Teaching Youth to Critically Evaluate AI in Healthcare

While Learning Data Science and Machine Learning Skills

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The Concord Consortium (project website)
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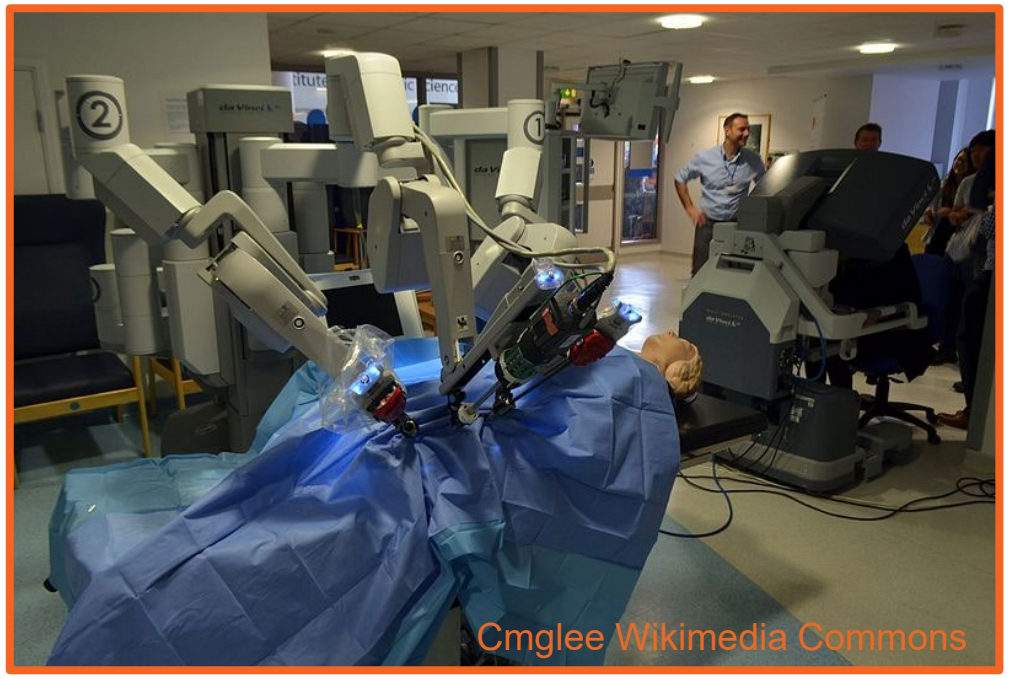
The AI Revolution

- Transforming healthcare
- New drug discoveries, treatments, surgical approaches
- Risk: amplify bias



DeepMind CEO Demis Hassabis: 'AI could cut drug discovery from years to...'; how it is changing medicine worldwide

TOI Tech Desk / TIMESOFINDIA.COM / Updated: Sep 13, 2025, 10:58 IST

How Do Students Use AI?

- **AI is like a black box**
- **Output is often accepted without question**
- **Student Panelists: Brown University AI-a-Thon, March 2026**
- **Homework and Learning**
  - Positive: Generating math problems for extra practice
  - Negative: AI summary in place of reading
- **Are the students thinking critically?**

AI Impacts on Youth

- Rising dependency
- Cognitive decline
- Deep fakes and bullying
- Poor advice
- Harmful decisions
- Need to understand how AI works
- Critically evaluate

AI use among youth raises concerns over cognitive decline and learning dependency

CO-EDP, VisionRI | Updated: 06-04-2026 07:35 IST | Created: 06-04-2026 07:35 IST

Megan Garcia via Associated Press

youtube.com
Kentucky is suing Character.AI after two teen suicides were linked to the platform
Apr 10, 2026

How do we teach students to *critically evaluate* AI?

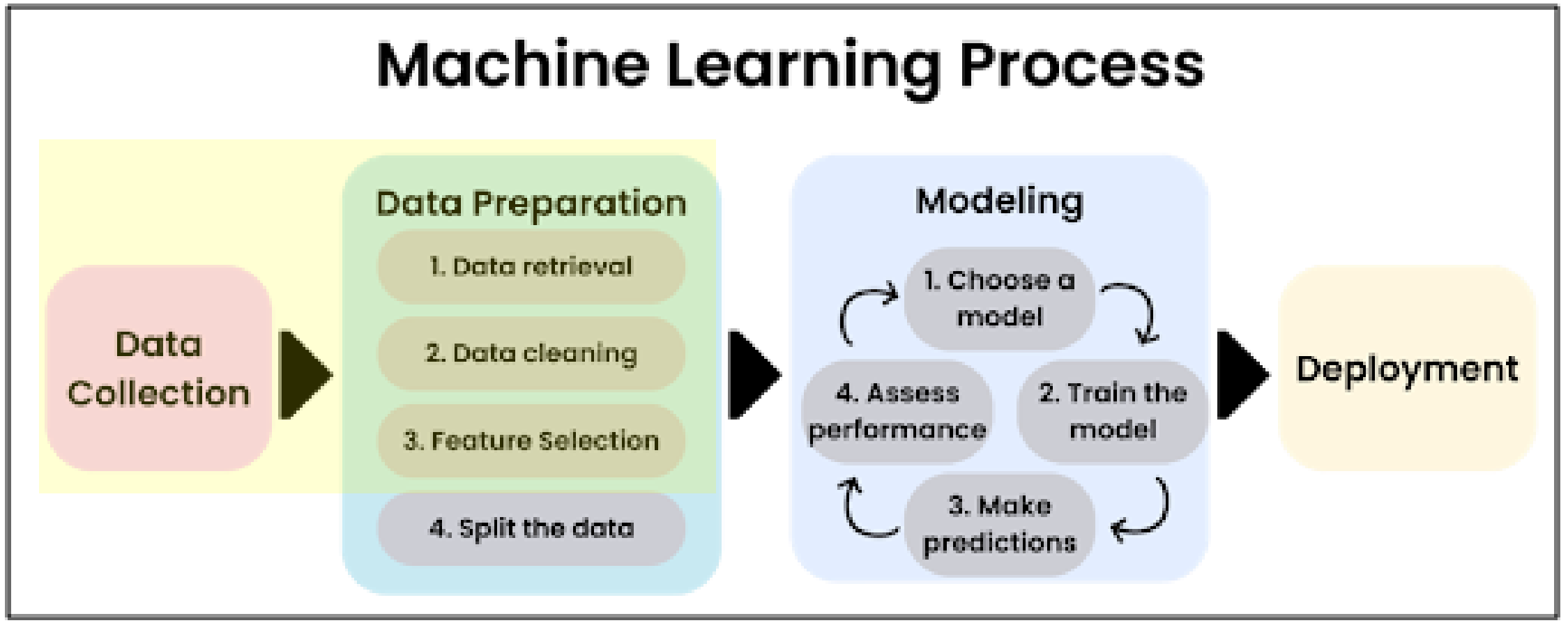
Data Science, AI in You (DSAIY) in Healthcare

- **Semester-long high school course**
- **Real-world AI-a-thon/datathon workforce experience**
- **Introduces the machine learning process, bias in AI, Python and developing and testing models**
- **No statistics or coding needed**
- **Teachers**
  - 4 days of PD
  - Monthly support meetings
  - Continuous technical support
- **Scaffolded on Scoutlier**
- **Unit 2 published in "The Science Teacher"**

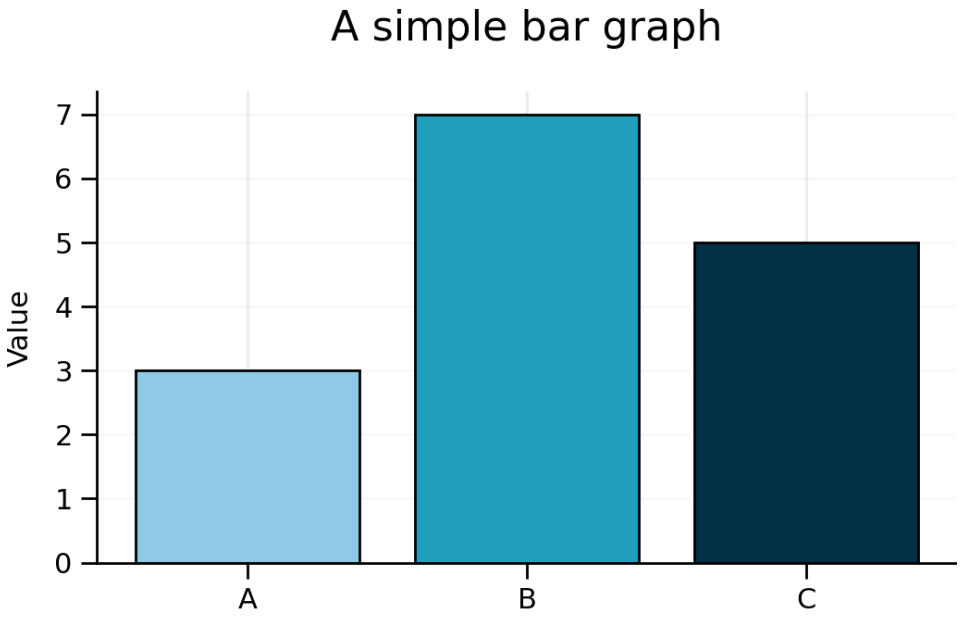
Jessen Eller et al. (2026) *Increasing Data Literacy in High School Students Through Data Science and Healthcare: Part 1 of 2 Leading to AI Instruction* The Science Teacher 93(2), pp. 54-63, DOI: 10.1080/00368555.2026.2626051

Who DSAIY Reaches

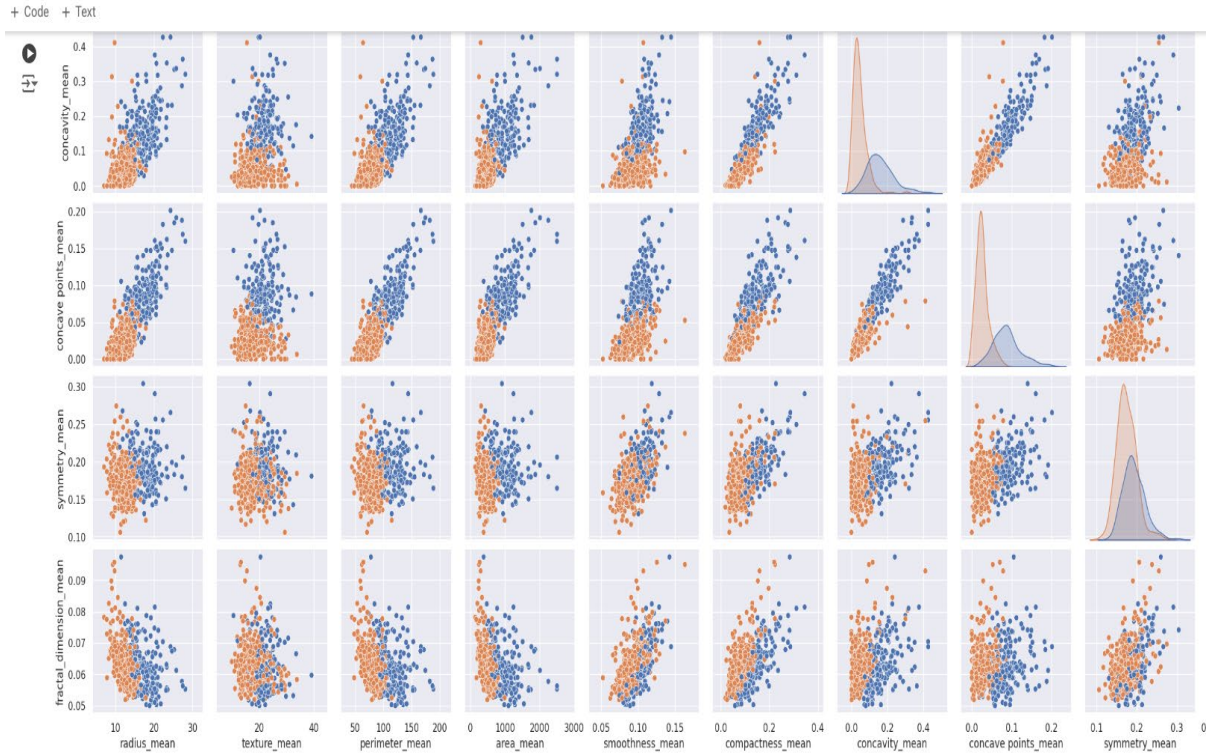
- 800+ students across Rhode Island
- 11 teachers, varied settings
- Wide range of prior experience
- From CS pathways to freshman intro courses
- AI, healthcare, and social impact


Machine Learning Process
Data Collection
Data Preparation
1. Data retrieval
2. Data cleaning
3. Feature Selection
4. Split the data
Modeling
1. Choose a model
2. Train the model
3. Make predictions
4. Assess performance
Deployment

From Graphs to Models (Point A → Point B)



Point A: Basic Graphing



Point B: Evaluating Models

Capturing Student Interest with Real-World AI

- AI triage decisions
- Same symptoms, different outcomes
- Reveals hidden bias

NHPI: Native Hawaiian Pacific Islander

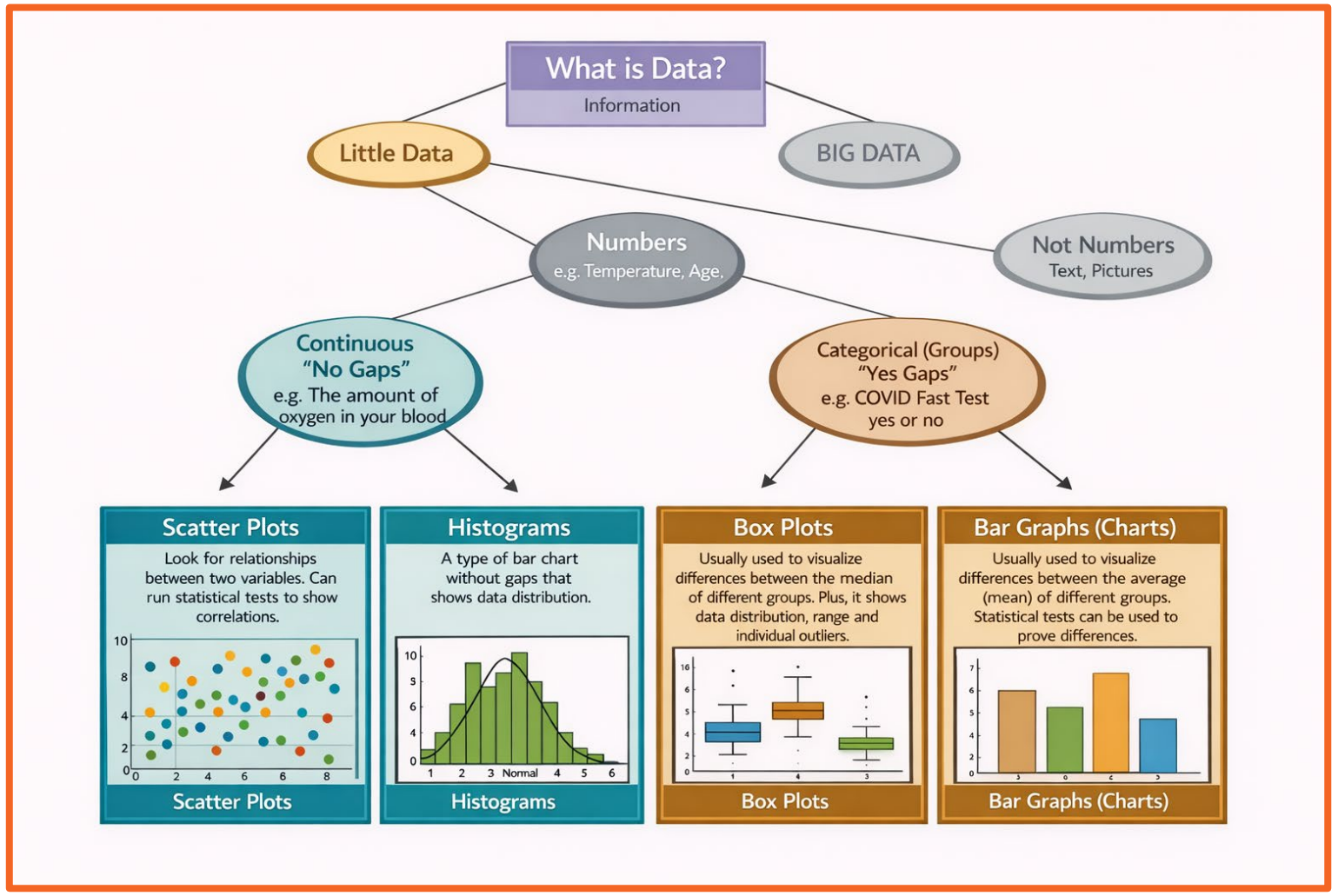
References:

Code.org Medical Priority App (AI & ML unit). Note: This App is no longer used

Eller, K. J. (2025). Data science, AI, and you in healthcare: Teaching students about medical data bias. *@Concord*, *28*(2), 4-6.

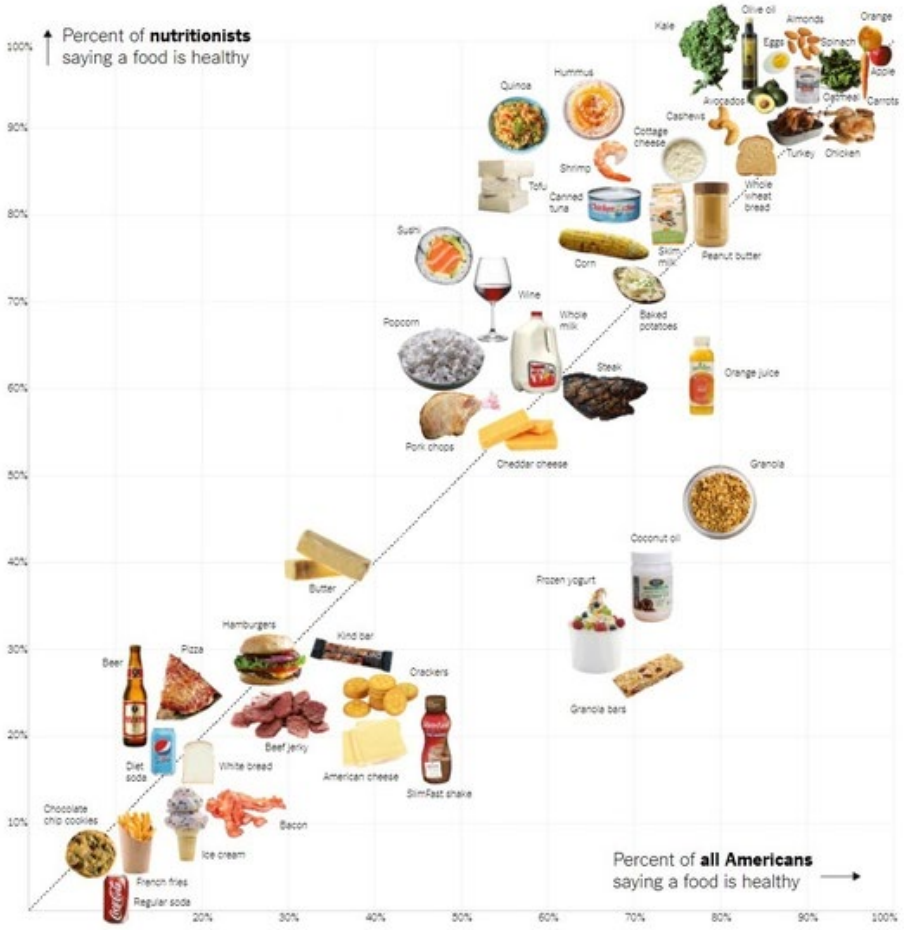
Scaffolding Learning with Classroom Supports

- Reinforce foundational concepts
- Visual reminders for students
- Support data-driven thinking



Teaching Students to Read and Question Graphs

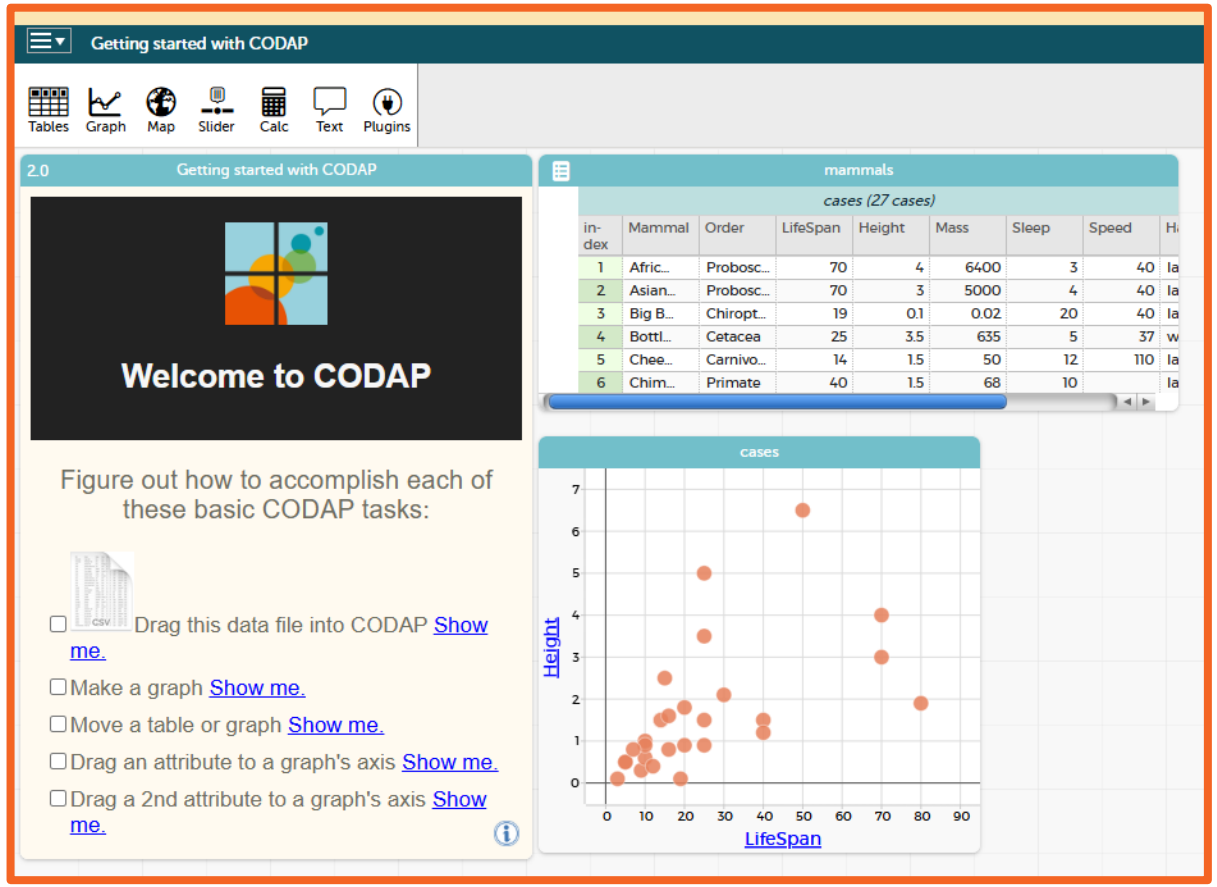
- **NYT “What’s Going on in This Graph?”**
- **Simple prompts**
  - What do you notice?
  - What do you wonder?
- **Deeper questions**
  - Is data clustering?
  - What is driving patterns?
  - Who is represented, missing?
- **Simple graphs to analyzing and questioning complex visualizations**
- **Visualization: foundation for machine learning**



https://www.nytimes.com/2025/05/01/learning/whats-going-on-in-this-graph-may-7-2025.html

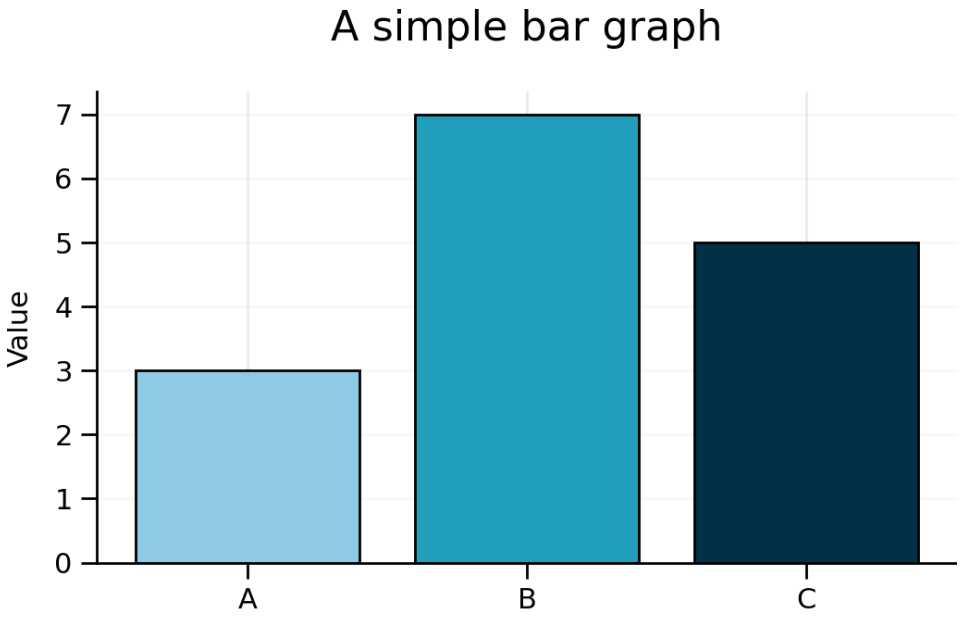
CODAP: Making Data Exploration Accessible

- CODAP, a free online tool, to explore datasets
- Interactive and visual
- Supports rapid exploration

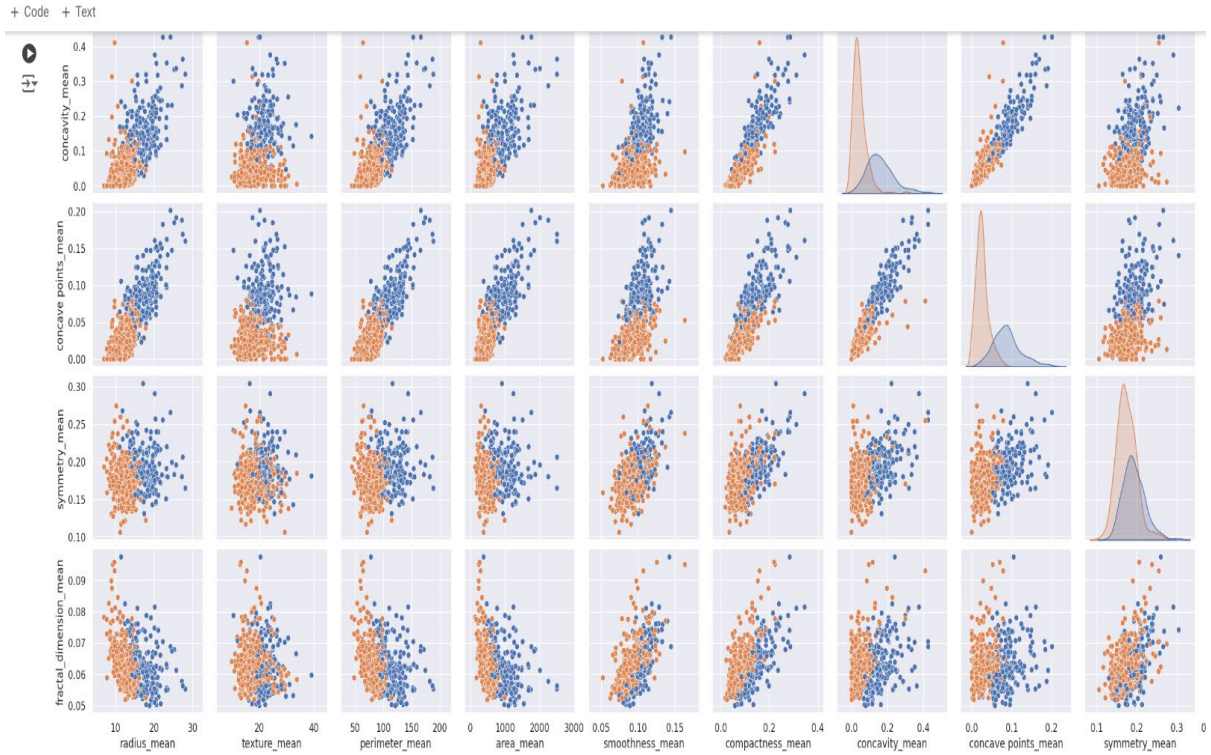


https://codap.concord.org / Common Online Data Analysis Platform

From Graphs to Models (Point A → Point B)



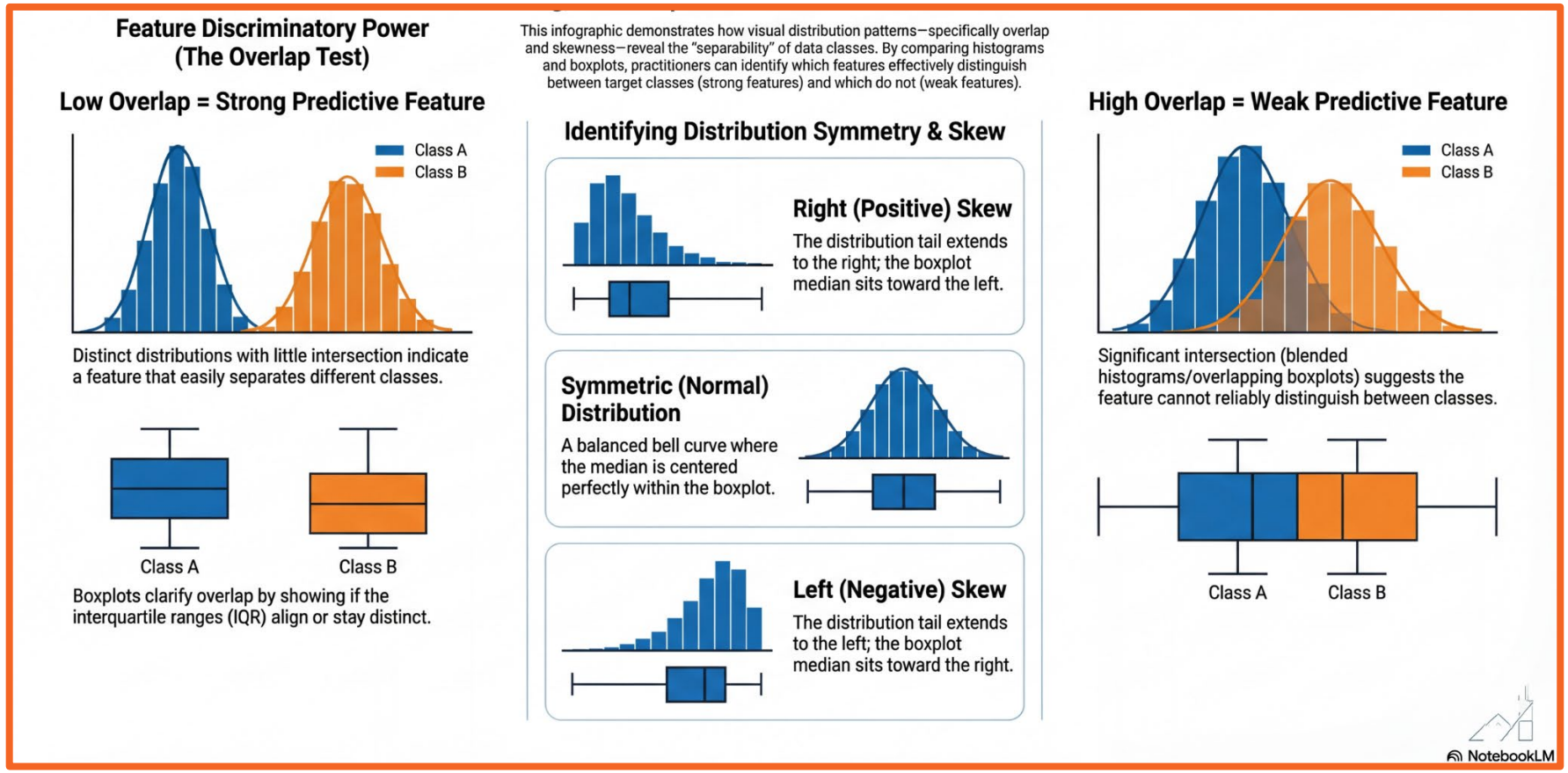
Point A: Describe Data



Point B: Evaluate Models

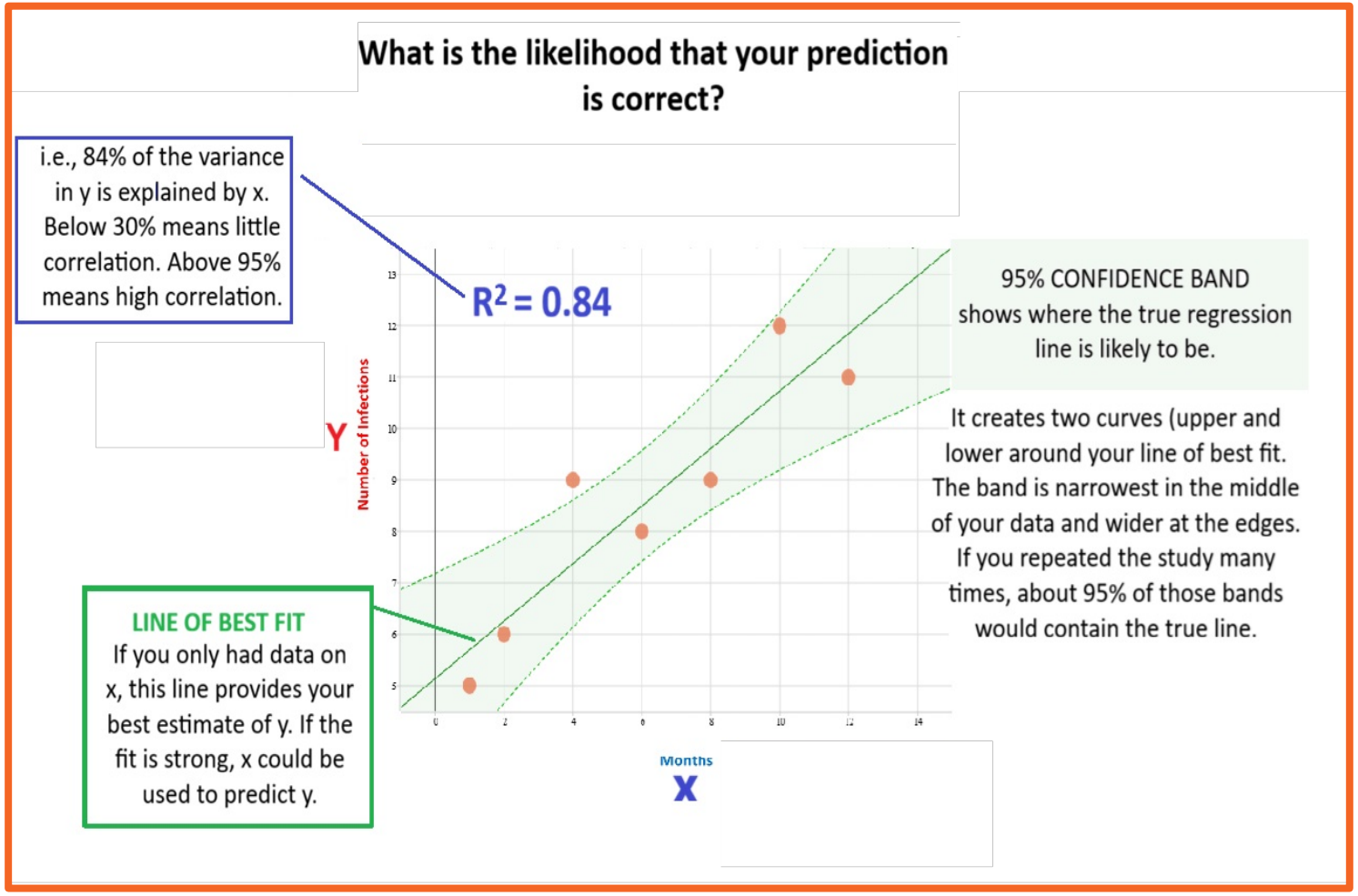
Feature Selection

- Compare distributions
- Look for overlap
- Identify strong predictors

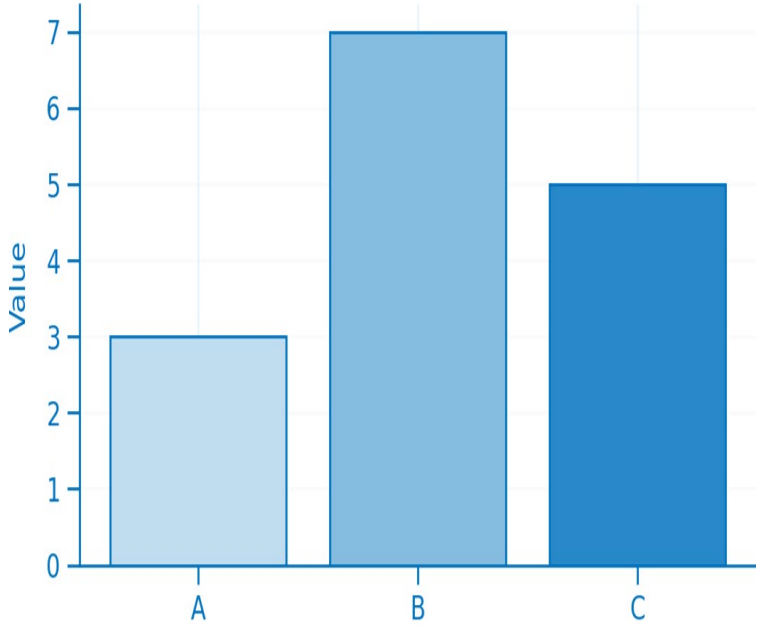


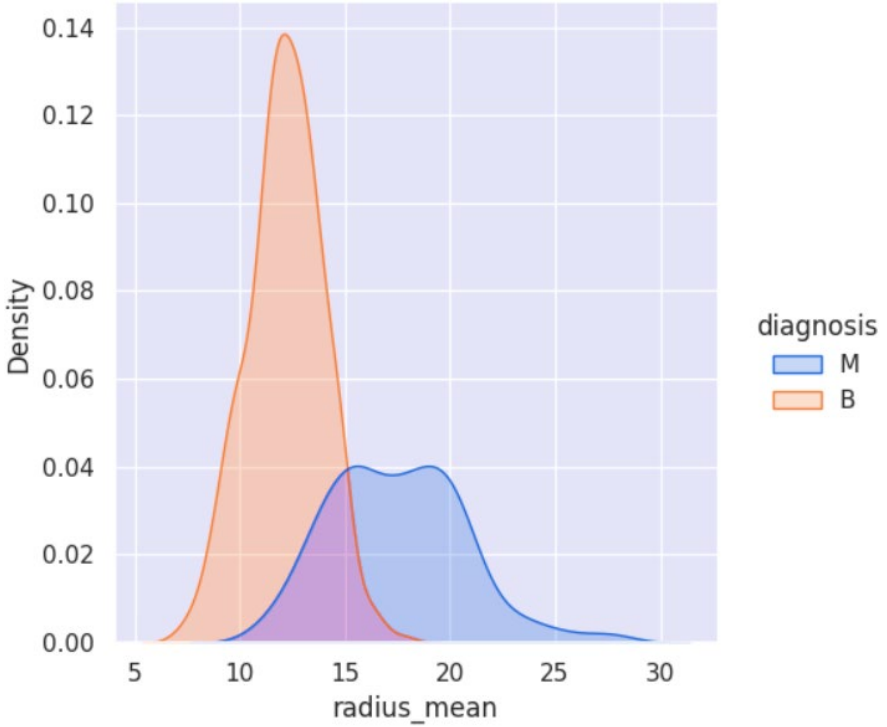
Building Toward Prediction

- Scatterplots reveal relationships
- Line of best fit shows trends
- Correlation measures strength



From Reading Graphs to Evaluating Features





BEFORE

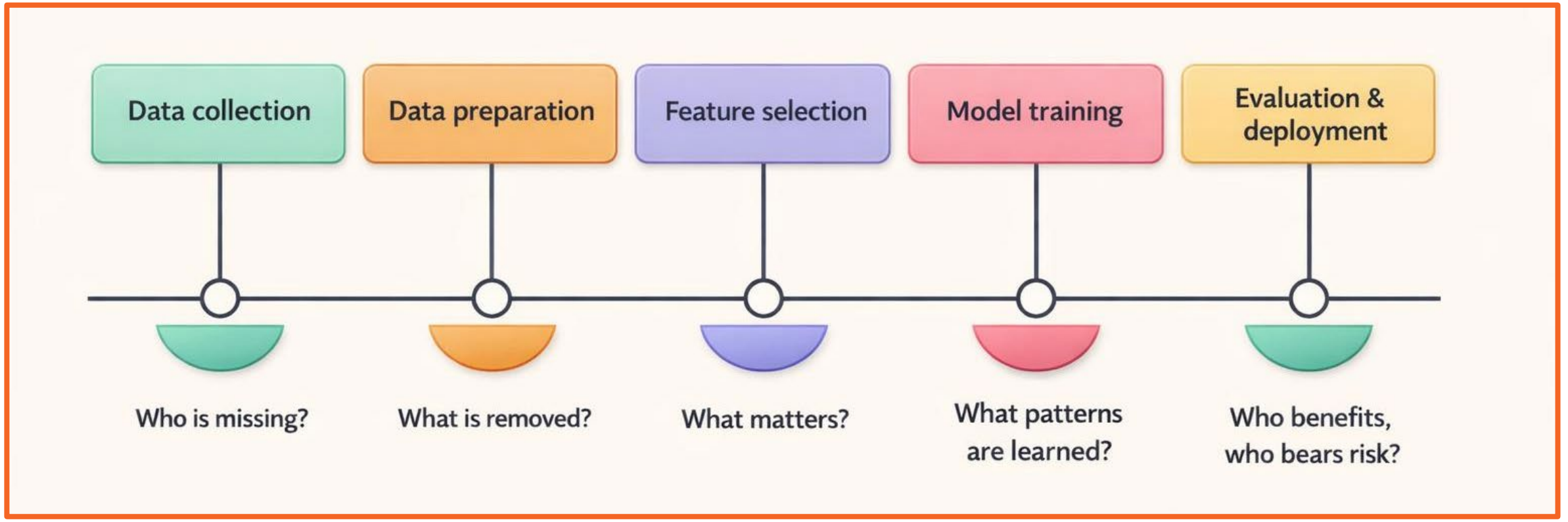
Which is bigger?

AFTER

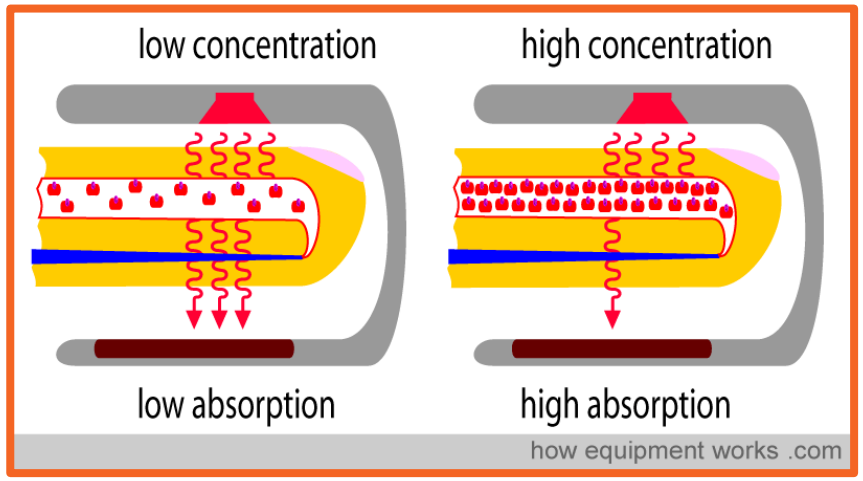
Does this separate?

Where Bias Enters the Machine Learning Process

Human decisions shape every stage

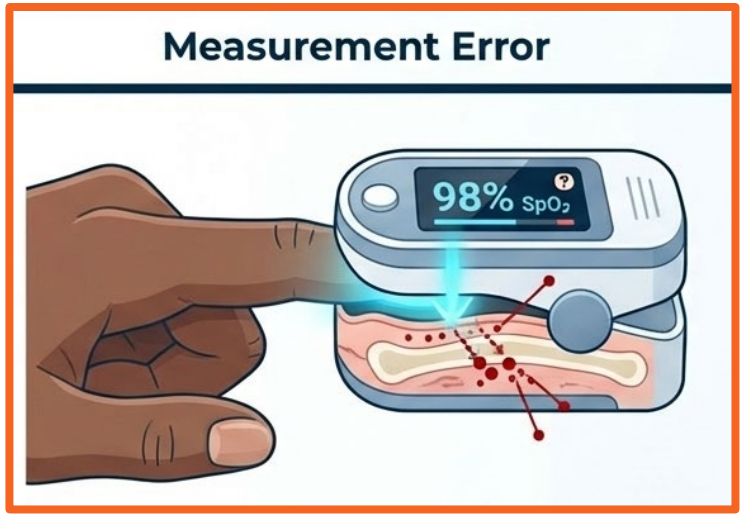


The Pulse Oximeter Problem



Why it's a problem that pulse oximeters don't work as well on patients of color

New research ties inaccuracies in pulse oximeter readings to racial disparities in treatment and outcomes.

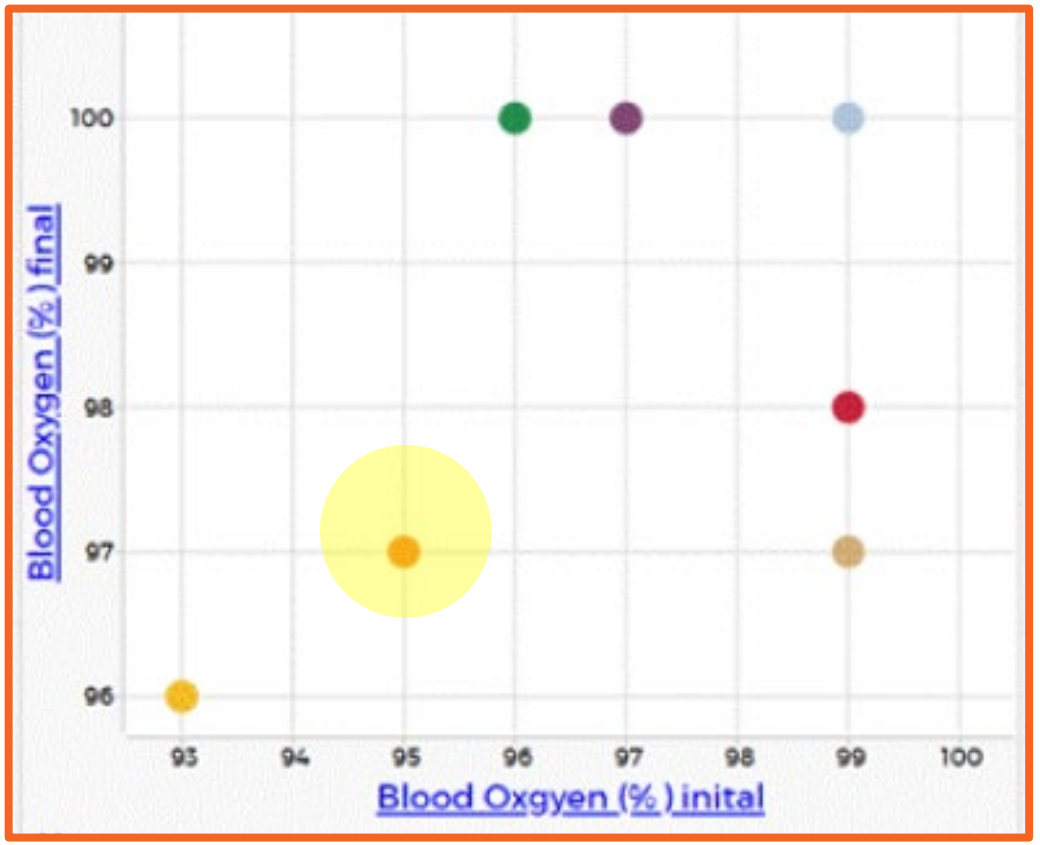


- Uses light to estimate blood oxygen
- Skin pigmentation can affect readings
- Can overestimate oxygen and delay care

References: Sjoding et al. (2020) *Racial Bias in Pulse Oximetry Measurement*. Gottlieb et al. (2022) Assessment of Racial and Ethnic Differences. Matos et al., (2023) *Shining light on dark skin: Pulse oximetry correction* models

Pulse Oximeter Experiment

- Students collect their own data
- Observe variability
- Question measurement accuracy



Jessen Eller, K., Larson, A., Price, E., Jackson, B., Hendrik, L., Cassidy, M., & Celi, L.A. (In press). Increasing Data Literacy in High School Students Through Data Science and Healthcare: Part 1 of 2 Leading to AI Instruction. *The Science Teacher*

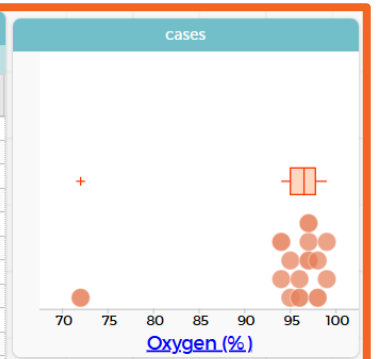
Pulse Oximeter Investigation: Classroom Results

Hypothesis: Skin tone will impact pulse oximeter oxygen readings

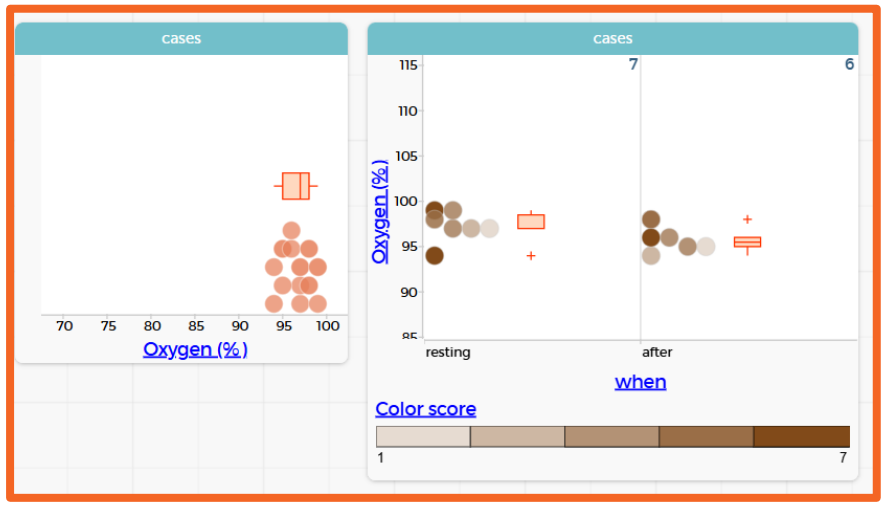
clipboard data

cases (14 cases)

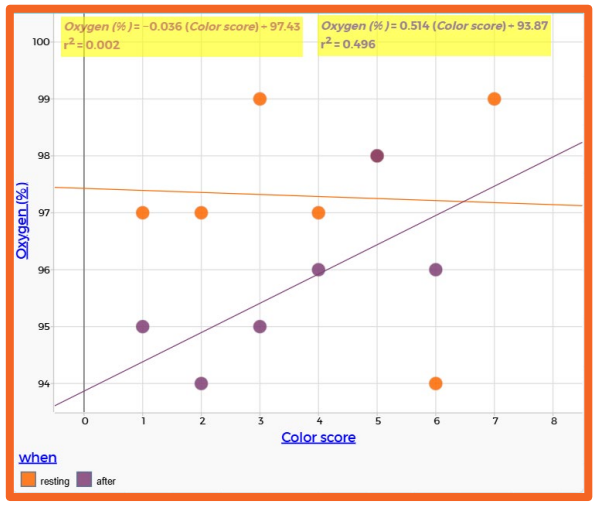
index	Oxygen (%)	when	Color score
1	97	resting	1
2	97	resting	2
3	99	resting	3
4	97	resting	4
5	98	resting	5
6	94	resting	6
7	99	resting	7
8	95	after	1
9	94	after	2
10	95	after	3
11	96	after	4
12	98	after	5
13	96	after	6
14	72	after	7



Outlier removed (human error)



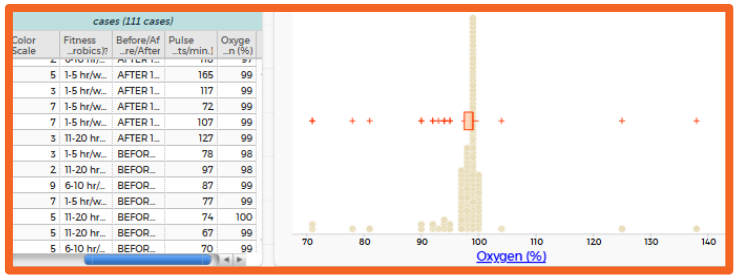
Exercise decreased oxygen



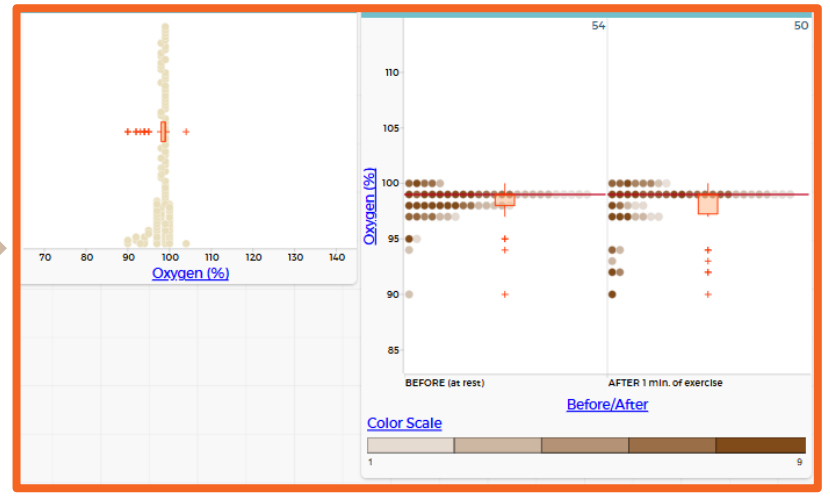
Possible trend with skin tone

Conclude: Skin tone does not impact oxygen readings, but sample size was small

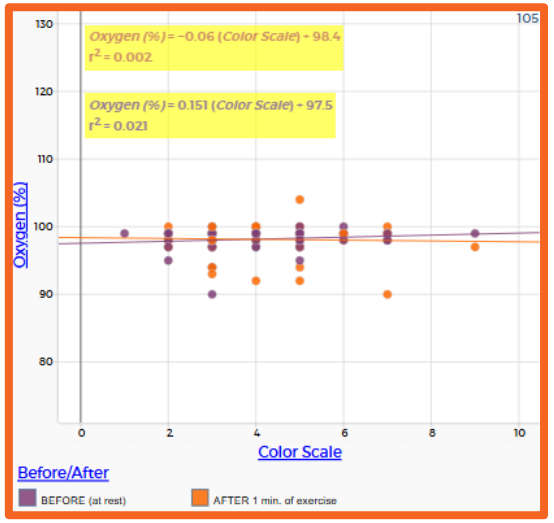
Pulse Oximeter Investigation: AI-a-thon Results



Outlier removed
(human error)



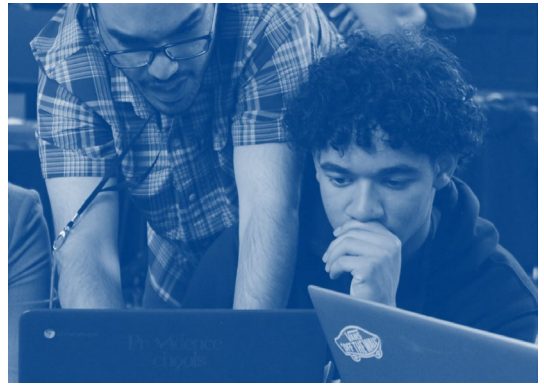
No change in oxygen
levels due to exercise

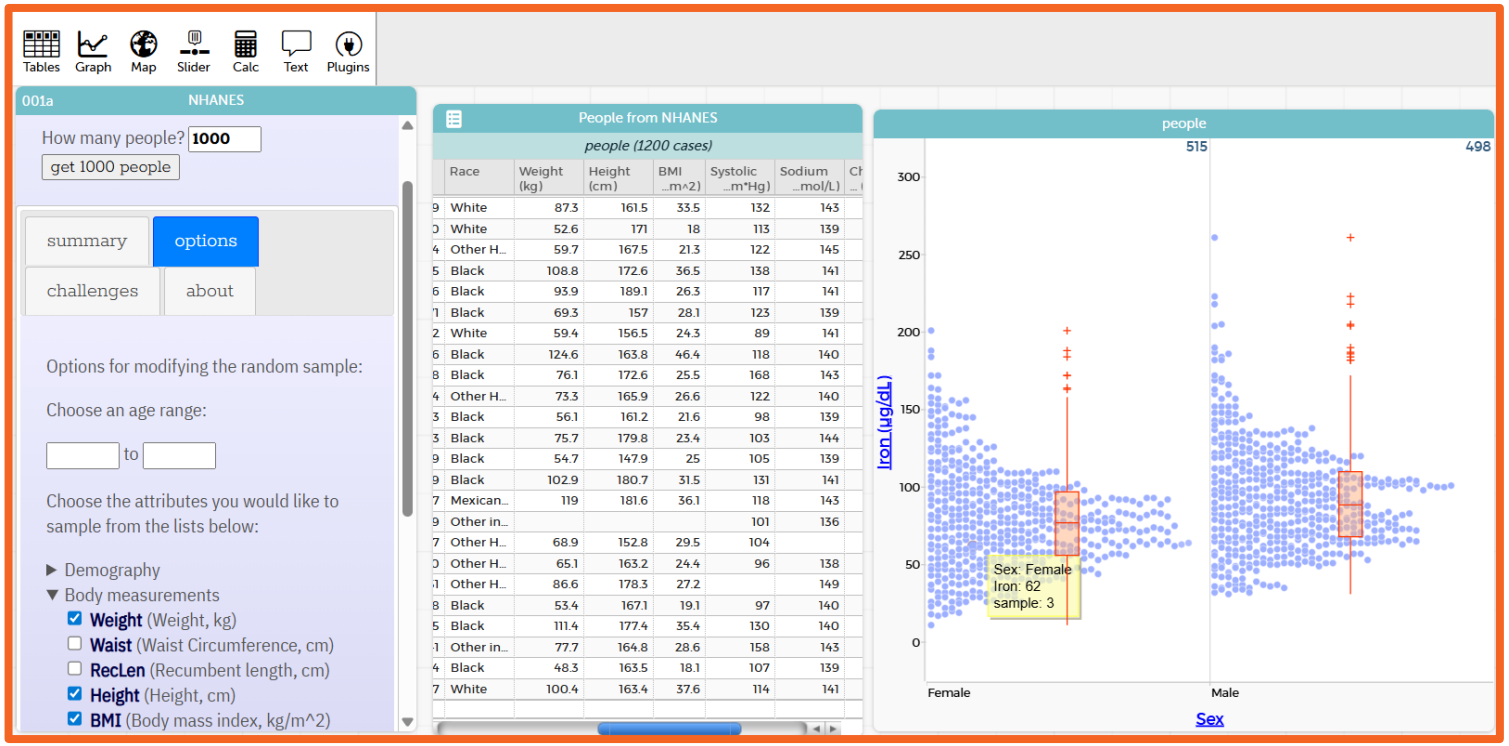


No change in oxygen
levels with skin tone.

Conclude: In this setting, students did not detect the bias.

Seeing the Person Behind the Data





- Real healthcare dataset (NHANES) in CODAP
- Click a data point to view an individual record
- Connect data to real people
- National Health and Nutrition Examination Survey (NHANES)

Every Data Point Represents a Human Life

The Standard Practice	The Danger	The Consequence
Standard statistical methods often encourage data scientists to omit outliers to "clean" the 'training data.	In healthcare databases like MIMIC, these statistical outliers frequently represent **minority populations, unique phenotypes,** or complex **edge cases.**	Omitting them trains AI to only serve the majority, permanently hardcoding systemic bias into downstream clinical tools.

NotebookLM

- Data represents real people
- Outliers are often underrepresented groups
- Removing data can remove representation

From Classroom Learning to Real-World Application

- **Cross-disciplinary, multi-generational teams**
- **Real healthcare challenges**
- **Collaboration with experts**

“doctors who admitted they didn't know anything about data sets working with data scientists who were asking questions about – the pulse oximeter, was powerful for kids “
- DSAIY Teacher

What Students Walk Away With

- **Stronger data reasoning**
- **Ability to evaluate models**
- **Increased**
  - interest in related careers
  - confidence in collaboration and presenting results
  - awareness of risks and bias in AI

“I would like to explore more with the health pathways because before, I used to think of tech as video games and stuff like that. But there's a lot more tech in healthcare." - student quote

Why This Works

- Real-world context (healthcare)
- Scaffolded progression
- Collaborative Learning

AI Literacy Begins with Data Literacy

- **Start with data, not code**
- **Build toward machine learning**
- **Emphasize questioning and evaluation**
- **Focus on real-world decision-making**

“Bias in data affects everyone.”
“I learned AI can both help and harm”
- student quote

Preparing Students for an AI World

- Understand how AI works
- Question outputs, not just use them
- Recognize bias and limitations
- Make informed, responsible decisions