DS2003 Communicating with Data
Fall 2026

Interactions & Interactive Storytelling

Adapted from slides by Hannah Bako

Notes

- Has everyone connected with their project 2 groups?
- Lab 6: get ½ points back if you resubmit by Friday @ midnight
- Due tonight: Lab 7; any questions? (WRITE OUT ANSWERS!)
- Due Wednesday: Project 2 proposal (<1 page)

What you will learn today

- Interaction techniques
  - Derive
  - Organize
- Interactive storytelling
- Activities: play & reflect, design critique

Seven Categories: “show me…”

- Select
- Explore
- Reconfigure
- Encode
- Abstract/Elaborate
- Filter
- Connect

Dynamic Queries

Dynamic queries are interactive controls that allow users to explore large information spaces by adjusting parameters (e.g., sliders, buttons, filters) and seeing immediate updates to the visualization.

Ben Shneiderman

Idea at heart of Dynamic Query

- There often simply isn’t one perfect response to a query
- Want to understand a set of tradeoffs and choose some “best” compromise
- You may learn more about your problem as you explore

Slide courtesy of John Stasko

Query Controls

- Nominal
  - Binary: buttons
  - Low cardinality: radio buttons
  - High cardinality: search box (with suggestions), add hierarchy
- Ordinal & Quantitative
  - One value: sliders, spinners
  - Value range: range sliders

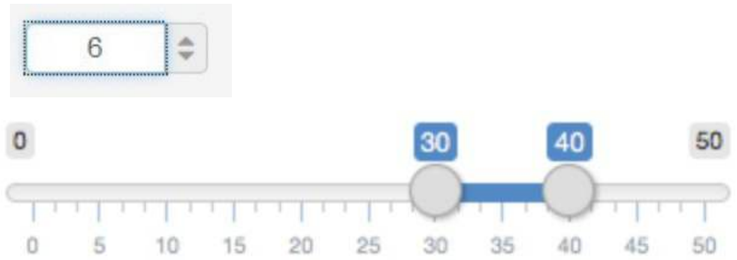


TABLE 1: Taxonomy of interactive dynamics for visual analysis

Data & View Specification	**Visualize** data by choosing visual encodings. **Filter** out data to focus on relevant items. **Sort** items to expose patterns. **Derive** values or models from source data.
View Manipulation	**Select** items to highlight, filter, or manipulate them. **Navigate** to examine high-level patterns and low-level detail. **Coordinate** views for linked, multi-dimensional exploration. **Organize** multiple windows and workspaces.
Process & Provenance	**Record** analysis histories for revisitation, review and sharing. **Annotate** patterns to document findings. **Share** views and annotations to enable collaboration. **Guide** users through analysis tasks or stories.

Interactive Dynamics for Visual Analysis

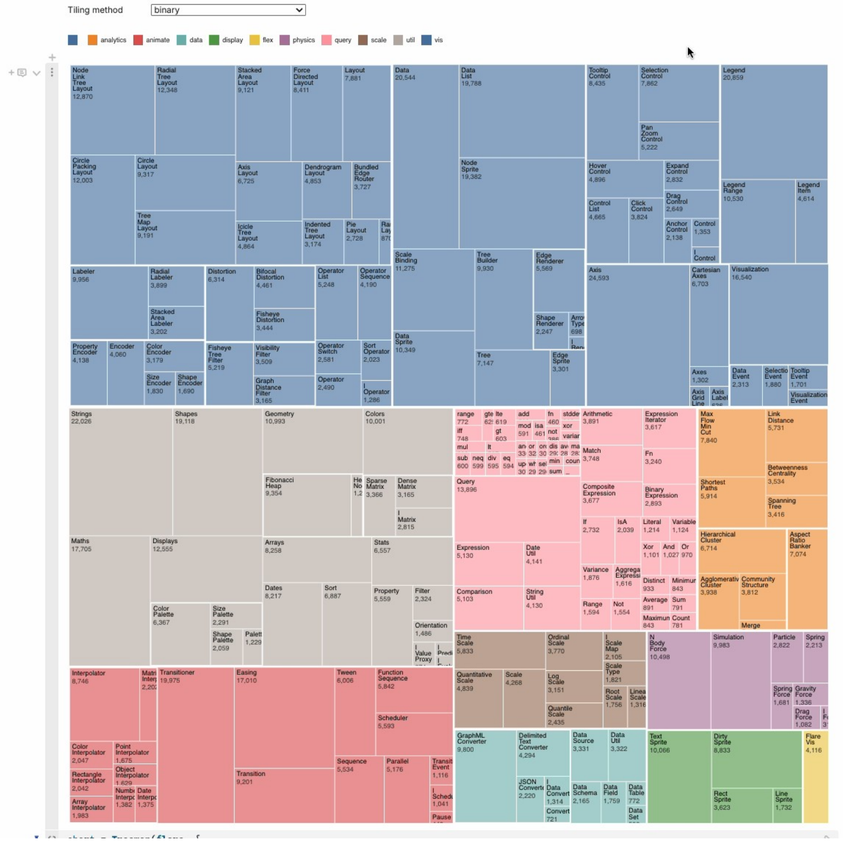
Heer and Shneiderman 2012

Derive

- variables may need to be transformed or new attributes derived from existing values
    - normalization
    - log transforms
- How can visual tools support flexible construction of more advanced models or derived values?
    - programming by demonstration
    - automatic suggestion of models

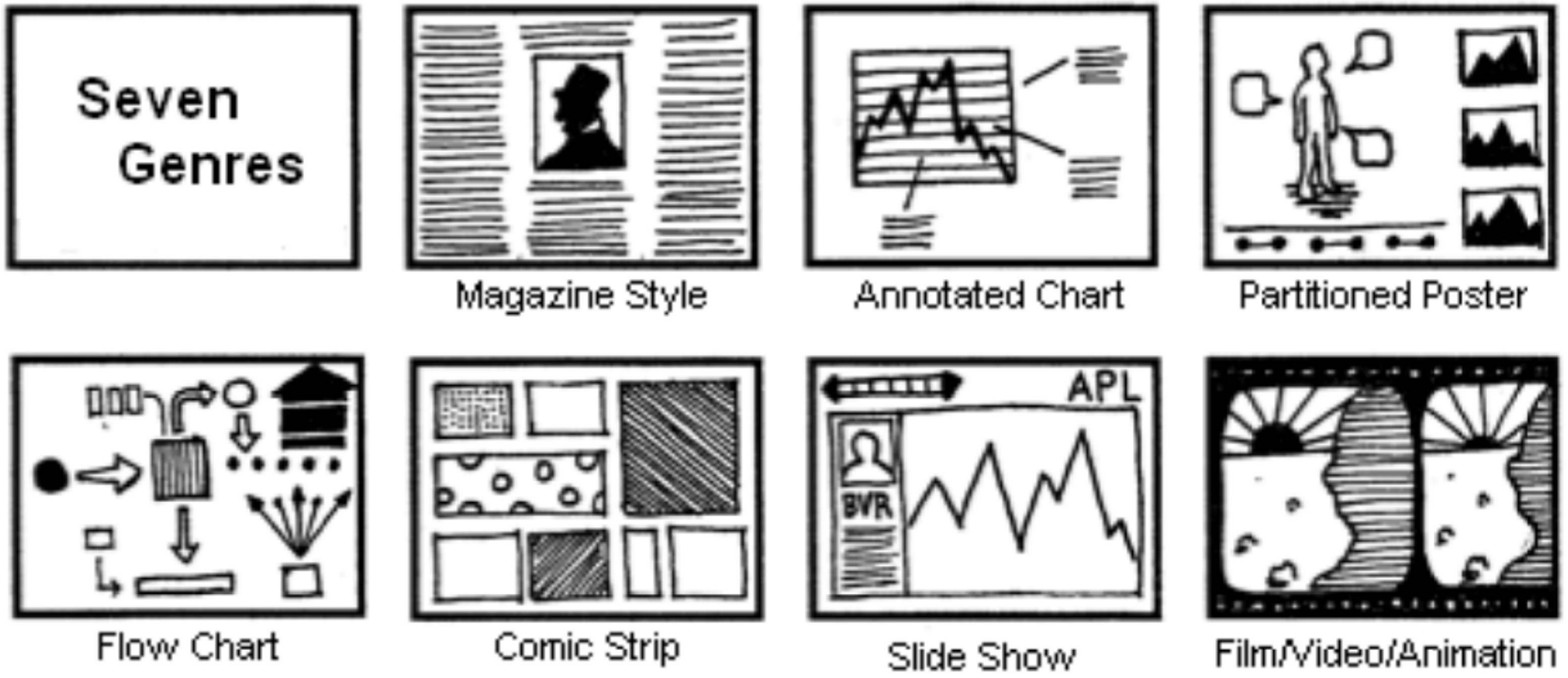
Organize

- manage a collection of visualizations
  - open, close, maximize, lay out components



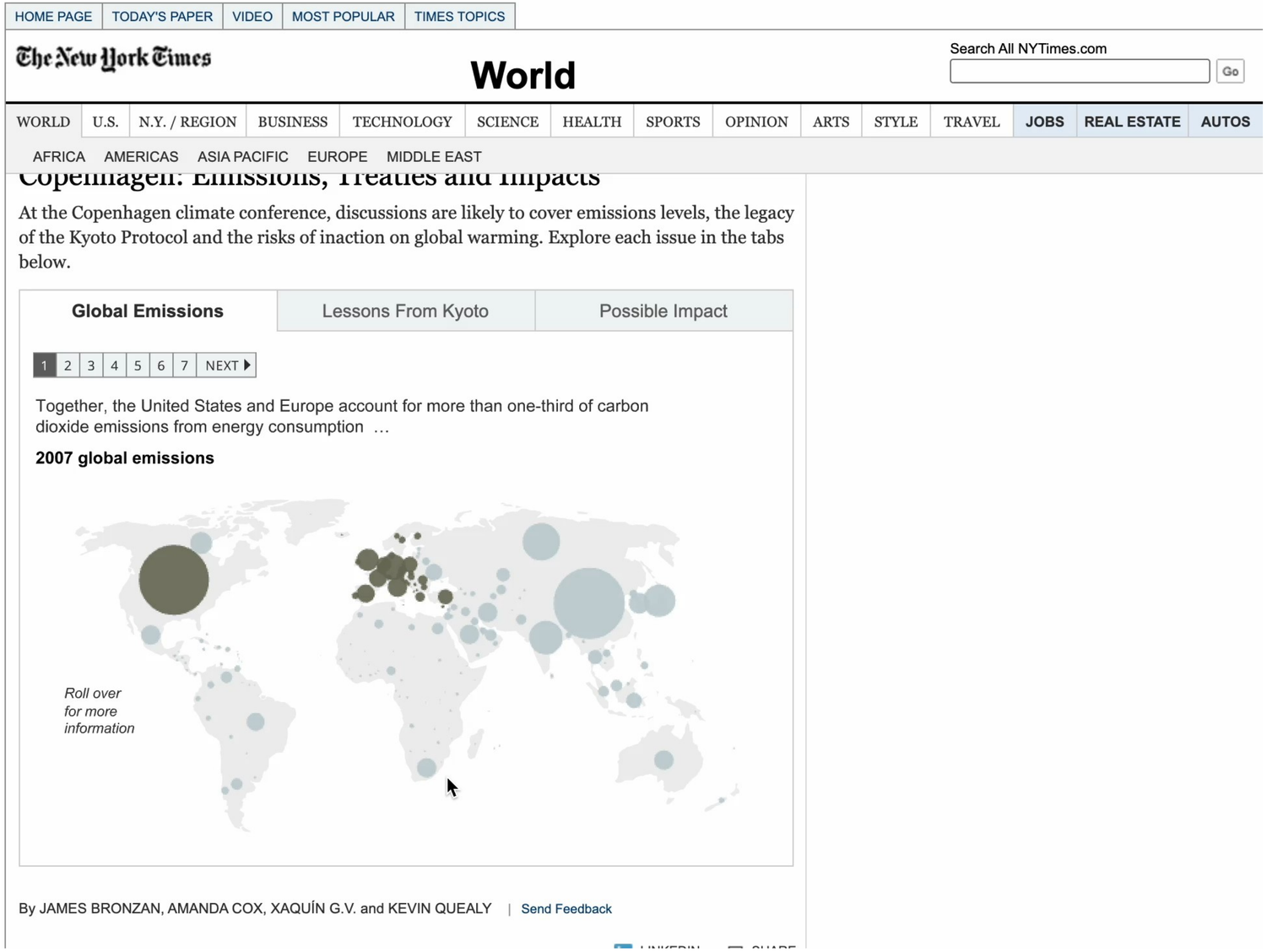
Interactive Storytelling

Genres



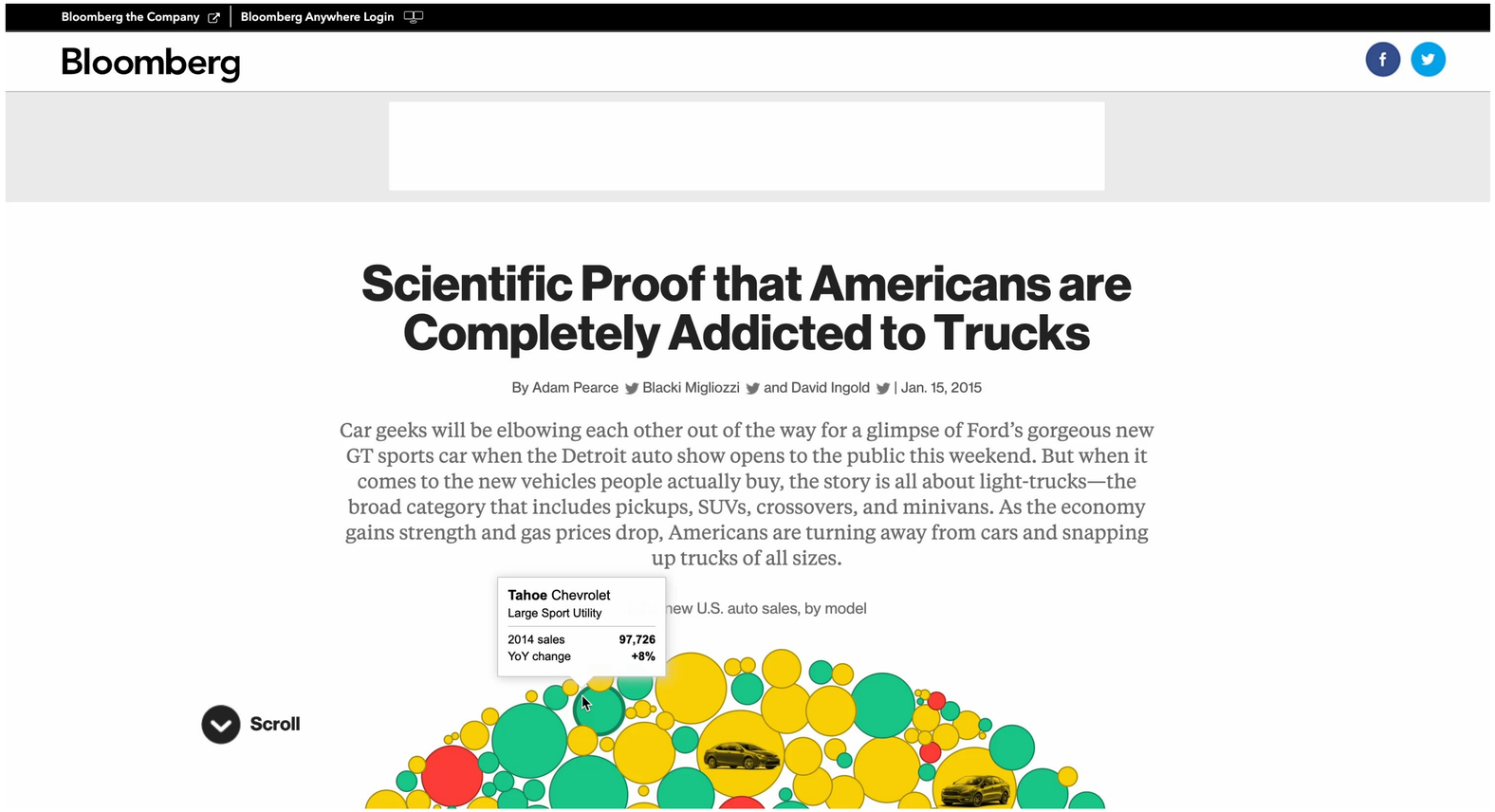
Missing “scrolly-telling” designs…

Interactive Documents: Stepper



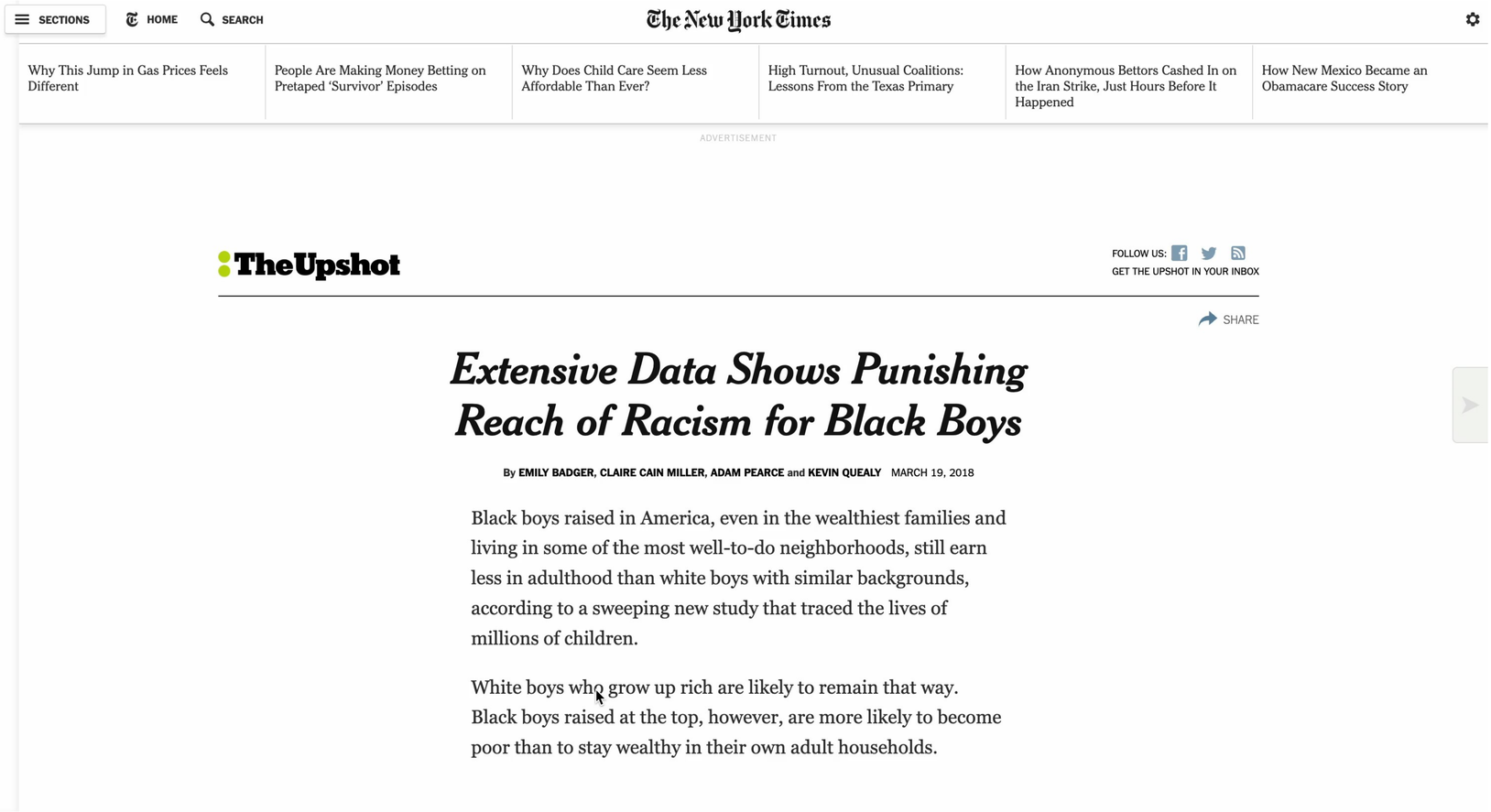
https://archive.nytimes.com/www.nytimes.com/interactive/2009/12/05/world/climate-graphic-background.html#tab=0

Interactive Documents: Scroller



https://www.bloomberg.com/graphics/2015-auto-sales/

Interactive Documents: Animation

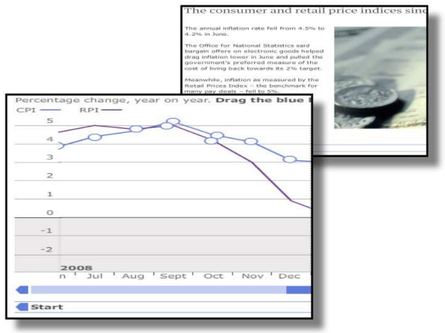


s://www.nytimes.com/interactive/2018/03/19/upshot/race-class-whit
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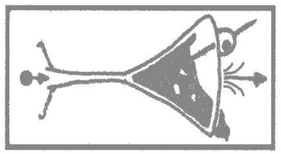
Interactive Documents: Design Considerations

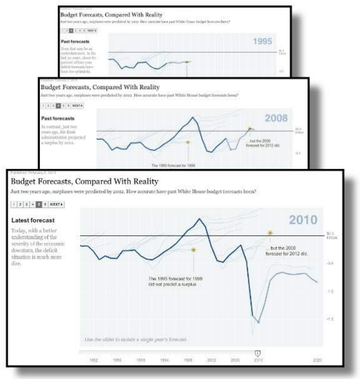
- Reader-driven vs. Author-driven

STORYTELLING	**Author Driven**	**Reader Driven**	ASK QUESTIONS
CLARITY	strong ordering	weak ordering	EXPLORE
SPEED	heavy messaging	light messaging	FIND
	limited interactivity	free interactivity	

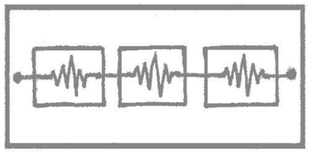


martini glass





interactive slideshow





drill-down story

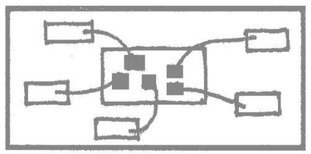


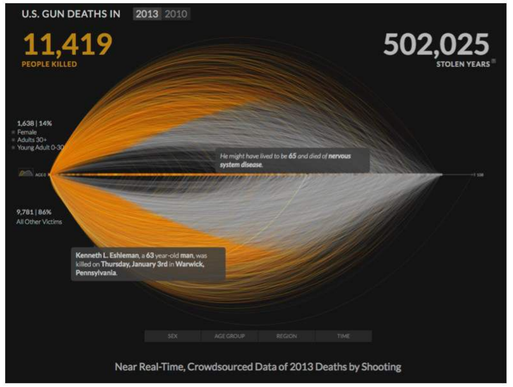
image courtesy of Matthew Conlen

Author or Reader Driven

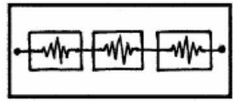
Martini Glass Structure



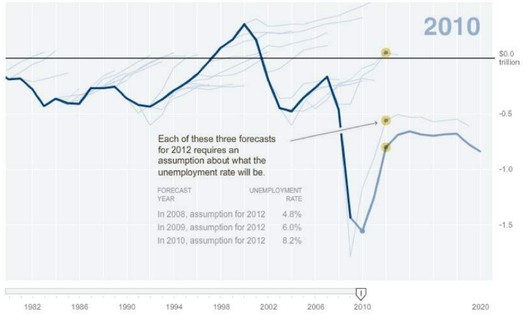
start with author driven, open up for exploration



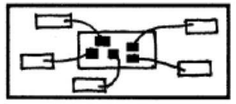
Interactive Slideshow



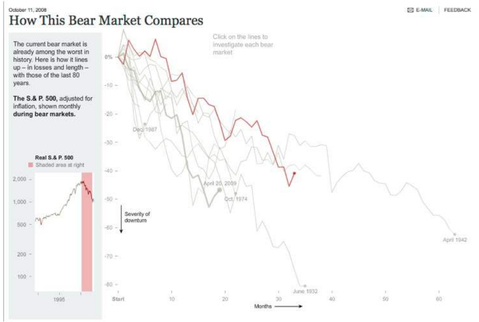
Split into multiple scenes, allow interaction mid-way



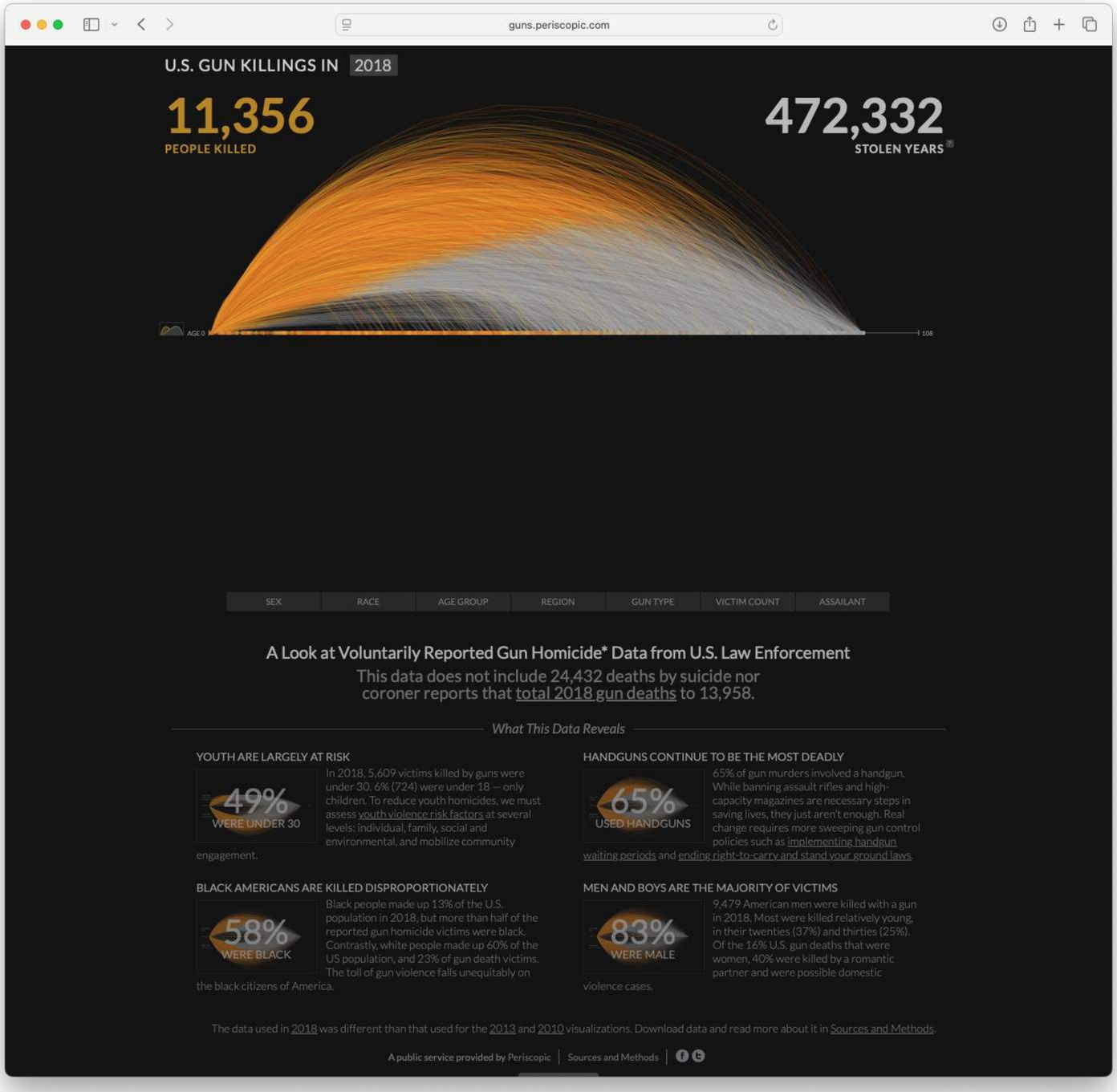
Drill-Down Story



Let reader decide which path to follow, all paths are annotated!



https://guns.periscopic.com/



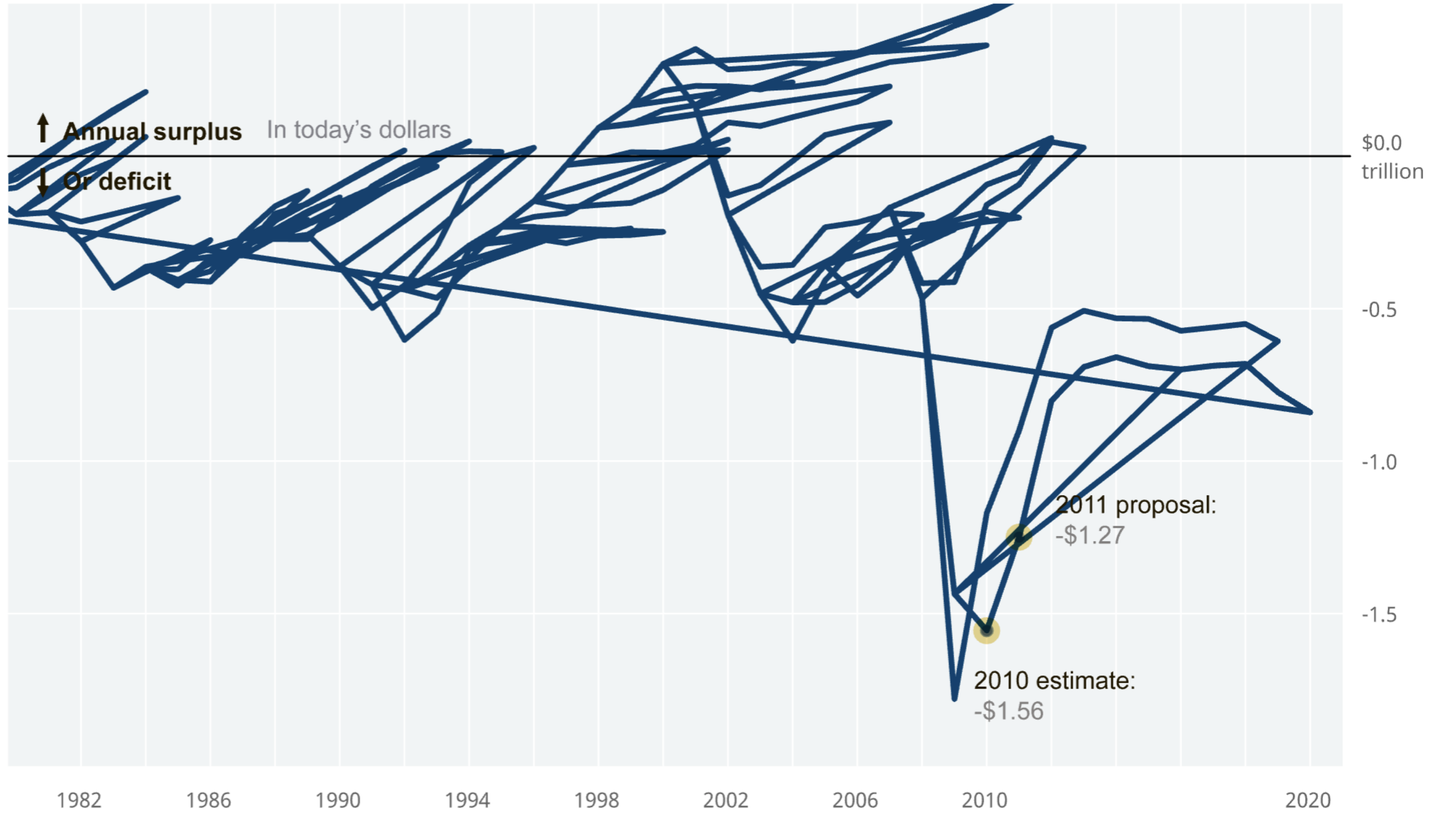
Budget Forecasts, Compared With Reality

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 ▶

Falling short

President Oba
budget propo
estimates a de
$1.6 trillion fo
current fiscal y
$1.3 trillion in



https://archive.nytimes.com/www.nytimes.com/interactive/2010/02/02/us/politics/20100201-budget-porcupine-graphic.html

October 11, 2008

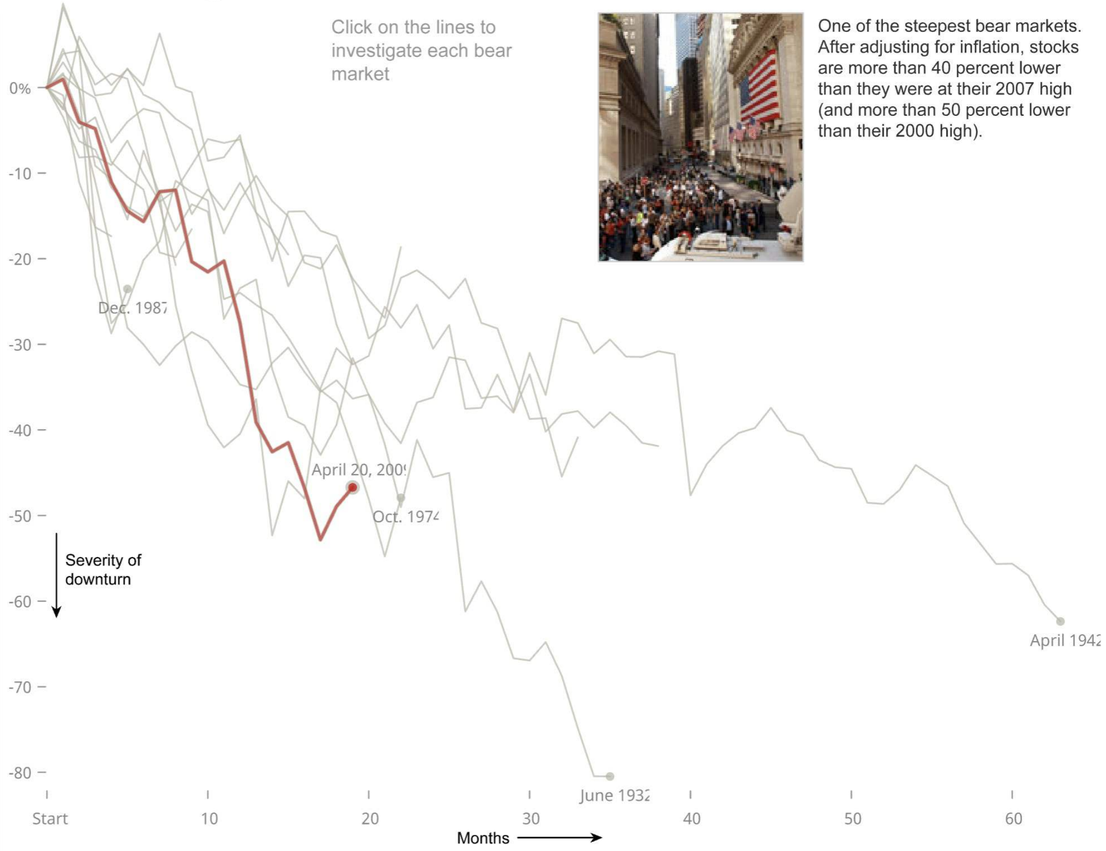
FEEDBACK

How This Bear Market Compares

The current bear market is already among the worst in history. Here is how it lines up – in losses and length – with those of the last 80 years.

The S.& P. 500, adjusted for inflation, shown monthly **during bear markets.**





One of the steepest bear markets. After adjusting for inflation, stocks are more than 40 percent lower than they were at their 2007 high (and more than 50 percent lower than their 2000 high).

https://archive.nytimes.com/www.nytimes.com/interactive/2008/10/11/business/20081011_BEAR_MARKETS.html

Death of interaction?

- Observation by Gregor Aisch who works at NYT, 2016 (link to talk)
  - “Barely anyone interacts with the New York Times’ graphics”
  - Only 10–15% of people clicking on buttons — even essential ones
  - On top of that, interactives are expensive to make — they have to work across devices, using trackpads and fingers.
- In the context of NYT graphics, storytelling is the goal
  - readers need to be interested in the topic
  - mobile device is a dominant platform to consume graphics

https://medium.com/@dominikus/the-end-of-interactive-visualizations-52c585dcafcb

Scrollytelling

- Pros and cons?



Step

- Simple and familiar
- Clear context
- Explicit navigation
- Engaging?

Scroll

- Continuity
- Lightweight
- Seamless
- may cause usability/scrolljacking issues

Main difference: who controls the timing/experience of the animaton between steps

https://medium.com/@zanarmstrong/why-choose-scrollytelling-steppers-155a59dd97fe

All Spending | Types of Spending | Changes | Department Totals

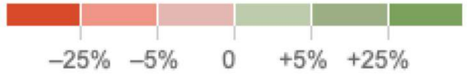
How $3.7 Trillion Is Spent

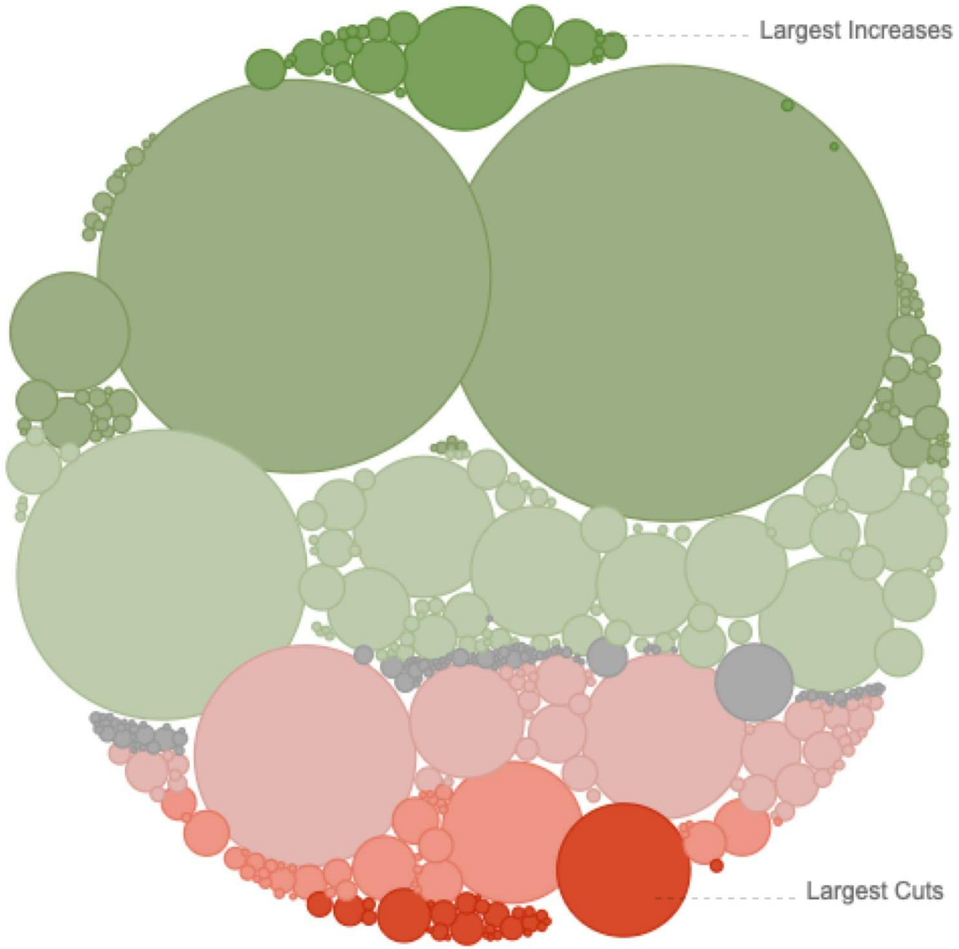
Mr. Obama's budget proposal includes $3.7 trillion in spending in 2013, and forecasts a $901 billion deficit.

Circles are sized according to the proposed spending.



Color shows amount of cut or increase from 2012.

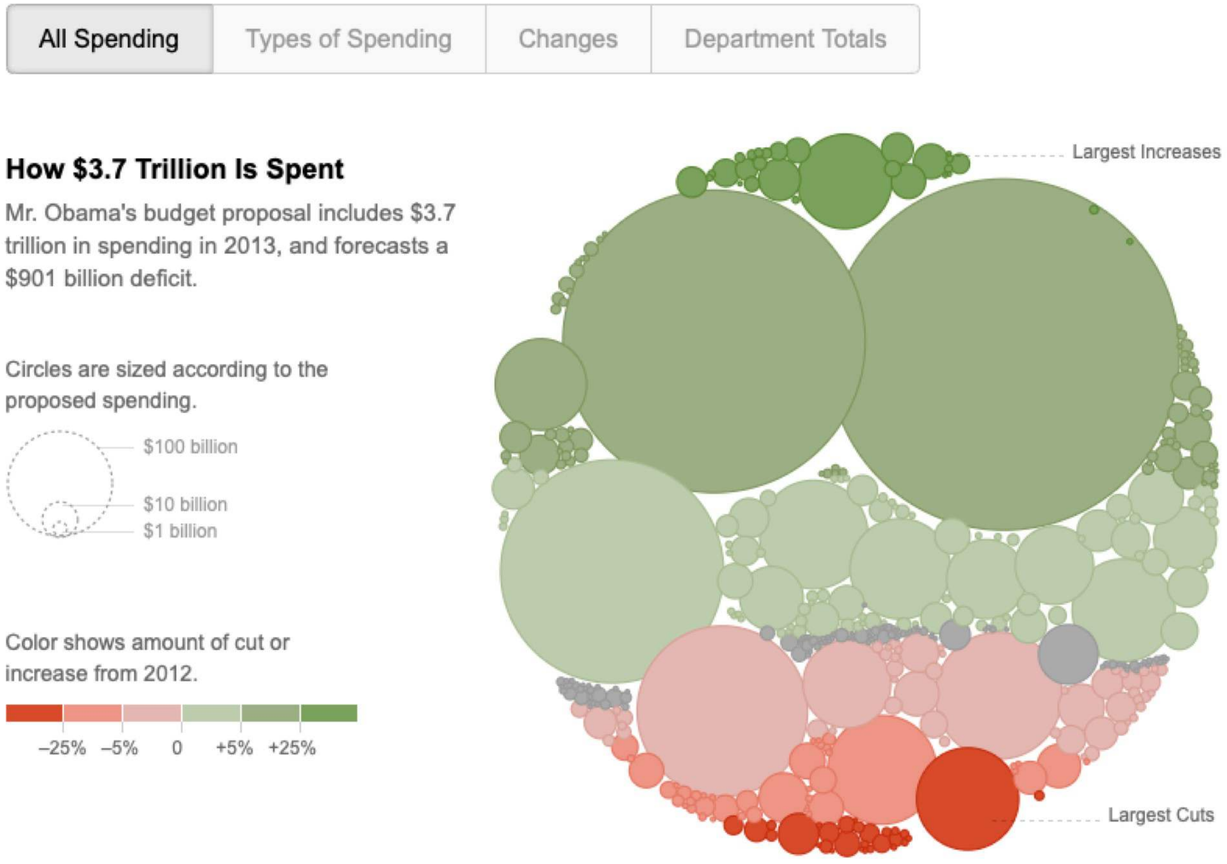




The proposal forecasts a $901 billion deficit.

Source: bit.ly/budget-vis

Group exercise



- What types of interactions are used in this visualization?
- Is the visualization easy to understand? Does interaction make it easier or harder to gain insights into the data?
- Can you suggest any improvements? How would you redesign it (both visually and from an interaction point of view)?

Link: bit.ly/budget-vis

Activity: Play & Reflect

Play & Reflect

- In your Project 2 group, try at least two examples, including one notebook
- Don't read any instructions first: give each one 2 minutes and just try to use it
- After each one, answer the reflection questions
- Share out: your clearest and your most confusing example, and why

Scrollytelling examples to explore

- **A Visual Introduction to Machine Learning** R2D3

  Scroller: one chart transforms as you read

- **Parable of the Polygons** Vi Hart & Nicky Case

  Explorable: you drag the shapes and run the model yourself

- **Film Dialogue by Gender** The Pudding

  Story first, then search and filter 2,000 films (martini glass)

- **Women's Pockets are Inferior** The Pudding

  Scroll essay built from measuring 80 pairs of jeans

- **Human Terrain** The Pudding

  Scroll-driven 3D map of world population, 1975 to 2015

NYT scrollytelling examples

- **Snow Fall: The Avalanche at Tunnel Creek** 2012

  The piece that made scrollytelling a genre: text, video and maps woven together

- **How the Recession Reshaped the Economy, in 255 Charts** 2014

  A guided scroll first, then all 255 charts to explore

- **You Draw It: How Family Income Predicts Children's College Chances** 2015

  You draw your guess before the data is revealed

- **How Much Hotter Is Your Hometown Than When You Were Born?** 2018

  Personalized: the story is built from your city and birth year

Dashboards

- **Gapminder Tools** Gapminder

  Income, health and population for every country since 1800

- **COVID-19 Data Explorer** Our World in Data

  Pick a metric, countries and a chart type

- **Unemployment Rate** FRED, St. Louis Fed

  75+ years of U.S. unemployment, plus thousands of other series

- **earth** nullschool

  Live global wind, weather and ocean conditions

- **Explore Census Data** U.S. Census Bureau

  Search any Census table, map or profile

Notebooks

- **Lego Price Explorer** marimo

  A Python notebook running in your browser: Lego set prices, 1970 to 2022

- **Movies Dashboard** marimo

  Pick a date range or a decade to explore films

- **Zoomable Sunburst** Observable

  Hierarchical data: you'll build sunbursts in Lab 9

- **Brushable Scatterplot Matrix** Observable

  Every pair of variables in one grid

Reflection questions (for each example)

1. Rate it 1–5: how clear was it what to do? What made it clear or unclear?
2. Was it an example of martini glass, interactive slideshow, or drill down? Was this an effective way to tell the story? (Notebooks with several sequential plots are akin to interactive slideshow)
3. What interactive techniques were possible? (Circle: Select, Explore, Reconfigure, Encode, Abstract/Elaborate, Filter, Connect, Organize, Derive)
4. Was there any interactivity that you felt was missing?
5. What could you learn from it that a static chart couldn't show you?
6. One thing to copy, and one to avoid (add to our shared Google doc)

Takeaways for your notebook

- **Hidden interaction** → say what to do: “drag to select”, “pick a country”
- **Scroll steps** → one markdown cell and one chart per idea
- **Martini glass** → author-driven About section, then the reader-driven Interactive section
- **Highlight the current step** → active titles, annotations, one highlighted series
- **Reader picks a path** → a dropdown that changes the chart's focus
- **Animated transition** → one chart and a slider (e.g., year), not ten charts