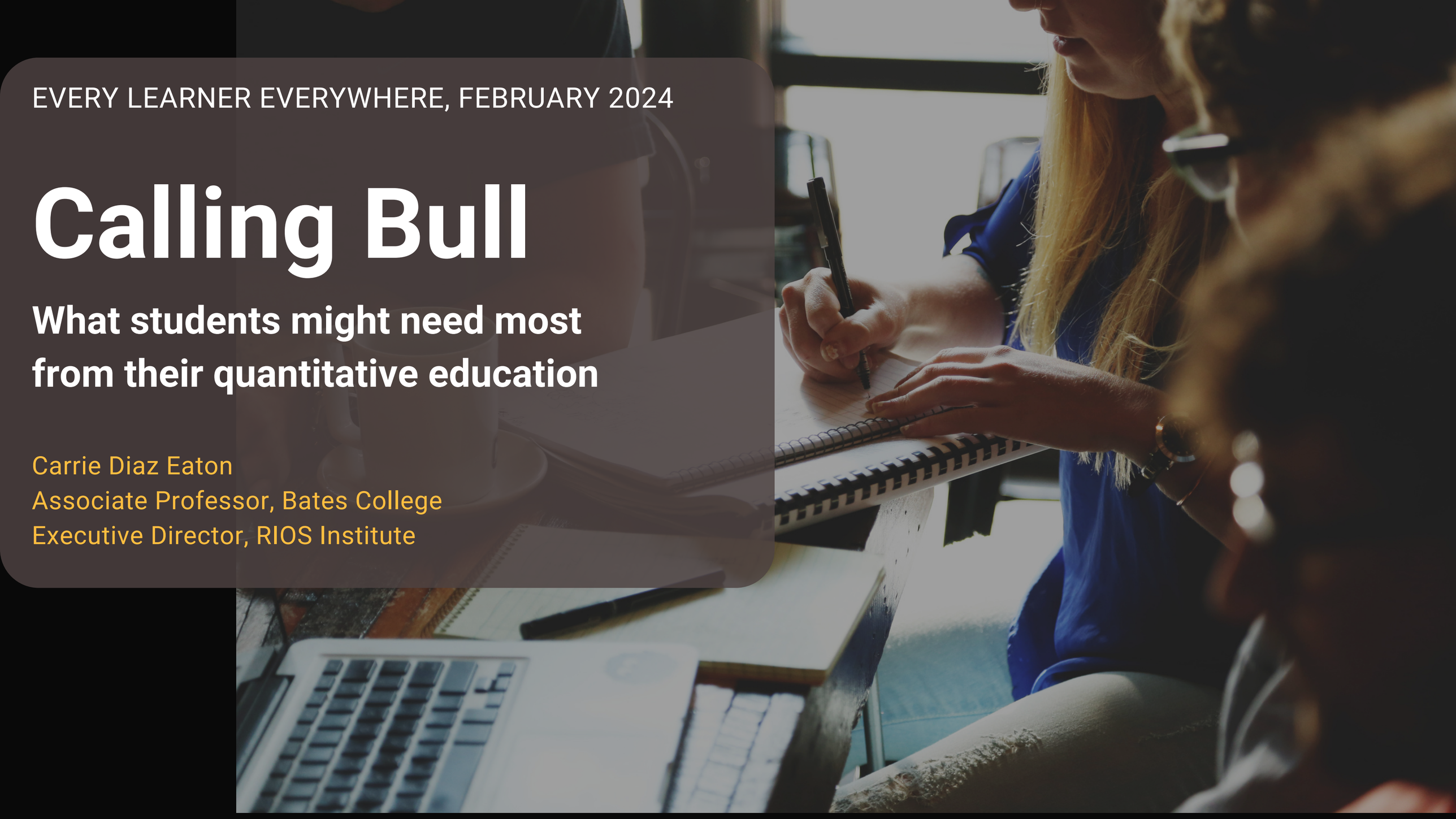

EVERY LEARNER EVERYWHERE, FEBRUARY 2024

Calling Bull

What students might need most from their quantitative education

Carrie Diaz Eaton
Associate Professor, Bates College
Executive Director, RIOS Institute

THE UNIVERSITY OF TENNESSEE KNOXVILLE

Bates

QUBES
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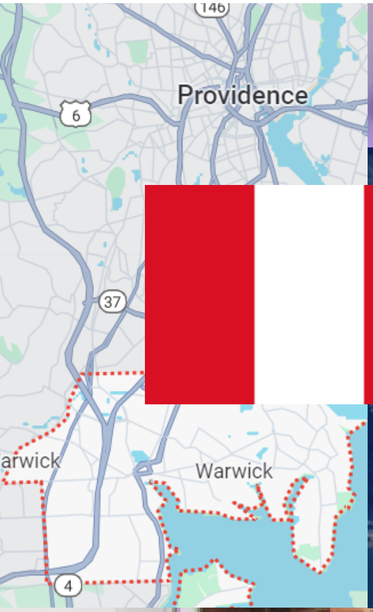
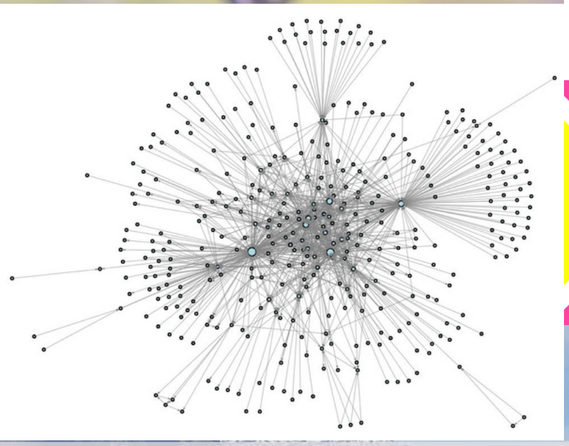
1865 THE UNIVERSITY OF MAINE





RIOS INSTITUTE
FOR A RACIALLY-JUST, INCLUSIVE, AND OPEN STEM EDUCATION

SUPPORT
ADVOCACY
LEADERSHIP

Why do we invest in education?

WHAT DO WE REALLY WANT FOR US AND FOR OUR STUDENTS?

What world are we preparing them for? What world will they create?

DECADE

Grand challenges

01 Social justice

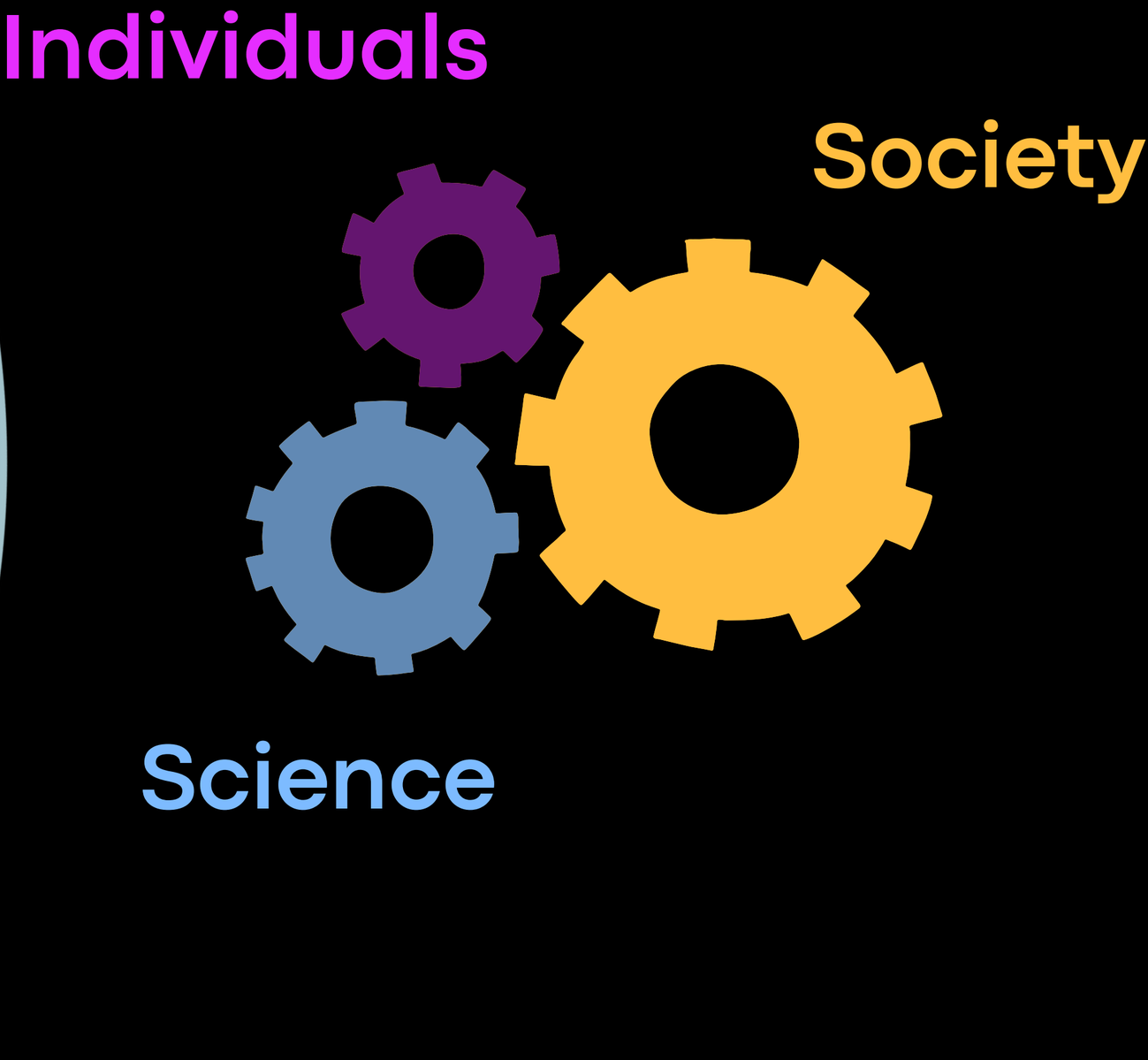
02 Democracy

03 Public trust of science

04 Artificial intelligence (AI)

COEVOLUTION

Individuals, Society, and Science are intertwined and shape each other



DECADAL

Grand challenges

Individuals

Society

Science

Experiences

Social justice
Public trust in science
Democracy

AI
Big data
Climate change
COVID-19

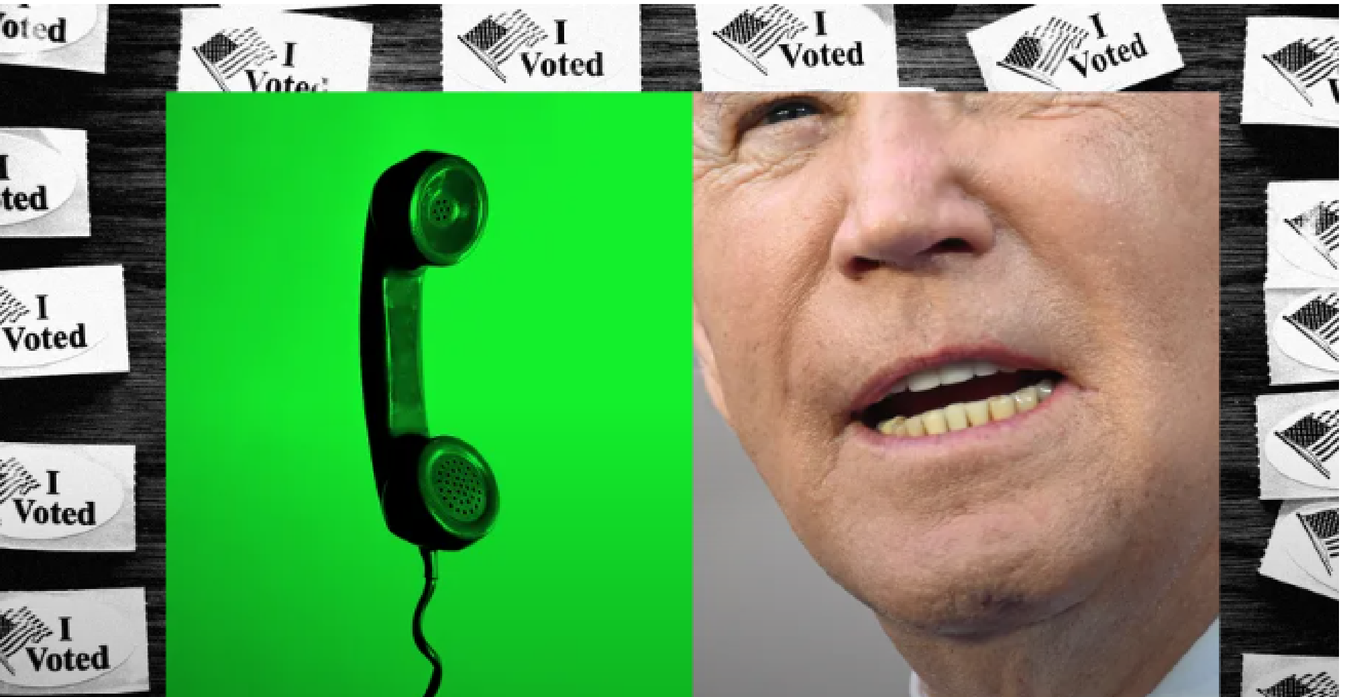
WIRED

SUBSCRIBE

VITTORIA ELLIOTT | MAKENA KELLY | POLITICS | JAN 23, 2024 12:58 PM

The Biden Deepfake Robocall Is Only the Beginning

An uncanny audio deepfake impersonating President Biden has sparked further fears from lawmakers and experts about generative AI's role in spreading disinformation.



These are the times we are living in - full of bullsh!t

These grand challenges are deeply intertwined and threaten our democracy.

DECADAL

Grand challenges

Individuals

Experiences
Skills
Agency
#OpenAsResistance
[Beyond] Ethics

Society

Social justice
Public trust in science
Democracy

?

Science

AI
Big data
Climate change
COVID-19

Science education

- Encourage students to think deeply about science and science communication, when they invoke p-values and probability?
- Encourage students to explore and critique bias in science and develop framing for ethics in scientific practice?
- Challenge students to analyze structures of power and grapple with ethics in their discipline and life?

Quantitative education

- Help students read and understand graphs and tell stories with data?
- Help students understand and ethically leverage computing?
- Empower students to critique big data models, such as machine learning models, and poor and/or manipulative representations of data?

Photo credit Phyllis Grabner, Bates College

Calling Bull

An educator’s response

Here we are

01 Bullshit is not new

02 Bullshit can harm

03 Technology has amped up the reach and the impact of bullshit

04 Information overload, the time to figure out what is BS and what isn’t takes a back seat

05 We share by bias, racism, trend, and media headlines, reinforced by algorithms

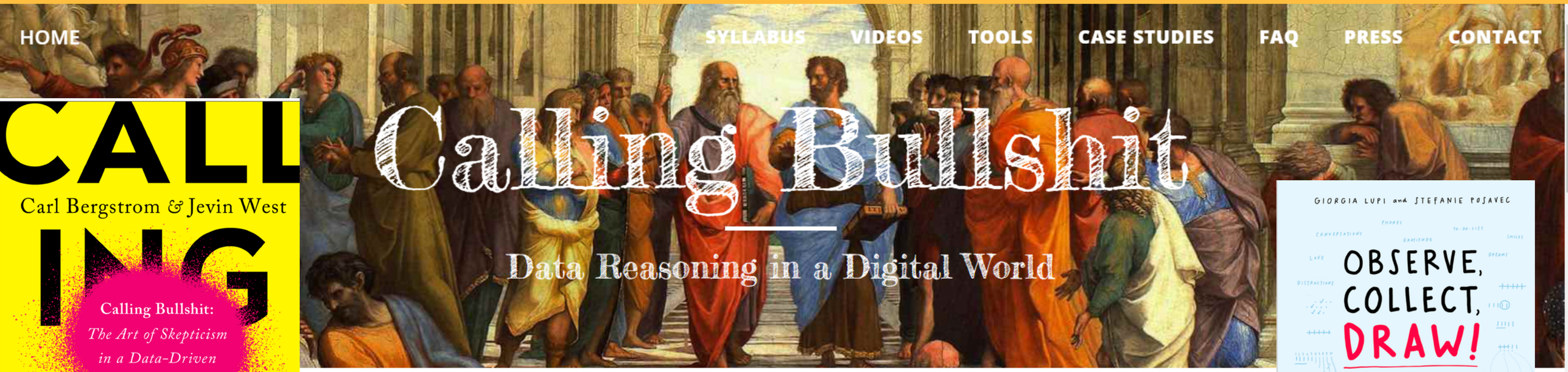
https://www.callingbullshit.org/
Harry Frankfurt (1986) On Bullshit. Raritan Quarterly Review 6(2)
Photo: CC

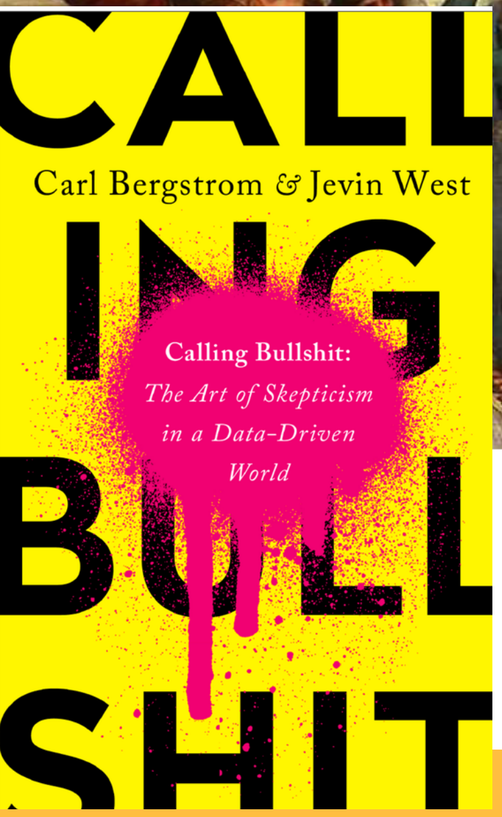
- Digital and computational studies
- Open Education commitment - Resources, Software, Science, Practices
- Social science (specifically econ & politics) students in mind
- Introduction to programming with R before a statistics course in their discipline

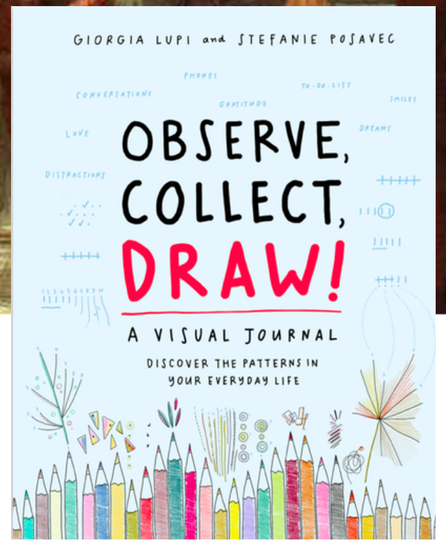
datacamp

R

BIOMAAP
Biology Students Math Attitudes and Anxiety Program







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

callingbull.qubeshub.org

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Biology × Math × Community
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Big ideas

Philosophy

Community Building

Critical Practice

Leverage Cultural Wealth

Building Self-Efficacy and Agency

I. Intro

Intro to BS, programming, and science

Getting comfortable with numbers, data viz & programming

#OpenAsResistance

II. Critical Data

Probabilities, p-values, correlation, bootstrap

Programming & data practices

AI & big data

Racism in science

III. Ecosystem

Economics of science, academia, publication, and misinformation

Ethical practices in science

Plan & execute an investigation

IV. Agency & Doing

Spot BS in the wild

Investigate it

Communicate it

Reflect on learning

#OpenAsResistance

Difficult Dialogues

DATA IS NOT NEUTRAL

Teaching difficulty rating:
AI < Programming < Economics < Justice

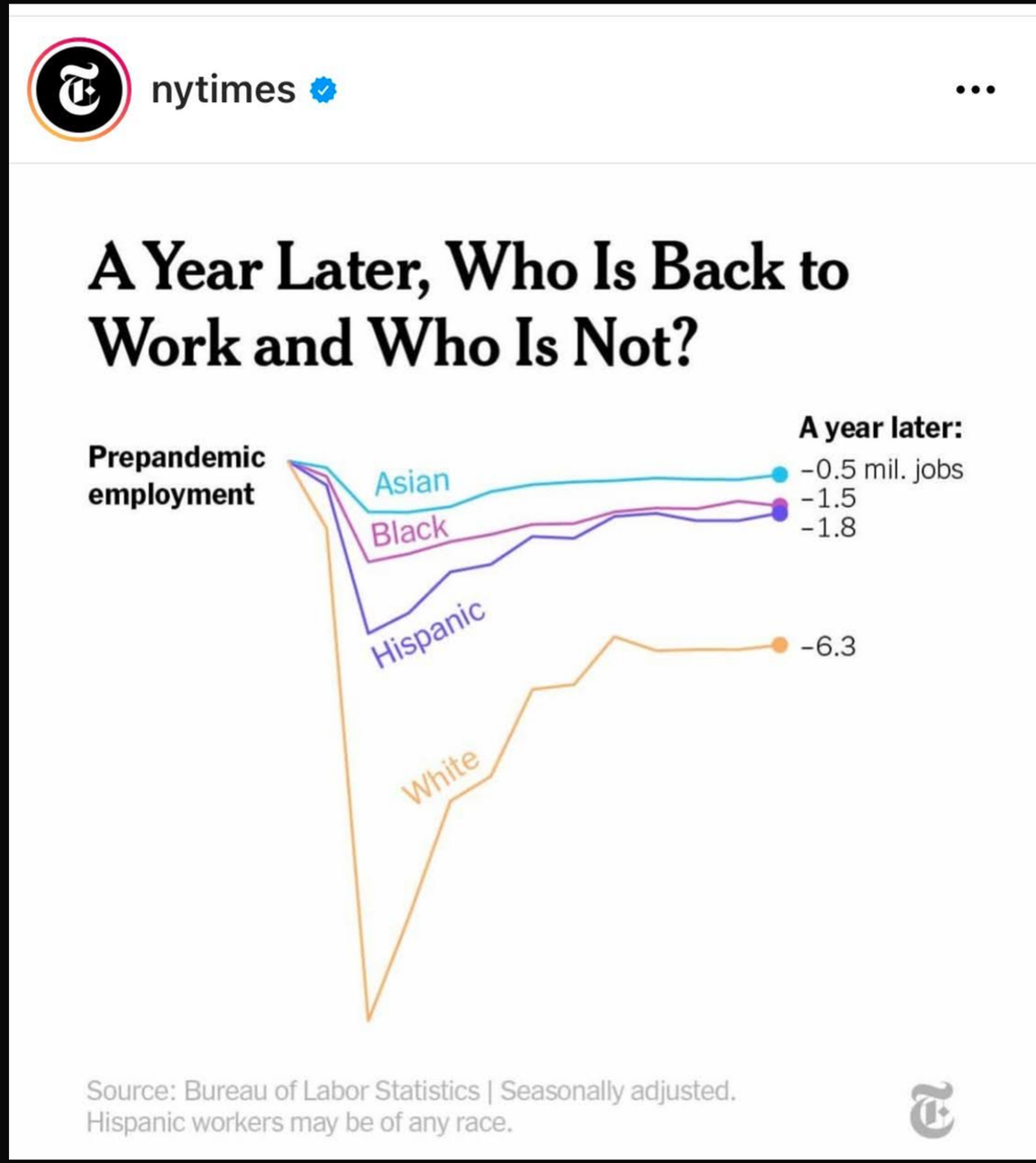
Your paragraph text

Much of this is easy in comparison to the courage it takes to lead conversatinos about the hard truths of racism and bias in science and society.

VISUALIZATION IS POWERFUL

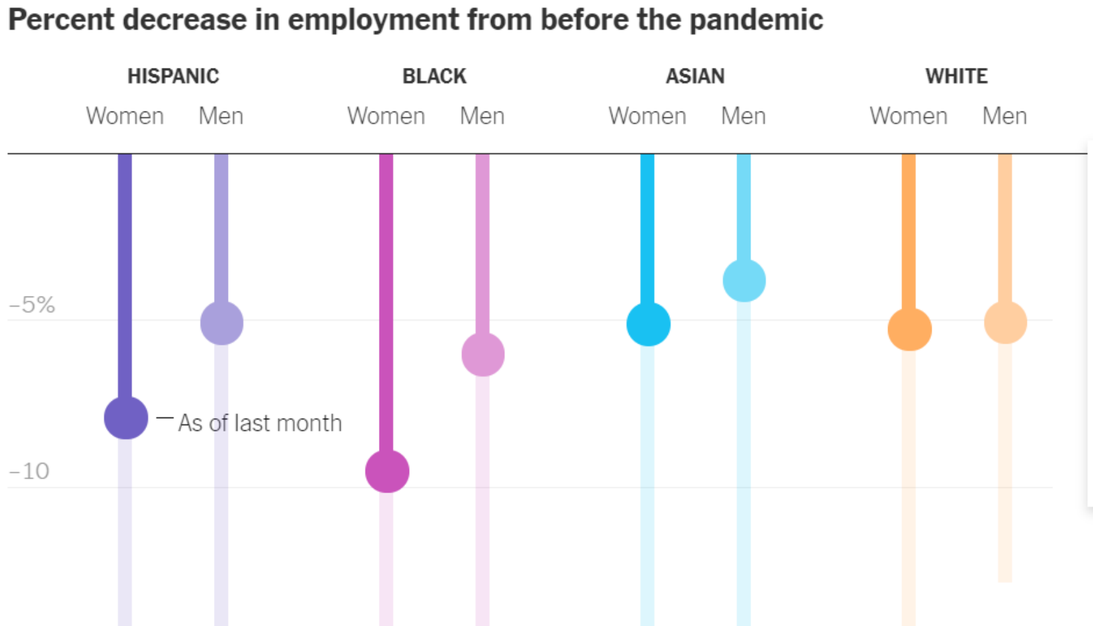
Dig deeper

Allows us space to talk about intersectionality and data analysis and visualization, binary gender data, assumptions of heteronormativity in data collection, and more.



VISUALIZATION IS POWERFUL

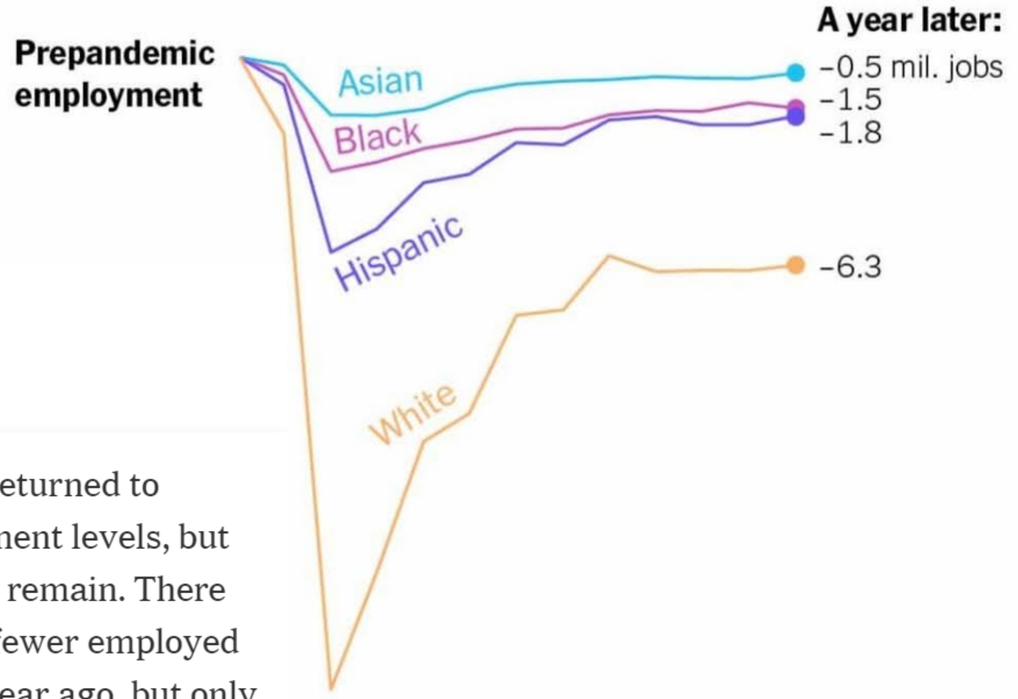
Dig deeper



No demographic has returned to prepandemic employment levels, but significant differences remain. There are nearly 10 percent fewer employed Black women than a year ago, but only 5 percent fewer employed white men.

nytimes

A Year Later, Who Is Back to Work and Who Is Not?



bor Statistics | Seasonally adjusted.
y be of any race.

- Criminal machine learning. Machine learning algorithms are sometimes touted as generating results that unbiased and without prejudice. This is bullshit. We explore an example in which two authors claim to have an algorithm that can determine whether one is a criminal simply from an 80x80 facial image, and show that this algorithm is actually doing something very different.

- Machine learning about sexual orientation? In this case study, we discuss a controversial paper that claims a deep neural network can predict sexual orientation from facial photographs. We illustrate how one can question the interpretation of results without delving into the details of the machine learning algorithm used to generate them.

NEW AGE BS?

Why?

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

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

NEW AGE BULLSHIT OR

Old school Bullsh!t?

SAME OLD BULLSH!T

How did we get here?

How does ML work?

For example - ML techniques can rely on regression

Who developed regression?

Early statistics was invested in to justify imperialism and slavery.

“During his lecture, Pearson claimed that Ling, when considered alongside her relatives (many of whom were on display outside the lecture hall that evening, in UCL’s main quad), could be understood as having unparalleled significance for understandings of human nature, racial difference, and the future of the British empire. (Figure 1). The dogs, he explained, represented the possibility of turning the entirety of the empire’s peoples into civilized citizens.”

– QUICK (2020) “THE MAKING OF A NEW RACE IN THE EARLY 20TH CENTURY IMPERIAL IMAGINARY,“ THE HISTORICAL JOURNAL

“Faculty, like Arnie, who exhibit lower racial consciousness often exempt themselves from the learning processes and make pedagogical decisions that re-center whiteness. When this happens, White faculty maintain their position as expert. If Arnie, as expert fails to confront race and racism, his silence communicates the minimization of race and racism.”

Haynes and Patton (2019) "From Racial Resistance to Racial Consciousness"

Reflections

HOW WE CAN TRANSFORM LEARNING

01

Student Skills Development

Ask questions, question assumptions, develop cultural competency, information, computing, and data literacy skills.

02

Student Lifelong Learning

Civic engagement, digital citizenship, healthy relationship with science, agency, #OpenAsResistance philosophy.

03

Instructor Learning

Community building is very important, I learned new content, less afraid to call out professional bull.

Interested in adopting Calling Bull at your institution?

JOIN US FOR A FREE WORKSHOP!
HOSTED BY THE RIOS INSTITUTE

Mar 8, 2024 at 2:30 PM ET

Register at

https://bit.ly/teachCB_FAQ

Credits

And more information

Bates

WILLIAM + FLORA Hewlett Foundation

- QUBES - Community-funded, run by BioQUEST
- Big thanks to Carl Bergstrom
- RIOS Institute and Leadership team - see our leadership development programs at **riosinstitute.org**
- Calling Bull instructional support team. Shout out to two research students this semester: Sadie Kriegler and Joaquin Torres

Thank you!

Photo credit Phyllis Grabner, Bates College

Questions please!