

Narrative Visualization

DSC 106: Data Visualization

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UC San Diego

Announcements

Lab 7 due today.

Final Project Proposals due next Tuesday.

Lecture next Wed will be me and Ben critiquing past final projects.

FAQs:

1. Final Project Showcase is Monday, June 9. Sorry about the mixup last time.

Interactive Articles

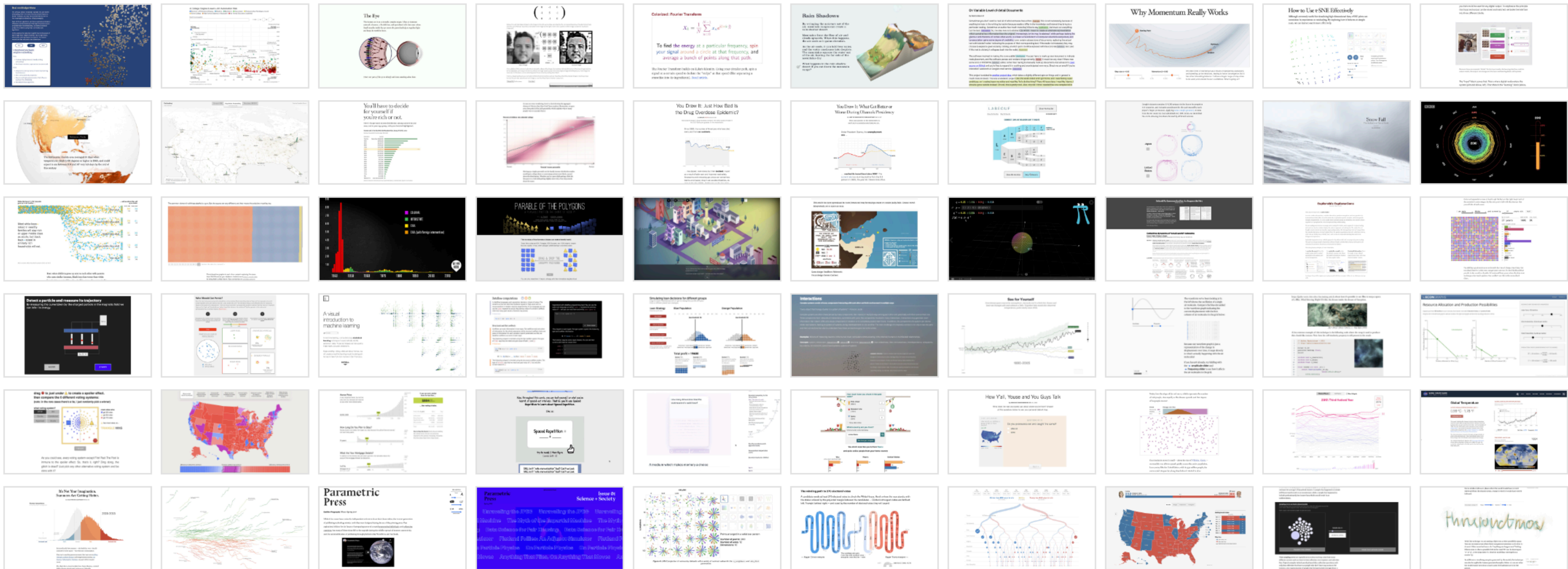


FIGURE 1: Exemplary Interactive Articles From Around The Web. Select an article for more information.

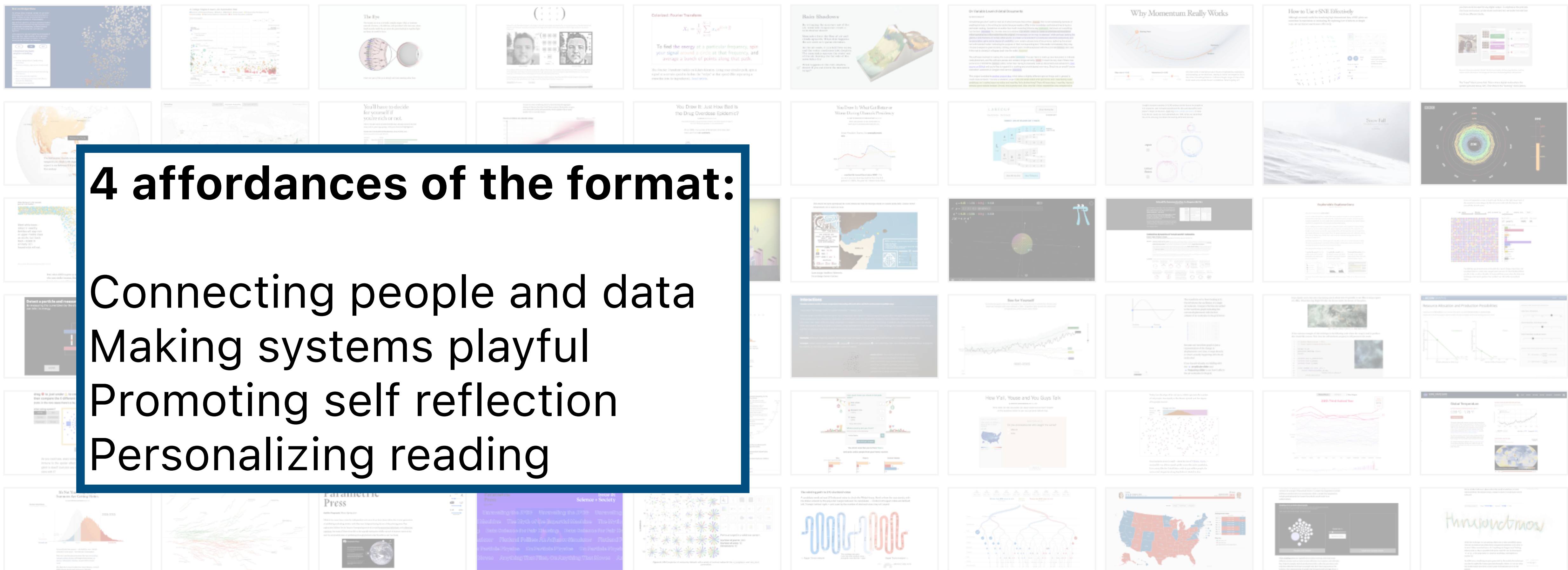


FIGURE 1: Exemplary Interactive Articles From Around The Web. Select an article for more information.

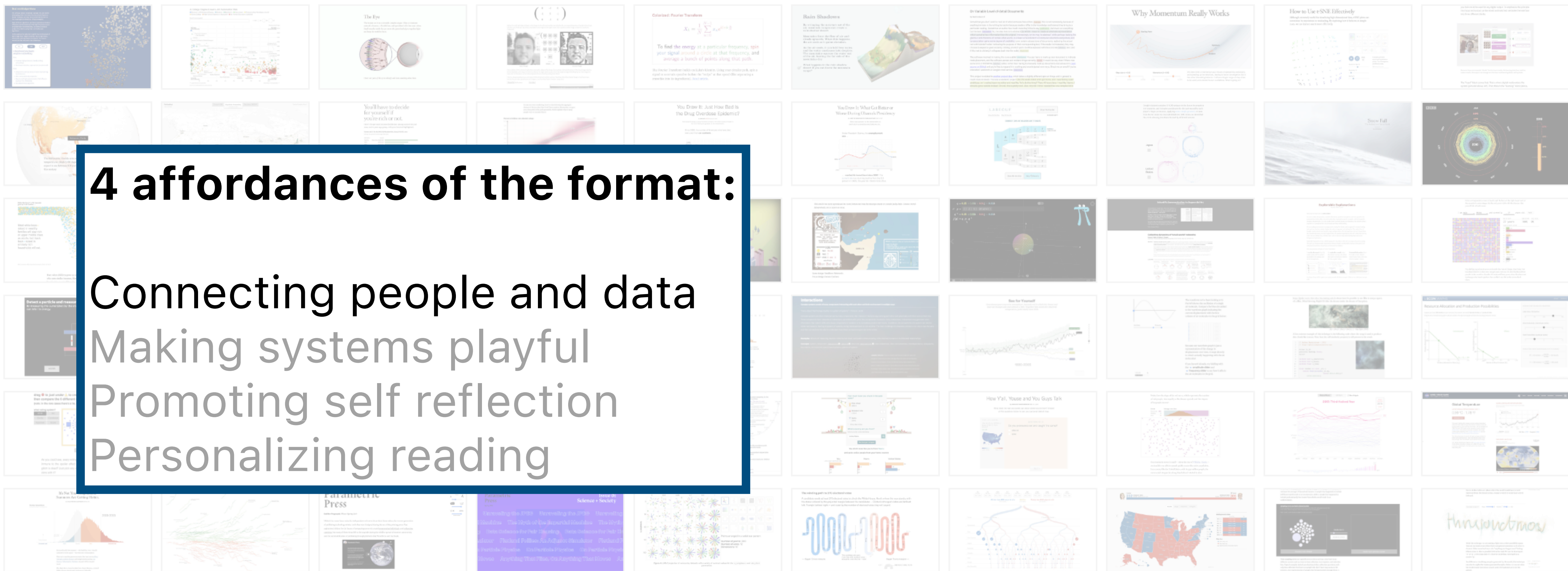
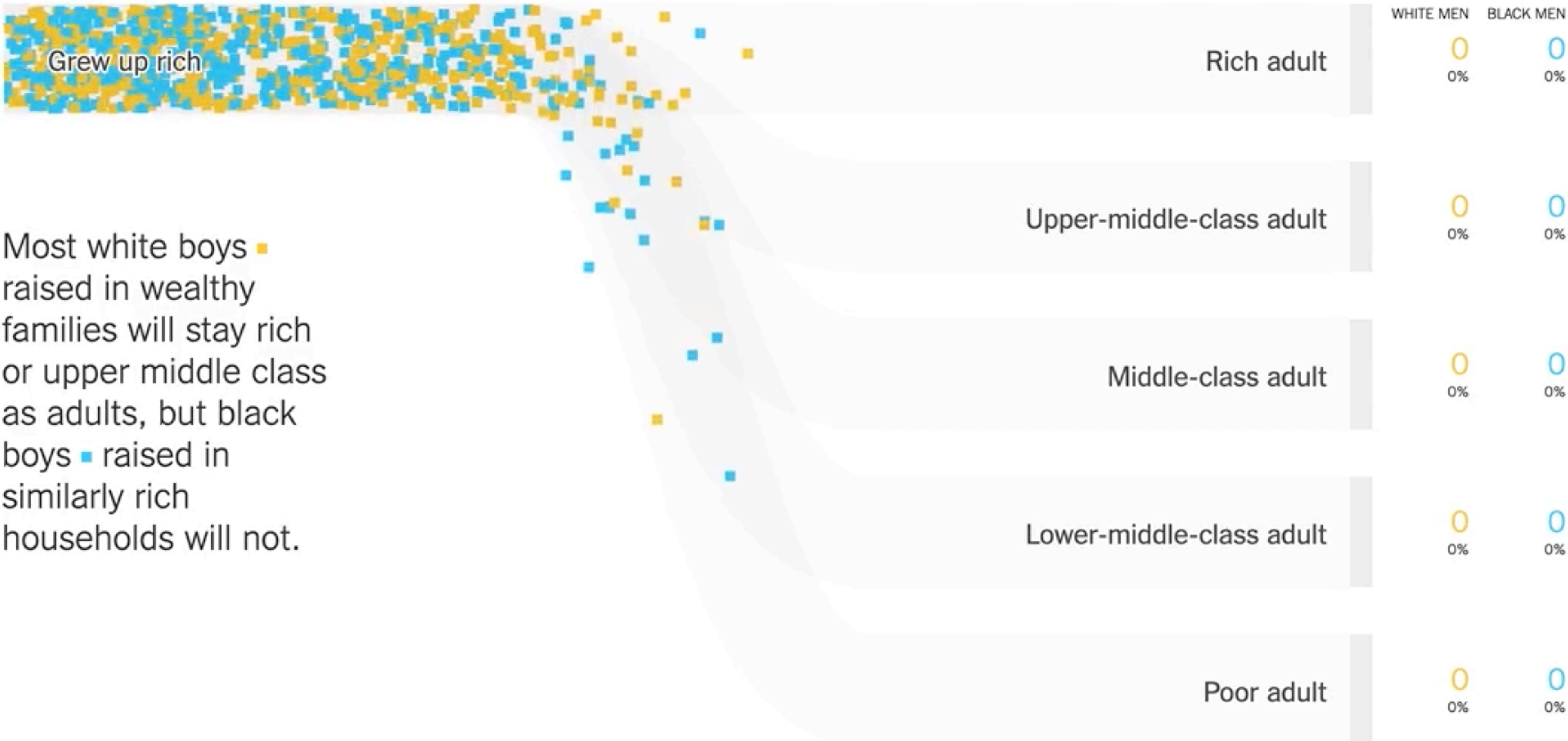


FIGURE 1: Exemplary Interactive Articles From Around The Web. Select an article for more information.

Follow the lives of 932 boys who grew up in rich families ...

...and see where they end up as adults:



Adult outcomes reflect household incomes in 2014 and 2015.

Most white boys raised in wealthy families will stay rich or upper middle class as adults, but black boys raised in similarly rich households will not.

Even when children grow up next to each other with parents who earn similar incomes, black boys fare worse than white

Gun Deaths In America

By Ben Casselman, Matthew Conlen and
Reuben Fischer-Baum

CLICK to advance

1 2 3 4 5 6 7 8 9 10 11 12 | Explore the data for yourself »

<https://bit.ly/guns-538>

Respond: I like, I wish, What if?

tryclassbuzz.com
Code: **guns**

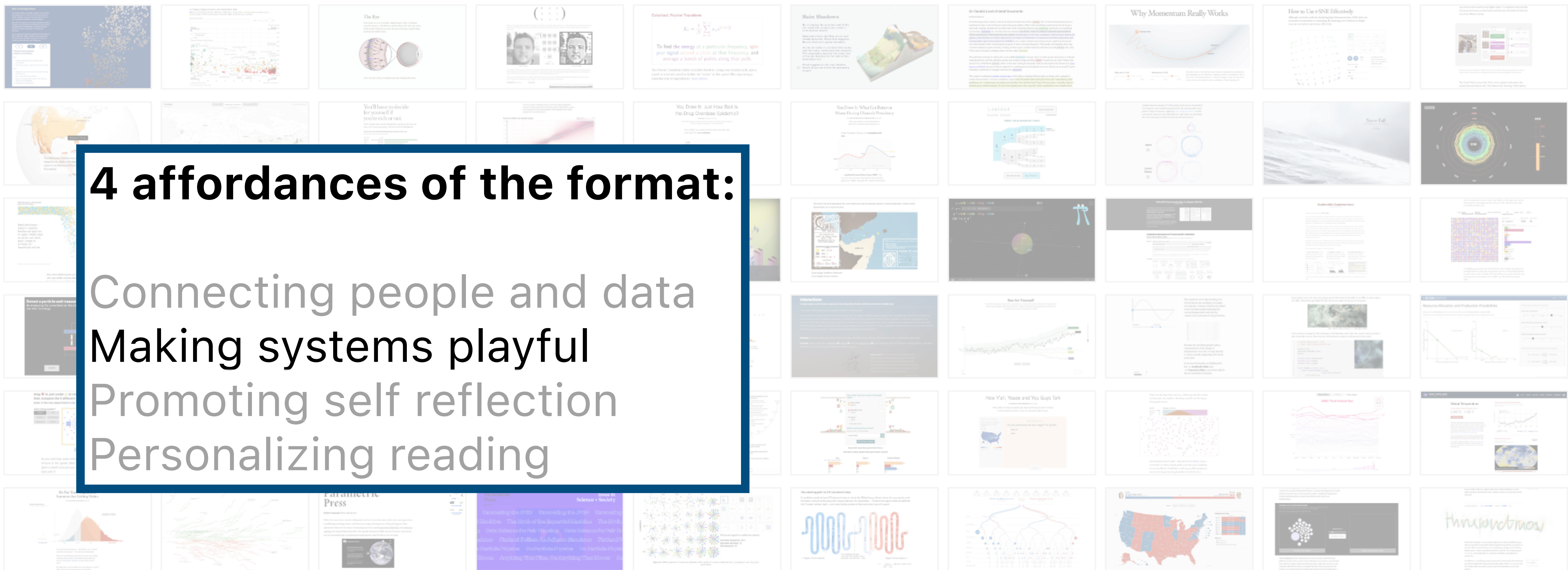
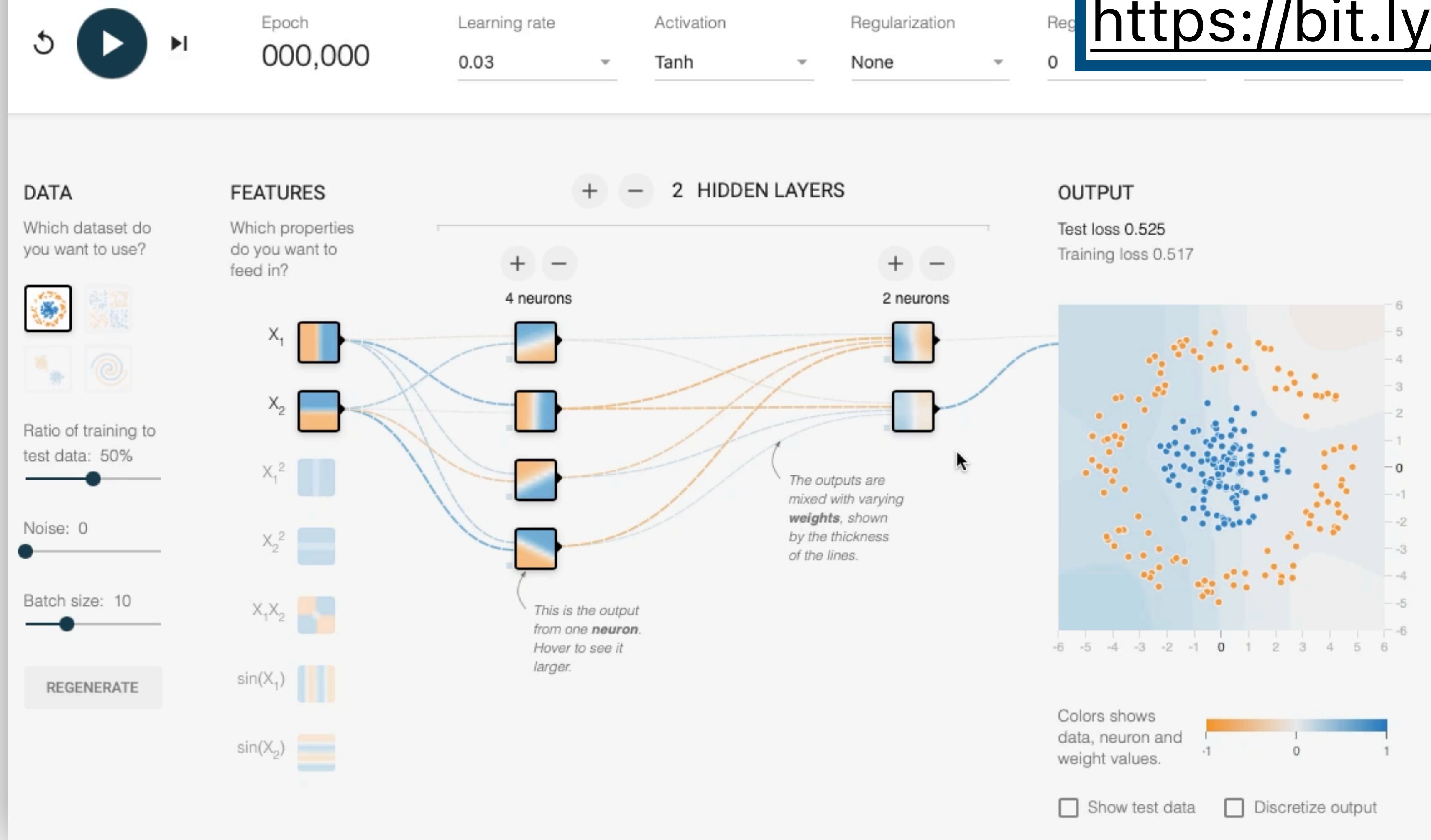


FIGURE 1: Exemplary Interactive Articles From Around The Web. Select an article for more information.

Tinker With a **Neural Network** Right Here in Your Browser.
Don't Worry, You Can't Break It. We Promise.

You Try:
<https://bit.ly/nn-play>



SPIN

Democrats: ??

Republicans: ??

Likely Democratic

Competitive

Likely Republican



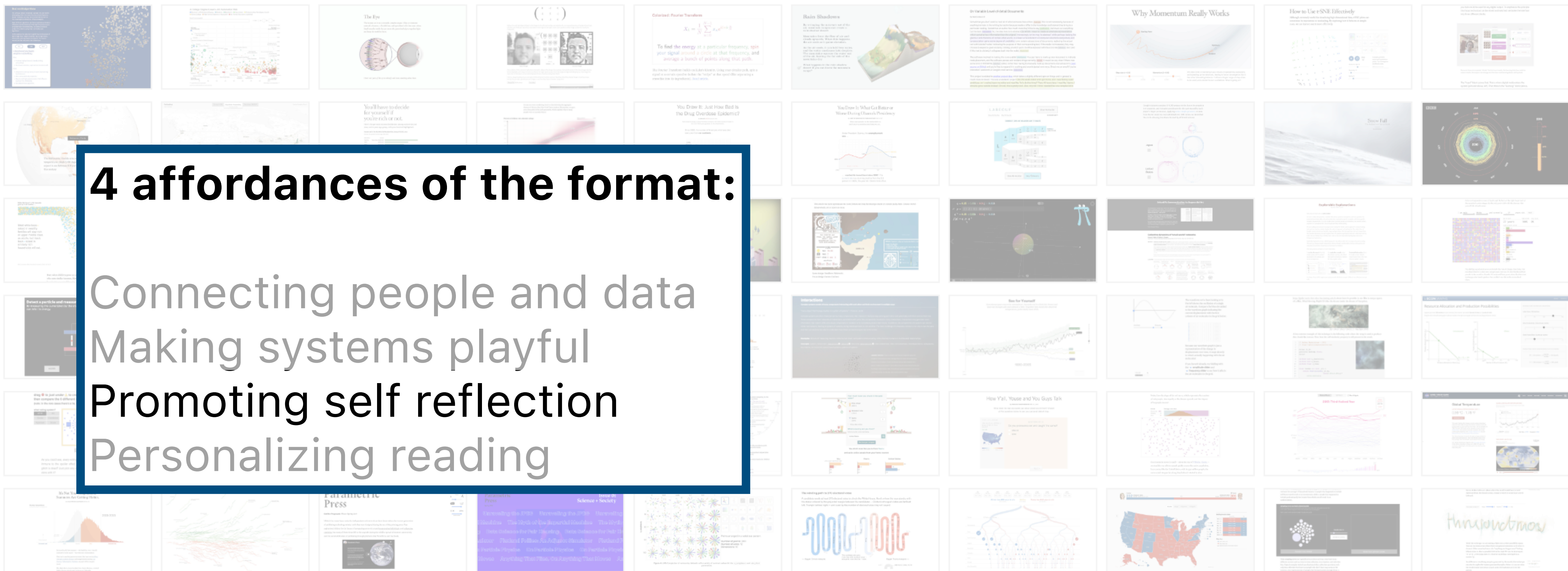
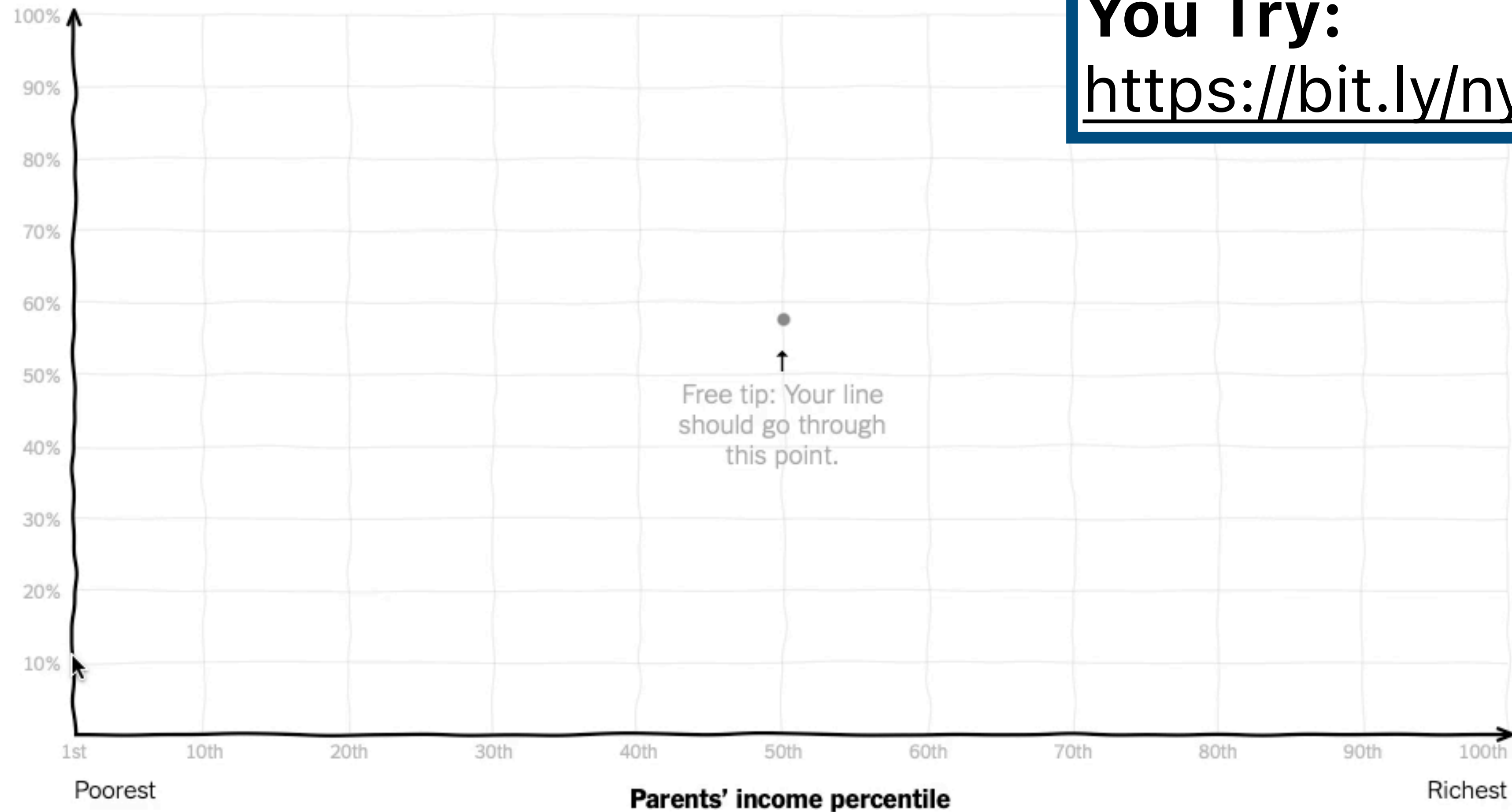


FIGURE 1: Exemplary Interactive Articles From Around The Web. Select an article for more information.

Draw your line on the chart below

Percent of children who attended college



You Try:
<https://bit.ly/nyt-college>

I'm done

Start over



ACTRESS

ZOOEY _____ 🔊

Phonetic Spelling

D |

I Think I've Got It

Show Me Another Skip To Results

12 NAMES LEFT

D

YOUR PATH

Show Me Another

Skip To Results

You Try:
<https://bit.ly/pudding-gy>

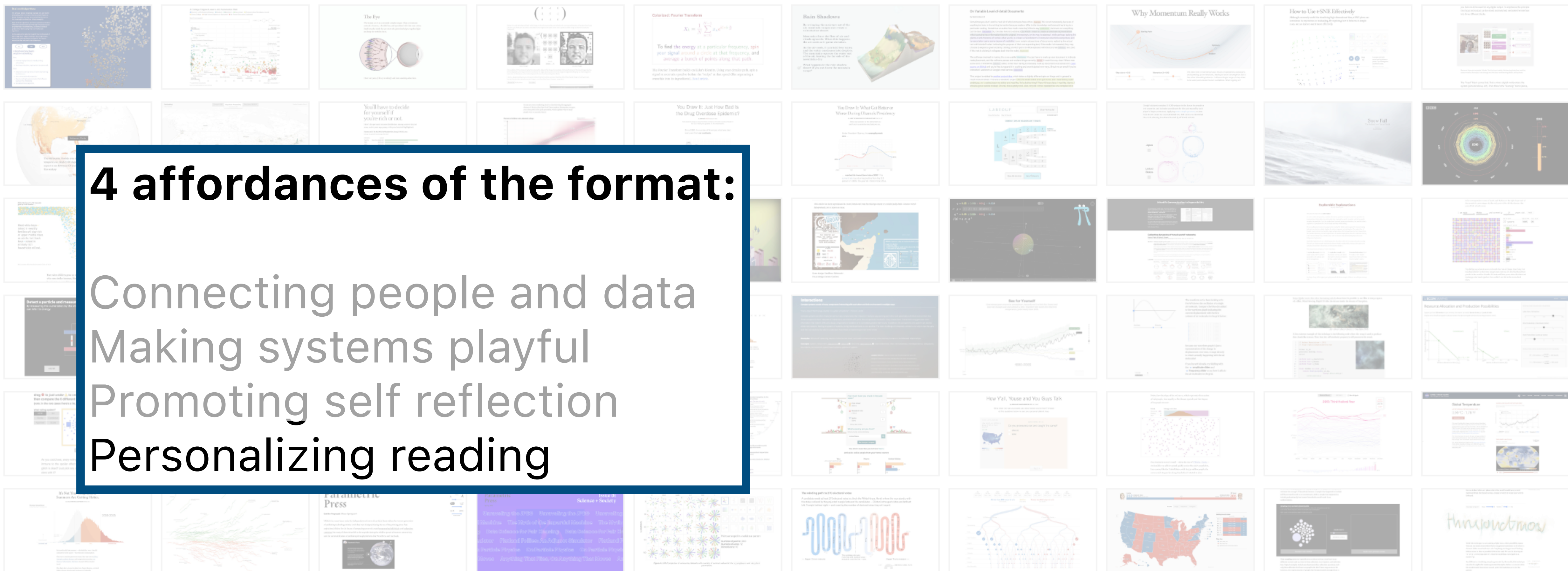


FIGURE 1: Exemplary Interactive Articles From Around The Web. Select an article for more information.

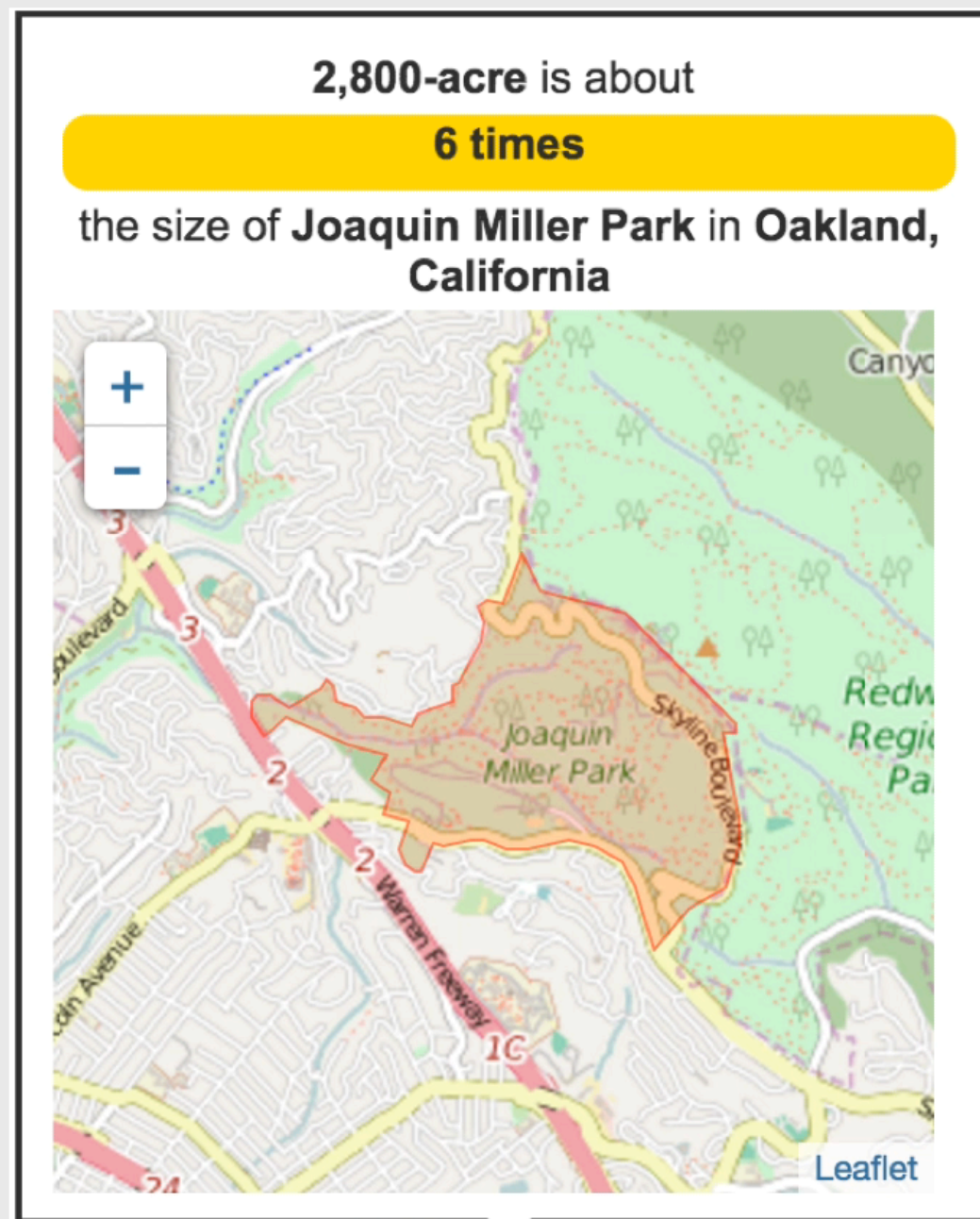
Originally published in 2018

How Much Hotter Is Your Hometown Than When You Were Born?

You Try:
<https://bit.ly/nyt-hot>

As the world warms because of human-induced climate change, most of us can expect to see more days when temperatures hit 90 degrees Fahrenheit (32 degrees Celsius) or higher. See how your hometown has changed so far and how much hotter it may get.

Please enter your information to continue.



ATLAS OF ME



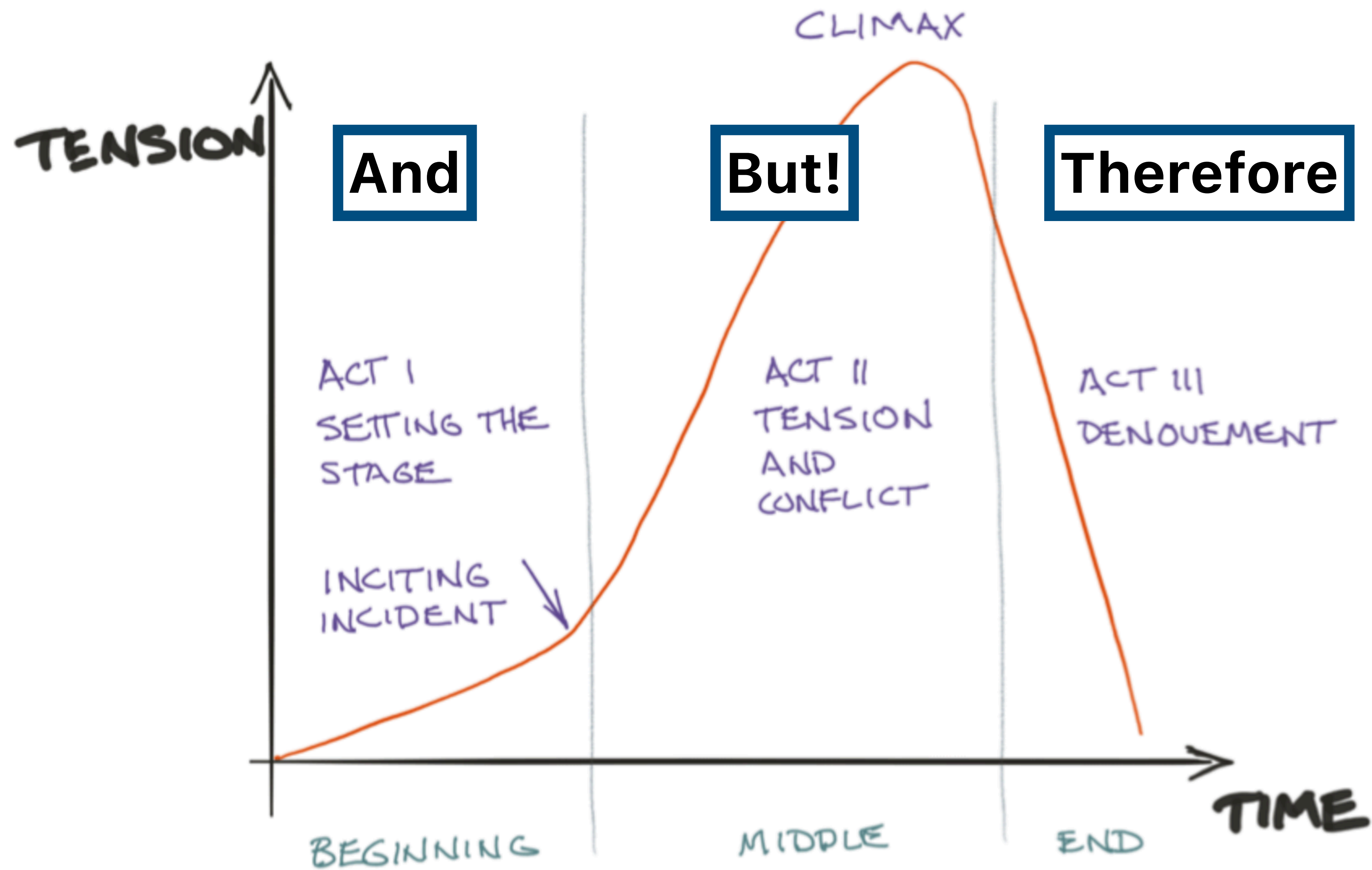
On-demand personalized maps for
unfamiliar distances, areas, and locations.

Created by Yea-Seul Kim, Francis Nguyen, and Jessica Hullman, University of Washington

Narrative Visualization

Aka: Telling a story using data

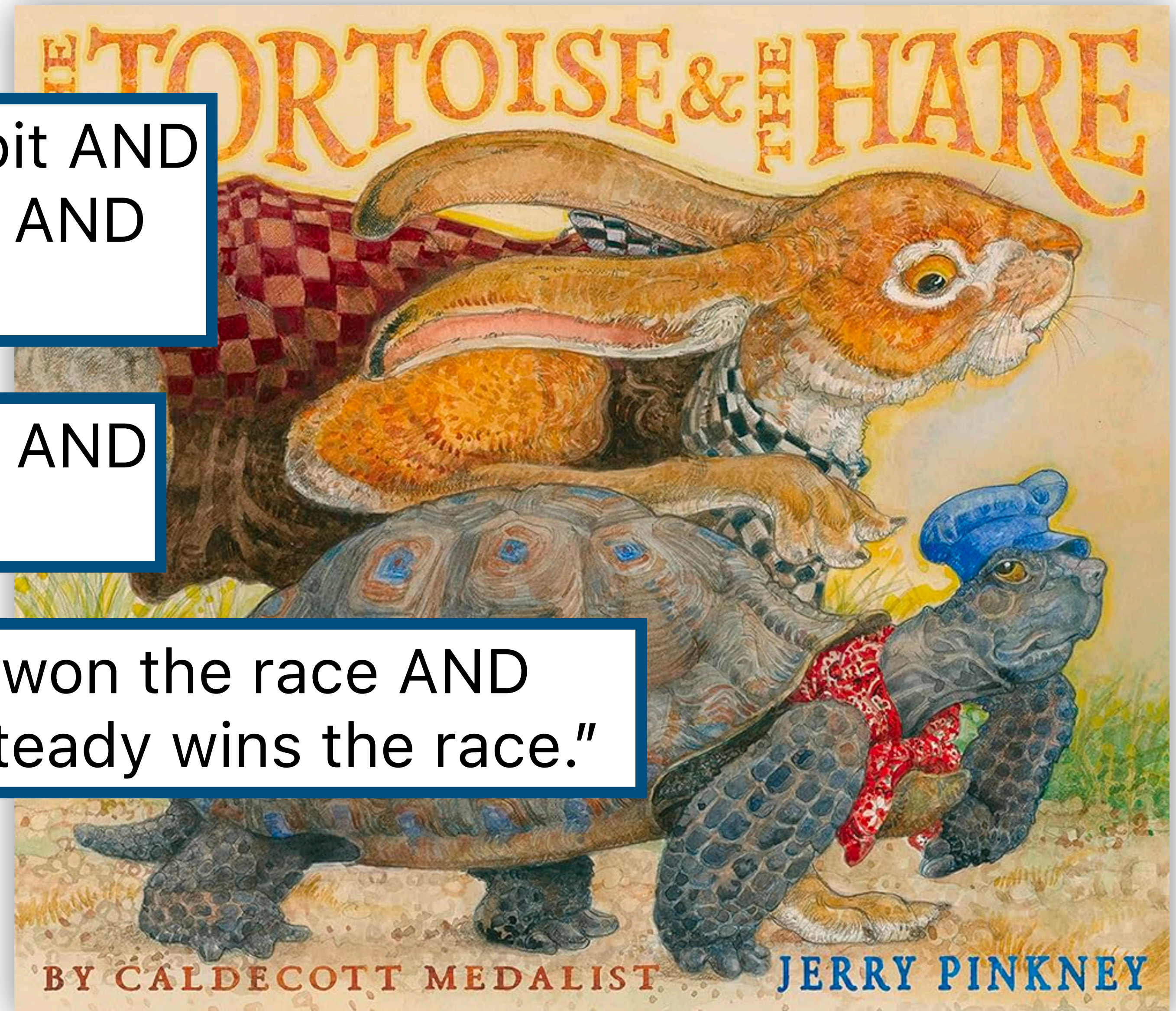
You'll make one for your final project!



There was a boastful rabbit AND
There was a slow tortoise AND
They decided to race...

BUT the rabbit fell asleep AND
The tortoise plodded on...

THEREFORE the tortoise won the race AND
The moral is: "Slow and steady wins the race."



Gun Deaths In America

By Ben Casselman, Matthew Conlen and
Reuben Fischer-Baum

CLICK to advance

How does this visualization use
and-but-therefore?

1

2

3

4

5

6

7

8

9

10

11

12

Explore the

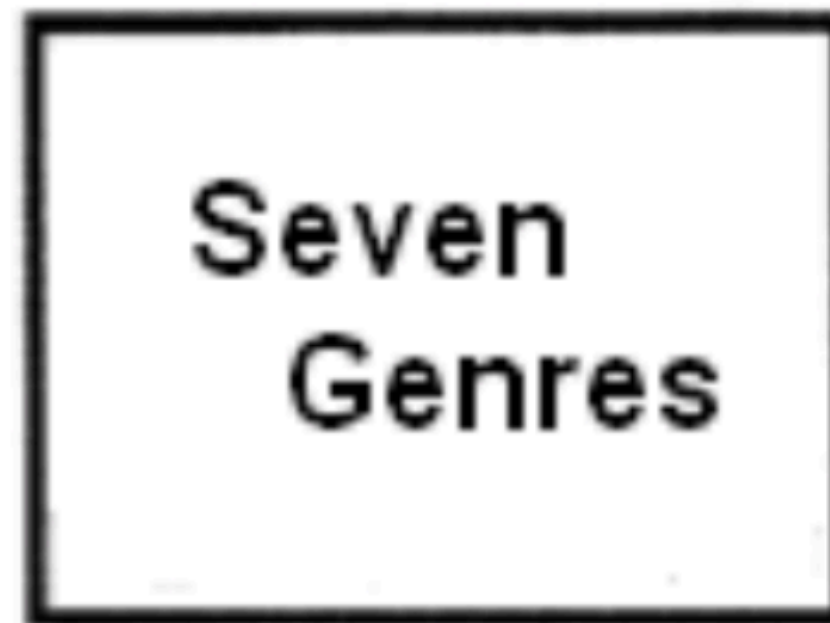
<https://bit.ly/guns-538>

tryclassbuzz.com
Code: **gun2**

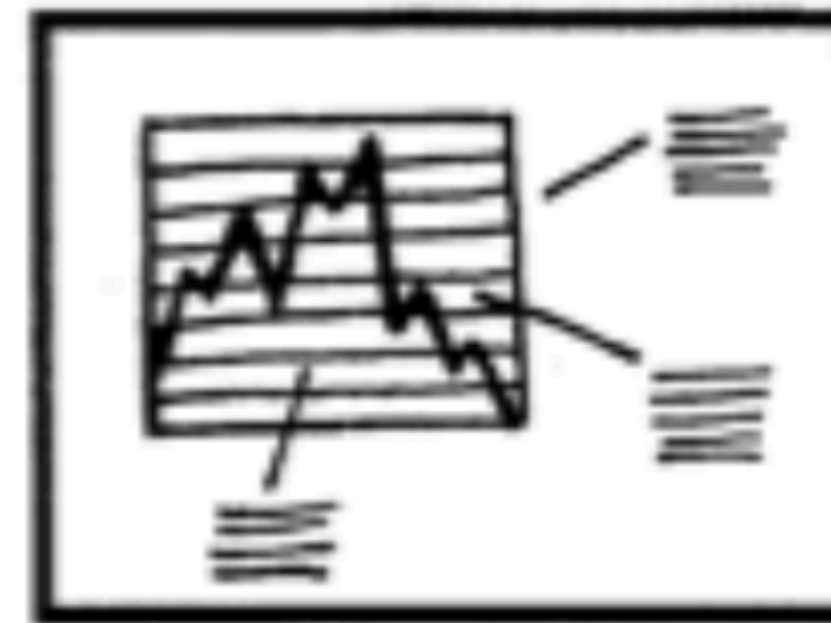
Observed Narrative Devices

[illegible]

Narrative Visualization Genres



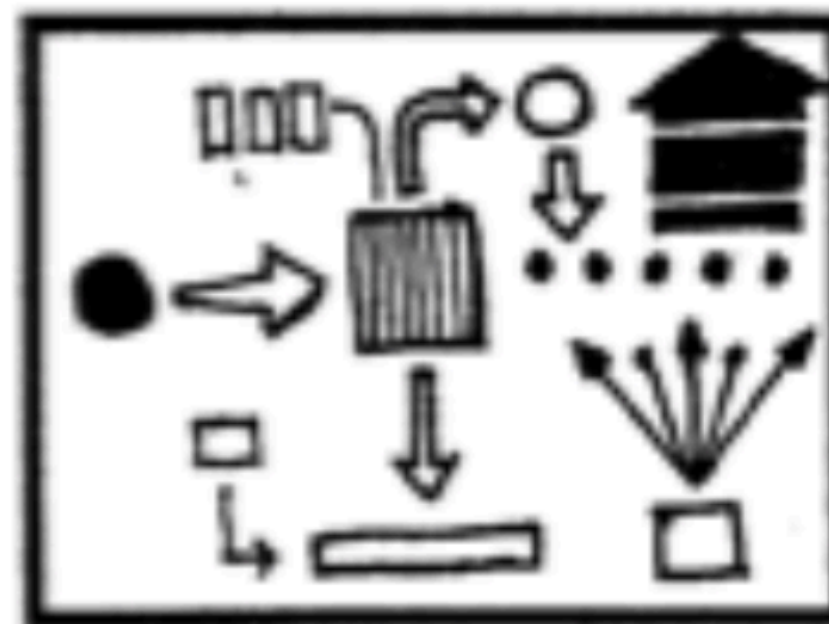
Magazine Style



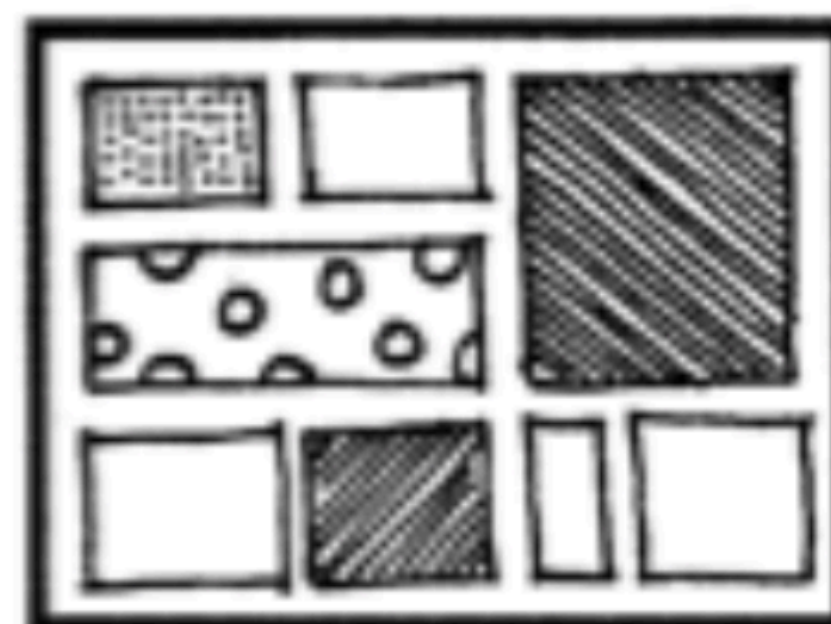
Annotated Chart



Partitioned Poster



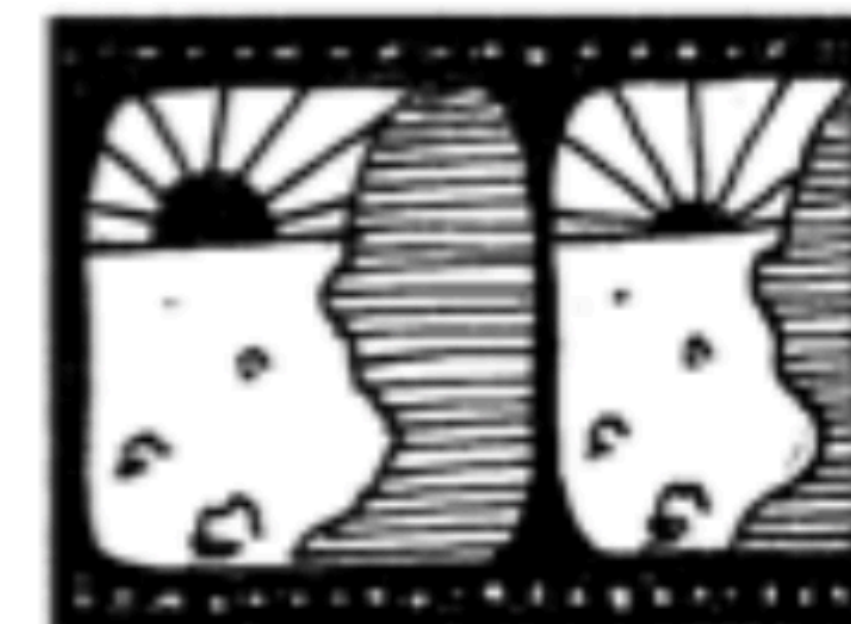
Flow Chart



Comic Strip



Slide Show



Film/Video/Animation



Magazine Style

The Economist

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even more sharply in Germany than in Italy, which is in recession, note economists at Goldman Sachs, a bank. Yet Germany's service sector appears to be growing strongly, as does that of the euro zone as a whole.

Production lines

Purchasing managers' indices*

Manufacturing

Euro area

United States

China

2017

18

19

Services

Euro area

United States

China

2017

18

19

Sources:
IHS Markit;
Caixin

*Based on surveys of executives. A reading above/below 50 indicates an expansion/contraction compared with the previous month

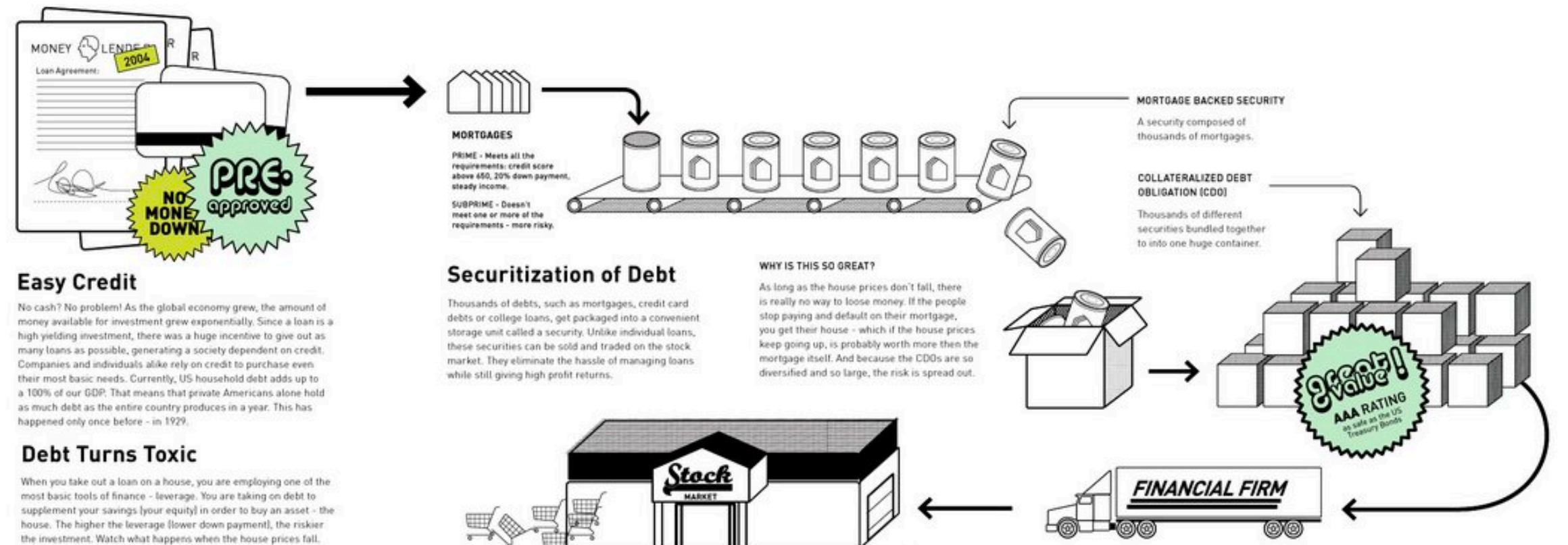
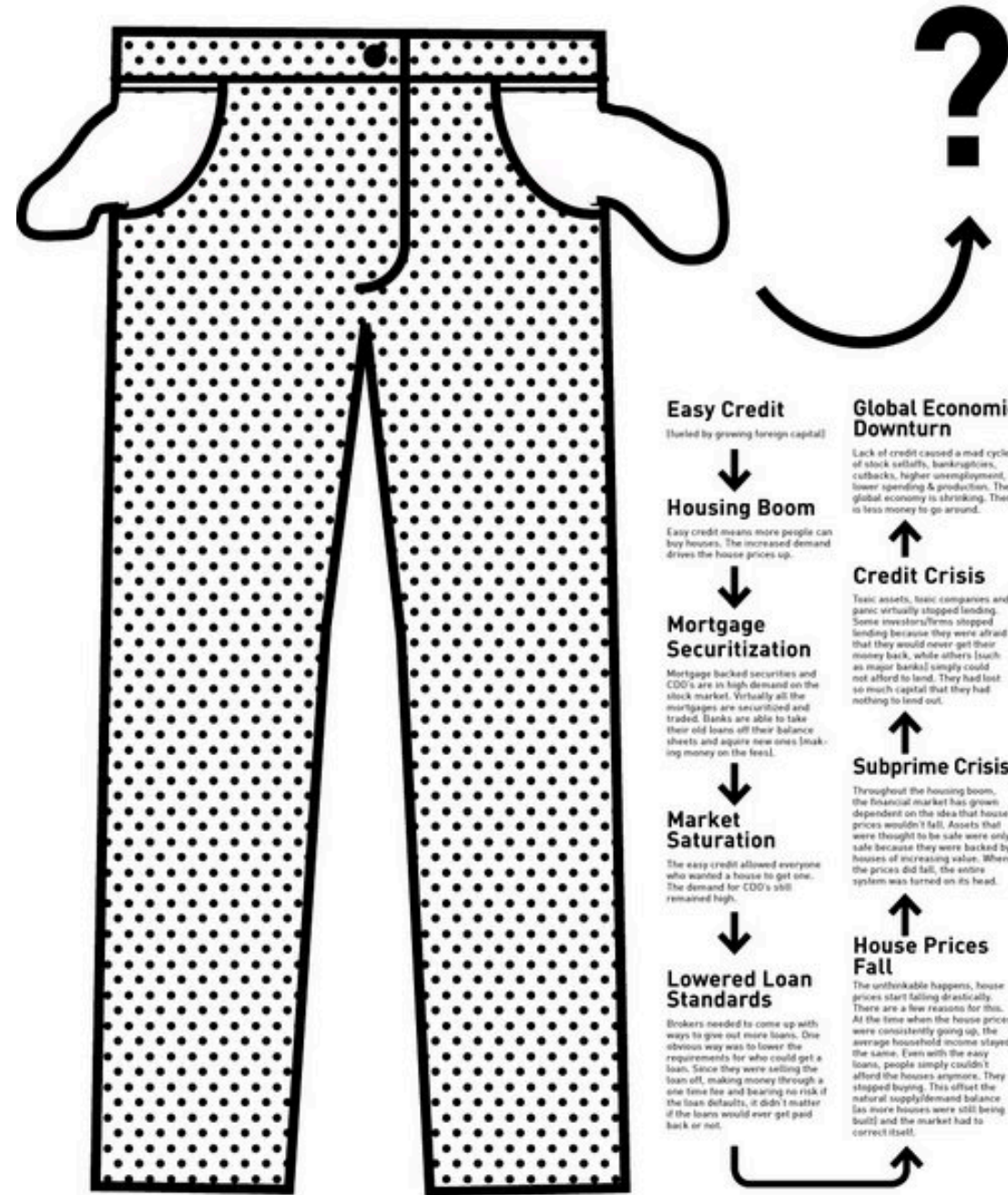
The Economist

Service industries are less volatile than manufacturing, make up a bigger slice of rich-world GDP and, by their nature, trade less. That they remain strong largely reflects relatively buoyant labour markets and consumers (German unemployment is only 3.1%). One exception has been Britain, where survey data released on April 1st and 3rd appear to show growth in manufacturing at its strongest in over a year and services shrinking. Both findings are Brexit-related. The British economy is suffering from falling confidence, while manufacturing appears so strong only because firms are stockpiling in case Britain soon crashes out of the EU without a deal.

In the 2000s some economists speculated that the growing weight of

Display a menu

WHERE DID ALL THE MONEY GO?

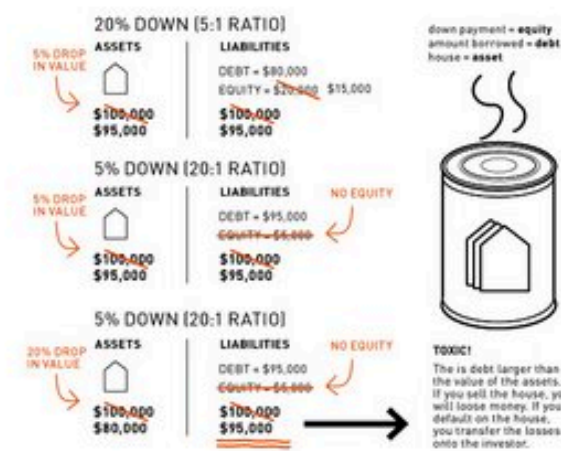


Easy Credit

No cash? No problem! As the global economy grew, the amount of money available for investment grew exponentially. Since a loan is a high yielding investment, there was a huge incentive to give out as many loans as possible, generating a society dependent on credit. Companies and individuals alike rely on credit to purchase even their most basic needs. Currently, US household debt adds up to a 100% of our GDP. That means that private Americans alone hold as much debt as the entire country produces in a year. This has happened only once before - in 1929.

Debt Turns Toxic

When you take out a loan on a house, you are employing one of the most basic tools of finance - leverage. You are taking on debt to supplement your savings (your equity) in order to buy an asset - the house. The higher the leverage (lower down payment), the riskier the investment. Watch what happens when the house prices fall.



Easy Credit

(fueled by growing foreign capital)

Housing Boom

Easy credit means more people can buy houses. The increased demand drives the house prices up.

Mortgage Securitization

Mortgage backed securities and CDOs are in high demand on the stock market. Virtually all the mortgages are securitized and traded. Banks are able to take their old loans off their balance sheets and acquire new ones looking for money on the loan.

Market Saturation

The easy credit allowed everyone who wanted a house to get one. The demand for CDO's still remained high.

Lowered Loan Standards

Banks needed to come up with ways to give out more loans. One obvious way was to lower the requirements for who could get a loan. Since they were selling the loan off, making money through a one time fee and bearing no risk of the loan default, it didn't matter if the loan would ever get paid back or not.

Global Economic Downturn

Lack of credit caused a mid cycle of stock volatility, bankruptcies, cutbacks, higher unemployment, lower spending & production. The global economy is shrinking. There is less money to go around.

Credit Crisis

Basic assets, toxic companies and panic virtually stopped lending. Some investors/firms stopped lending because they were afraid that they would never get their money back, while others found an easier banked simply could not afford to lend. They had lost so much capital that they had nothing to lend out.

Subprime Crisis

Throughout the housing boom, the financial market had grown dependent on the idea that house prices wouldn't fall. Assets that were thought to be safe were only safe because they were backed by houses of increasing value. When the prices did fall, the entire system was turned on its head.

House Prices Fall

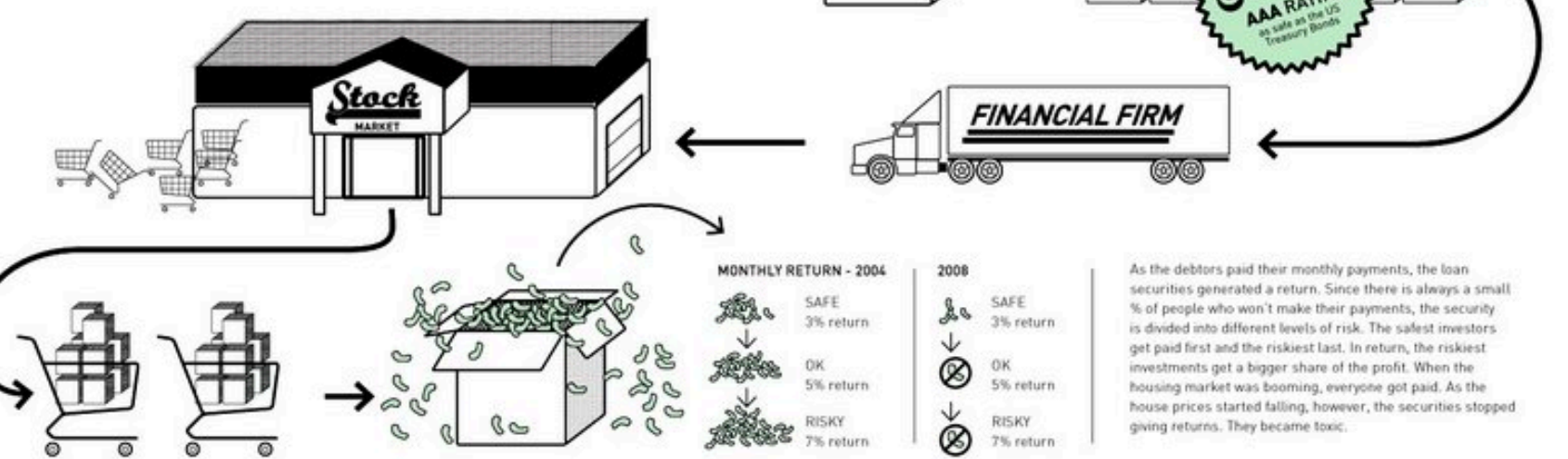
The unthinkable happens, house prices start falling drastically. There are a few reasons for this. At the time when the house prices were consistently going up, the average household income stayed the same. Even with the easy loans, people simply couldn't afford the houses anymore. They stopped buying. This shifted the natural supply/demand balance (as more houses were still being built) and the market had to correct itself.

Securitization of Debt

Thousands of debts, such as mortgages, credit card debts or college loans, get packaged into a convenient storage unit called a security. Unlike individual loans, these securities can be sold and traded on the stock market. They eliminate the hassle of managing loans while still giving high profit returns.

WHY IS THIS SO GREAT?

As long as the house prices don't fall, there is really no way to lose money. If the people stop paying and default on their mortgage, you get their house - which if the house prices keep going up, is probably worth more than the mortgage itself. And because the CDOs are so diversified and so large, the risk is spread out.



Investors

The global economy has been growing fast. It has been acquiring enormous amounts of capital. This money had to be invested somewhere. The CDOs were particularly appealing because they were perceived as safe and they yielded a high interest rate at a time when the U.S. Bonds were at a record low.

Demand Lowers Standards

As the demand for Mortgage Securities grew, the supply dried up. Everyone who qualified for a loan and wanted one, already had one. In order to generate more loans to satisfy the growing demand for securities, the standards for getting a loan were lowered. Not only did this create "toxic" loans (packaged into toxic securities), but it also triggered the burst of the housing bubble. As the house prices peaked, the average income stayed flat. People couldn't afford to buy the overpriced houses. The housing market stopped, the prices fell & everyone found themselves owing a lot more than they owned.



Credit Crisis

The toxic assets made their way through the financial system quickly. After several investment firms "broke the bank" - losing the investors money, and several major companies nearly collapsed, full blown panic set in. No one knew who was going to go under next. Because the assets they were holding were so complex, unregulated, and interconnected no one even knew to what extent their own assets were exposed. Lending stopped.



What is money?

Money can be anything. Rare & valuable resources have been used historically because they are easy to control, but anything that people collectively agree on can be used as money. There are four general functions money fulfills: medium of exchange, unit of account, store of value & standard of deferred payment. Money needs to have a perceived value. This is an overview of the different forms of money and where their value comes from.

Barter

In a barter, no money is used. People trade goods or services directly.

no money

Commodity Money

The value comes from the commodity it is made out of (gold, silver, bronze). In other words, a \$1 coin made out of silver would have \$1's worth of silver in it.

money = commodity

Representative Money

Taken money that stands in direct and fixed relation to the commodity which backs it, while not itself made of it. (eg. early paper money which originated as receipt for gold deposits).

money = tokens backed by a commodity

Credit Money

When you take out a loan, you agree to pay it back. In return the bank transfers money to your account. This money is not directly backed by a commodity. It is created when you take out the loan and is backed by your promise to pay it back.

money = promise to repay

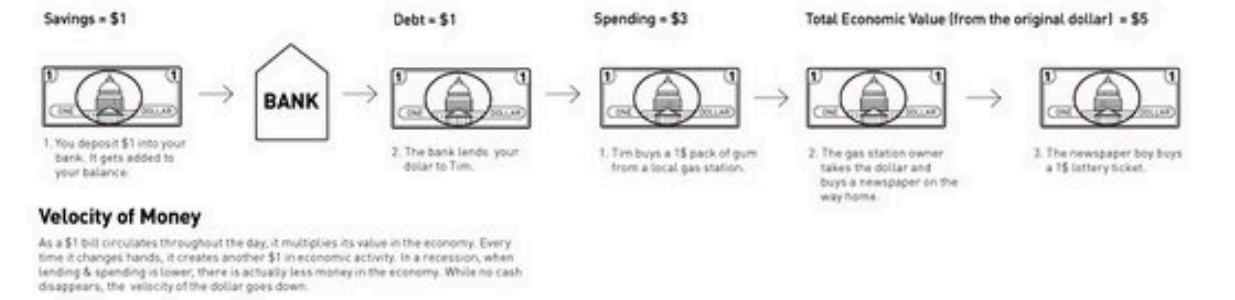
Fiat Money

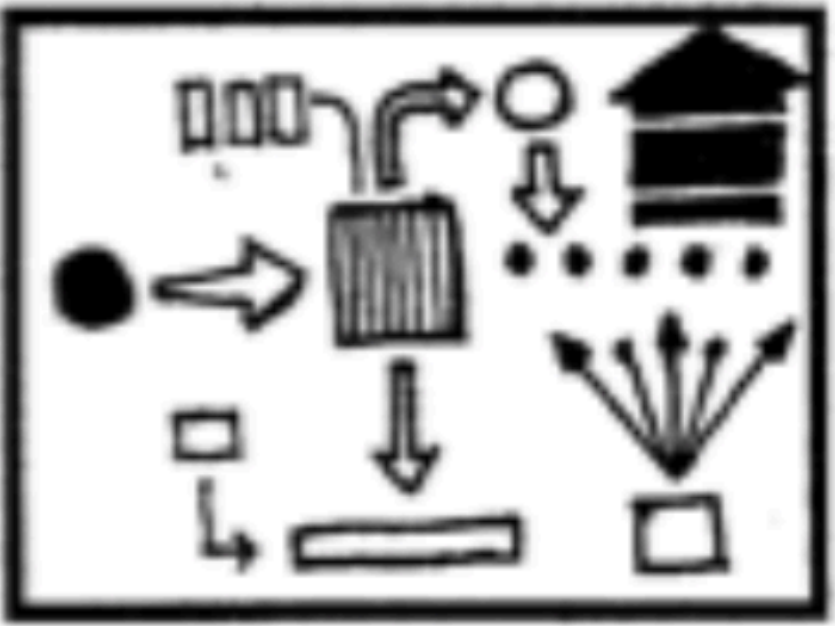
Money which is not backed by a commodity, but by a government law declaring it to be legal tender (currency that must be accepted as payment). It is usually printed by the country's national bank (a private institution).

money = paper given value by law

Money Supply

The Money Supply is the amount of available money in the economy. It fluctuates with the market. In times of economic growth, the money supply is high. In a recession, the money supply is low. Lending and spending are two major factors that influence the money supply.





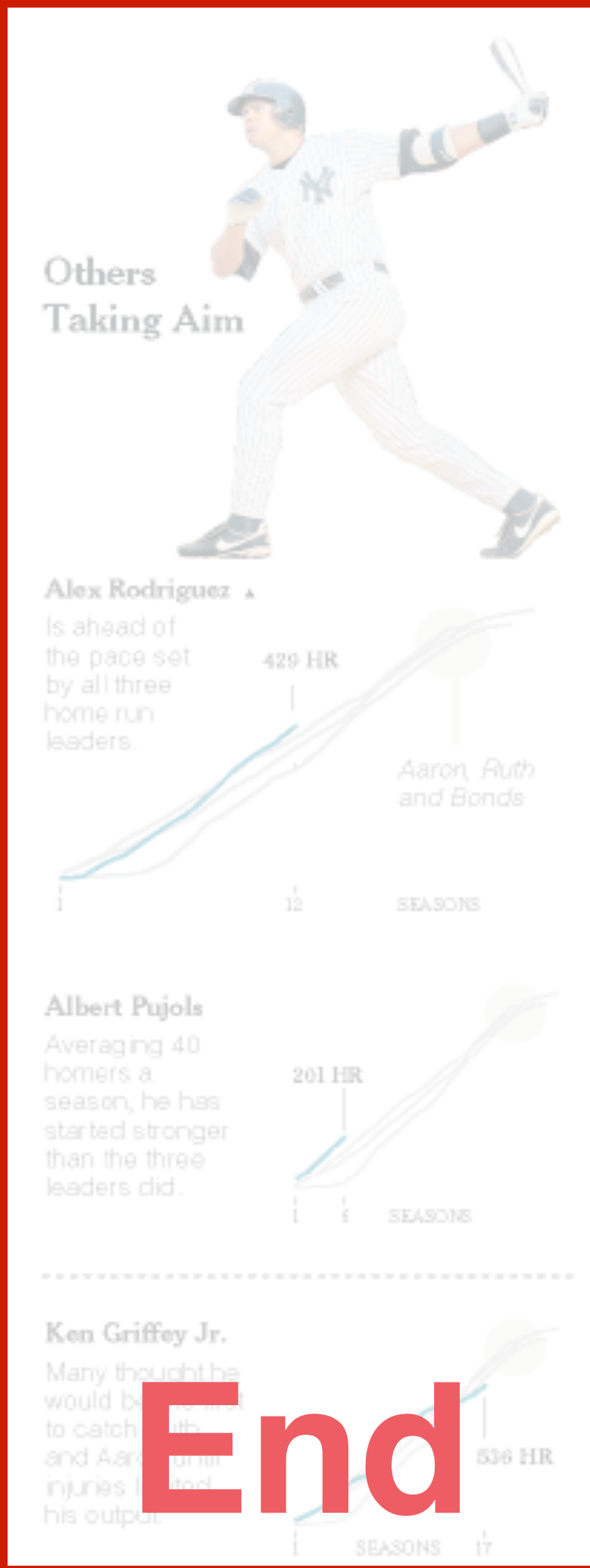
Flow Chart



Partitioned Poster



Middle



End

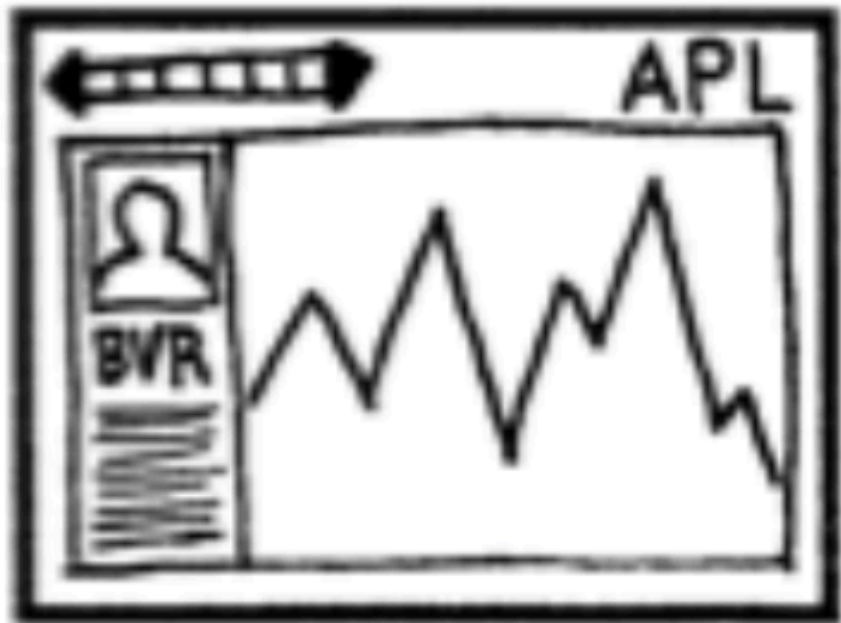


Published: February 2, 2010

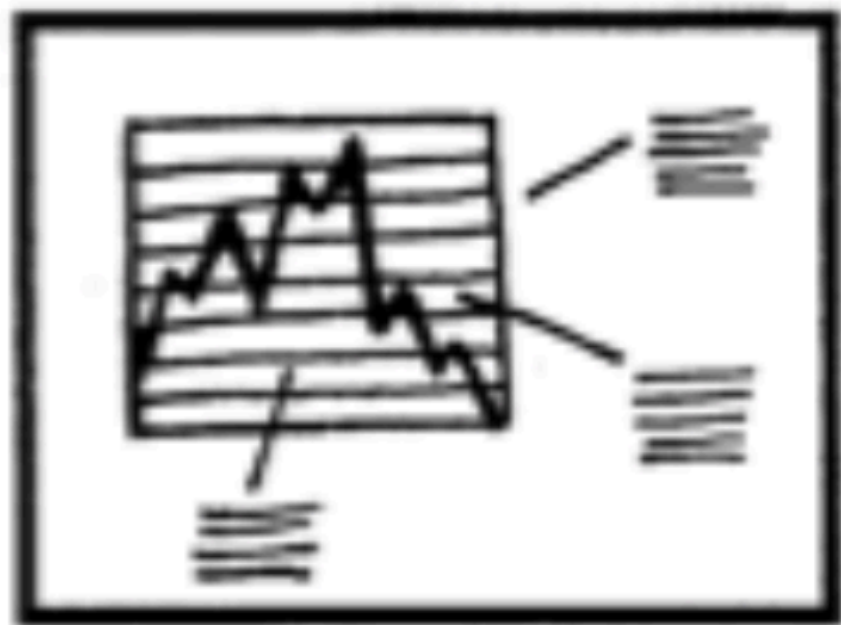
Budget Forecasts, Compared With Reality

Just two years ago, surpluses were predicted by 2012. How accurate have past White House budget forecasts been?

1 2 3 4 5 6 NEXT ▶



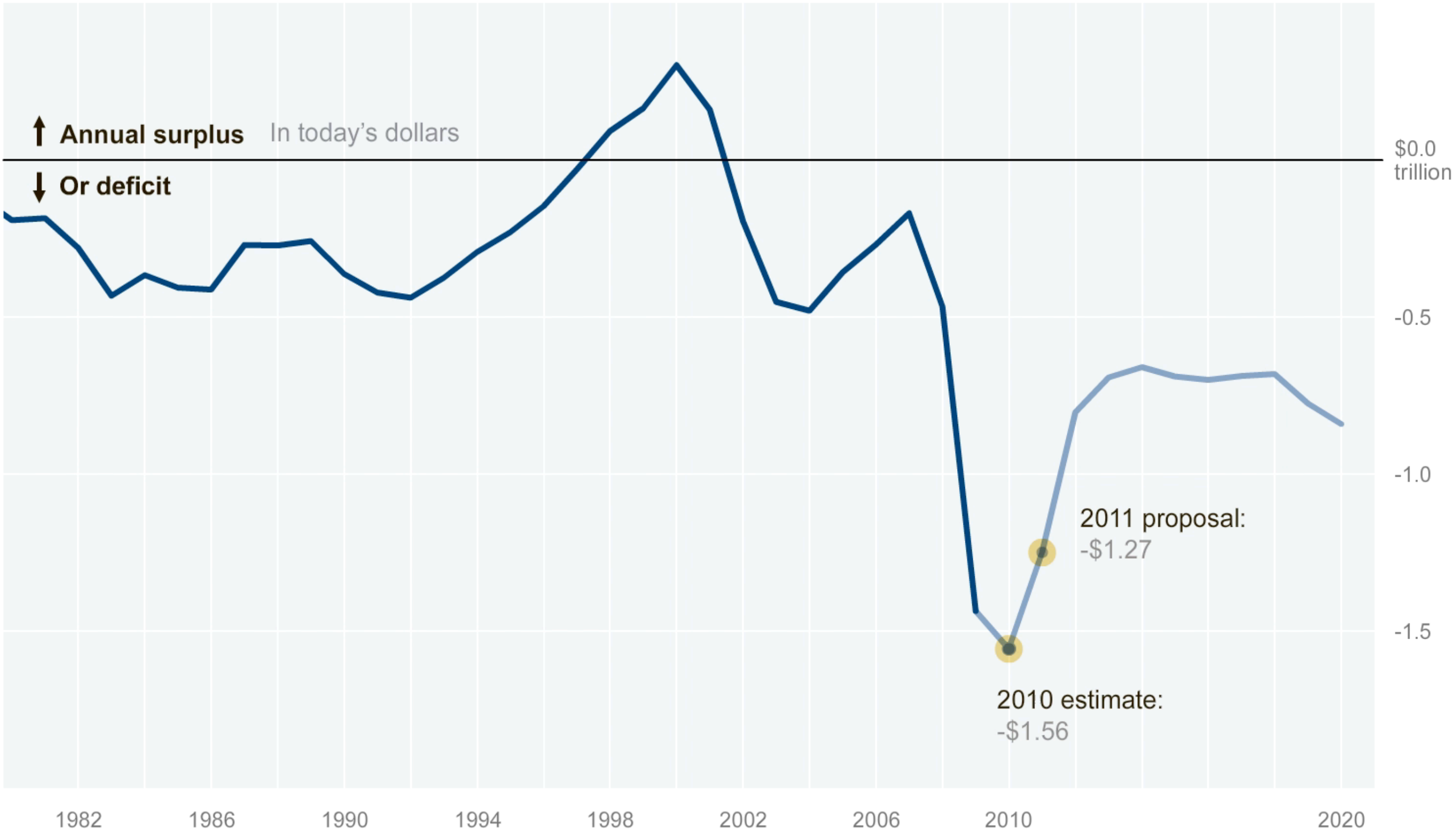
Slide Show



Annotated Chart

Falling short

President Obama's budget proposal estimates a deficit of \$1.6 trillion for the current fiscal year and \$1.3 trillion in 2011.



By AMANDA COX | [Send Feedback](#)

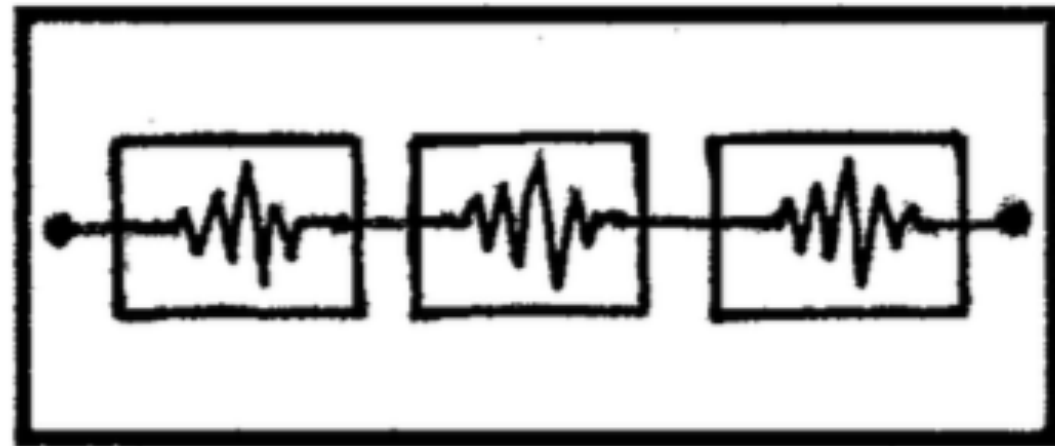
Source: Office of Management and Budget

[TWITTER](#)

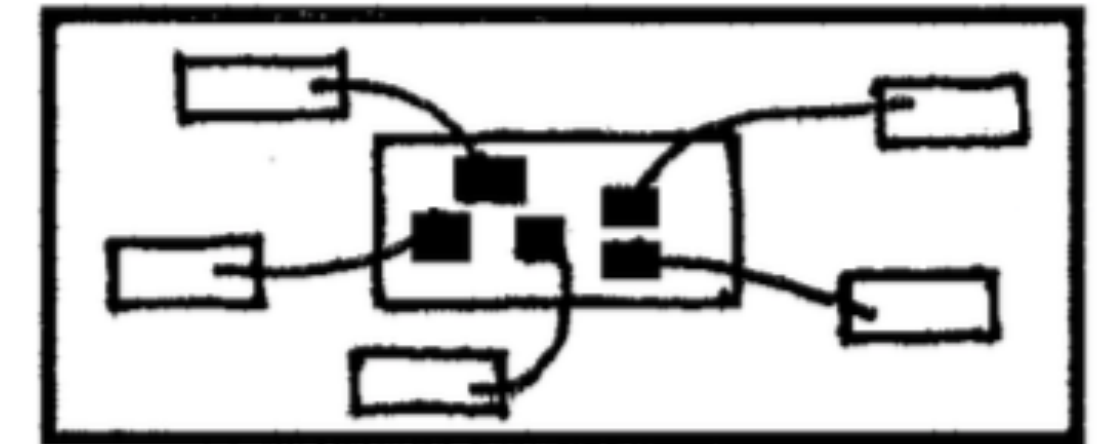
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Interactive Slideshow



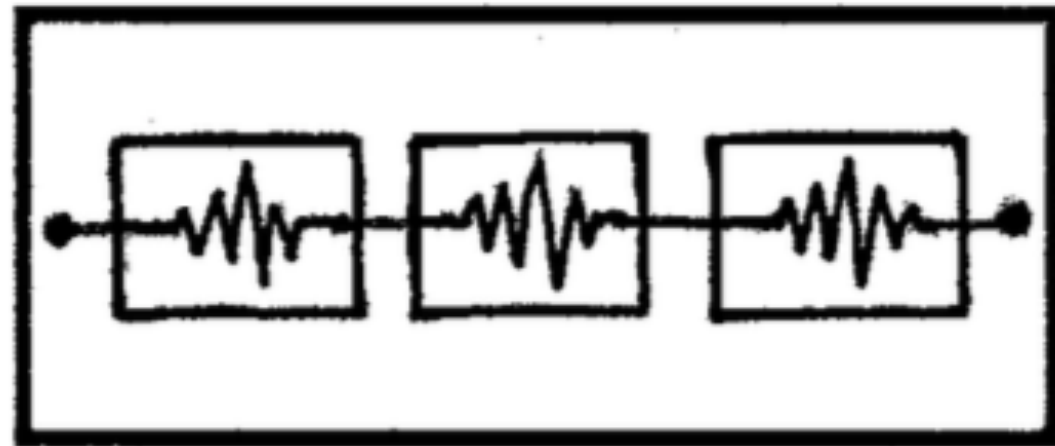
Drill-Down



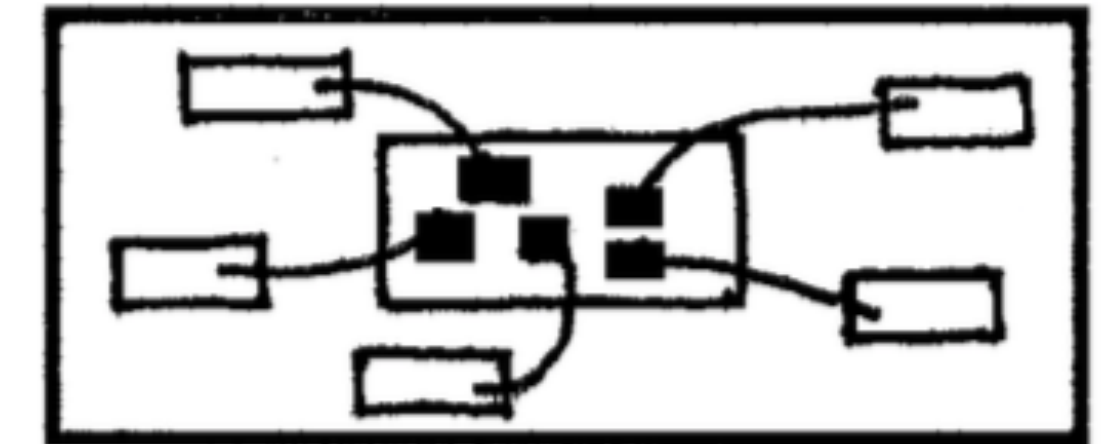
Author-Driven

Reader-Driven

Interactive Slideshow



Drill-Down



Author-Driven

Reader-Driven

On the Map: Five Major North Korean Prison Camps

North Korea has operated political prison camps for more than 50 years, twice as long as the Gulag in the former Soviet Union. People suspected of opposing the government are forced to do slave labor in the camps, which hold an estimated 200,000 prisoners. North Korea's government says the camps don't exist, but high-resolution satellite images show otherwise.

Click on the  map markers below for more information on each site.

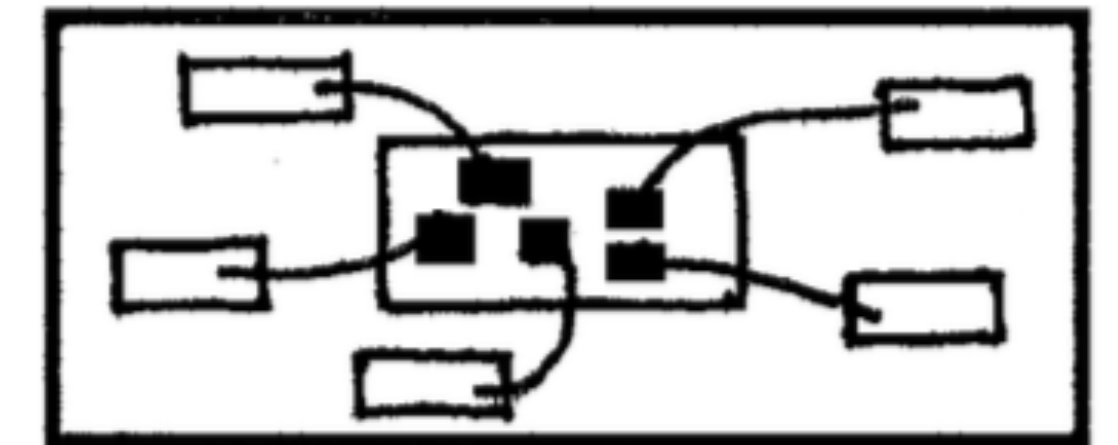
RELATED

- Article: [On the Diplomatic Back Burner](#)
- Google Earth: [North Korea Uncovered](#)



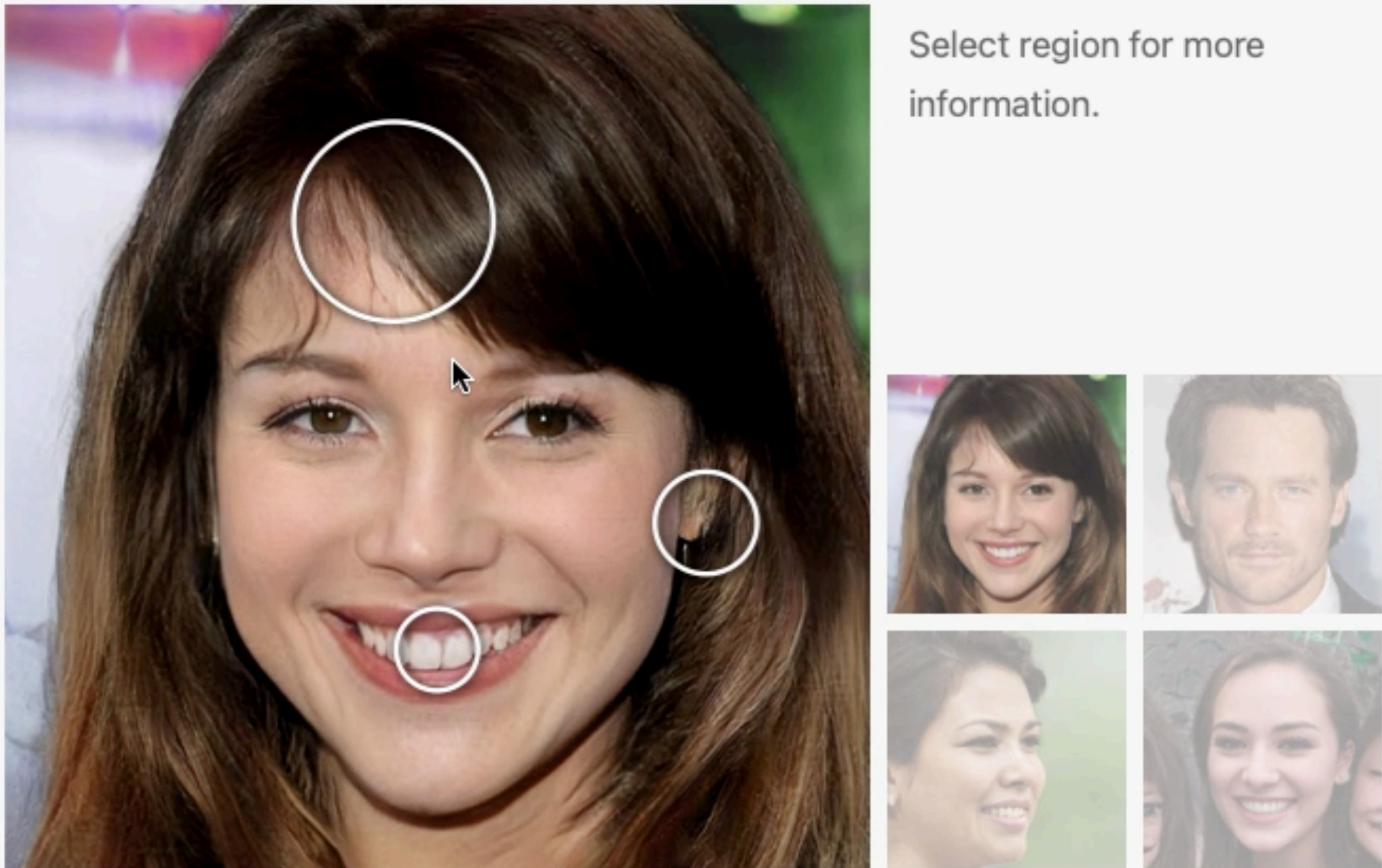
SOURCES: North Korea Uncovered; Korean Bar Association ("2008 White Paper on Human Rights in North Korea"); "The Hidden Gulag," David Hawk, U.S. Committee for Human Rights in North Korea; Joshua Stanton, *One Free Korea*; interviews with former prisoners and guards; Satellite Images: Google Earth; GRAPHIC: Kat Downs, Blaine Harden, Liz Heron, Laris Karklis and Francine Uenuma - The Washington Post

Drill-Down



What gives away a machine-generated image?

Interactivity on illustrations can help people get more context around certain objects that may not have clear and seperable boundaries.



Select region for more information.

FIGURE 7: Choose between 1 of 4 machine-generated images and brush over the circle callouts to display a short message about each region. Generated images from [128, 129].

The Universal Approximation Theorem in 3 levels of detail.

Readers come with different backgrounds. What if our content could be tailored to their level of knowledge about certain topics?

ILLUSTRATIVE — PRECISE

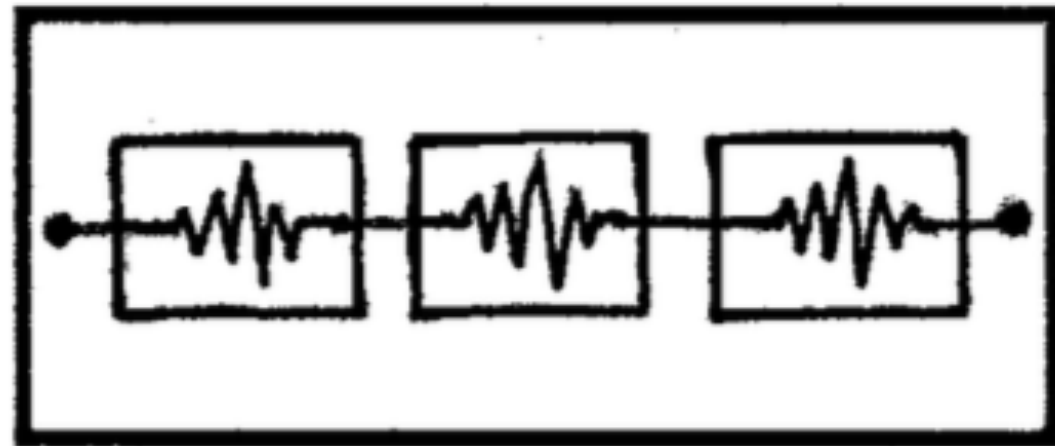
Neural networks can approximate any function that exists. However, we do not have a guaranteed way to obtain such a neural network for every function.

FIGURE 9: Drag the slider to display the theorem's statement in increasing levels of detail.

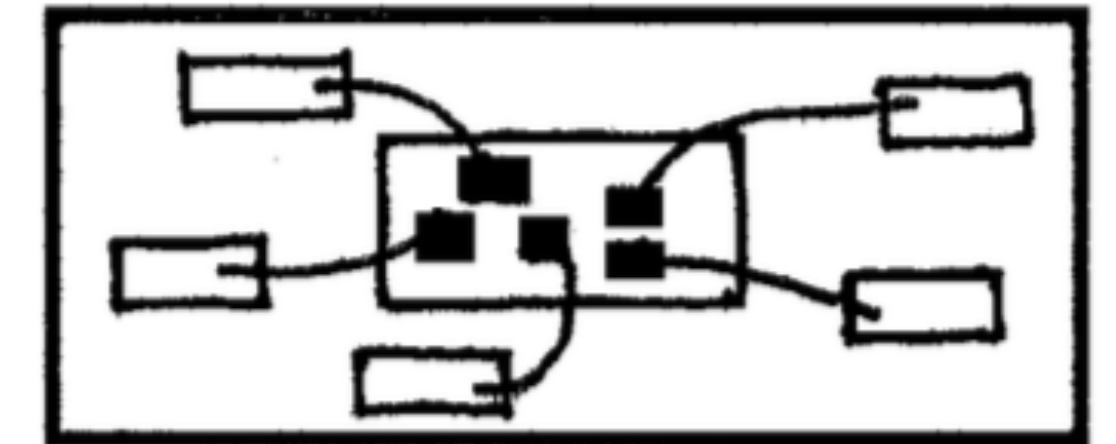
PREVIEWING CONTENT

Details-on-demand can also be used as a method for previewing content without committing to another interaction or change of view. For example, when hovering over a hyperlink on Wikinedia a preview card is shown that can contain an image and brief description: this

Interactive Slideshow



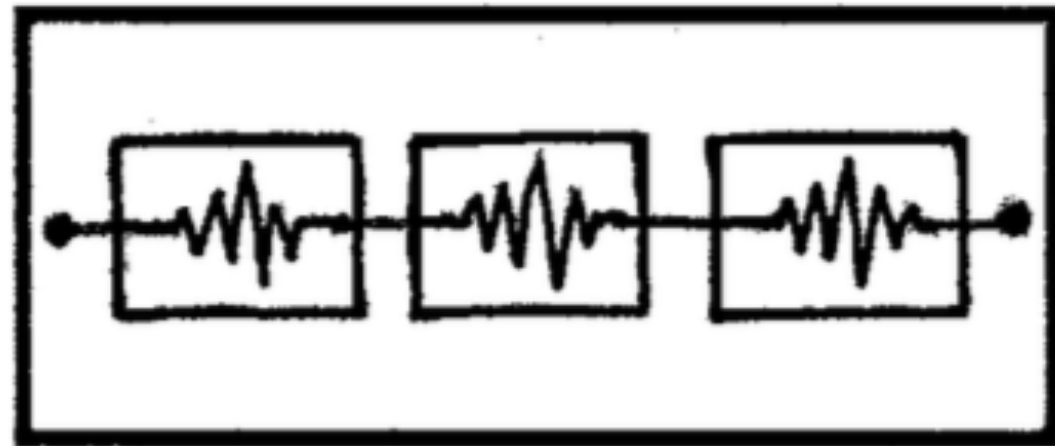
Drill-Down



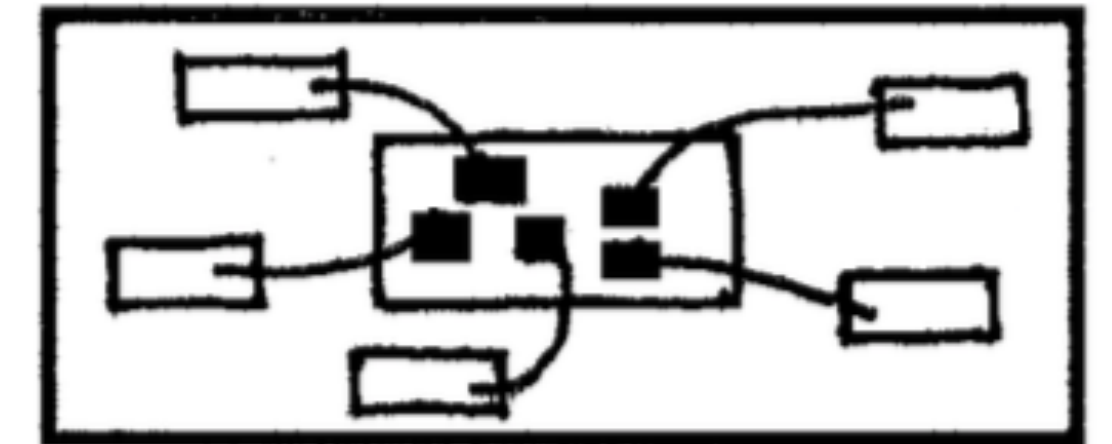
Author-Driven

Reader-Driven

Interactive Slideshow



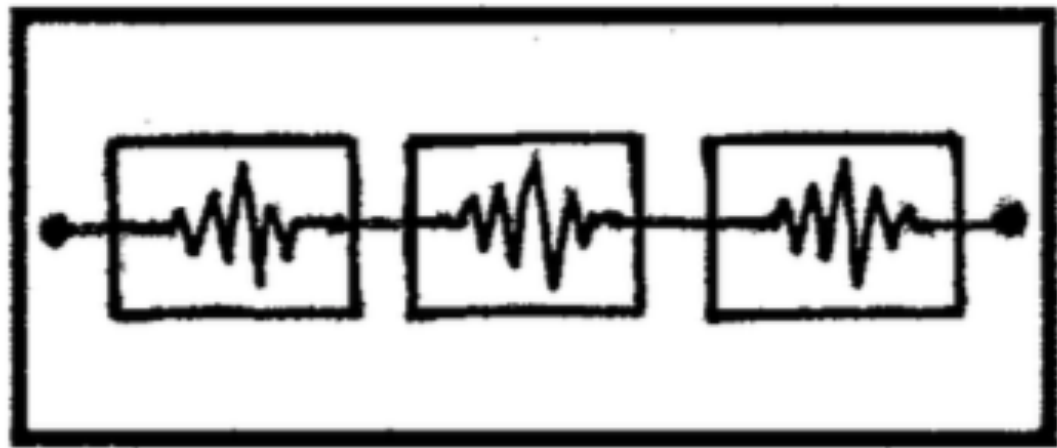
Drill-Down



Author-Driven

Reader-Driven

Interactive Slideshow



Stepper

Copenhagen: Emissions, Treaties and Impacts

At the Copenhagen climate conference, discussions are likely to cover emissions levels, the legacy of the Kyoto Protocol and the risks of inaction on global warming. Explore each issue in the tabs below.

Global Emissions

Lessons From Kyoto

Possible Impact

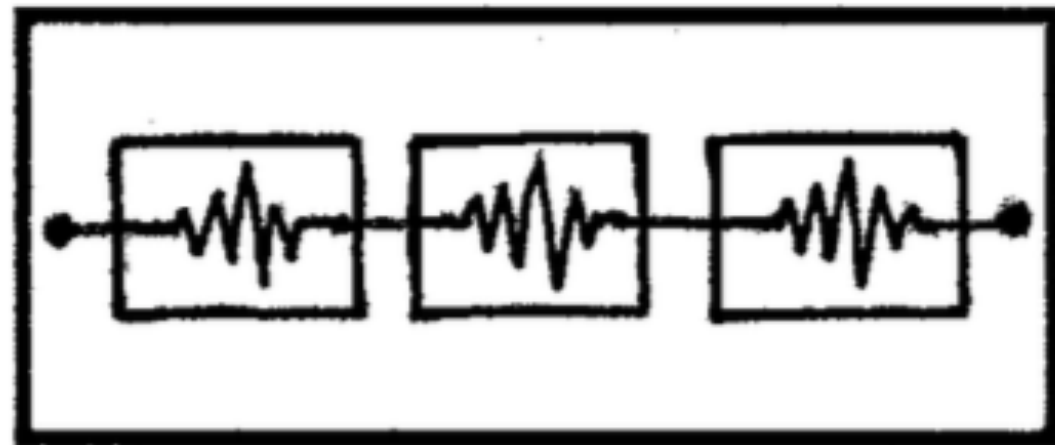
1234567891011NEXT ▶

Almost every country in the world signed and ratified the protocol. The treaty's aim was to provide a starting point for reducing global carbon dioxide emissions.

Countries that ratified Kyoto

Roll over countries to learn more

Interactive Slideshow



R2
D3

A visual introduction to machine learning

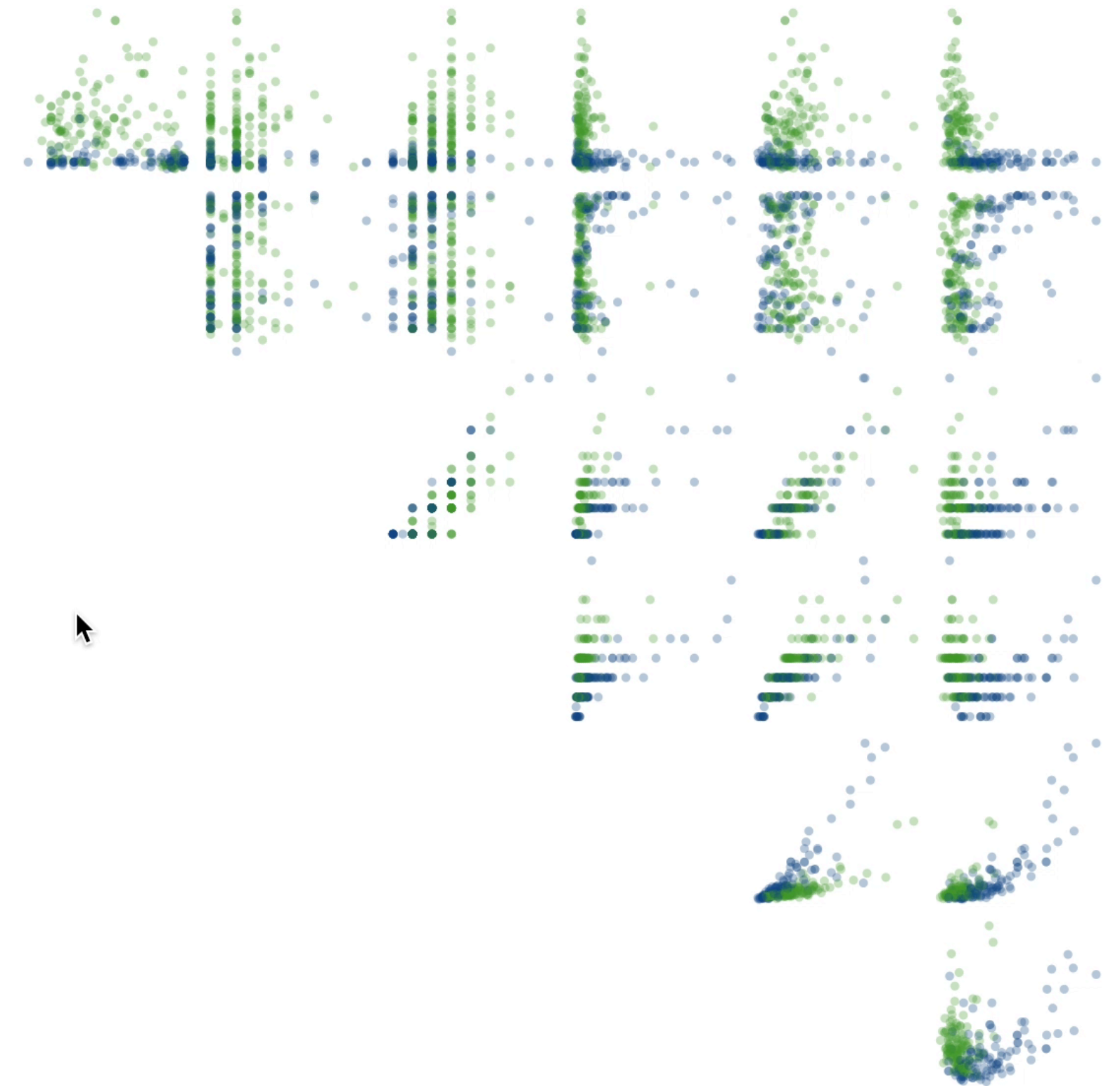
English

In machine learning, computers apply **statistical learning** techniques to automatically identify patterns in data. These techniques can be used to make highly accurate predictions.

Keep scrolling. Using a data set about homes, we will create a machine learning model to distinguish homes in New York from homes in San Francisco.

“Scrolly”-telling

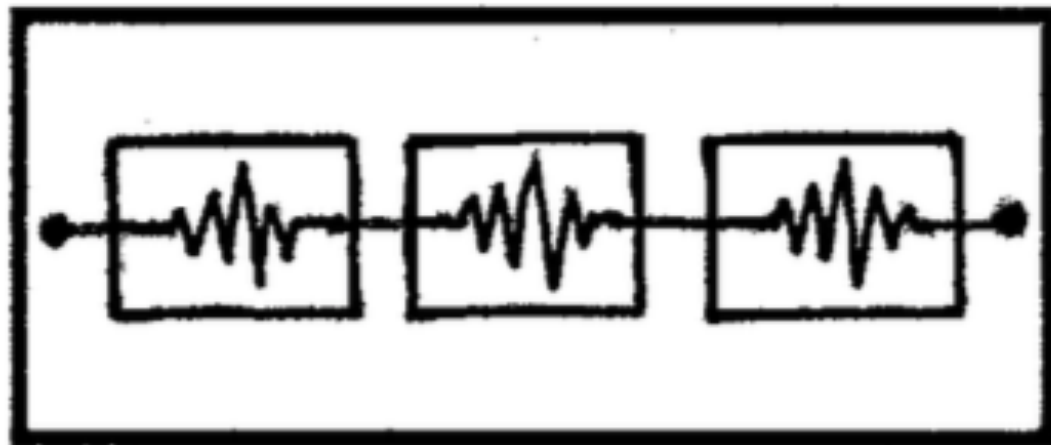
SCROLL



Discrete vs. Continuous Steps

A source of debate among practitioners!

Interactive Slideshow



You will make one for Lab 8!

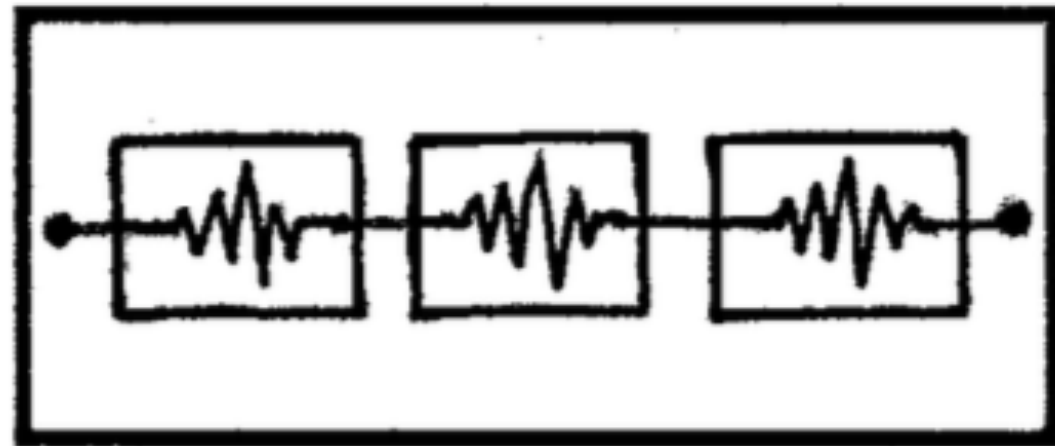
Discrete

- ✓ Simple & familiar.
- ✗ But less engaging?

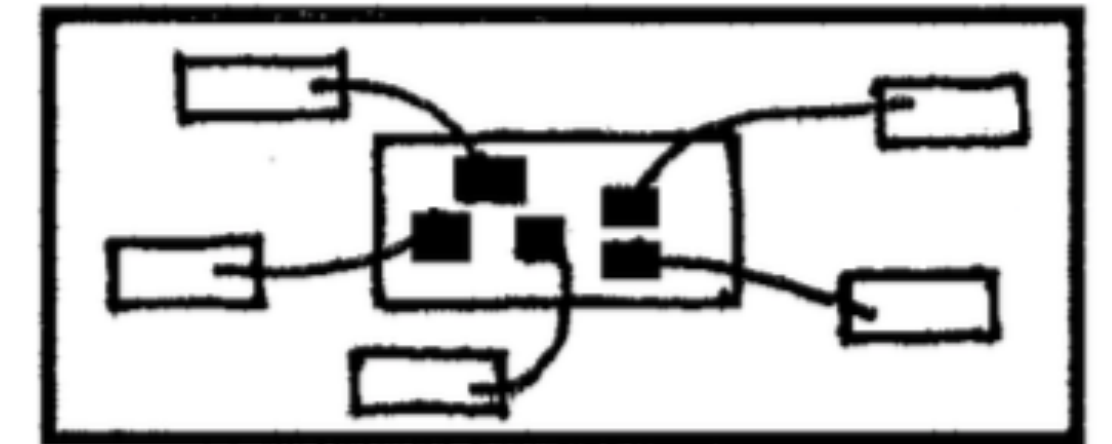
Continuous

- ✓ Less “activation energy” required.
- ✓ More fluid/direct: parameterized by scroll position = rapid, incremental experience.
- ✗ But, difficult to implement properly.
Can result in “*scrolljacking*.”

Interactive Slideshow



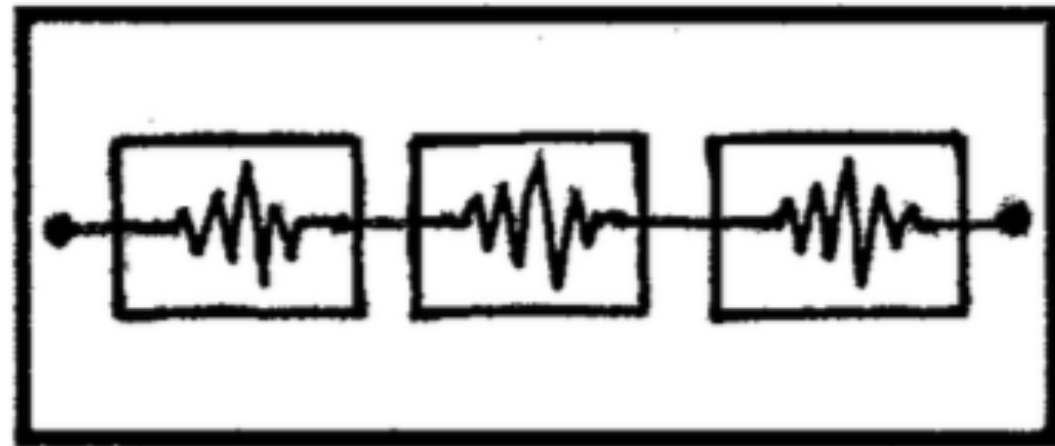
Drill-Down



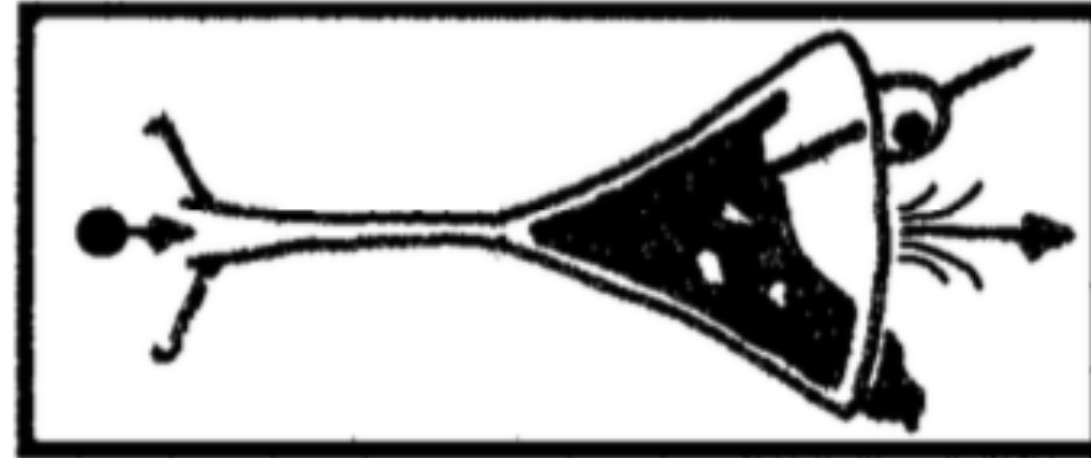
Author-Driven

Reader-Driven

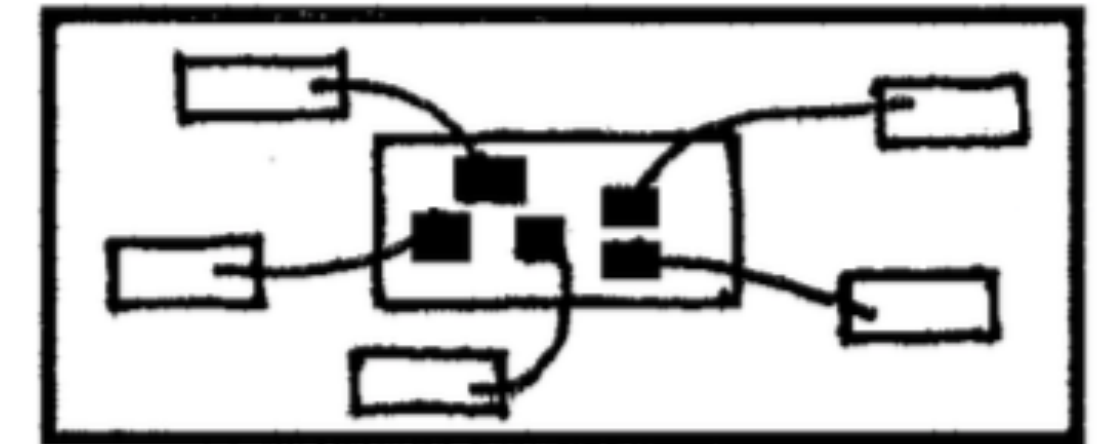
Interactive Slideshow



Martini Glass



Drill-Down

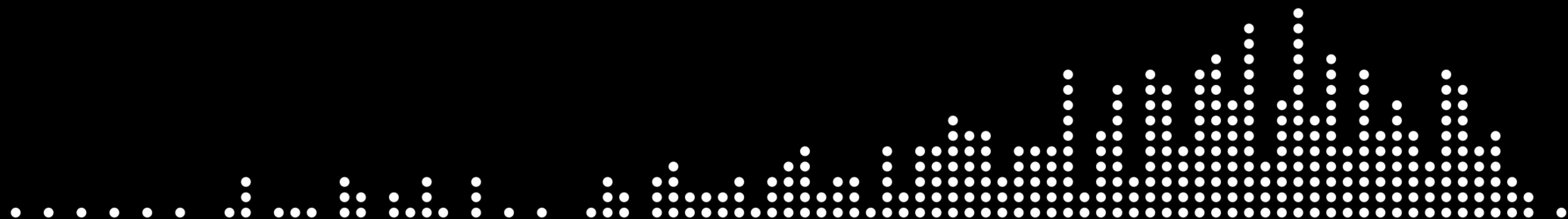


Author-Driven

Reader-Driven


Kernel Density Estimation

By: [Matthew Conlen](#)



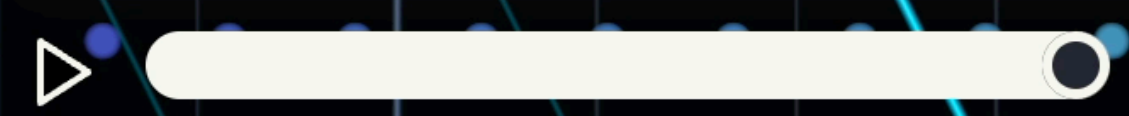
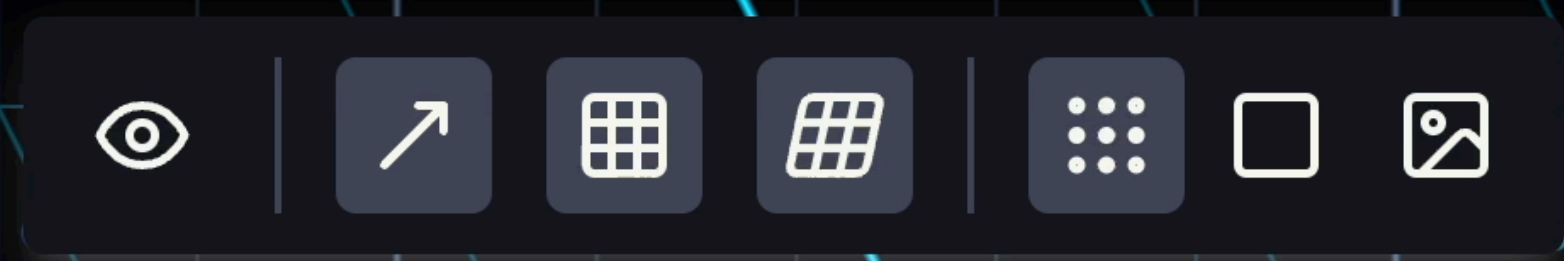
What do **matrices** mean to you?

Why do we need a way to represent an array of rows and columns of numbers, and to execute computations and operations between them?

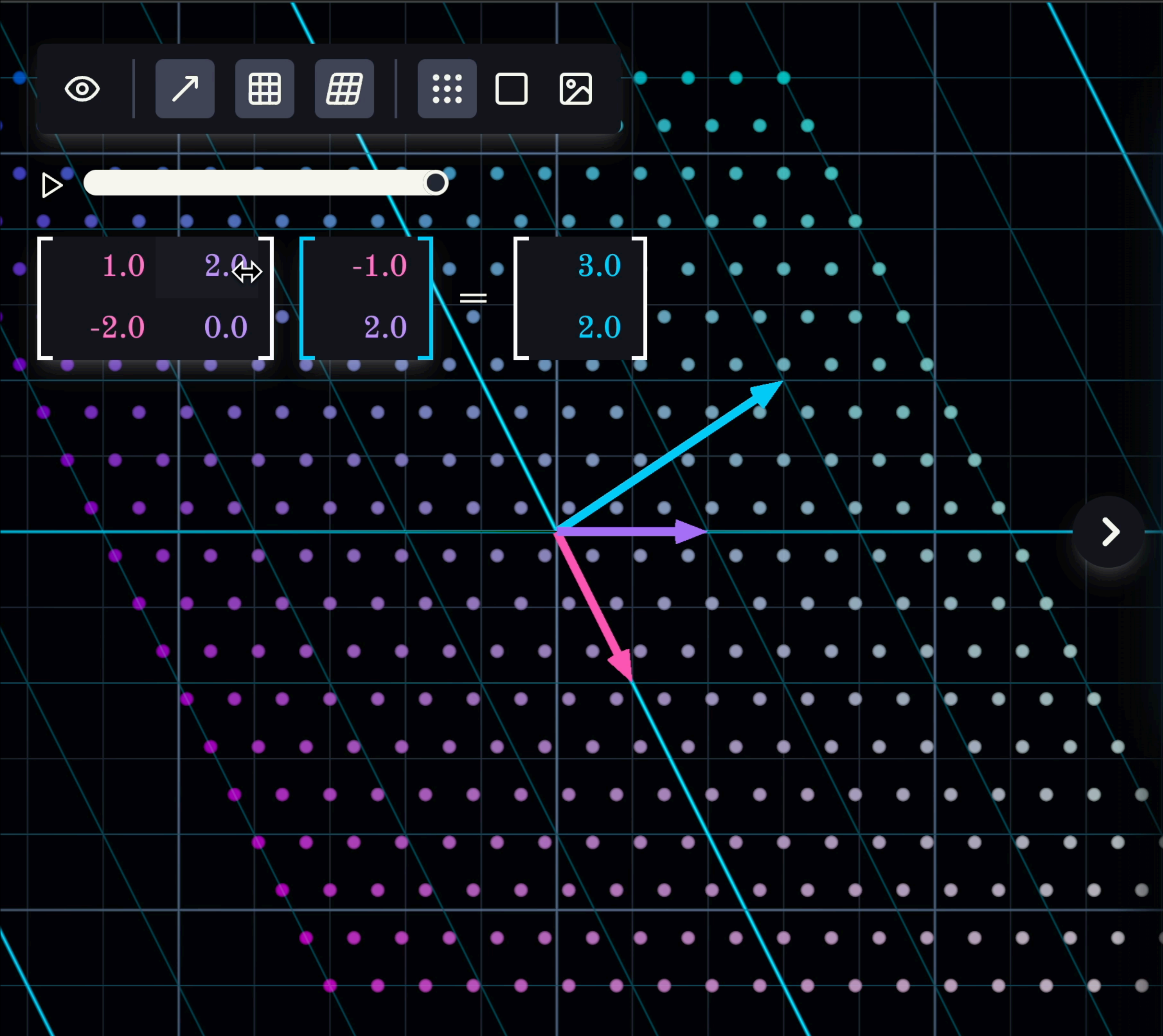
$$\begin{bmatrix} 1 & 2 \\ -2 & 0 \end{bmatrix} \begin{bmatrix} -1 \\ 2 \end{bmatrix} = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$$


In school, you may recall reluctantly performing drill after drills of matrix-vector multiplications mechanically. You may even have been taught to memorize several inane formulas.

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = x \begin{bmatrix} a \\ c \end{bmatrix} + y \begin{bmatrix} b \\ d \end{bmatrix}$$
$$= \begin{bmatrix} ax + by \\ cx + dy \end{bmatrix}$$



$$\begin{bmatrix} 1.0 & 2.0 \\ -2.0 & 0.0 \end{bmatrix} \begin{bmatrix} -1.0 \\ 2.0 \end{bmatrix} = \begin{bmatrix} 3.0 \\ 2.0 \end{bmatrix}$$



RECAP

- Any vector can be expressed as the addition of scaled basis vectors, i.e. **a linear combination of basis vectors**.
- A matrix can be viewed as a way to **package information about a linear transformation**. The columns of a matrix represent where the new basis vectors land after the transformation.
- Matrix-vector multiplication is a way to compute where a given vector lands after the transformation defined by a matrix.

With our understanding so far, try to tinker about and figure out what kinds of transformations are possible with matrices!

Takeaways

What's your and, but, therefore?

Storytelling	The project tells a compelling story. It follows the and-but-therefore structure and also incorporates elements of surprise, personalization, or emotion. (+3 points)	The project tells a story – it follows the and-but-therefore structure. (+2 points)	The project does not tell a story (e.g. it doesn't follow the and-but-therefore structure or something similar). (+1 point)
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We will grade you on storytelling for your final projects!