



#ChartingTheCourse:

Data Science in K-12 Education?



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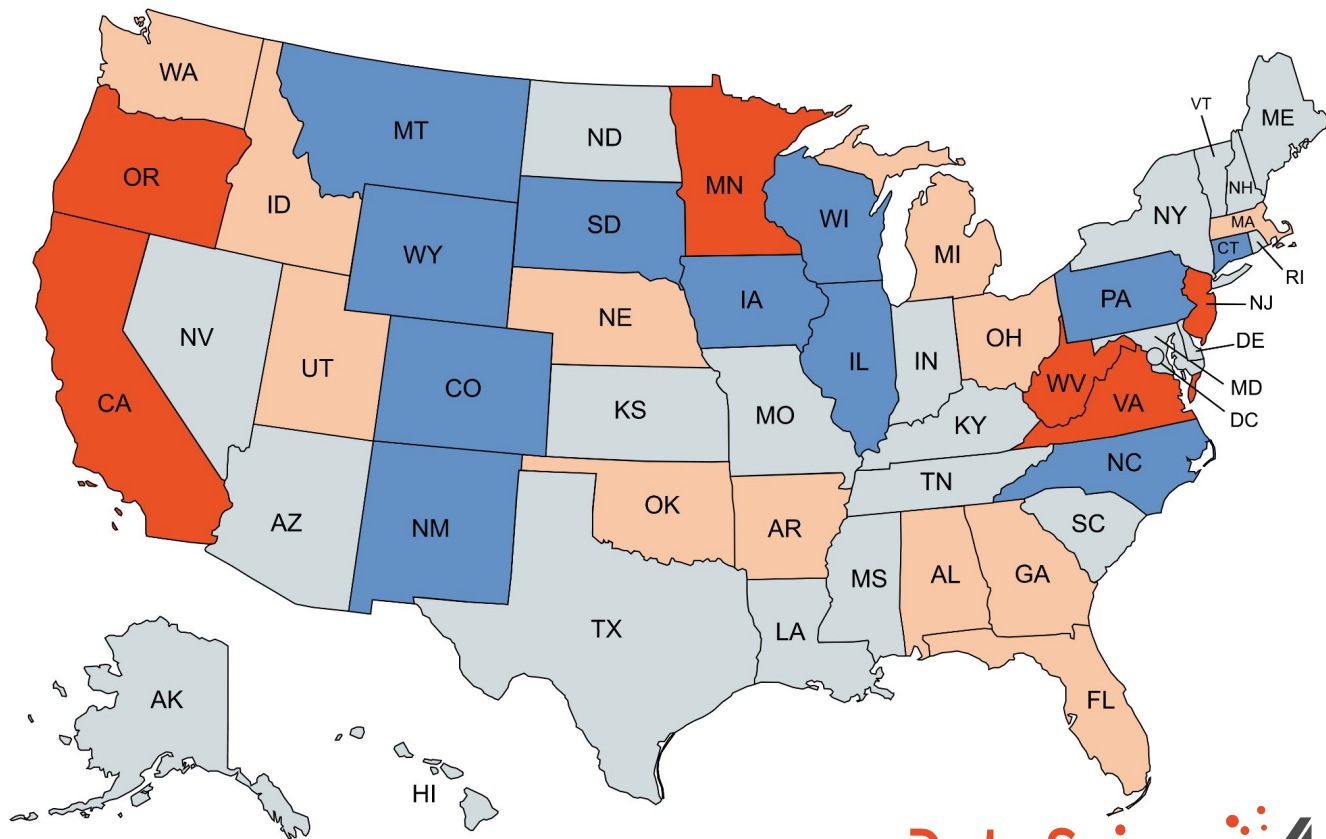
Banquet Talk Goals



32+ states investing in K-12 Data Science

Tier 2 - Course Pilot, Course Sequence or Teacher PD

Tier 1 - Added to State Course Catalog



Banquet Talk Goals

State Education Agencies

- Dedicated data science courses **with** state-level course codes



Curriculum Developers

- Dedicated data science courses **without** state-level course codes
- Data science content modules



Data Science Student Enrollment

- Students enrolled in a dedicated data science course **or** a course that included a data science content module

*Most recent
school year data
available*

2,846

Tier 0: Research and/or Development

11,184

Tier 1: State Course Code

17,013

Tier 2: Course Pilot, Course Sequence, or Teacher Professional Development Program

70,581

Tier 3: Standards Adoption

139,089

Nationwide Total

Banquet Talk Goals

Aggregated SEA-Reported Student Demographics: Gender



Demographics of **3,615 students** enrolled in Data Science courses in **Arkansas, New Jersey, Pennsylvania, Rhode Island, Utah, and Virginia**

Banquet Talk Goals

Aggregated SEA-Reported Student Demographics: Race/Ethnicity

Two or More Races

5.8%

Native Hawaiian/Other Pacific Islander

0.6%

Native American/Alaska Native

0.3%

Hispanic/Latino/Latina

22.8%

Black/African American

14.7%

Asian

7.0%

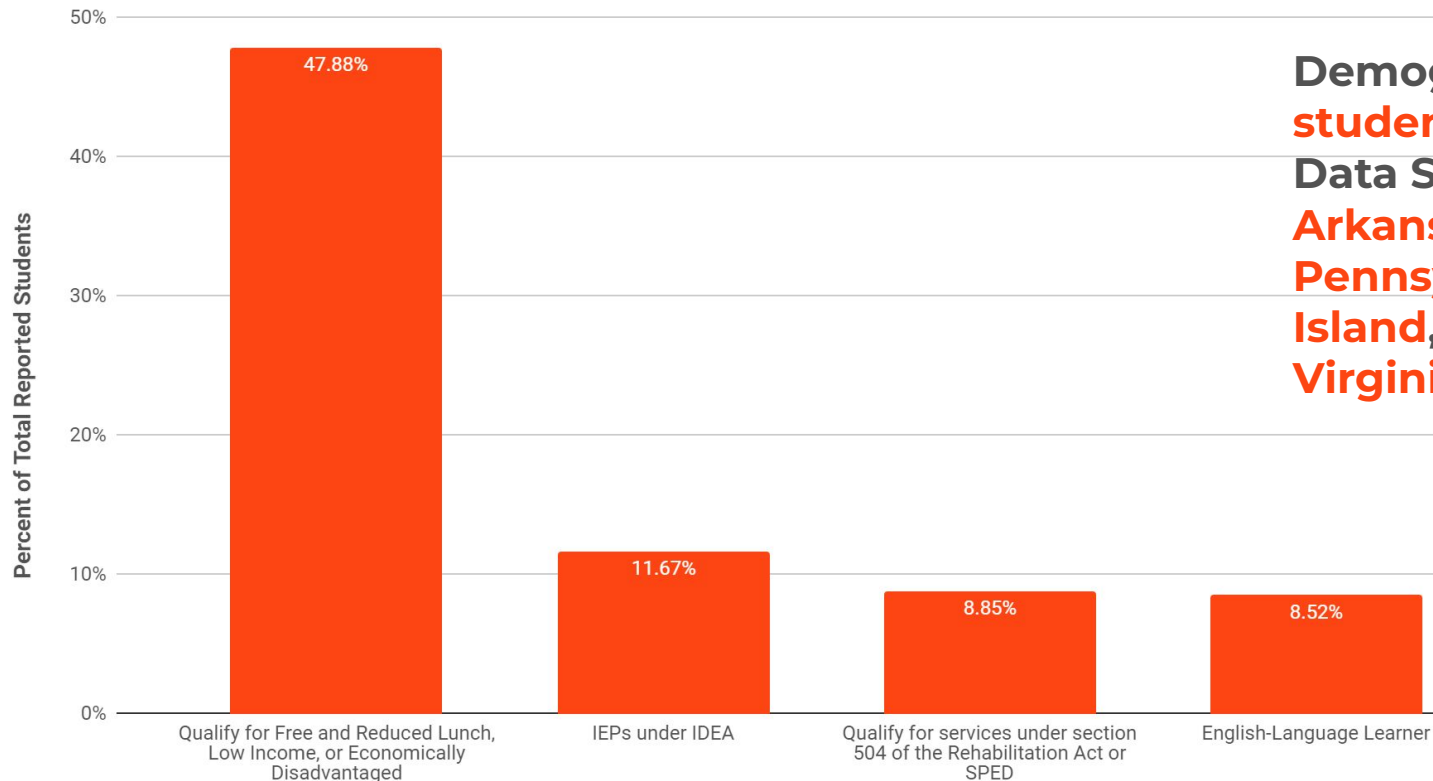
White

48.6%

Demographics of **3,615** students enrolled in Data Science courses in **Arkansas, New Jersey, Pennsylvania, Rhode Island, Utah, and Virginia**

Banquet Talk Goals

Aggregated SEA-Reported Student Demographics: Status



Demographics of **3,615 students** enrolled in Data Science courses in **Arkansas, New Jersey, Pennsylvania, Rhode Island, Utah, and Virginia**

Banquet Talk Goals

- **The Case for K-12 Data Science**
- **Also: differentiate Data Science vs. Statistics?**
- **Also: example projects that address skepticism.**
- **Also: Everyone will be tired.**
- **Also: Some people are waiting for their awards.**
- **30 mins?**

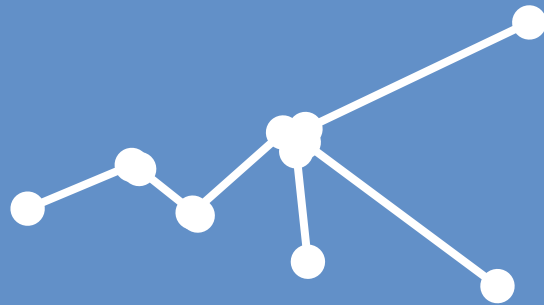
Banquet Talk Goals

things on the right side, that would also be great.

(I always feel guilty when I ask speakers to be thought-provoking, practical, and fun, all in the same presentation, because I realize that this is a very challenging (Herculean?) task.



Three Quotes



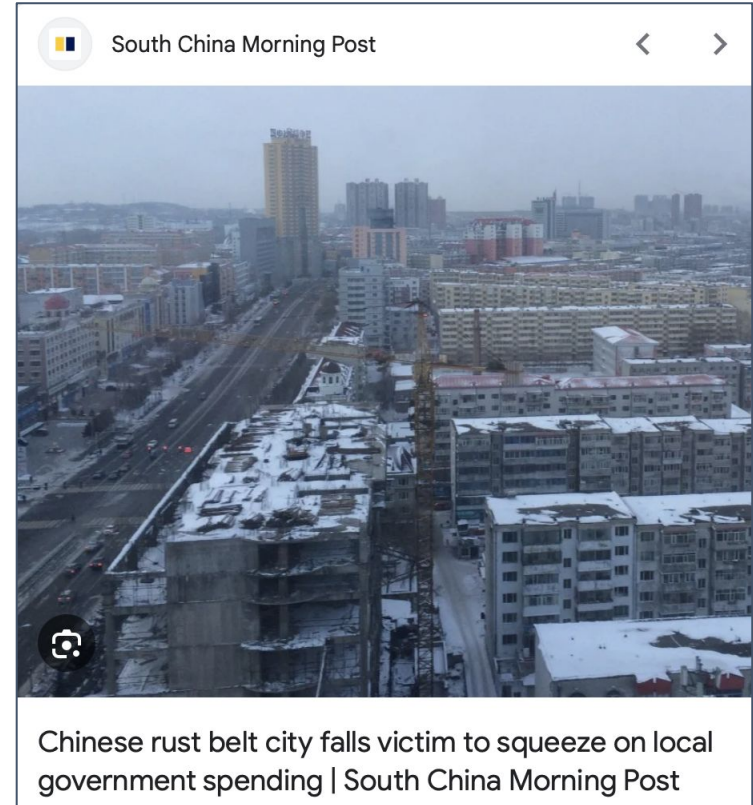
Favorite Professor's Take on Data Science

Robert Gulotty >

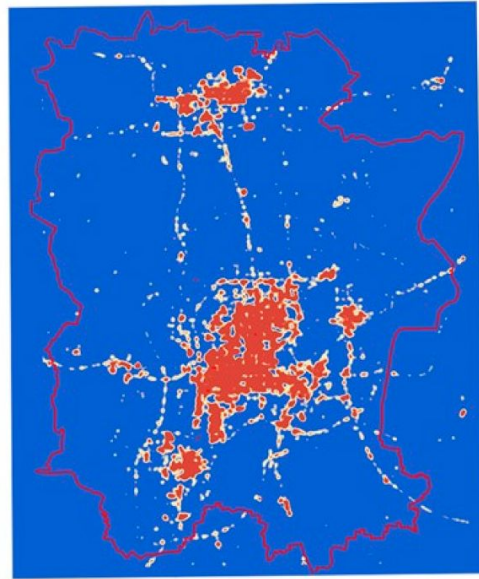
International Political Economy
@ University of Chicago



Using Machine-Learning in Political Science

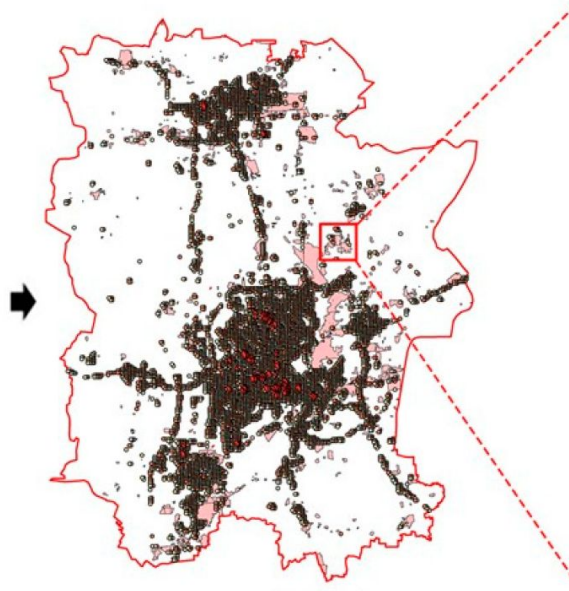


Using Machine-Learning in Political Science



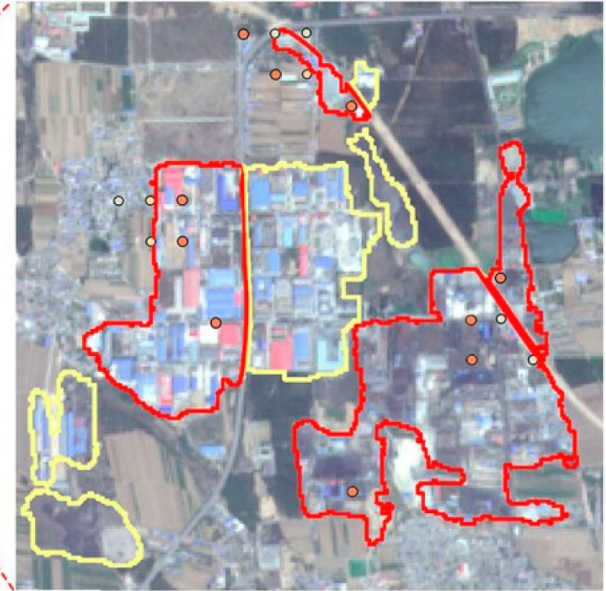
a

Legend
BHI
High: 10
Low: 1



b

Legend
POP
247–300
301–712
713–868
869–927
928–986
987–2277



c

Legend
○ Average pedestrian density within a radius of 1 ha
Operational industry
Potential IVL

Quote #1

“Data Science is what Silicon Valley calls Statistics.”

- Robert Gulloty

Data Science vs. Statistics-As-Required

An introductory data science _____:

1. Uses modern technology tools that are in synthesis or enhancing mathematics methods.

Example: Students learn data manipulation and automation skills using popular languages like Python, R, and SQL; utilizes software and analytical tools that students will find in the workplace

2. Teaches content through motivating projects with student-driven investigatory questions that motivate the need for data analysis methods.

Example: Students begin with research questions that investigate the conditions of their lived experience and learn about sample and bias by collecting data themselves

3. Imparts a problem-solving process from start to finish, emphasizing investigation cycles, iteration, and comparing multiple solutions.

Example: Students intentionally plan an analysis, and then iterate based on what they find. This may include scenarios such as (interpreting a model's fit, and then deciding whether to add additional variables or new data in the process of analysis with a computer) or (checking for the effect of outlier data, and after making a decision, validating that it was successfully addressed after identification). Several scenarios like this may occur for the same dataset or analysis question in combination.

4. Emphasizes durable, practical techniques, including wrangling, cleaning, merging, validation, and visualization, along with regression, significance, hypothesis testing, simulation, etc.

Example: Students work with real and unsanitized datasets and think critically about how to address analytical problems.

5. Includes quantitative communication / presentation skills and an exploration of data ethics.

Example: Students are encouraged to think about issues of privacy, bias, and validity in the collection and analysis of data. Students are also encouraged to give a presentation of a data analysis to their class, and engage in a Question & Answer dialogue with their classmates and

A required (AP) version of statistics:

Does not impart technology learning or confidence-building with digital tools currently used widely in the workplace

Uses printed t-tables / z-tables / p-values for significance in the back of textbooks

Focuses on methods for statistical significance over purpose or motivation

Leverages static datasets on trees, cars, or other mundane objects that rarely interest students

Often misses or buries critical intuition for correlation vs. causation, types of possible research methods, etc.

Introduces a discrete set of techniques with little relation between

Misses opportunities to show practical significance of outliers, missing data, and other analysis challenges otherwise emphasized in theory

Misses opportunities to have students explore cost-benefit comparison of different problem-solving techniques

Fails to demonstrate the interplay of theory and practical techniques

Often misses or buries intuition for key tradeoffs of overfitting, missing variable bias, or explanatory power

Silos statistical techniques in a vacuum and ignores the research & social context in which these methods exist.

Data illiteracy, including in communication or social contexts, contributes to the replication crisis in science, psychology, and other research

Classroom examples? Go to Hannah's session:

B4D: Going viral with statistics: Teaching data analysis through TikTok

Saturday, July 19th

2:30 pm – 3:45 pm CT



Hannah Kurzweil (Data Science 4 Everyone)

Location: Gerdin 0119

Abstract

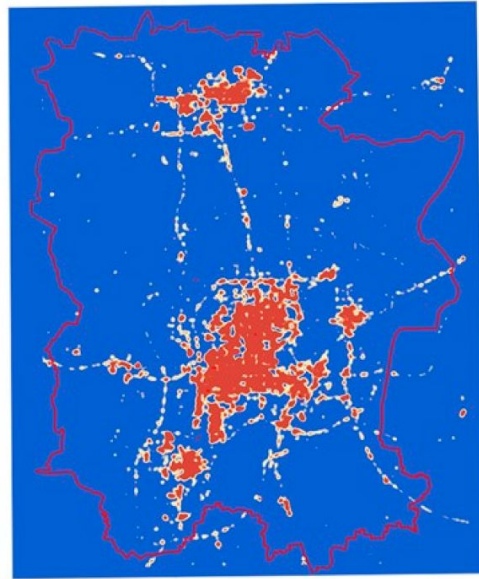
Transform your statistics classroom by leveraging the analytical potential of TikTok data with students' inherent love of

Quote #1

“Data Science is what Silicon Valley calls Statistics.”

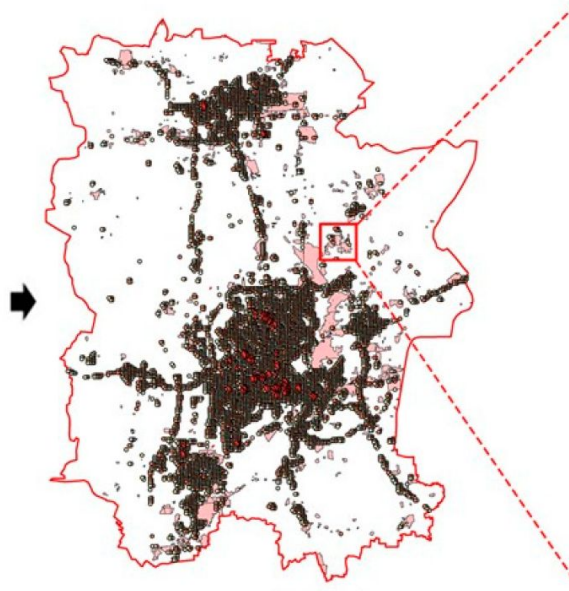
- Robert Gulloty

Using Machine-Learning in Political Science



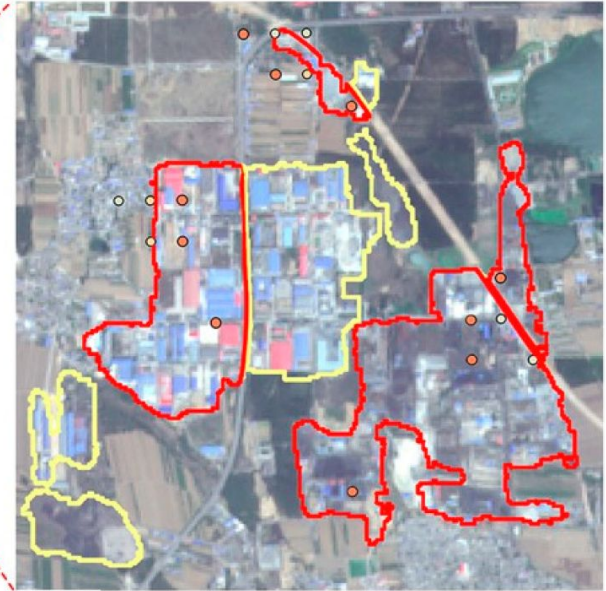
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Legend
BHI
High: 10
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b

Legend
POP
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301–712
713–868
869–927
928–986
987–2277



c

Legend
○ Average pedestrian density within a radius of 1 ha
Operational industry
Potential IVL

Quote #2

Artificial Intelligence

~~“Data Science~~ is what Silicon Valley calls Statistics.”

- Robert Gulloty, modified, circa 2025

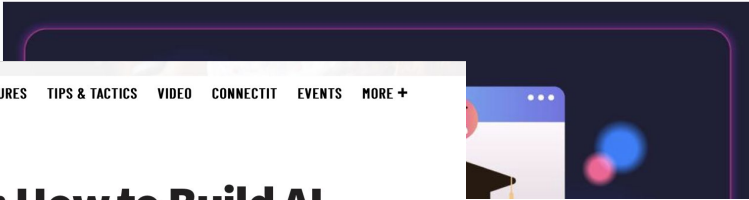
Trump Signs Executive Order For AI Education For K-12 Schools

By [Sarah Hernholm](#), Contributor. ⓘ Sarah Hernholm writes about...

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Published Apr 24, 2025 at 04:01pm EDT, Updated Apr 25, 2025 at 03:24pm EDT

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ARTIFICIAL INTELLIGENCE

ISTELive 25: How to Build AI Literacy in Elementary School Students

Artificial intelligence is the hottest topic in K-12 education right now, how do educators approach that subject with the youngest learners:



by [Amy McIntosh](#)

Amy McIntosh is the managing editor of *EdTech: Focus on Higher Education* and *EdTech: Focus on*

[▶ LISTEN](#) 07:56

Teaching [artificial intelligence](#) concepts to students at any level can be intimidating for teachers who technology experts, but it can feel especially overwhelming to those with students of elementary sch age or younger. That's what a group of educators came together to discuss at ISTELive 2025 in San An

K-12 EDUCATION

California Law Requires Schools to Teach Students About AI

A new law, passed unanimously by both legislative chambers, mandates AI literacy in school curricula. In response, the state is moving to incorporate those studies in math, science and history-social science.

October 04, 2024 • Ryan Macasero, Bay Area News Group



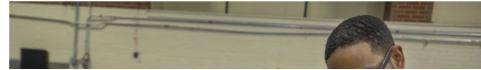
WUNC
NORTH CAROLINA PUBLIC RADIO

[♥ Donate](#)

NC A&T State University partnering in \$25 million initiative to boost AI literacy among youth

WUNC | By [Brianna Atkinson](#)

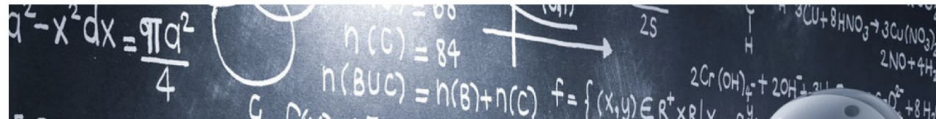
Published November 26, 2024 at 4:33 PM EST



College Of Agriculture And Environmental Sciences

e to boost AI literacy among youth. The

[only public institution in](#)



What do statisticians think?

ASA Statement on

“The Role of Statistics in Data Science and Artificial Intelligence”

August 4, 2023



ASA Statement on *The Role of Statistics in Data Science and Artificial Intelligence*
August 4, 2023

Data science and artificial intelligence (AI) have, in recent years, captured the attention of a world audience for their spectacular contributions in a wide range of scholarly research and commercial endeavors. Whether it be the development of self-driving cars, machines to recognize speech and generate human-like text, or technology that can accurately detect cancer, the success of data science and AI is all around us and will continue to affect scientific innovation and how we live our lives. The ability to address challenging questions with complex data combined with thoughtful methods is largely the fruit of the innovative and entrepreneurial spirit that characterizes these burgeoning areas. Nonetheless, the interdisciplinary nature of data science and AI means a substantial collaborative effort is needed, and that statisticians—who themselves are data scientists—should be extensively involved in data science and AI initiatives to realize their full potential for productivity, innovation, and problem-solving.

In the past 20 years, data science and AI have rapidly evolved, fueled by the explosion of data and advancements in computing power. This evolution has been marked by the development of sophisticated machine learning (ML) algorithms, deep learning neural networks, and generative AI—including large language models—that have revolutionized industries such as health care, finance, and marketing and generated new areas of research in statistics and computing. The big tent of statistics has grown massively bigger, with the role of statisticians in this new and evolving world requiring adaptation. The boundaries between statistical and computational methods have become more blurred, given the advances in ML and deep learning algorithms, which often require a deep understanding of both statistical theory and computer science. This has led to a rethinking of the traditional role of statisticians in data science and a recognition that statisticians need to be equipped with a wider range of skills and expertise to remain effective and, indeed, relevant.

Data science and AI rely heavily on statistics, mathematics, and computer science to gain knowledge from data. These fields produce tools to interact with data, provide effective and

What makes effective AI education?

- Boundaries between statistical and computational methods have become more blurred
- “Data science and AI rely heavily on statistics, mathematics, and computer science to gain knowledge from data.”
- Skill-building that deals with:
 - Randomness or bias in data input
 - Methods of predictions and estimation
 - Skeptical questioning of underlying computing or analysis processes
 - Quantify uncertainty in their answers
 - Separating signal from noise
 - Correlation vs. causation
 - Reproducibility



ASA Statement on *The Role of Statistics in Data Science and Artificial Intelligence*
August 4, 2023

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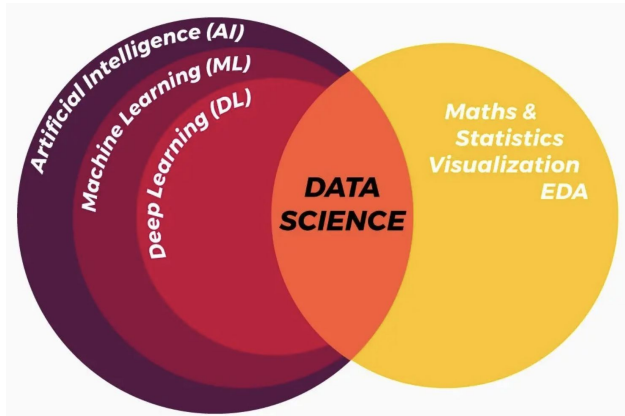
Data science and AI rely heavily on statistics, mathematics, and computer science to gain knowledge from data. These fields produce tools to interact with data, provide effective and

What makes responsible AI?

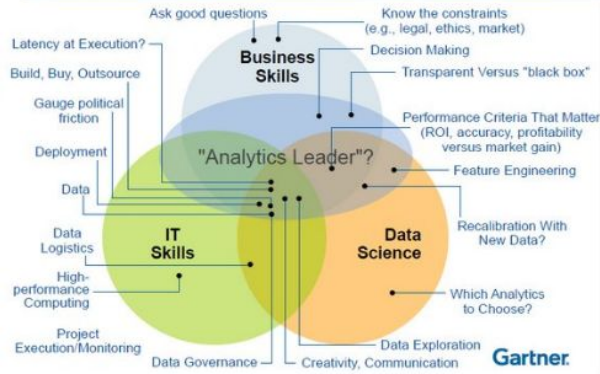
“Contributing to the responsible development of data science and AI systems requires a sustained and substantial collaborative effort with researchers knowledgeable **in areas not typically in the purview of statisticians, including those with expertise in data organization, distributed computation, and model lifecycle management**”

Effective teaching of data science and AI requires more than just a mechanical explanation of algorithms; it must be done in the context of the entire data science process. This includes understanding how to formulate a research question, collect and preprocess data, choose appropriate statistical methods and models, and interpret and communicate results in a meaningful way.

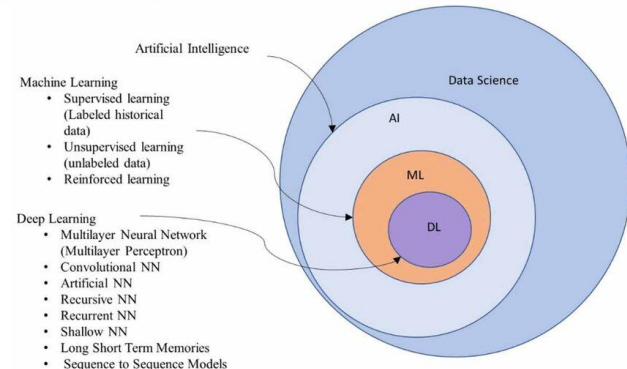
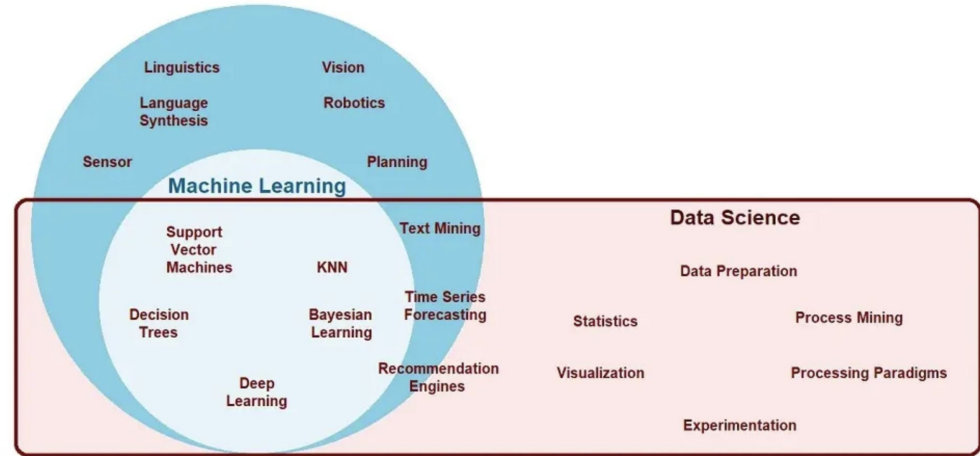
How is Data Science vs. AI Related?



Driving the Success of Data Science Solutions: Skills, Roles and Responsibilities ...



Artificial Intelligence

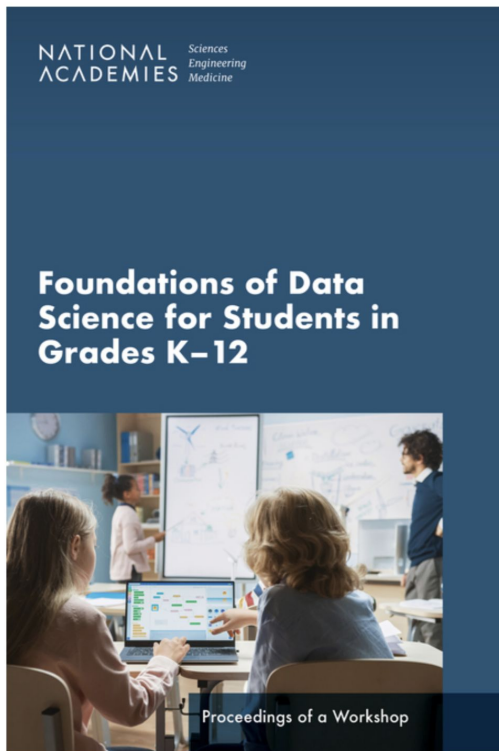


Quote #3

“Statisticians are bad at marketing”

– paraphrased, Chris Franklin,
ASA K-12 Ambassador

Quote #3



Developing Competencies for the Future of Data and Computing: The Role of K-12

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Jump to Section



The rapidly changing landscape of computing, information, and communications technologies have catapulted us into the computing revolution and era of big data. Currently, multiple, disconnected efforts in K-12 are attempting to address these new demands. However, there is a need to consider the similarity across computing-related disciplines to identify the core set of flexible, foundational competencies that will allow for adapting across changing workplace demands. This project aims to advance national conversations by identifying the competencies students need to navigate and succeed in the changing computational landscape and the role that K-12 education can play in developing these competencies.



We need to help students prep for the speed of a data-fueled world:

Artificial Intelligence

ChatGPT

Machine Learning

AV (vehicles, manufacturing)

Blockchain / Web
3.0

Quantum
Computing

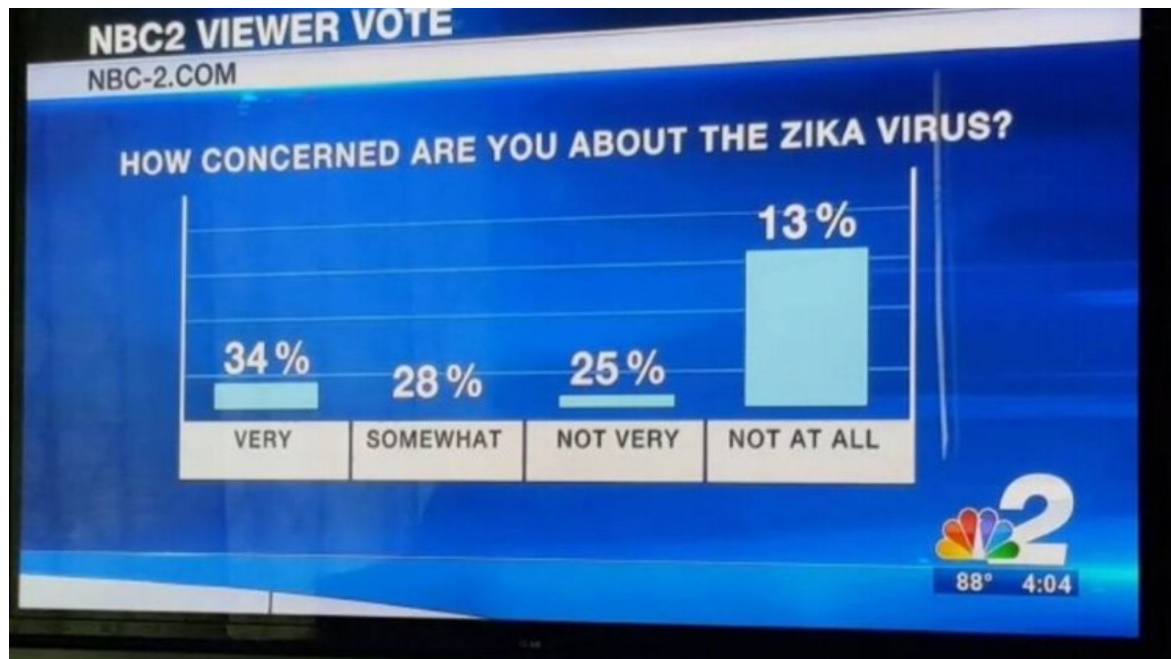
Internet of Things (IoT)

E-Commerce & Trade

(HTF) High-Frequency
Trading

Neural Networks

Today's Challenges



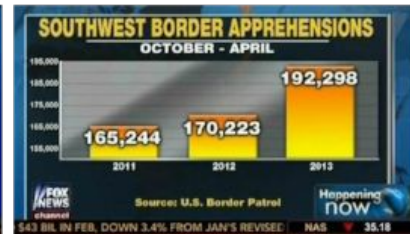
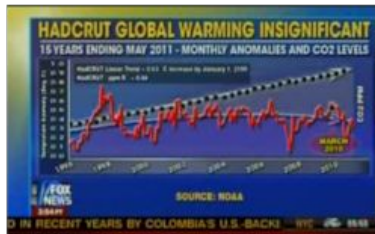
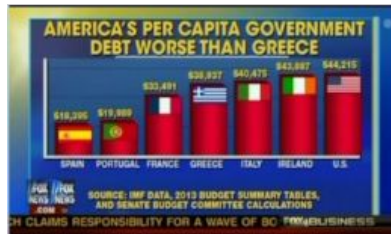
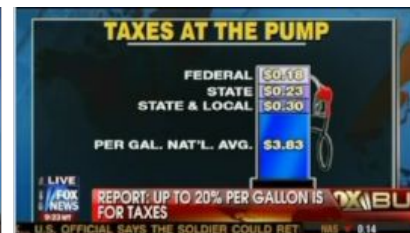
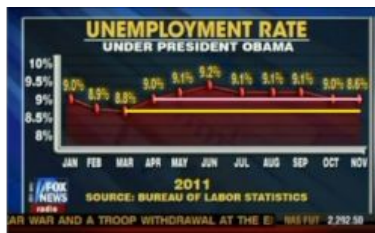
Whether intentional or accidental, how do we keep our guard up 24/7?

[How To Lie With Charts](#) (Stephen Tracy)

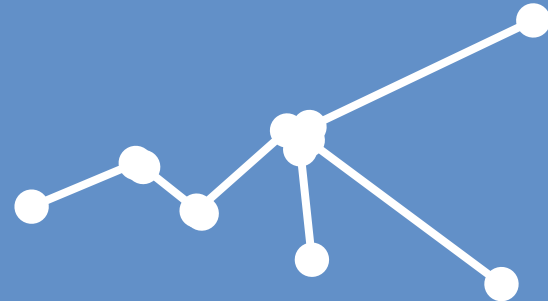
Today's Challenges

The news is **often overstuffed with data** - students need questioning habits to deal with the deluge as a second-nature.

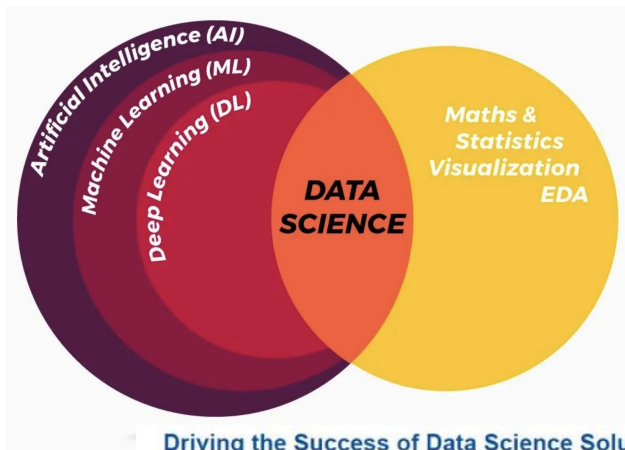
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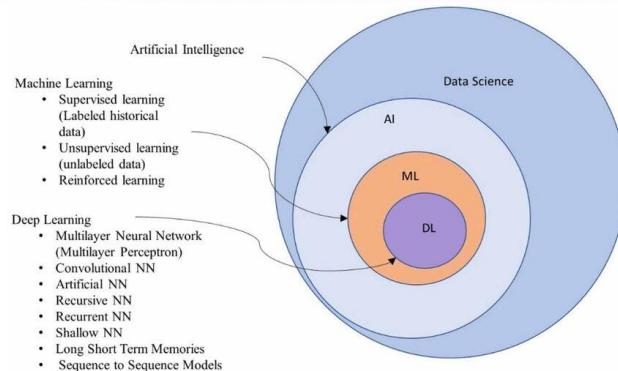
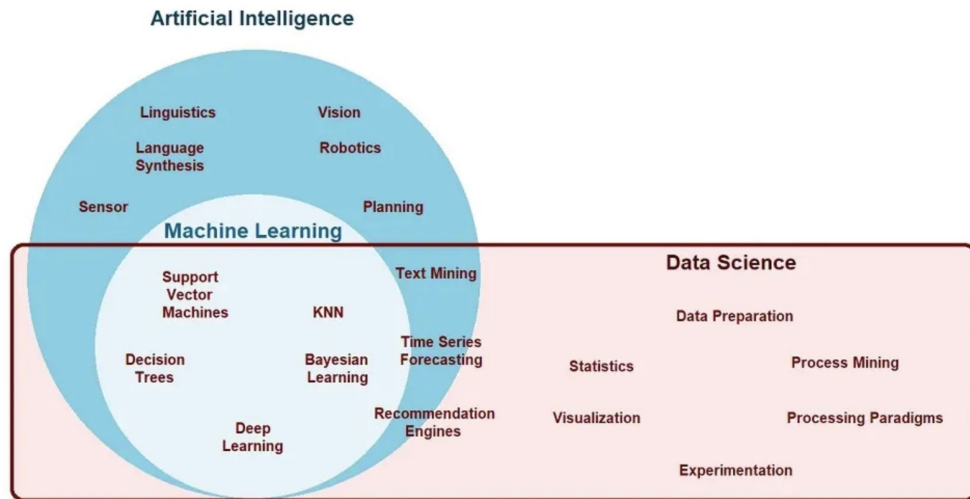
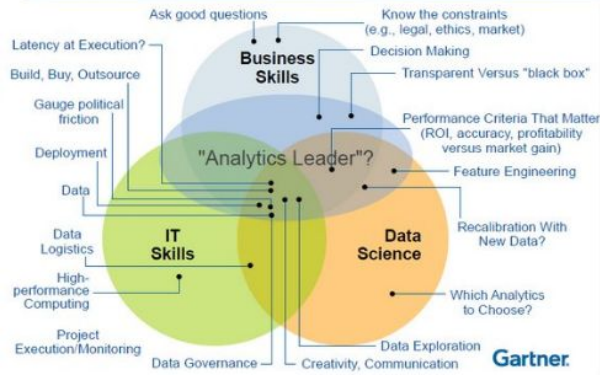
Audience Participation



Can you explain AI in one sentence?

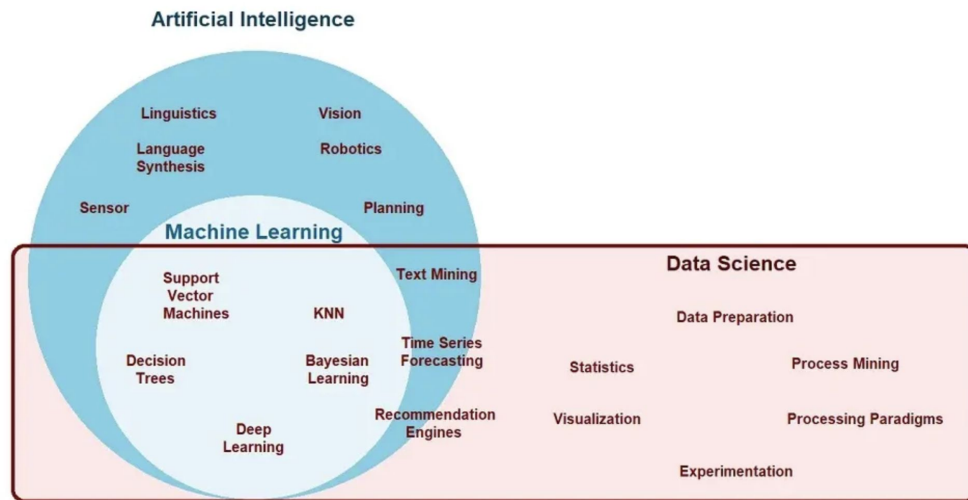
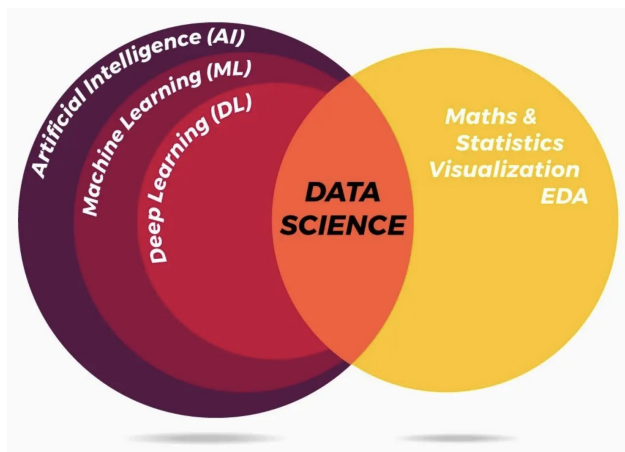


Driving the Success of Data Science Solutions: Skills, Roles and Responsibilities ...



How is Data Science vs. AI Related?

Complicated:



Simple:

An AI model is a set of math functions improved by data automatically by code.

Resource #1: Burning Glass Job Market Report

DATA SCIENCE

+ IS FOR EVERYONE +



MARCH 2024

THE NEW LANDSCAPE FOR DATA SCIENCE SKILLS AND A NATIONAL IMPERATIVE FOR INVESTING IN THE NATION'S WORKFORCE

By Carlo Salerno and Frank Steemers

FIGURE 4 – Change in employment by broad occupation type, 2011-2023

Source: Bureau of Labor Statistics

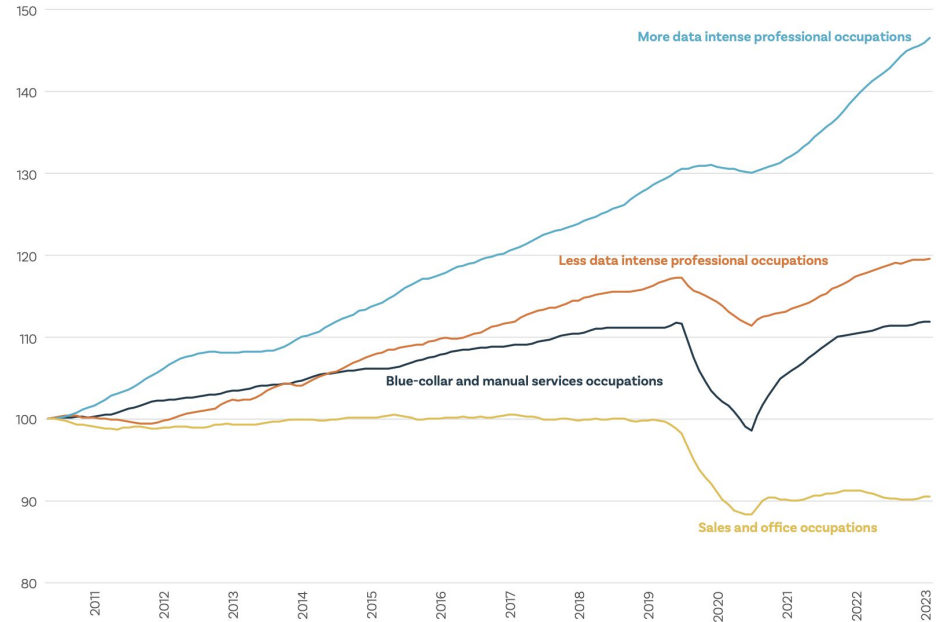
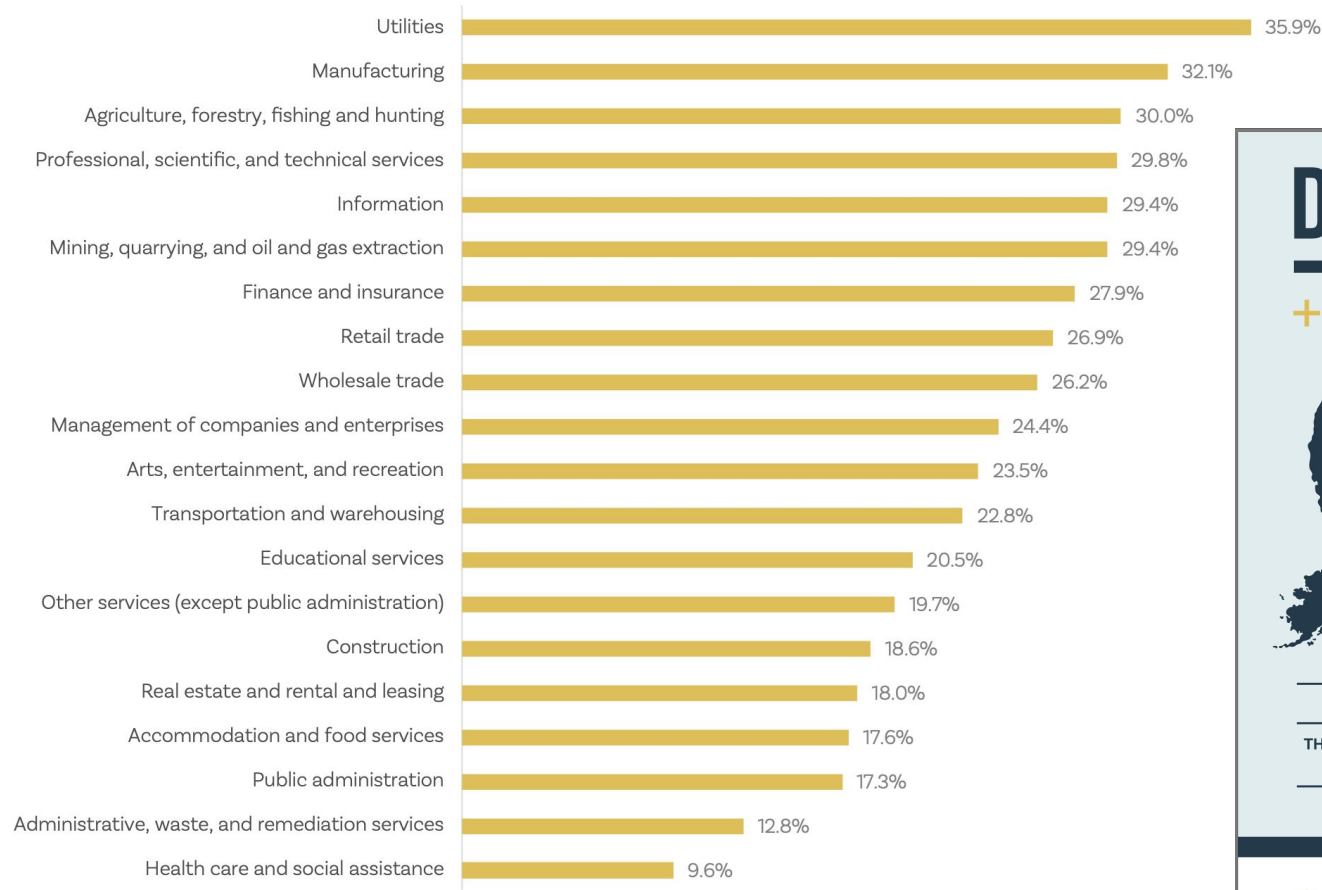


FIGURE 5 – Share of job postings listing at least one data science skill as a share of all job ads in the industry, 2023

Source: Burning Glass Institute analysis of Lightcast posting data



Sector Analysis

DATA SCIENCE

IS FOR EVERYONE

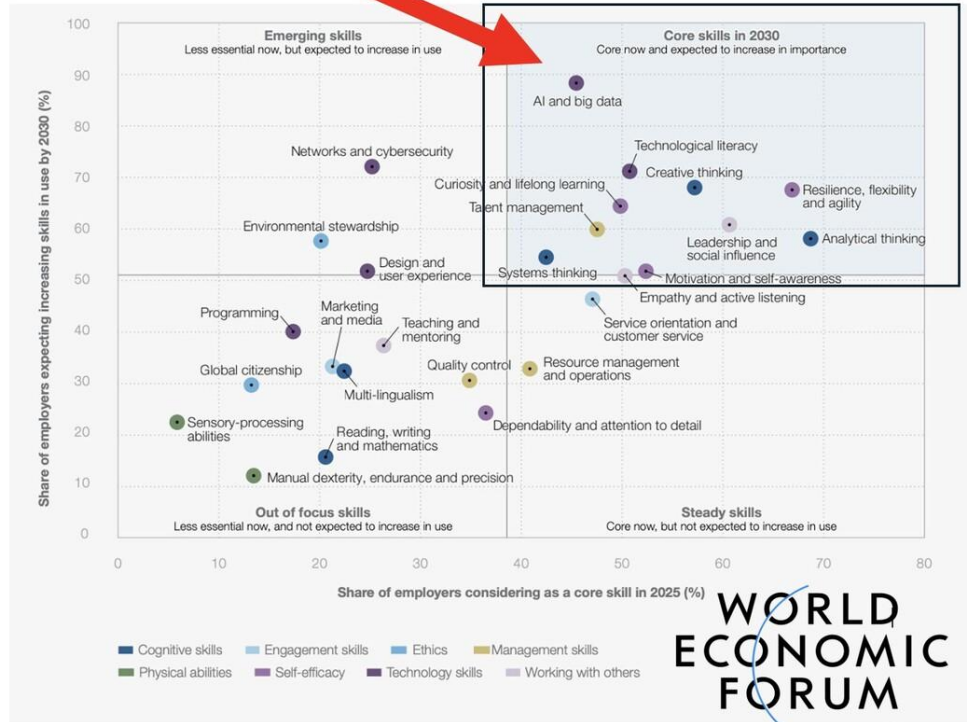
MARCH 2024

THE NEW LANDSCAPE FOR DATA SCIENCE SKILLS AND A NATIONAL IMPERATIVE FOR INVESTING IN THE NATION'S WORKFORCE

By Carlo Salerno and Frank Steemers

Resource #2: World Economic Forum

Core Skills in 2030



Resource #3: Gallup Survey on Math

Americans Say They Missed Out on Financial Math, Data Skills in School

Which of the following math skills, if any, do you wish you had learned more of in middle or high school? Select all that apply.

% Among all Americans

Financial math — such as personal finances, budgeting, accounting 29

Data science — such as managing spreadsheets or large amounts of information 21

Software — using a program to process or manipulate data or apply functions 20

Programming — using a coding language like Python or writing instructions for a computer 20

Statistics — such as probability and statistical inference 18

Solve a problem with multiple variables to account for 16

Create tables and charts with data 16

Decide which formula is the best to use in a given situation 15

Solve a problem with measurements, scales, position or direction 14

Algebraic thinking — such as applying formulas (or equations), using inequalities, estimating an outcome 14

Advanced math topics — such as trigonometry or calculus 14

Communicating mathematical ideas (such as making a chart to share data) 13

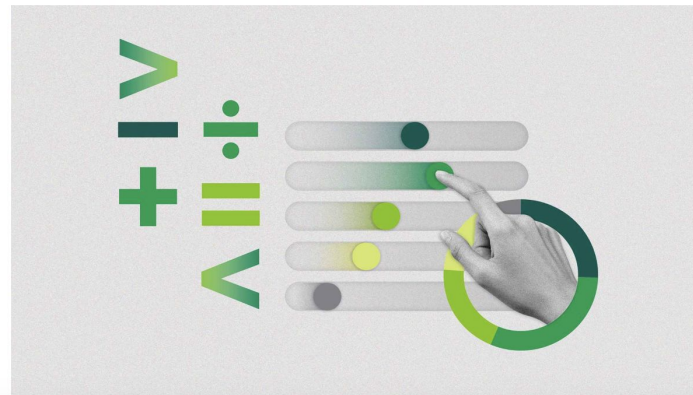
Interpreting a chart, diagram or the output of a machine (such as a chart with medication dosage based on weight) 13

Using artificial intelligence — interacting with AI to conduct, improve or speed up your 13

U.S. Managers Say Data Science Skills Needed Now, in Future

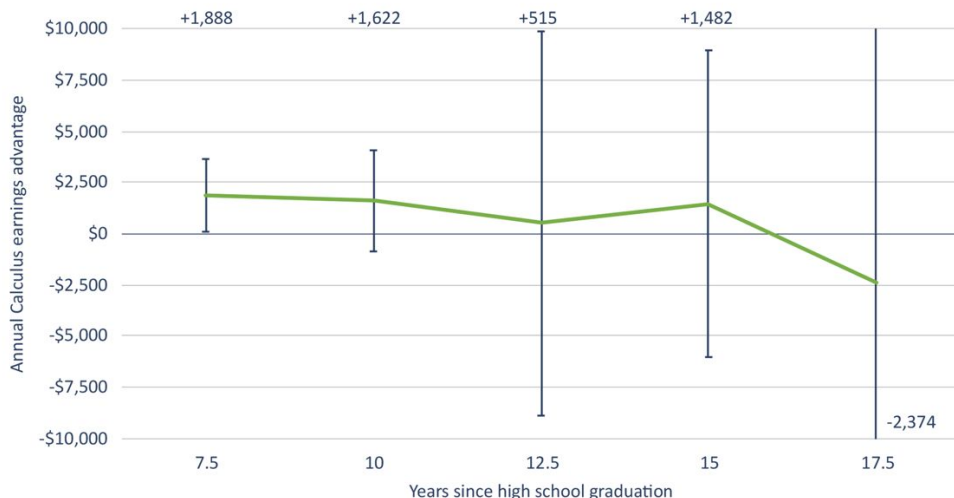
Eighty-five percent also wish direct reports had one or more additional math skills

BY KATHERINE SENSEMAN

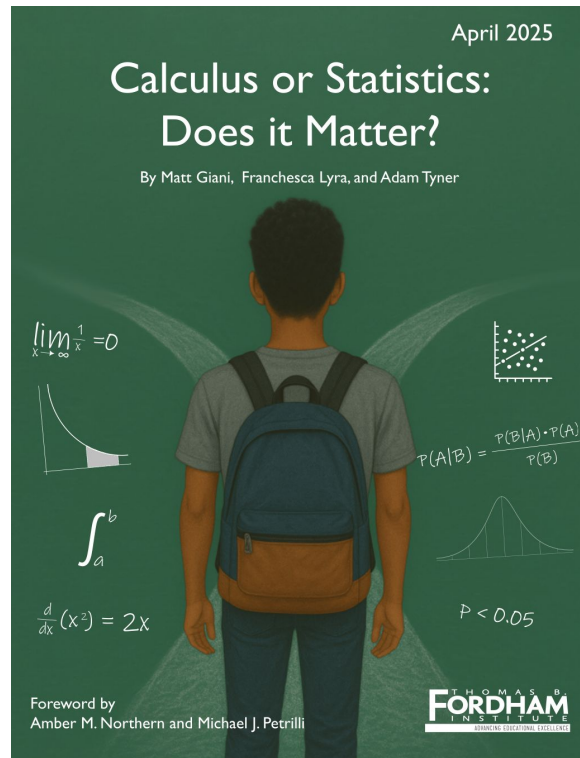


Resource #4: What Math Matters in High School?

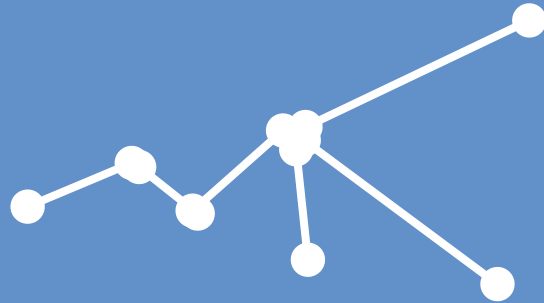
Figure 17. AP Calculus AB students have an initial earnings advantage over AP Statistics students, but the advantage fades eventually.



Note: $N = 177,986$. The sample is also restricted to students who participated in AP Statistics and AP Calculus AB in earlier cohorts, for whom long-term earnings data are available. The sample was also restricted to students who remained in Texas, given that the wage records come from the TWC. Error bars represent 95 percent confidence intervals. Those whose freshman year math course was "Other," "AP Statistics/Regular Statistics," and "Calculus AB/BC" are excluded from analyses.



Tell the Field This Matters.
(or rather, market better)



Think students deserve modern math experiences?



**< Consider
adding your
voice to this
letter.**

<https://tinyurl.com/ModernizeMath>