

# Interaction

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**DSC 106: Data Visualization**

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UC San Diego

# Announcements

Lab 5 due today.

Project 3 team form due Monday.

Project 3 checkpoint due Tuesday.

Project 2 peer grading out, due Tuesday.

## **FAQs:**

- 1. What if I forget to turn in the team form?** We will randomly assign you to a team of 3-4 students.
- 2. What if I can't find a team by Monday?** We will randomly assign you to a team of 3-4 students.

# Project 2 Peer Feedback

Opportunity to get feedback from your peers.

"I like / I wish / What if?" format.

Worth 1% of your final grade, graded by completion.

# Project 3: Interactive Visualization

Choose a dataset.

Create **one** interactive graphic to let readers explore the data.

**Must use D3**, no other plotting libraries allowed.

Must complete in teams of 3-4.

Pro-tip: Explore lots of options using pen-and-paper. Then, keep scope of project very tight! Do one thing well.

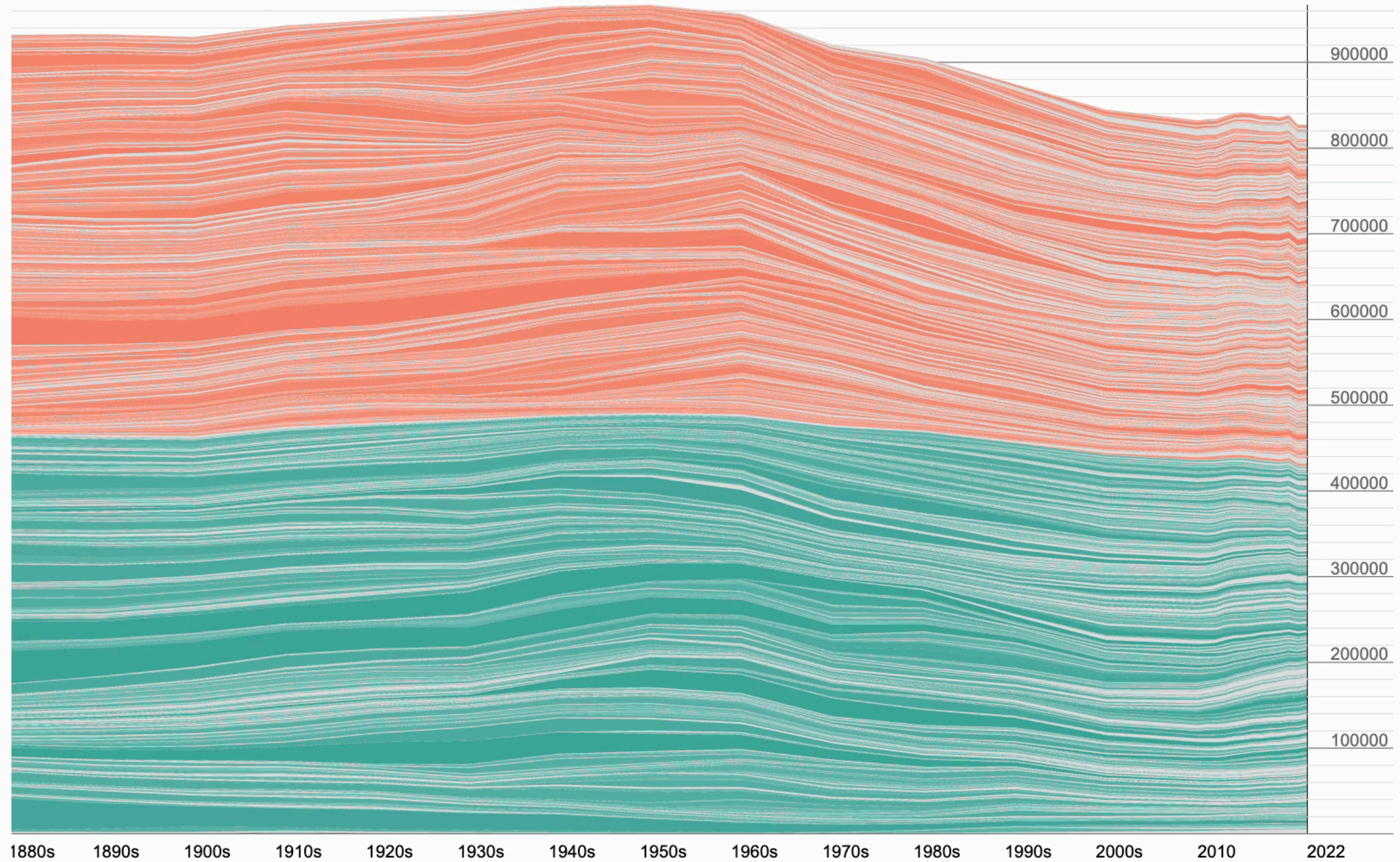
Starts with Ends with Contains Exact Match

Girls Boys Both

↑ Type a name

Total Compare

per million births



<https://namerology.com/baby-name-grapher/>

# Interaction

## Gulf of Evaluation

The level of difficulty in interpreting the system and assessing if goals were met.



User Goals



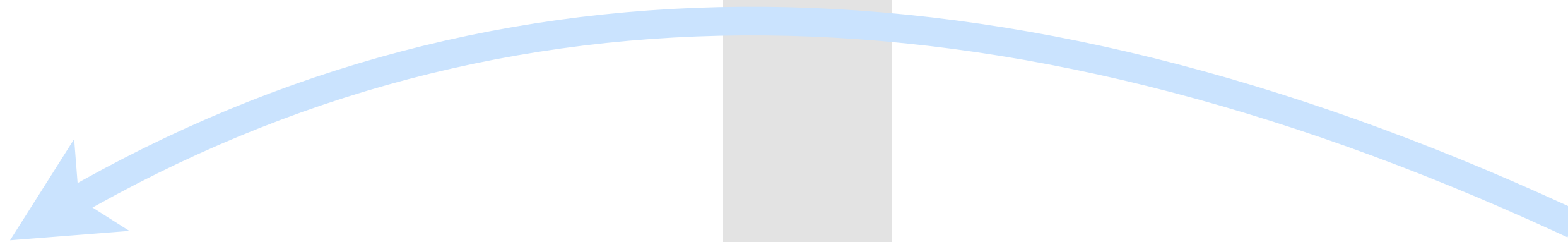
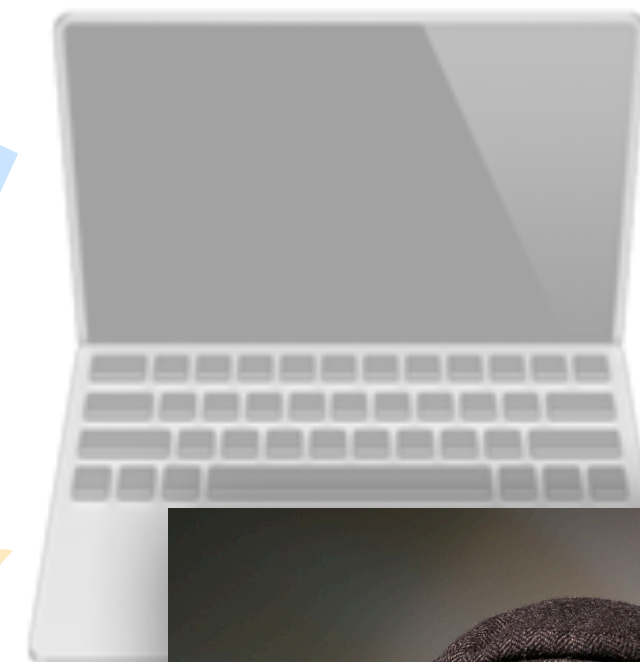
Interface

## Gulf of Execution

The gap between the user's goals and their ability to achieve them using the system.

# Gulf of Evaluation

The level of difficulty in interpreting the system and assessing if goals were met.



Goals

Inter

**Gulf of Execution**  
The gap between a user's goals and the ability to achieve them by interacting with the system.



**Edwin Hutchins**



**Jim Hollan**



**Don Norman**

## Gulf of Evaluation

The level of difficulty in interpreting the system and assessing if goals were met.



User Goals



Interface

## Gulf of Execution

The gap between the user's goals and their ability to achieve them using the system.

day	stock	price
10/3	AMZN	957.10
10/3	MSFT	74.26
10/4	AMZN	965.45
10/4	MSFT	74.69

```
pd.read_csv('stocks.csv')
```

day	symbol	price
10/3	AMZN	957.10
10/4	AMZN	965.45

```
df[df['price'] > 900]
```

day	stock	price
10/3	AMZN	957.10
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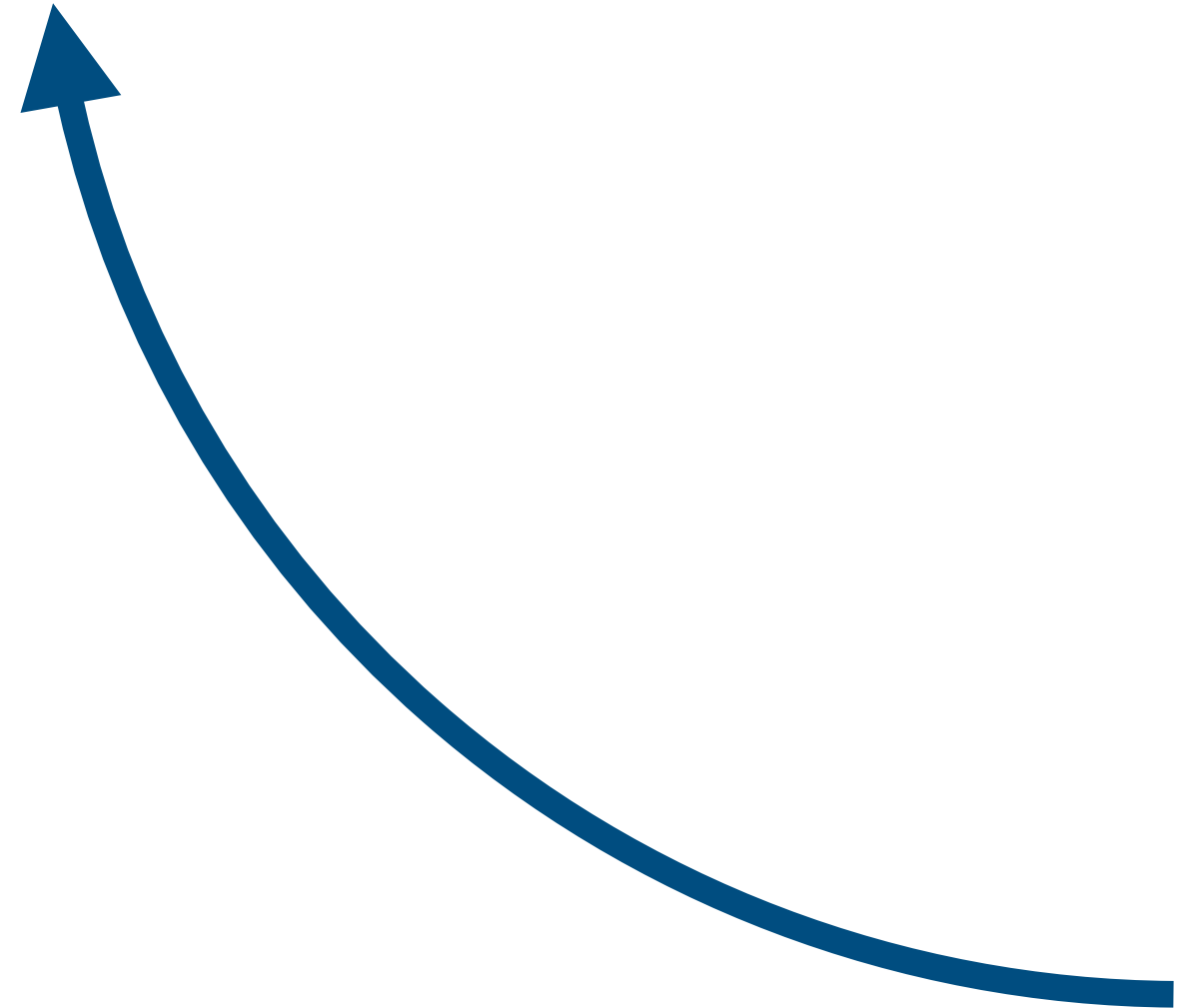
day	symbol	price
10/3	AMZN	957.10
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```
df[df['price'] > 900]
```

```
df.sort_values('price',  
ascending=False)
```

day	stock	price
10/3	AMZN	957.10
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10/3	MSFT	74.26
10/4	MSFT	74.69

symbol	avg(price)
AMZN	961.275
MSFT	74.475

```
df[df['price'] > 900]
```

```
df.sort_values('price',  
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```

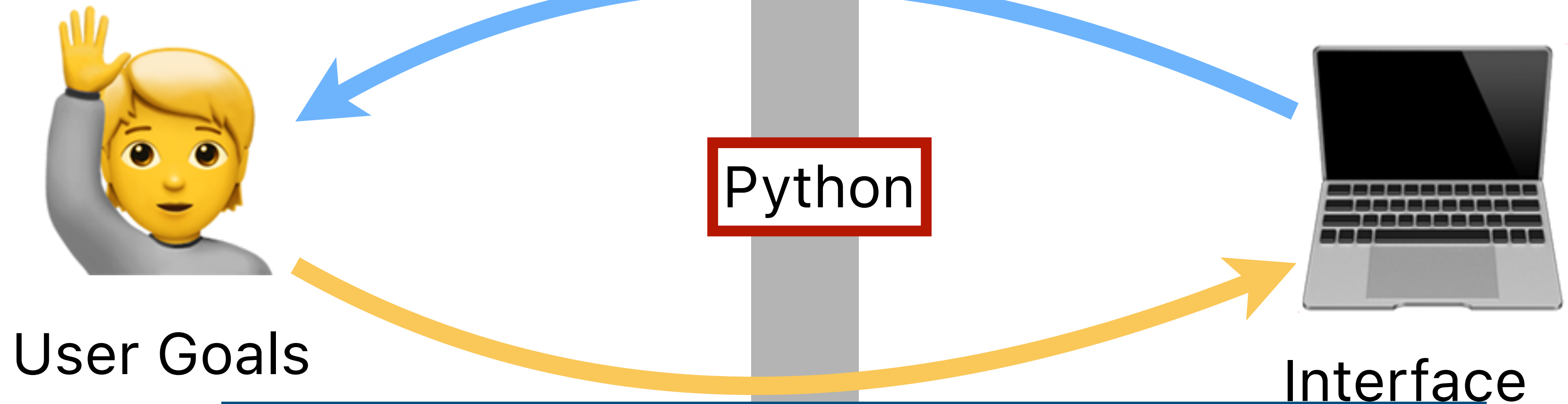
```
df.groupby('symbol')  
.mean()
```

day	stock	price
10/3	AMZN	957.10
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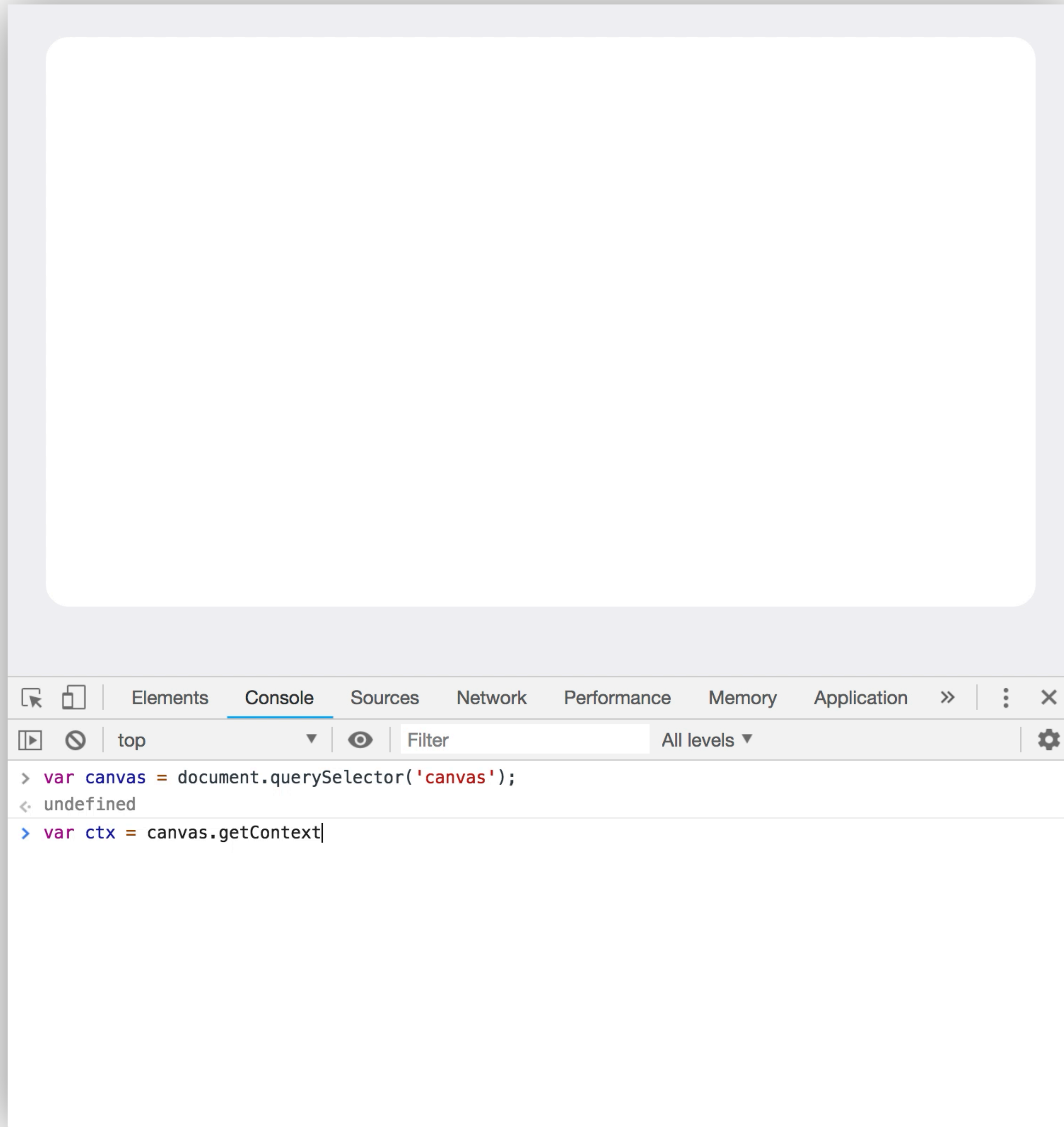
## Gulf of Evaluation

- Results returned as a table.
- No hint on how to reformulate query.
- Slow question-answer loop.



## Gulf of Execution

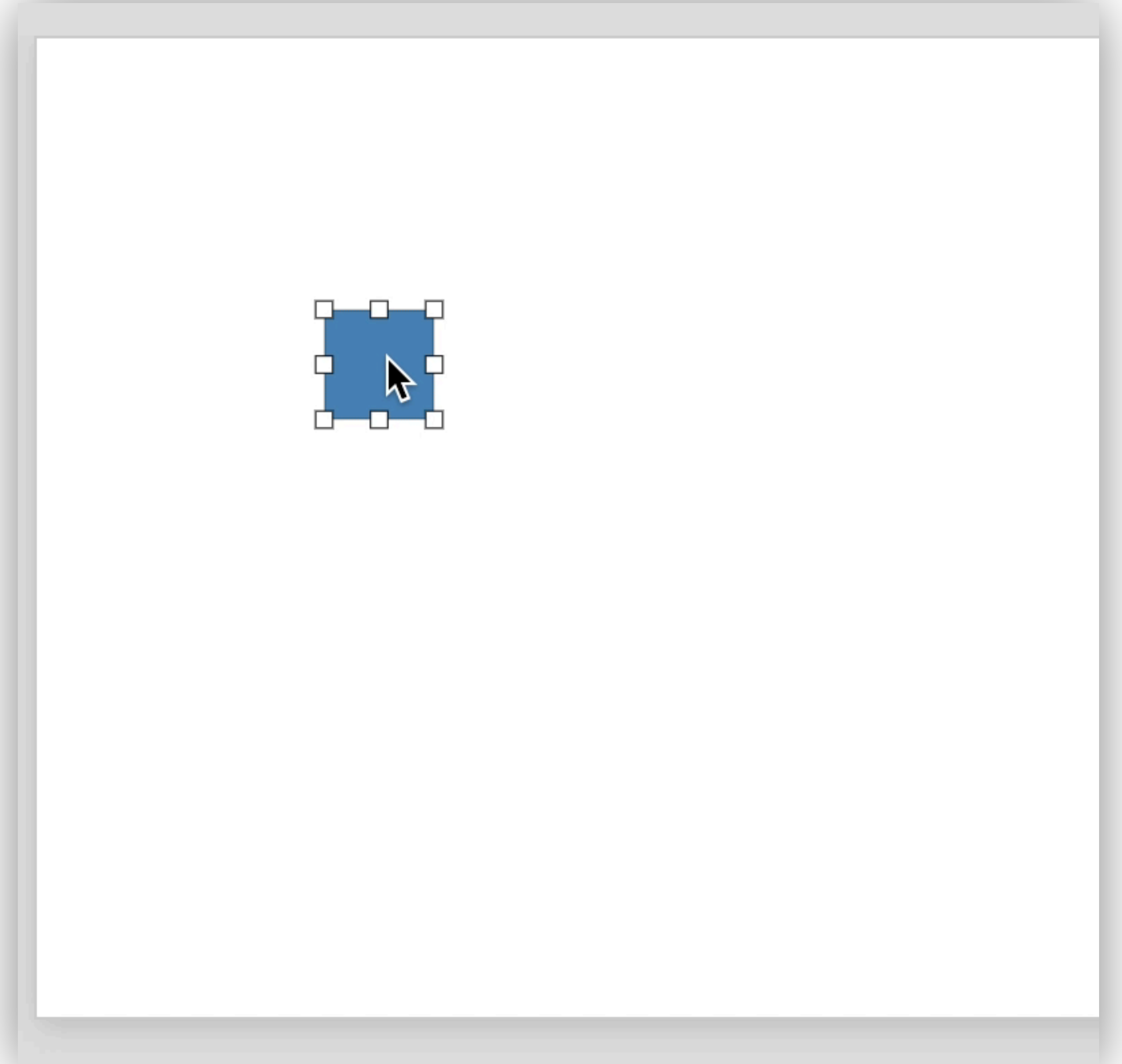
- A rigid syntax designed by/for programmers.
- Difficult to do "fuzzy" matching.



The screenshot shows a web browser's developer console with the following code and output:

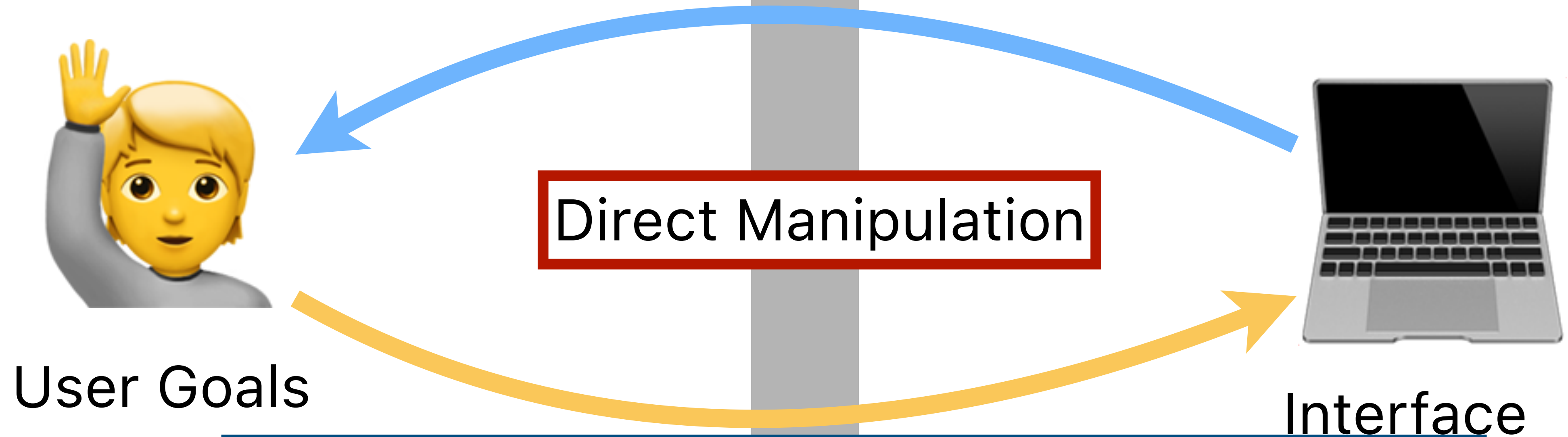
```
> var canvas = document.querySelector('canvas');  
< undefined  
> var ctx = canvas.getContext|
```

The console interface includes tabs for Elements, Console, Sources, Network, Performance, Memory, and Application. The Console tab is active, showing the current filter set to 'top' and 'All levels'.



## Gulf of Evaluation

- Visual representation of objects + actions.
- Immediate + continuous display of results.



## Gulf of Execution

- Physical actions or labeled buttons instead of complex syntax.
- Rapid, incremental, and reversible actions.

# Interaction in Visualization

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**Abstract/Elaborate** show me related items.

**Filter** show me more or less detail.

**Reconfigure** show me a different arrangement.

**Explore** show me something else.

**Encode** show me a different visual representation.

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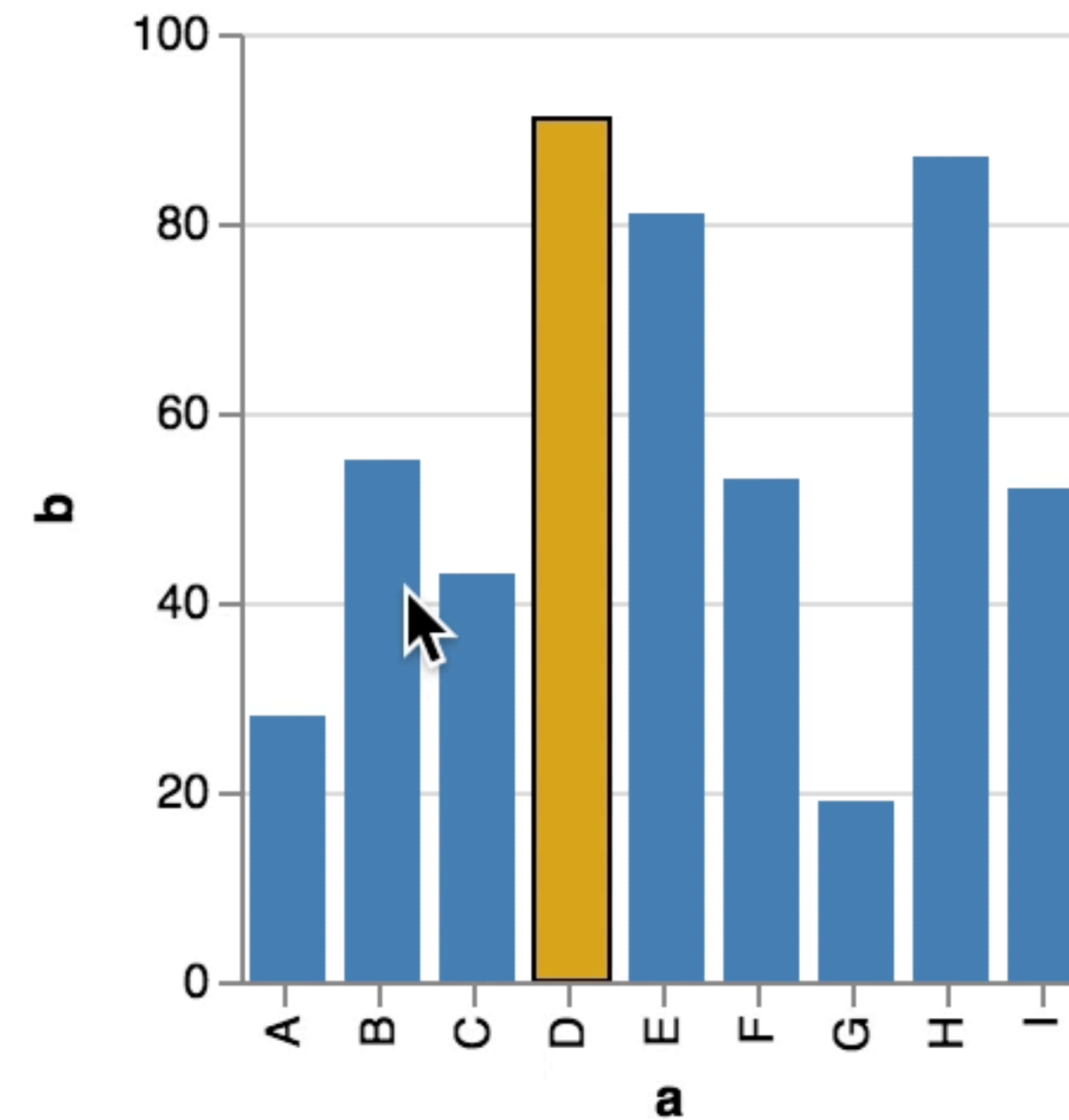
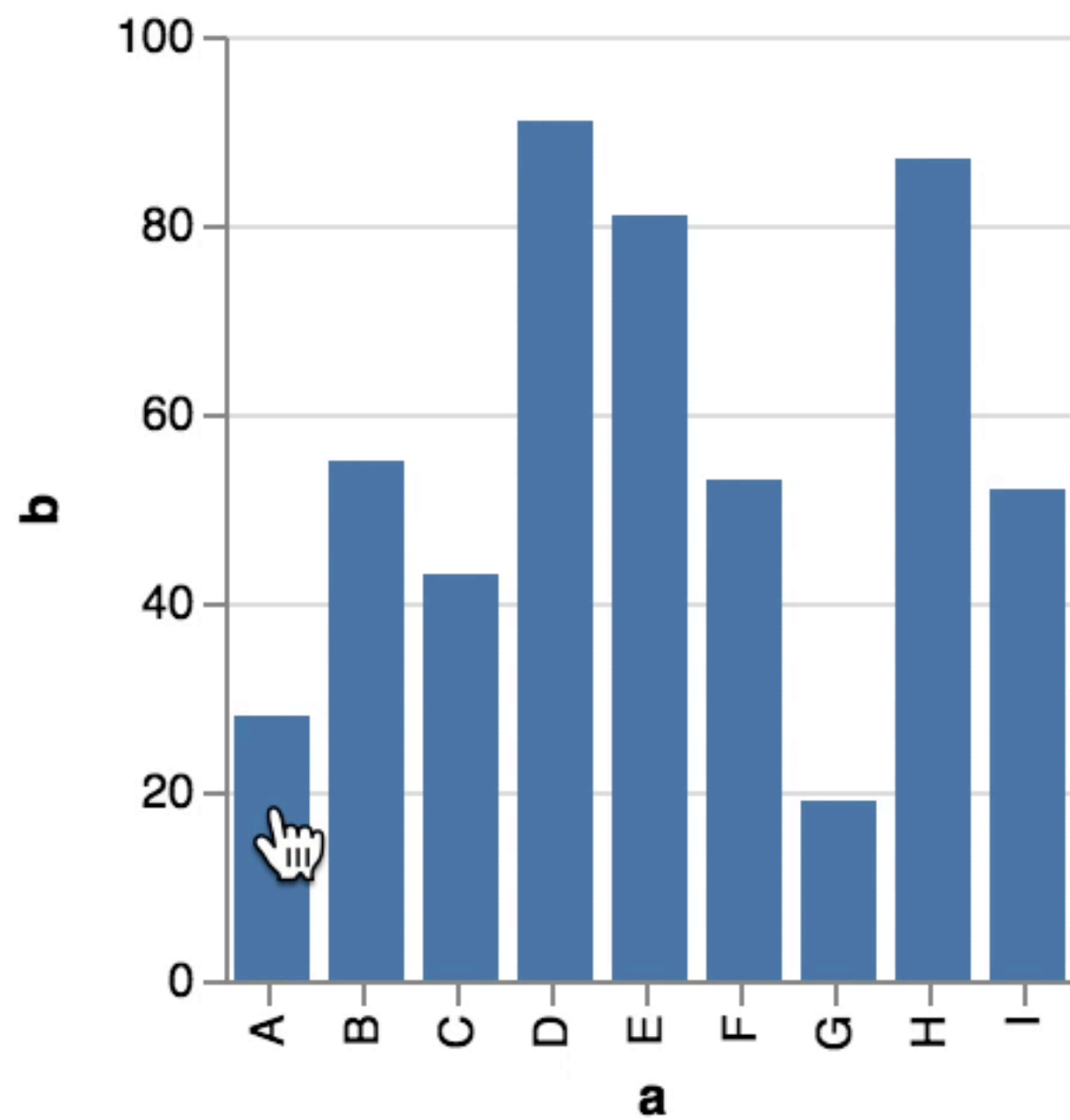
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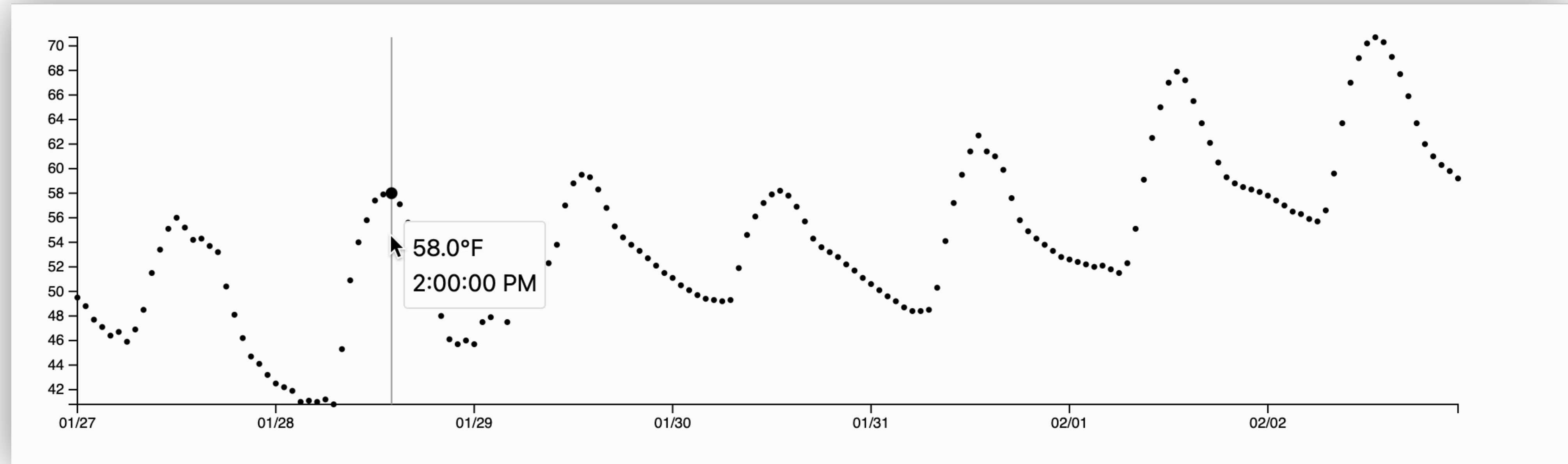
# Point Selection

Select discrete data values.

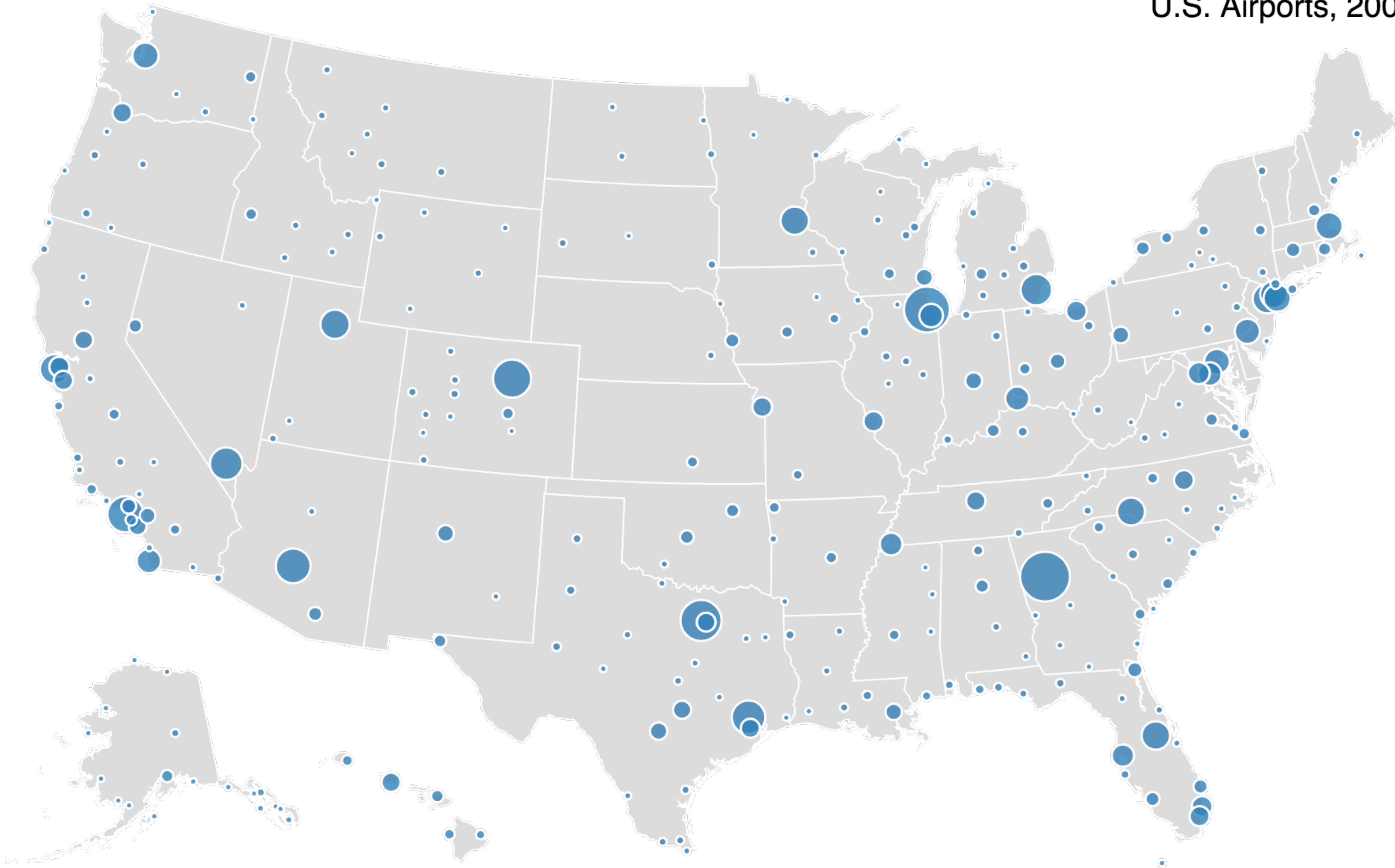
- How many points are selected? 1, 2, 3, ...
- How are points selected? Mouse hover, click, tap, ...



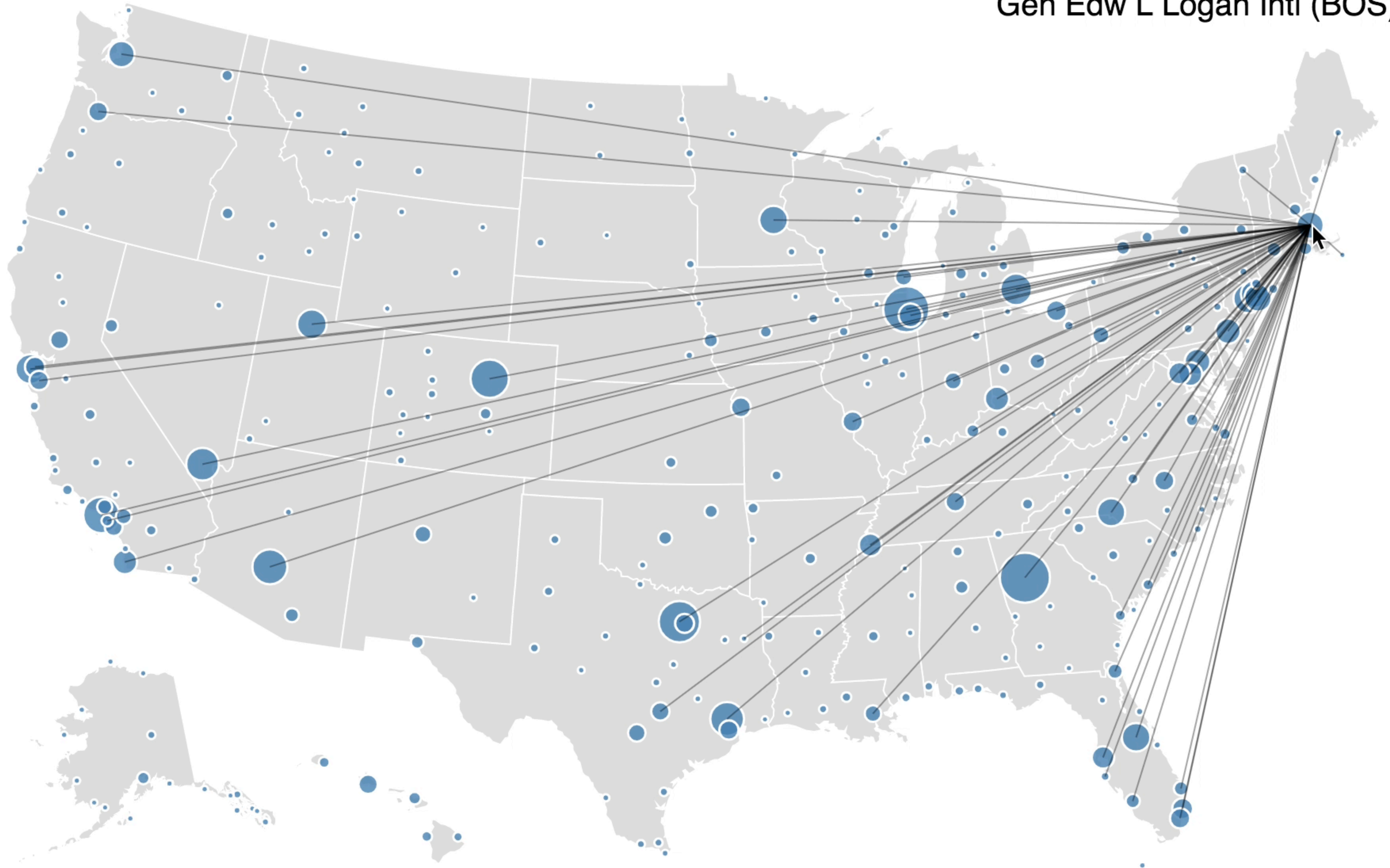
# Point Selection



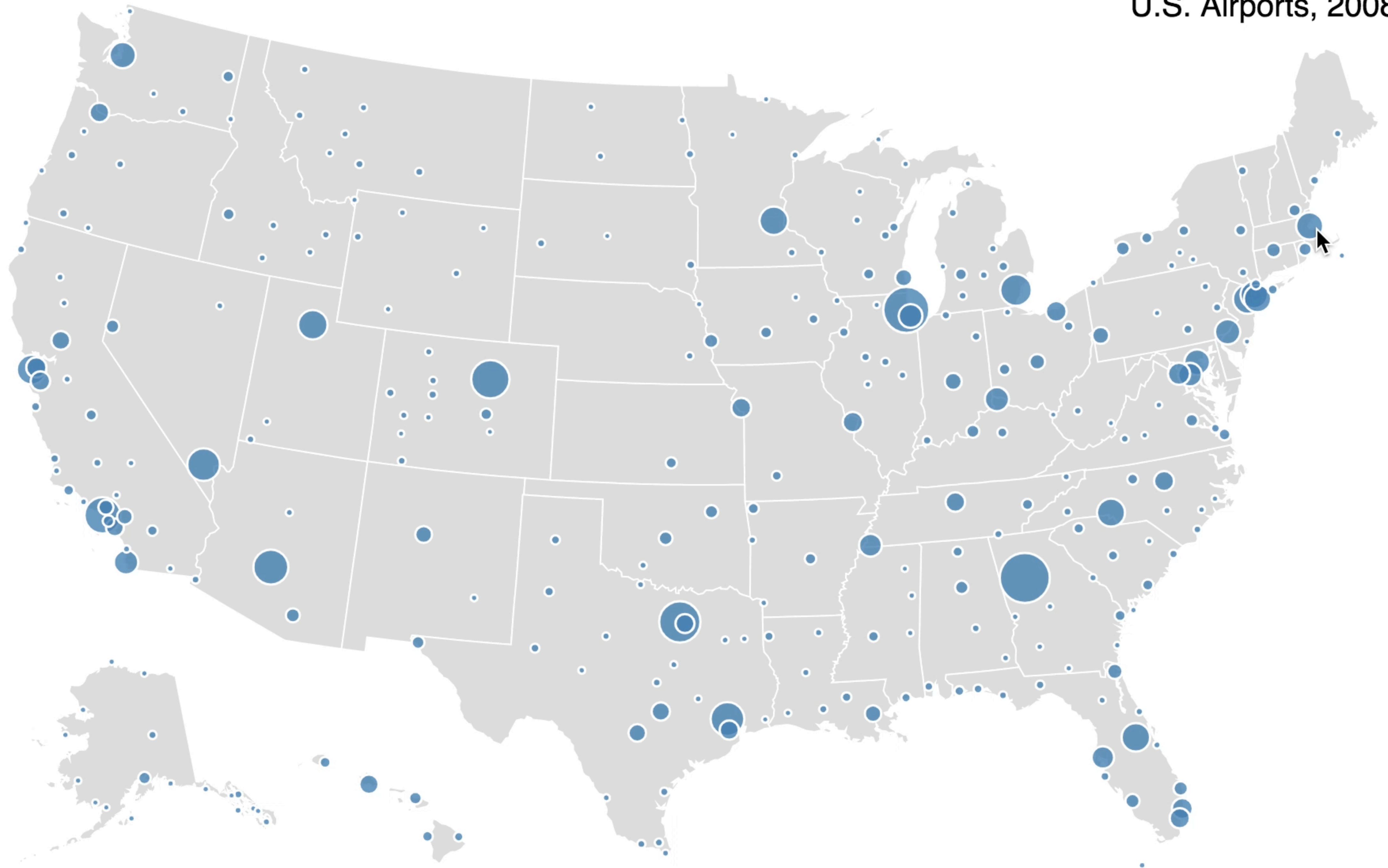
U.S. Airports, 2008



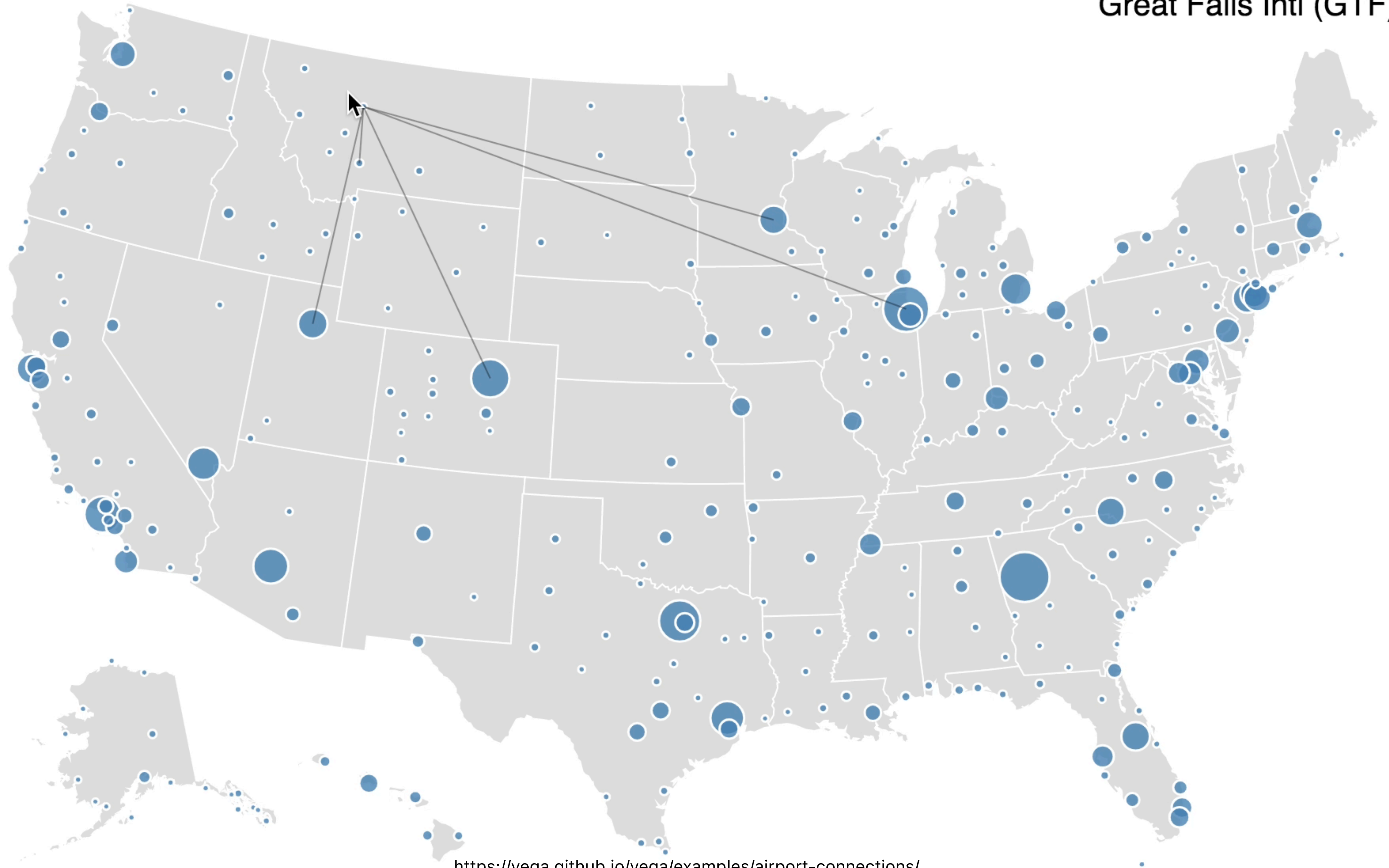
# Gen Edw L Logan Intl (BOS)



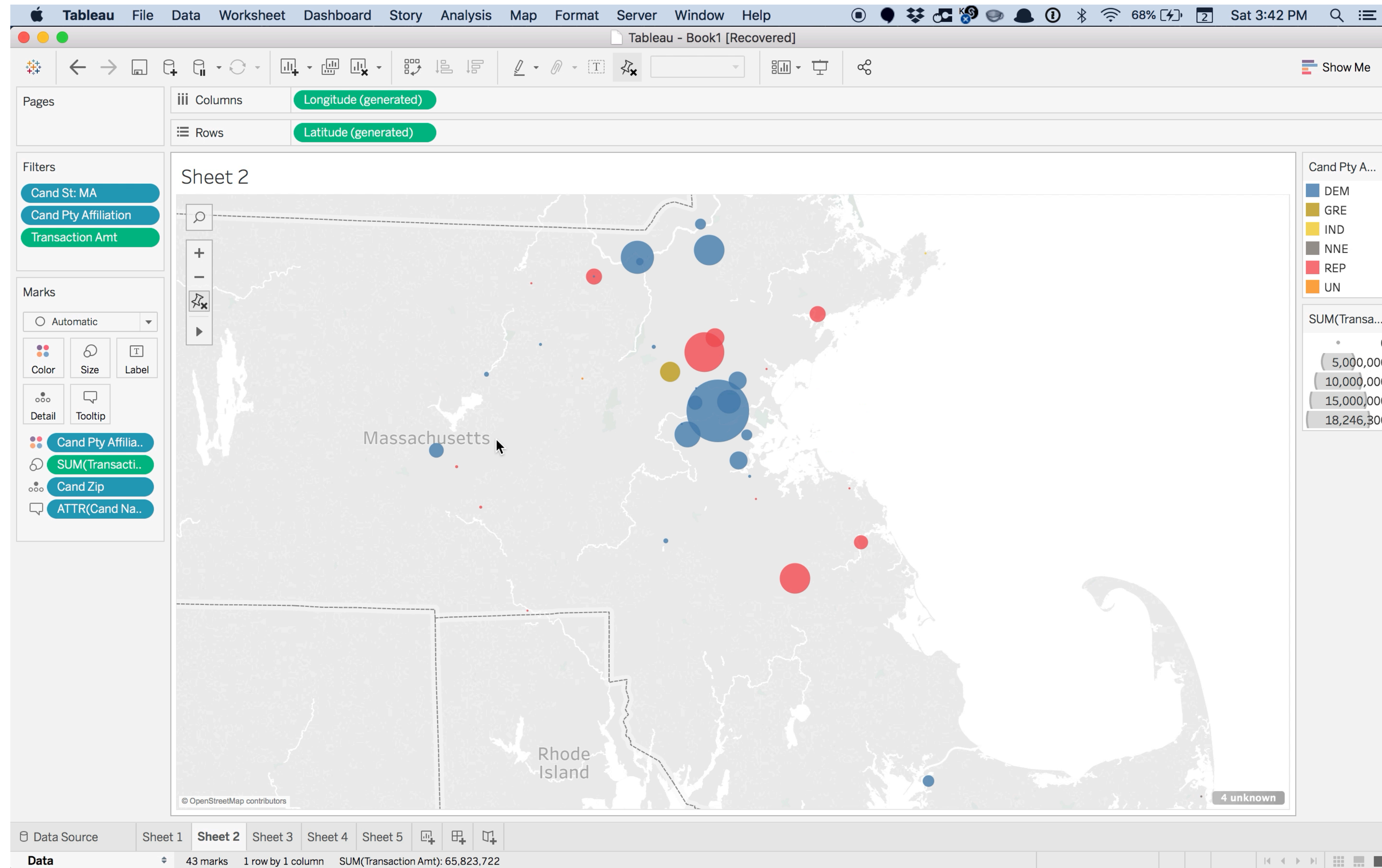
# U.S. Airports, 2008



# Great Falls Intl (GTF)



# Region Selection



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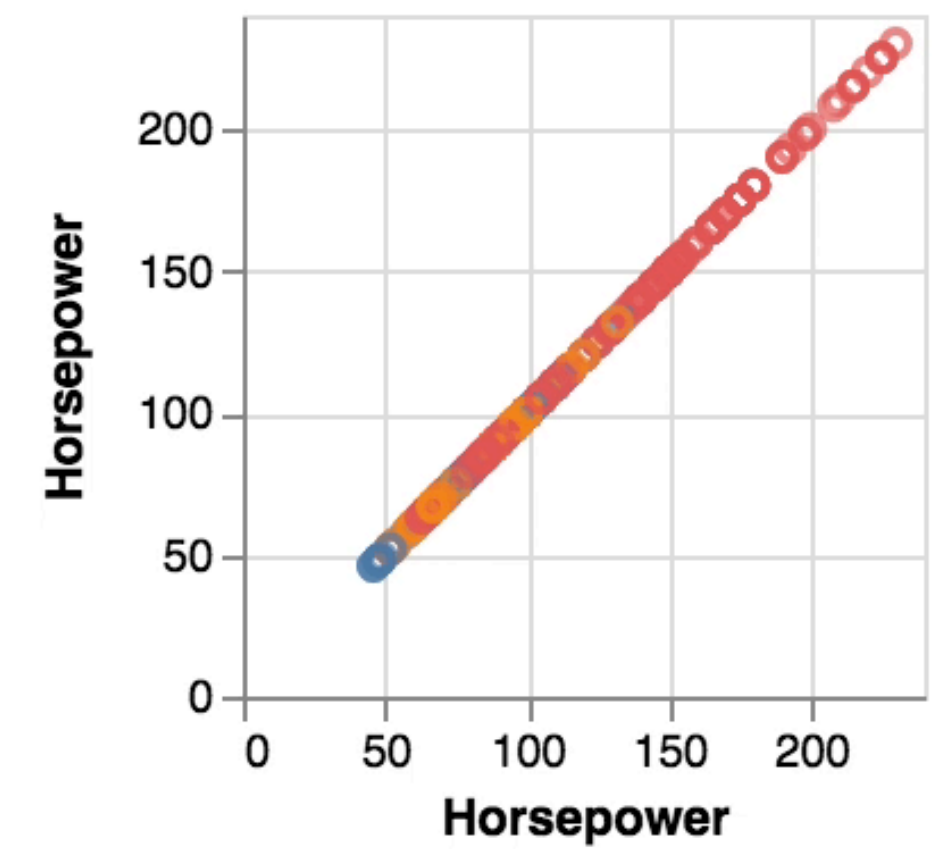
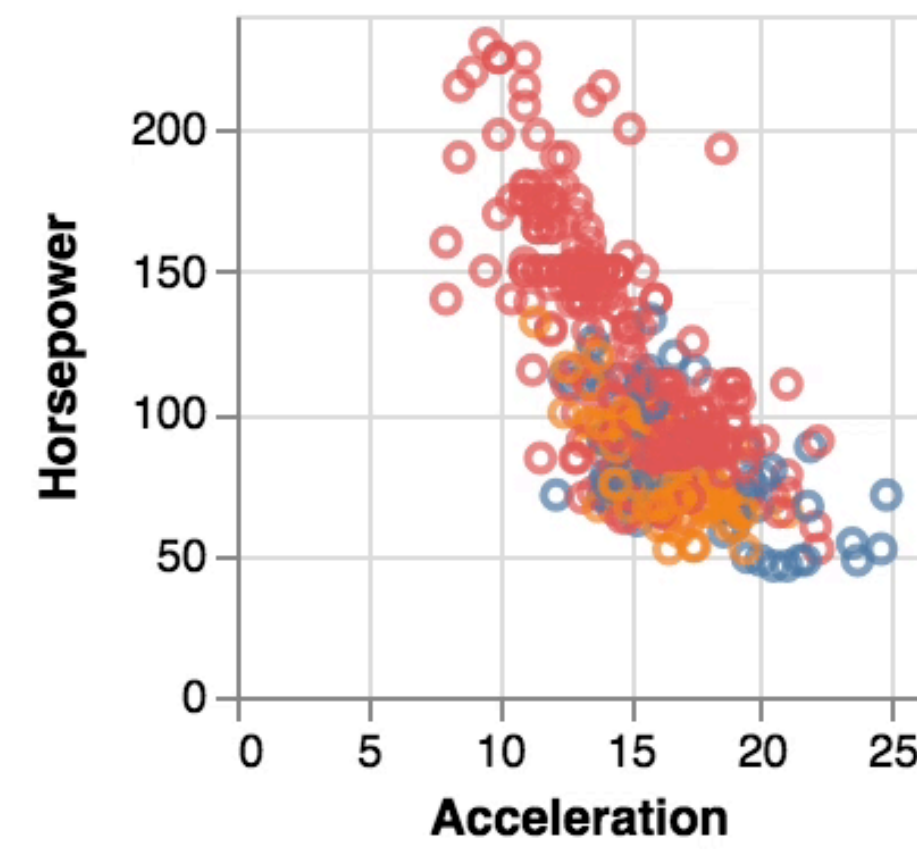
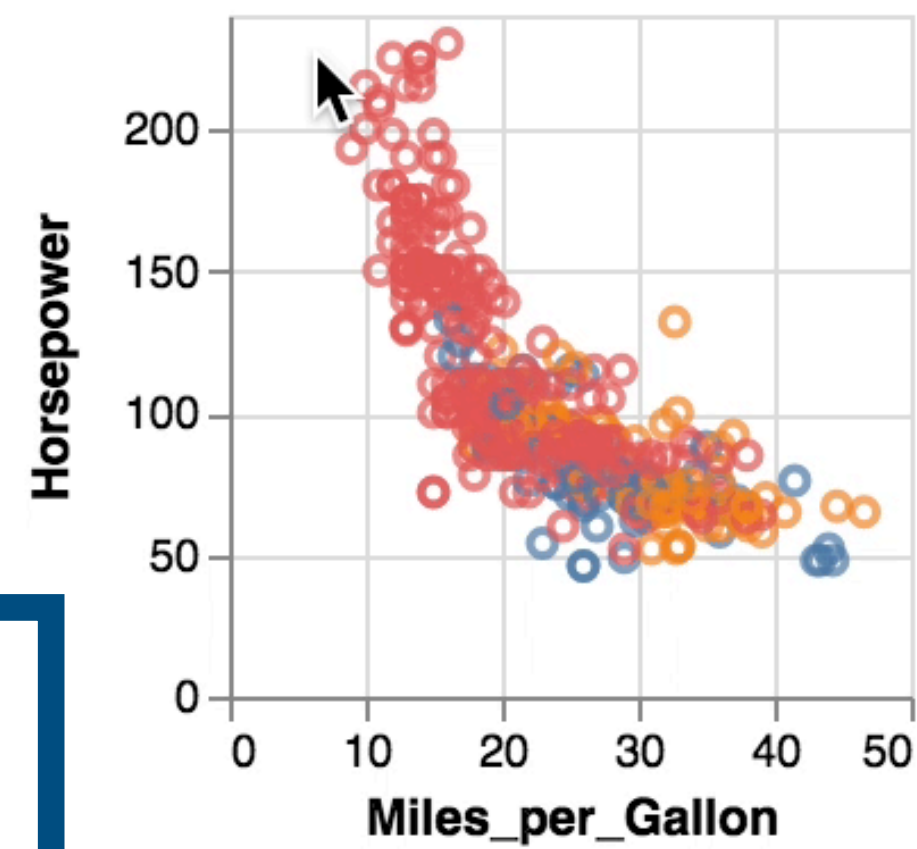
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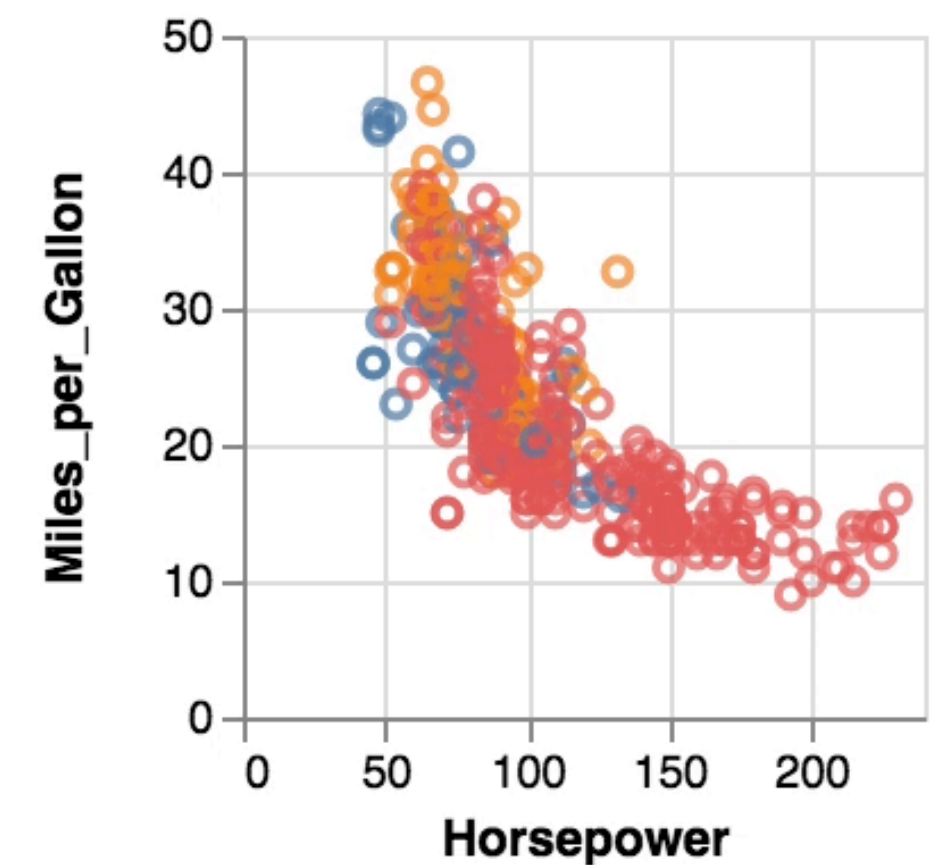
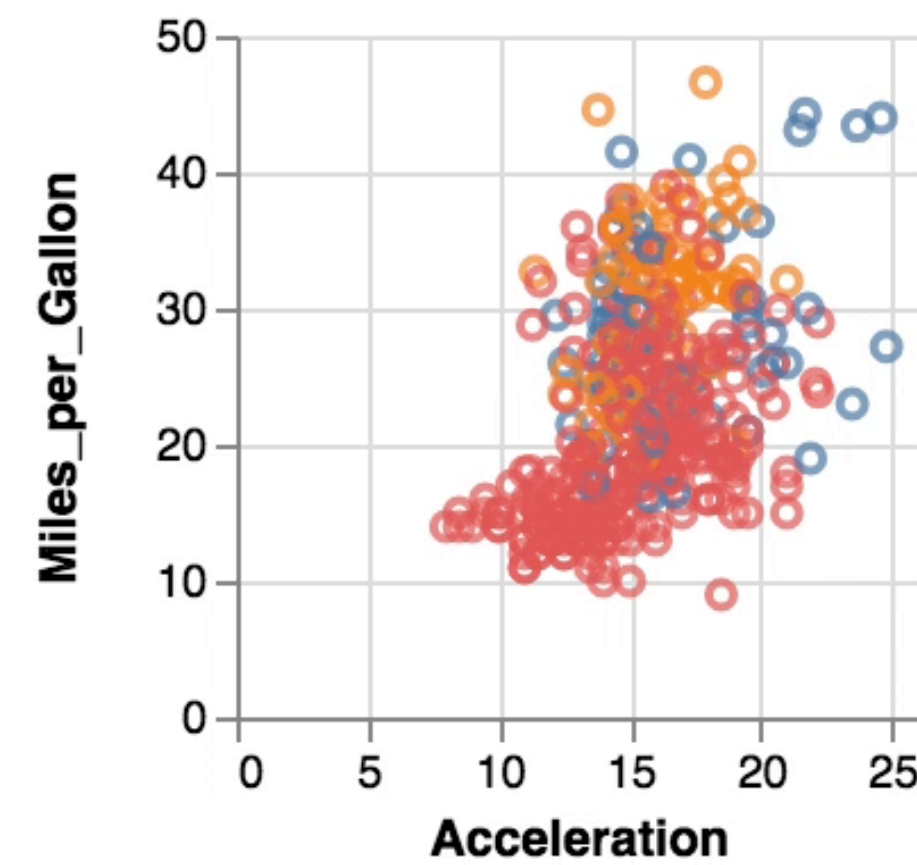
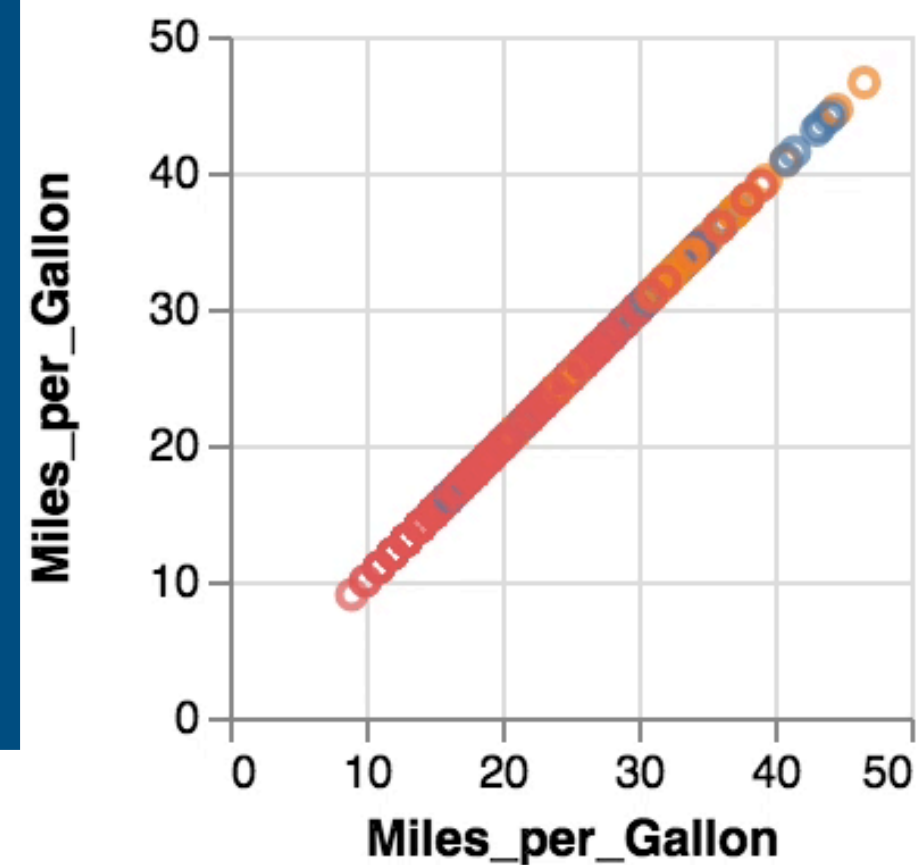
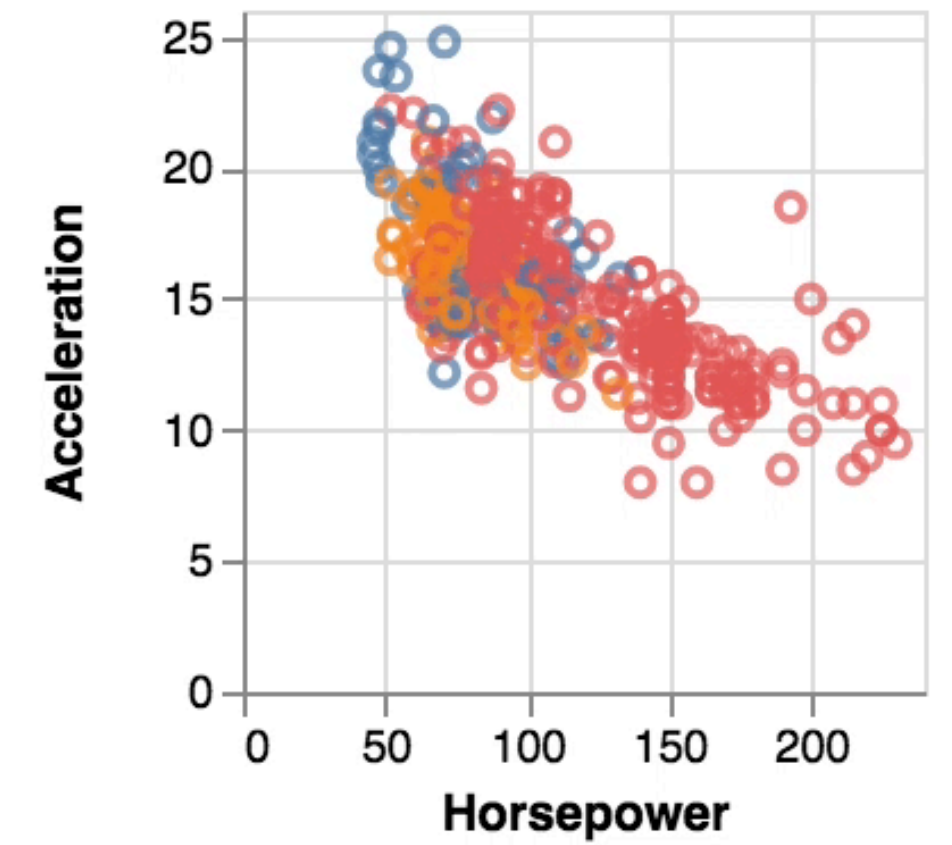
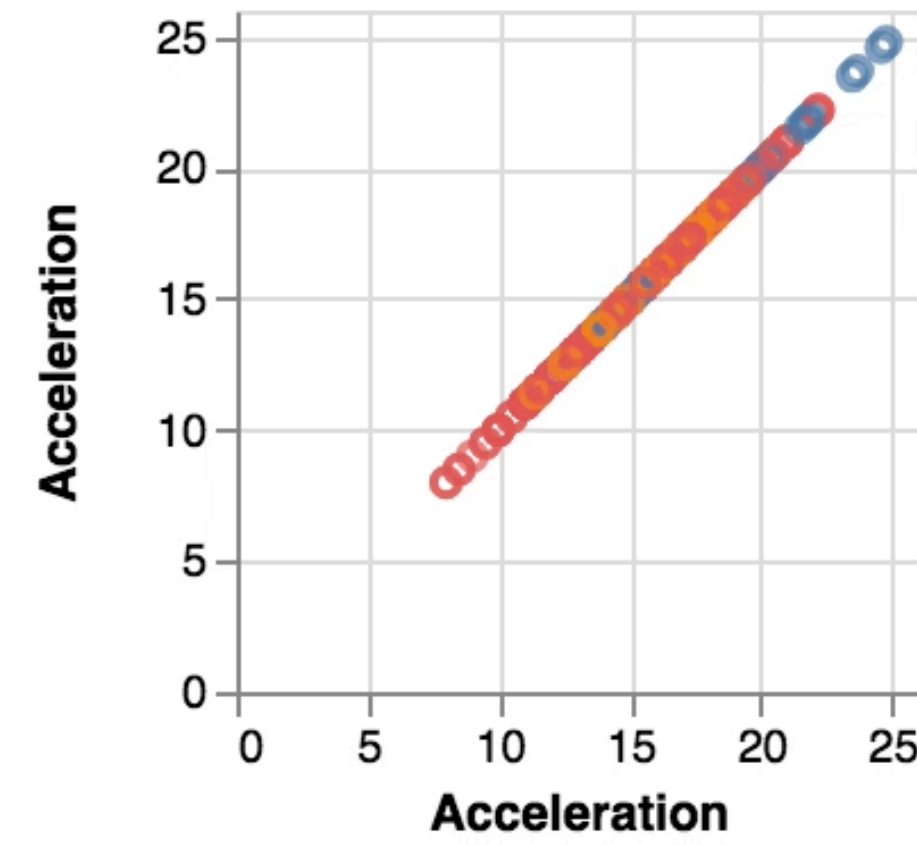
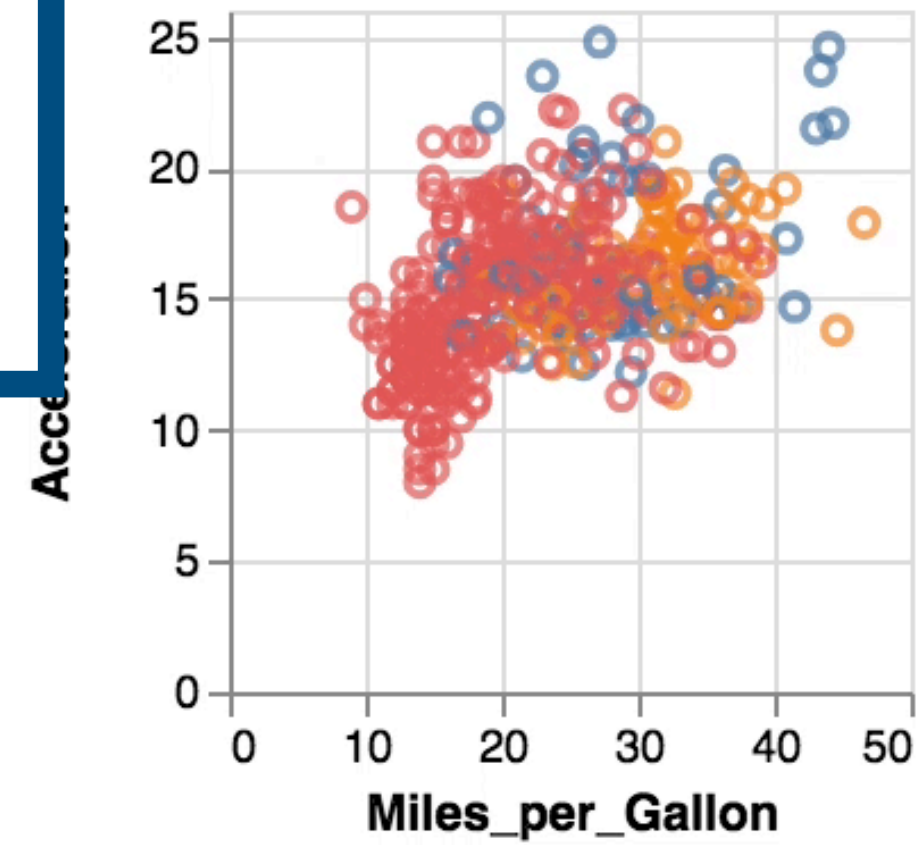
# Connect

**Brushing & linking:**  
selection = "brush",  
selected data "linked" in  
other views.

**Link by tuple:** explicitly  
identify and match the  
same data values  
across every view.

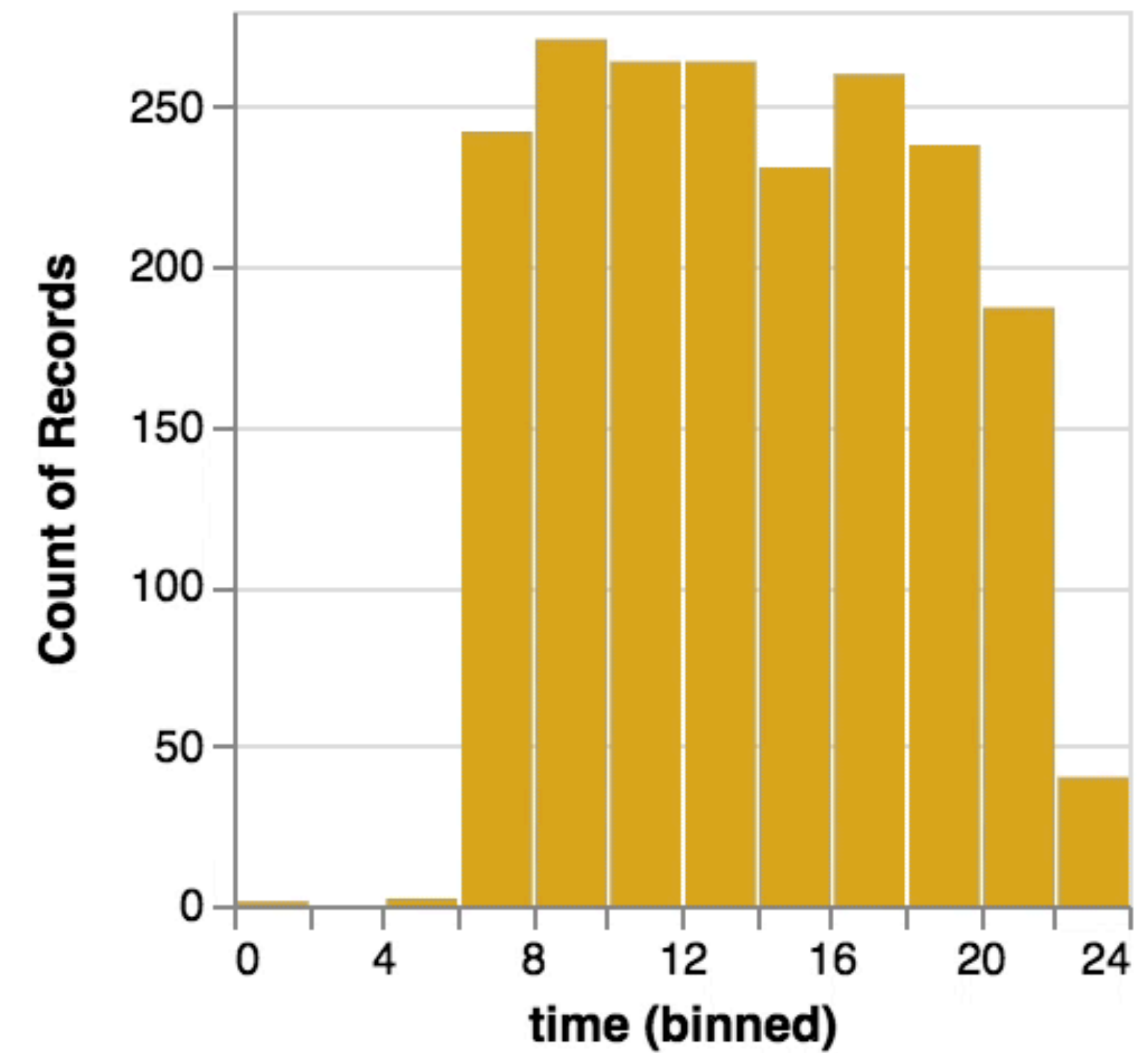
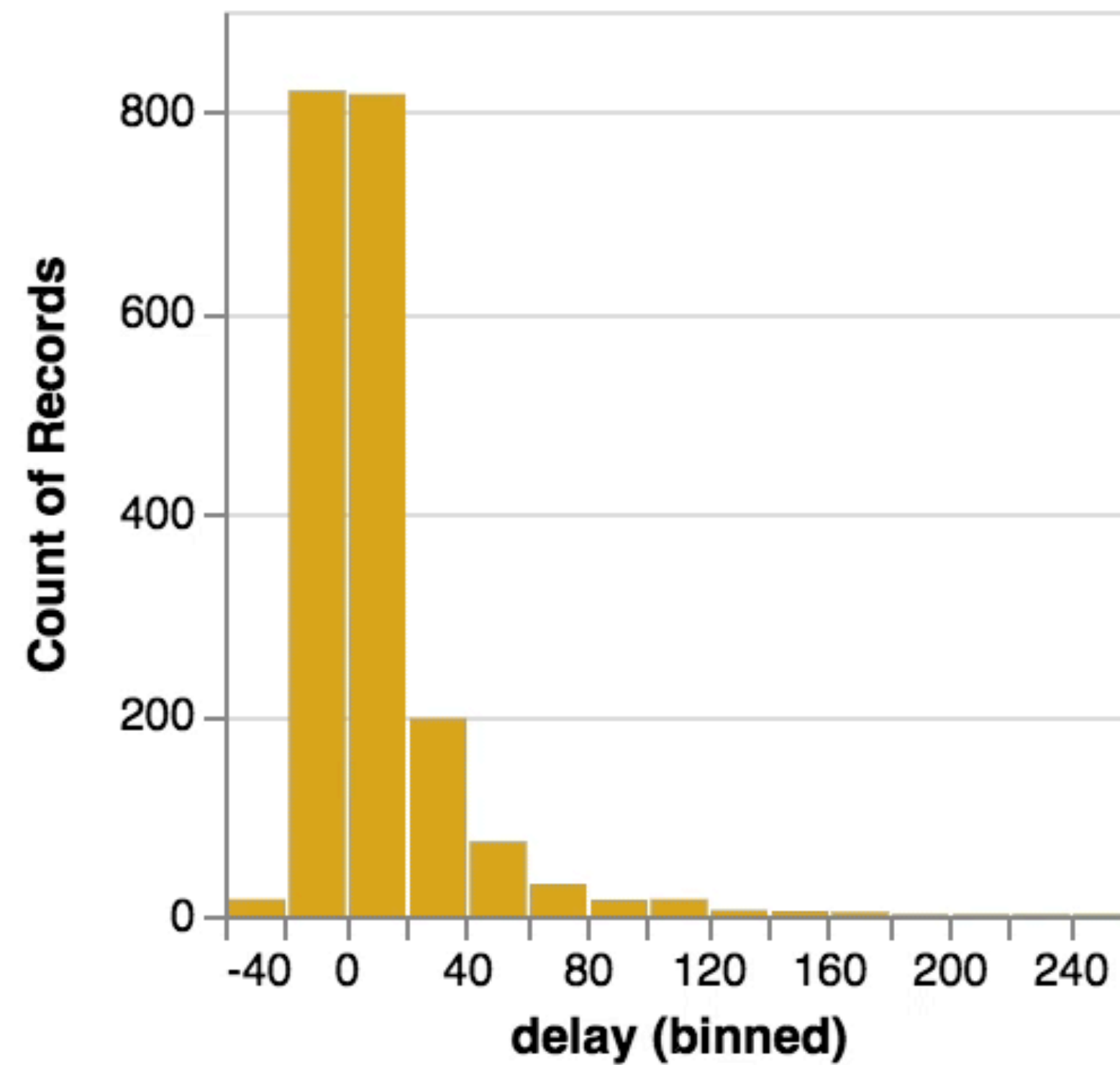
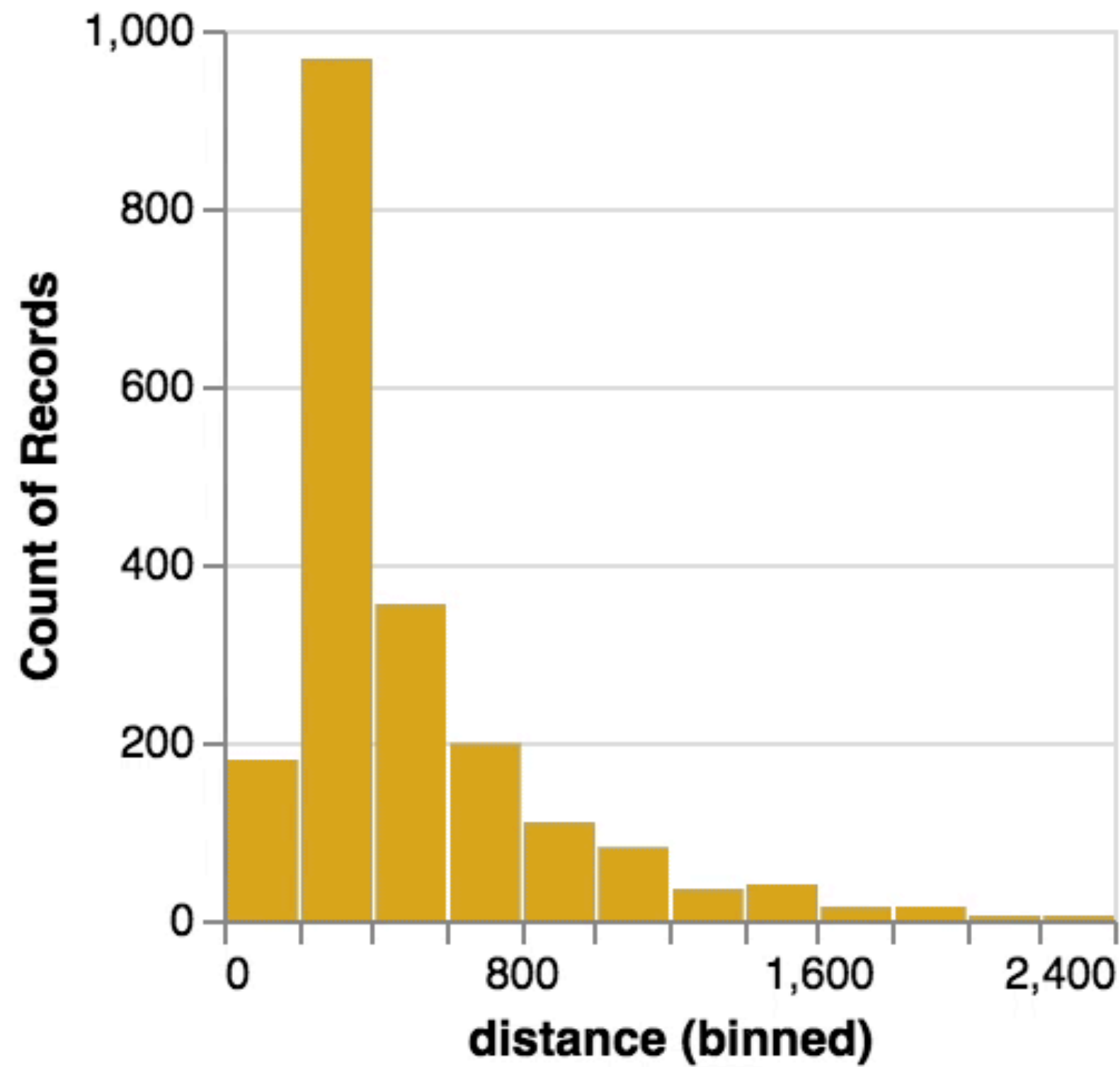


**Origin**  
● Europe  
● Japan  
● USA



# Connect

Link by query: matching range or values of fields.



Connect doesn't have to be just highlighting!

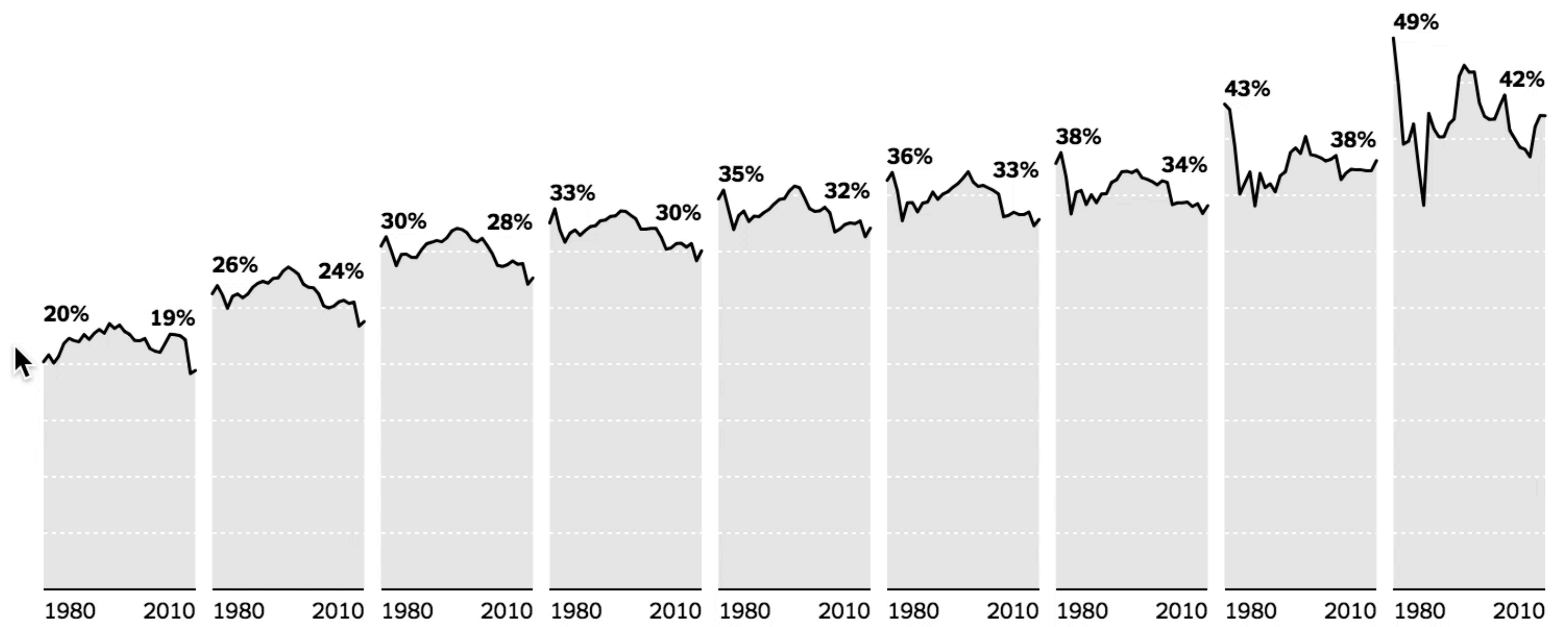
# How the Tax Burden Has Changed

Most Americans paid less in taxes in 2010 than people with the same inflation-adjusted incomes paid in 1980, because of cuts in federal income taxes. At lower income levels, however, much of the savings was offset by increases in federal payroll taxes, state sales taxes and local property taxes. About half of households making less than \$25,000 saved nothing at all. [About the Data »](#) | [Related Article »](#)

- \$0-25k
- \$25-50k
- \$50-75k
- \$75-100k
- \$100-125k
- \$125-150k
- \$150-200k
- \$200-350k
- \$350k+

## Tax rates have fallen for most Americans, especially high earners.

Share of yearly income paid in federal, state and local taxes, by income bracket.



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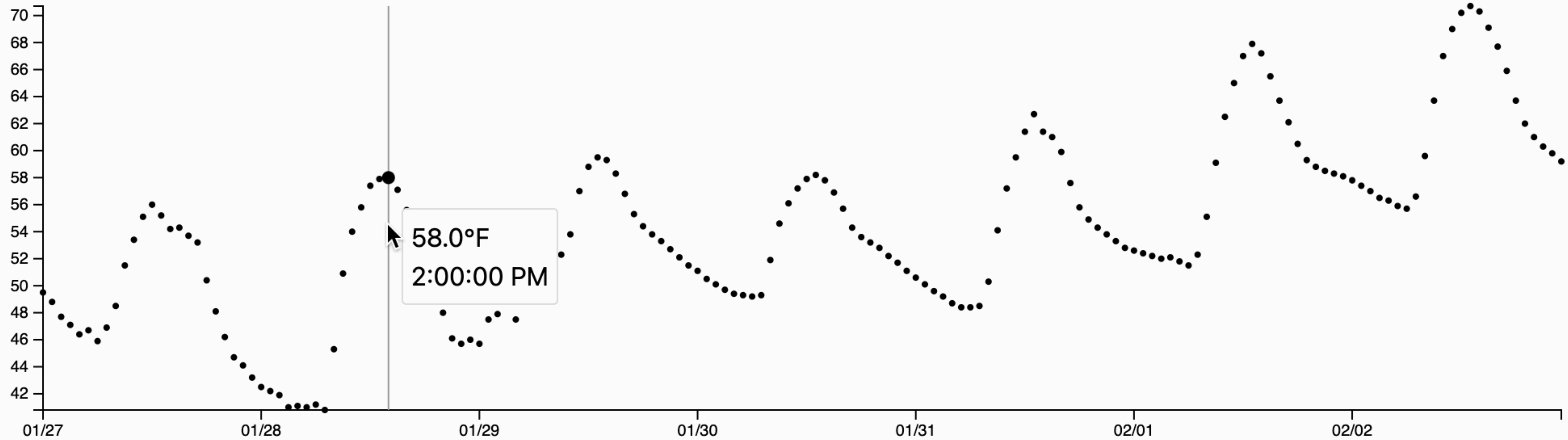
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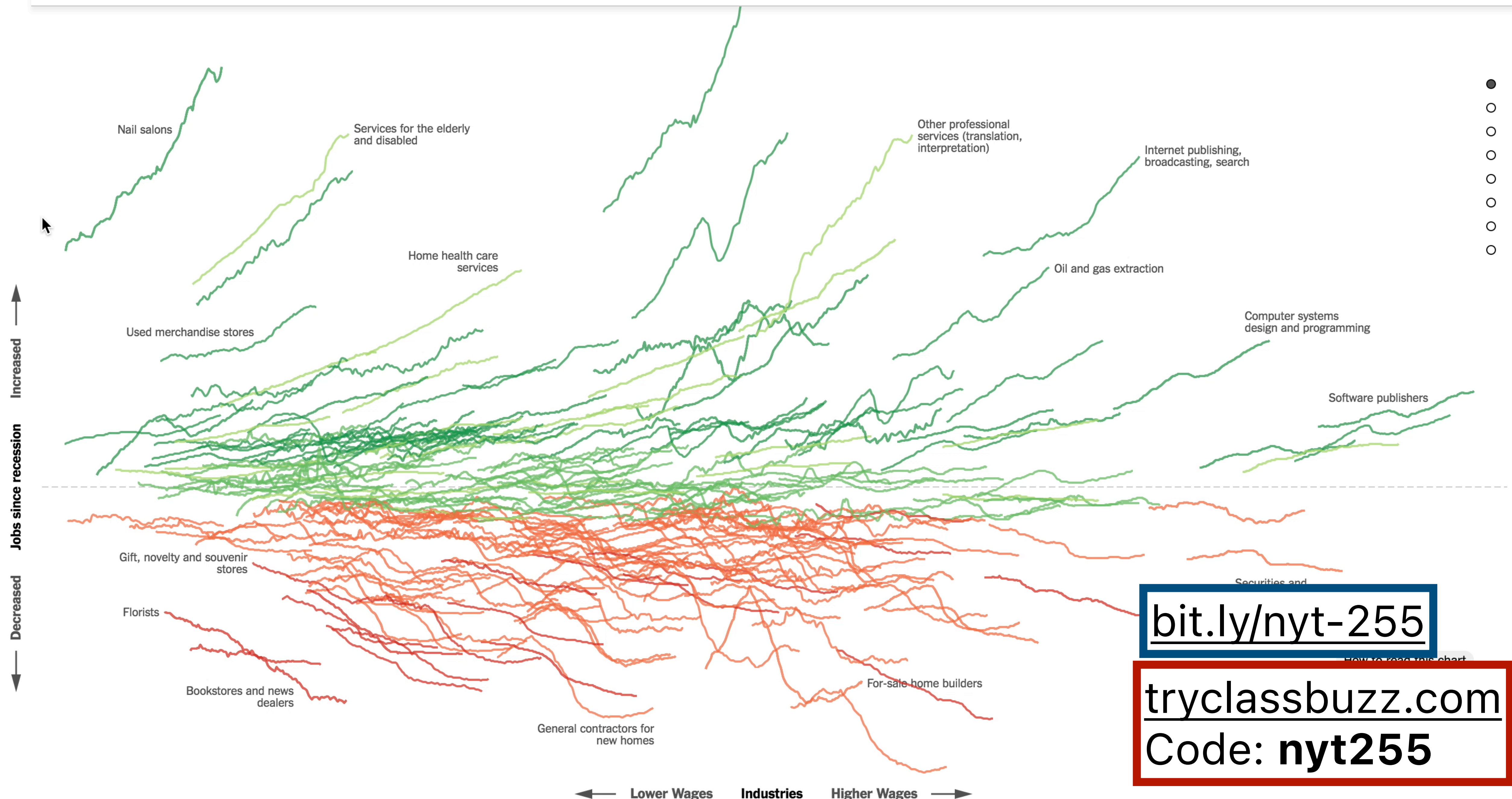
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# Elaborate

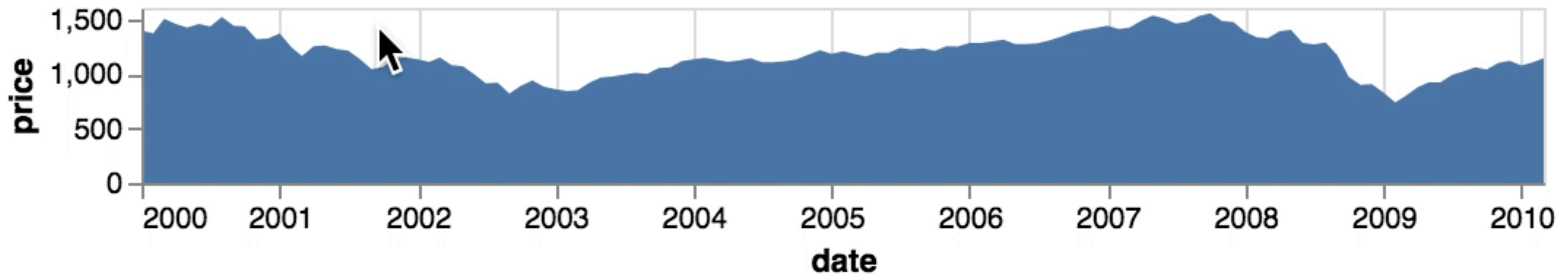
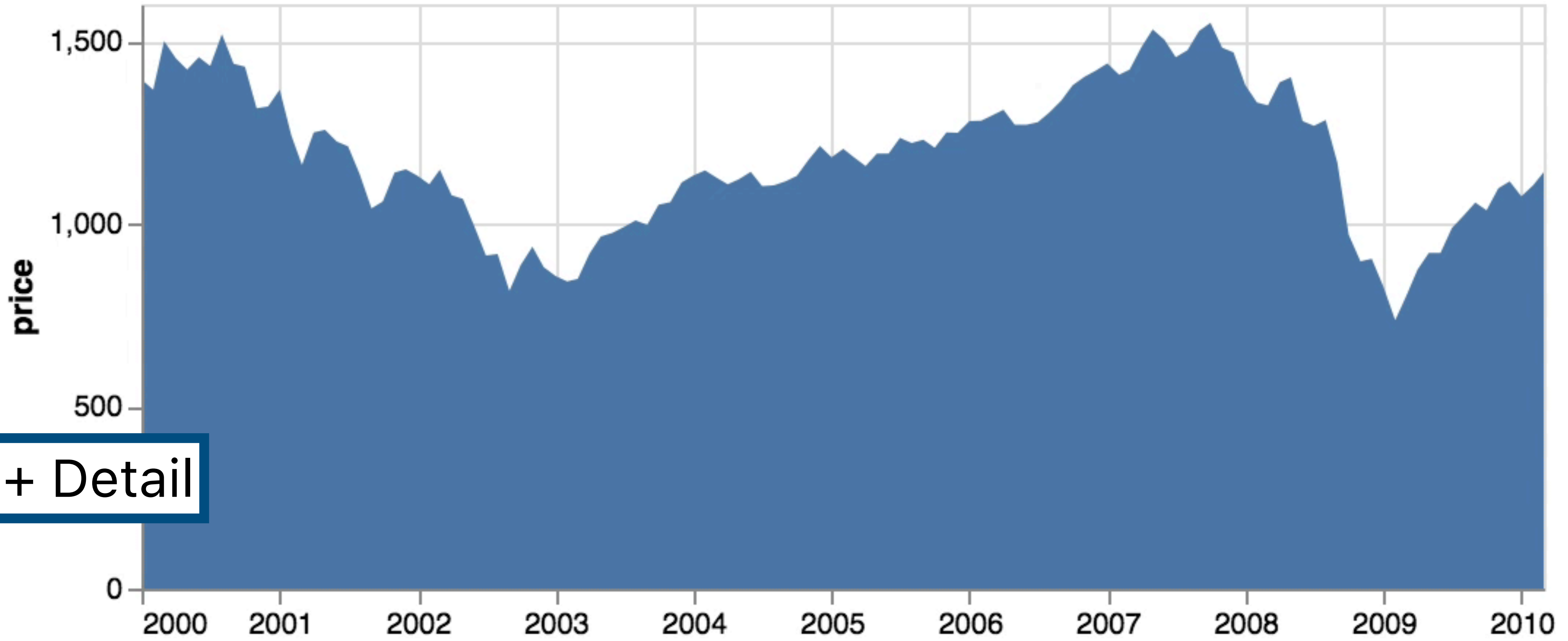




[bit.ly/nyt-255](http://bit.ly/nyt-255)

[tryclassbuzz.com](http://tryclassbuzz.com)  
Code: **nyt255**

Overview + Detail





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type the digits of a zip code

[benfry.com/zipdecode/](http://benfry.com/zipdecode/)

[tryclassbuzz.com](http://tryclassbuzz.com)  
Code: **zip**

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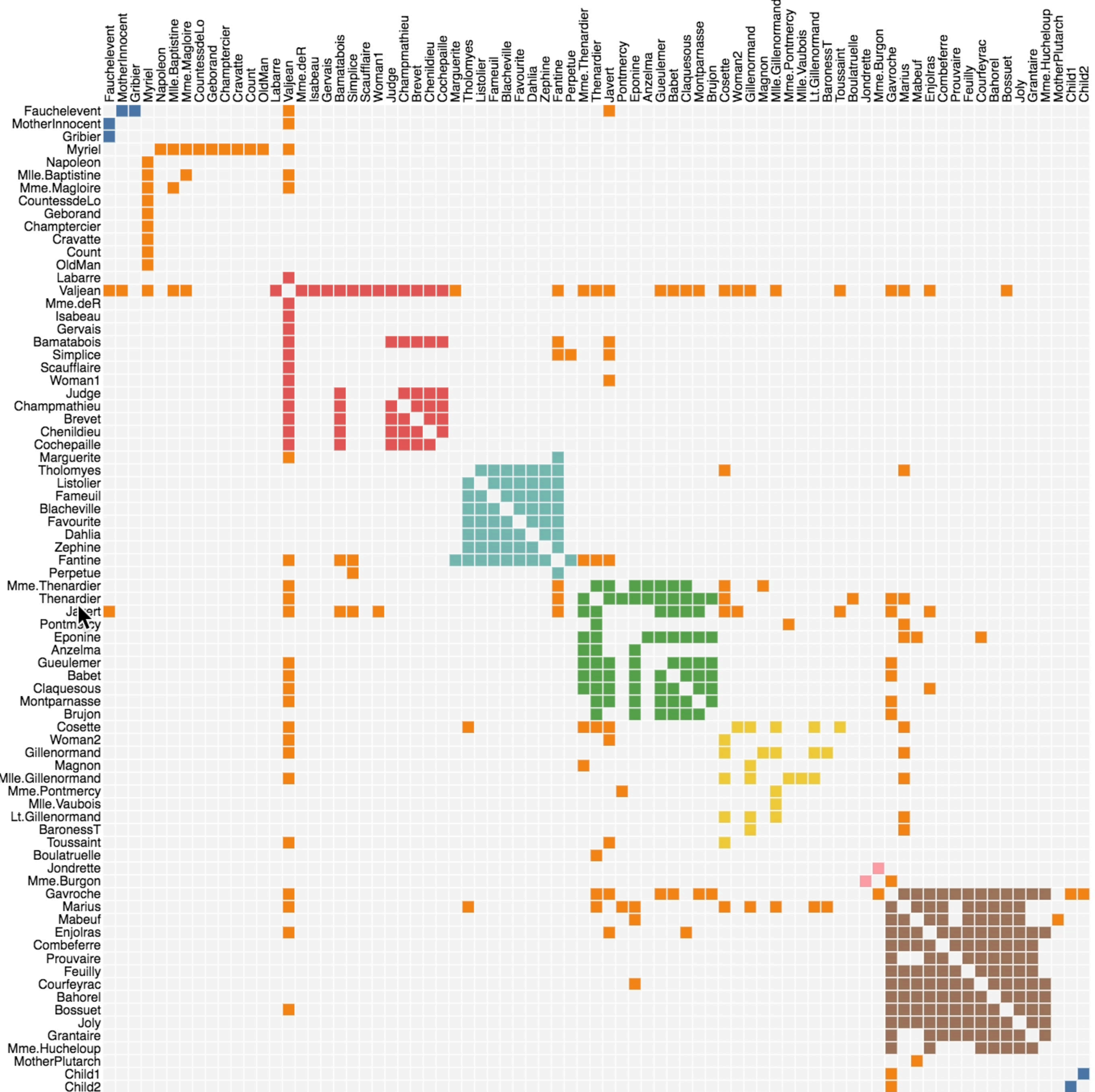
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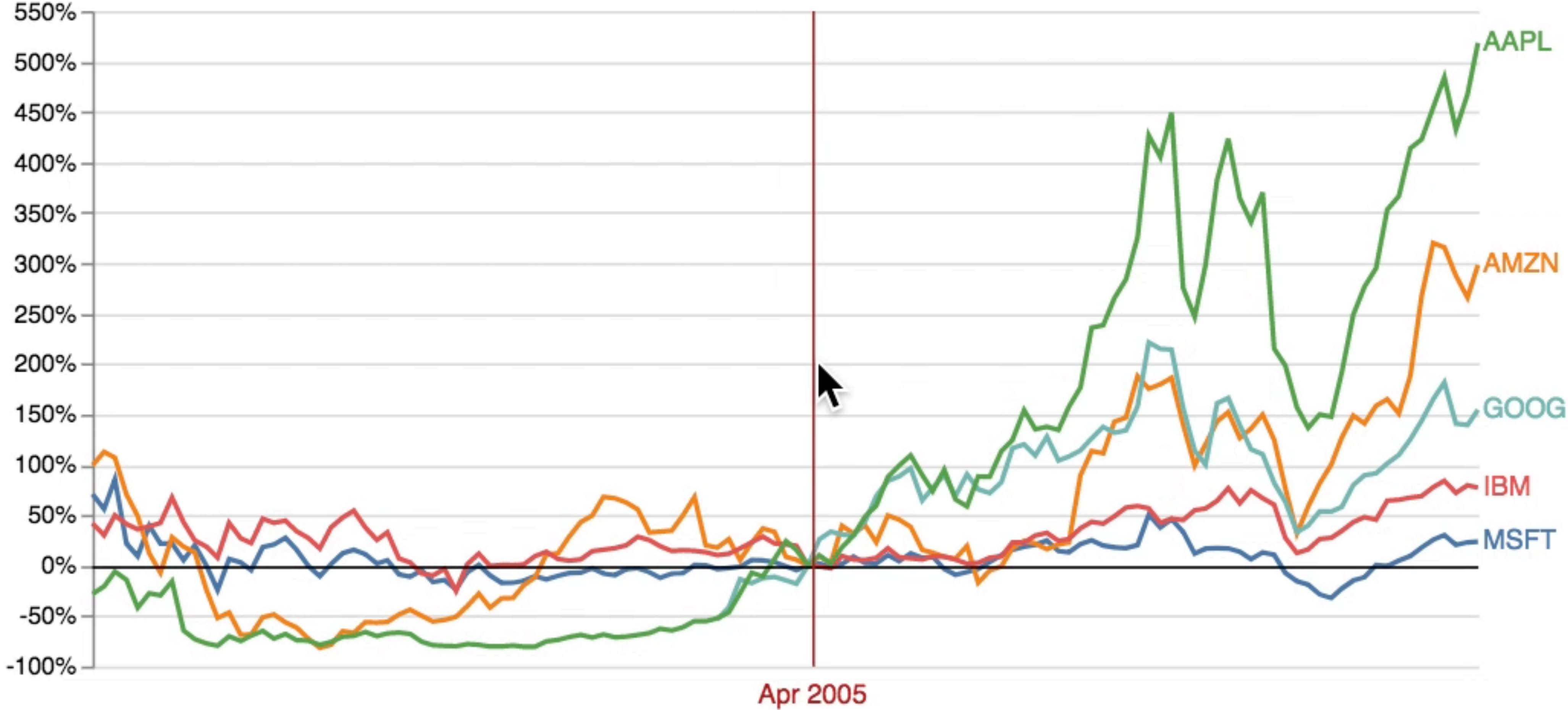
# Reconfigure



# Reconfigure



# Reconfigure



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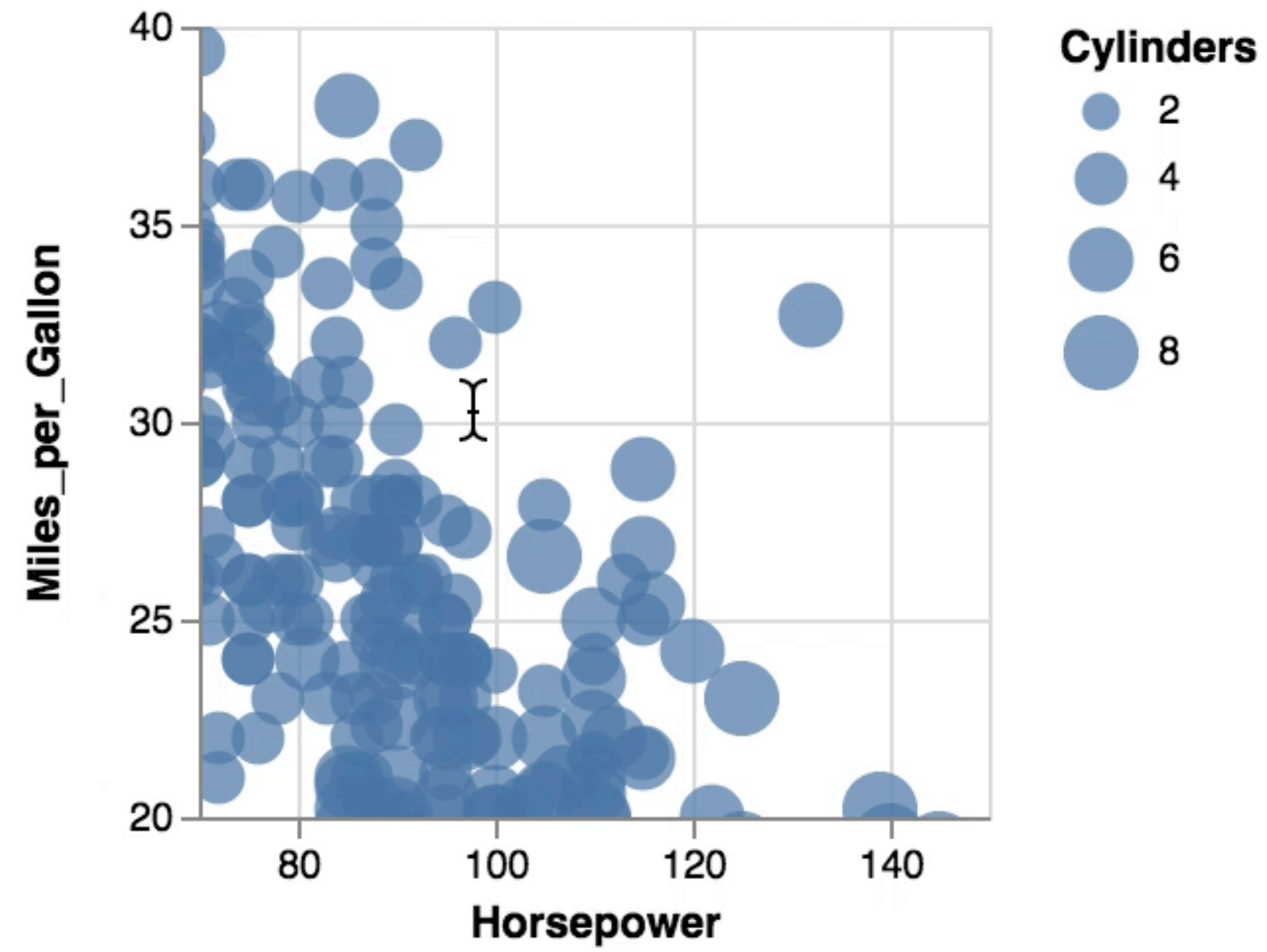
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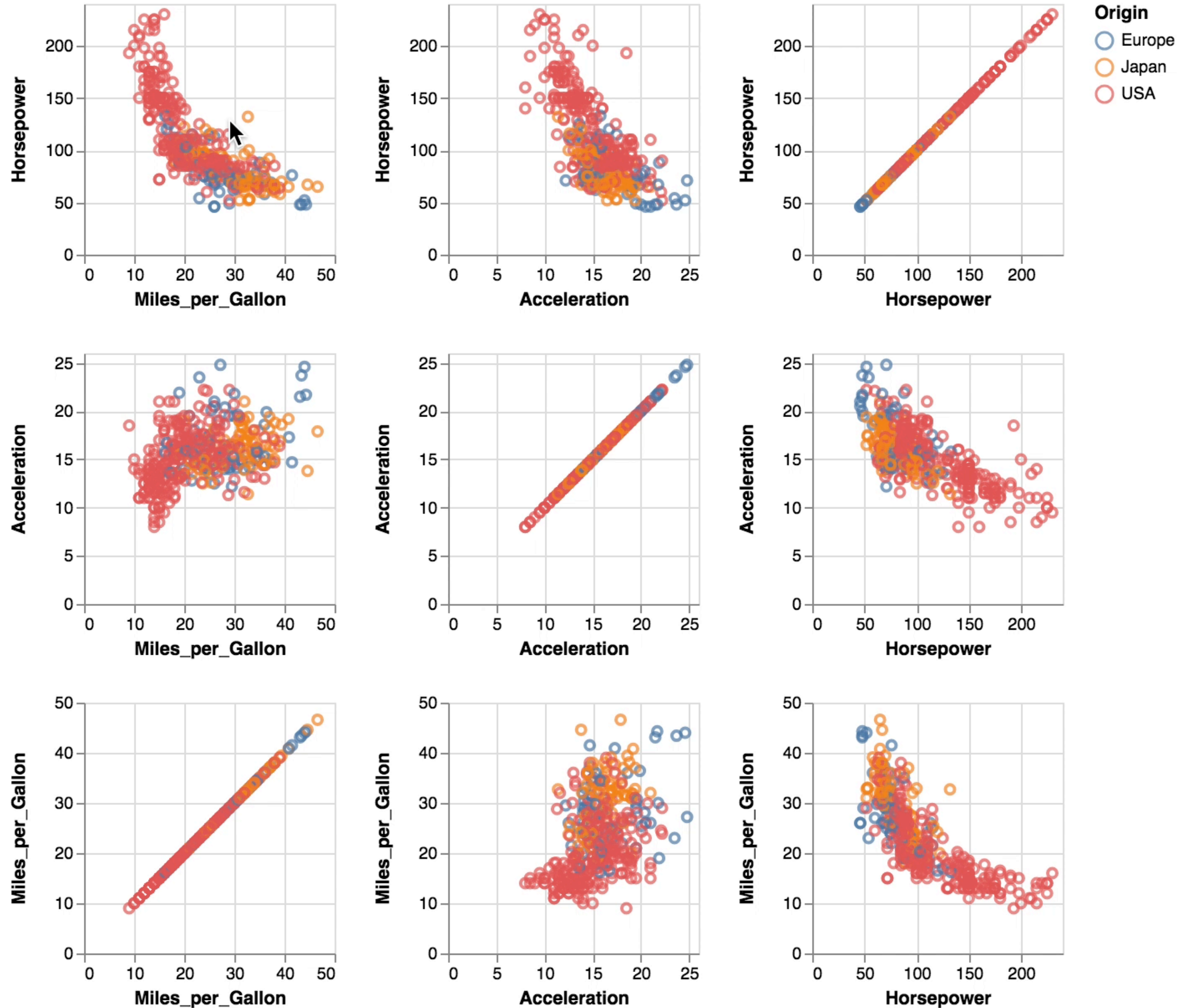
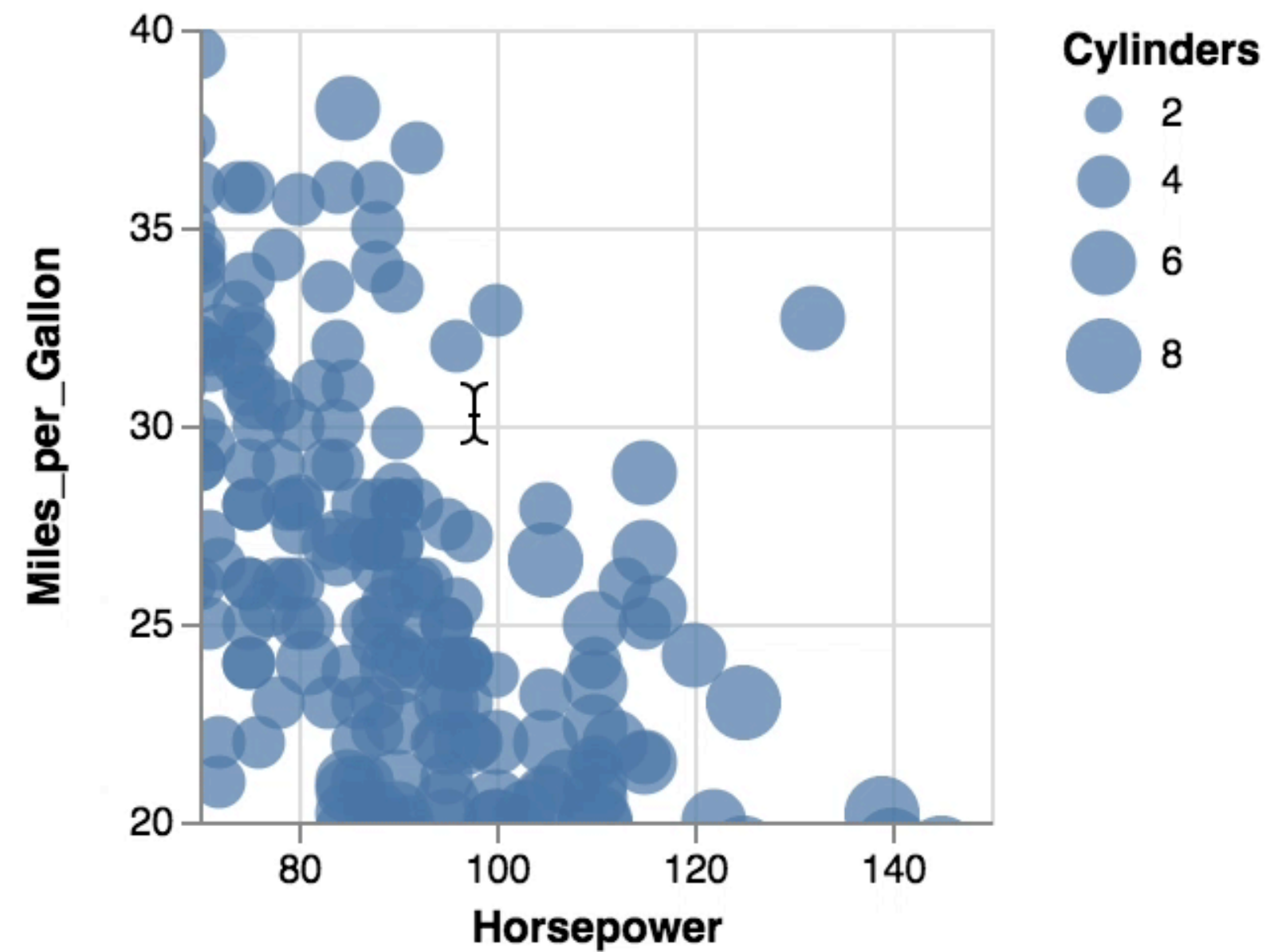
**Explore** show me something else.

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# Explore

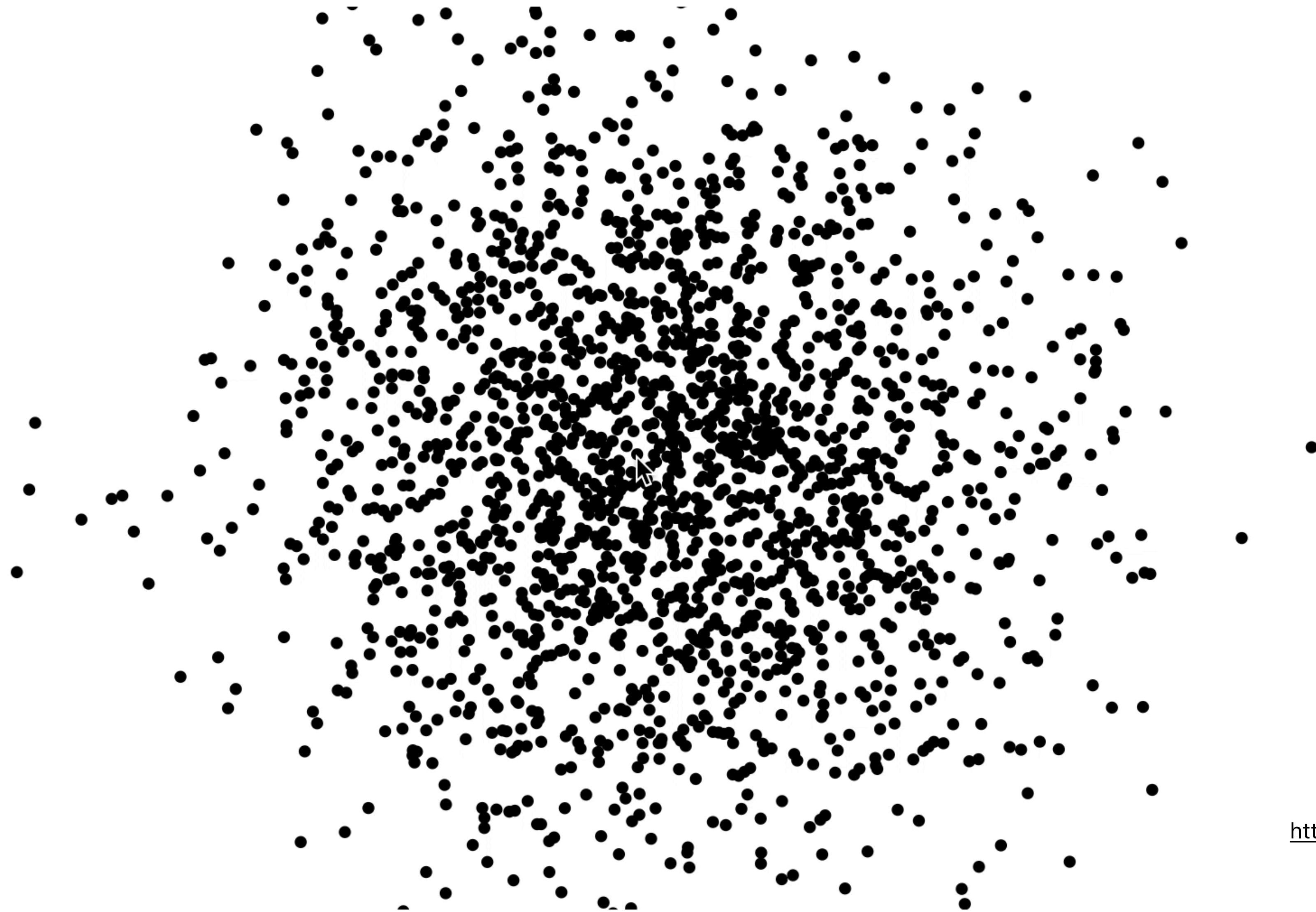


# Explore



# Explore

**Geometric zoom:** transforms the physical view (i.e., objects get larger as they get "closer").



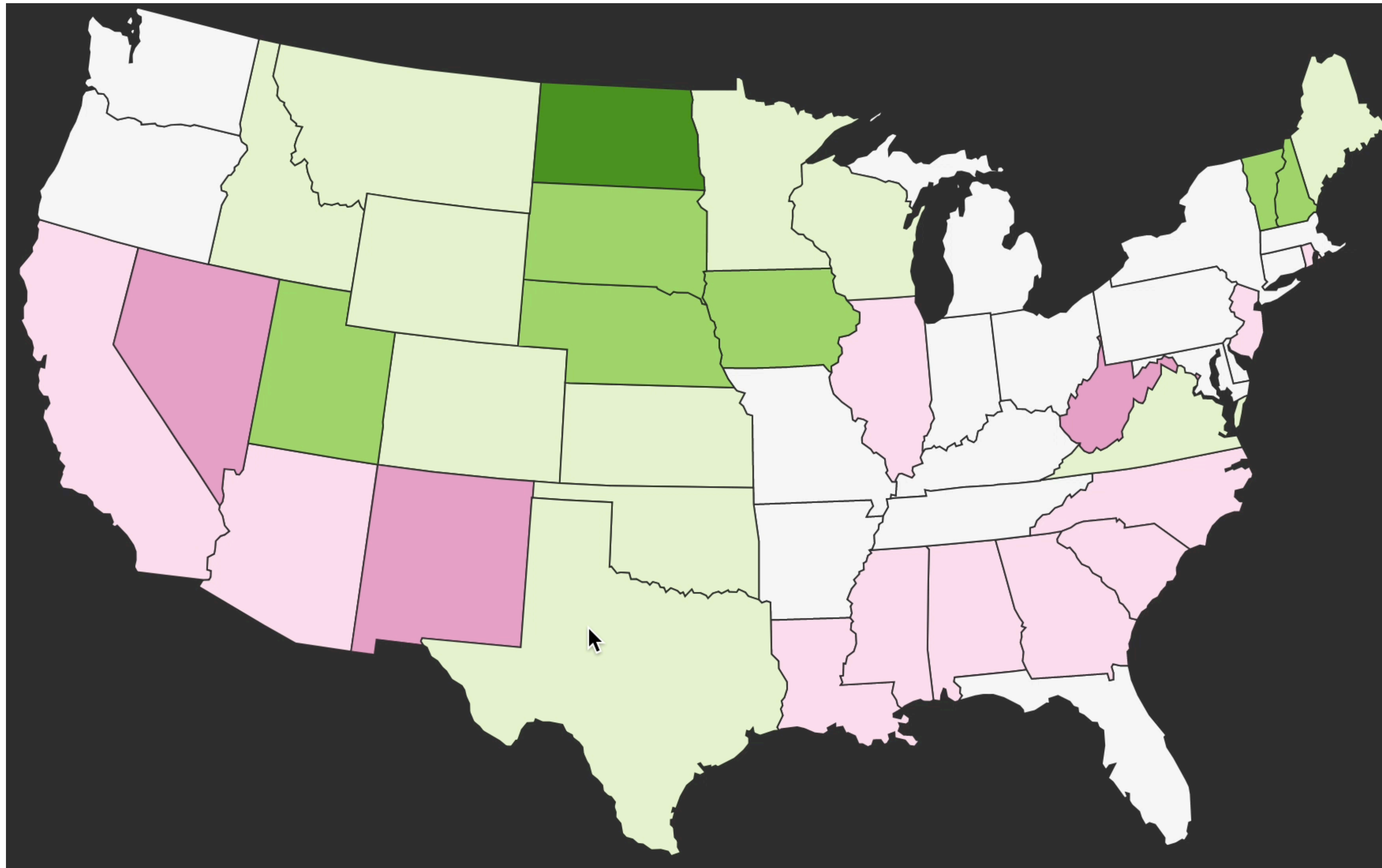
# Explore

**Semantic zoom:** transforms the data space (i.e., objects stay the same size, but get further apart).



# Explore

**Semantic zoom:** transforms the data space (i.e., objects stay the same size, but get further apart).



<https://bl.ocks.org/cmgiven/d39ec773c4f063a463137748097ff52f>

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See interactive systems like Tableau / Voyager

**Encode** show me a different visual representation.

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**Reconfigure** show me a different arrangement.

**Explore** show me some

**Encode** show me a dif

**Use interaction to help  
audience see something new,  
not just for visual eye candy!**