

## CHAPTER 6

# Interactive Visualization

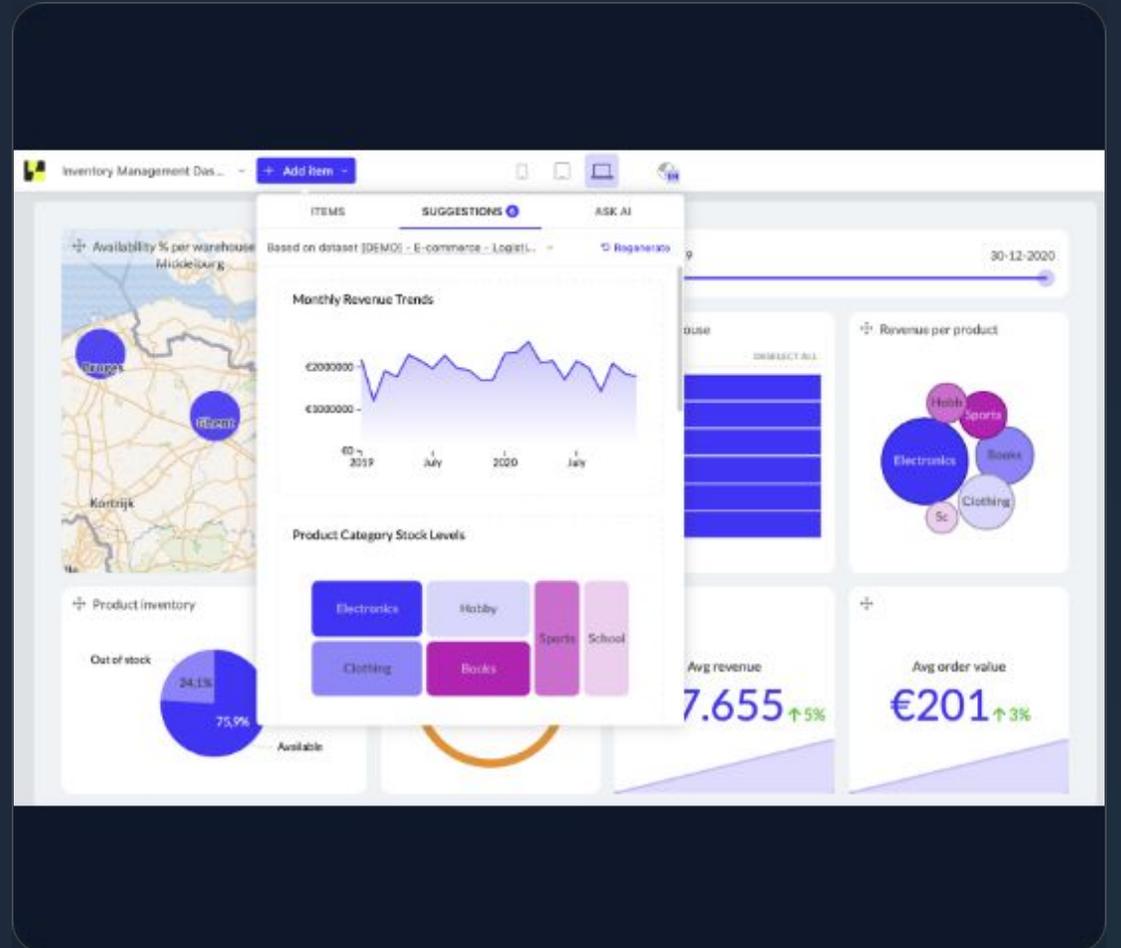
Introduction to interactive visualization tools, techniques, and designing for user experience.

# What is Interactive Visualization?

**User-Centric:** A form of visualization that allows direct user interaction with the data interface.

**Exploration:** Enables users to explore, control, and manipulate data views dynamically.

**Dynamic:** Goes far beyond static charts, offering a responsive and engaging experience.



# TRAFFIC OVERVIEW

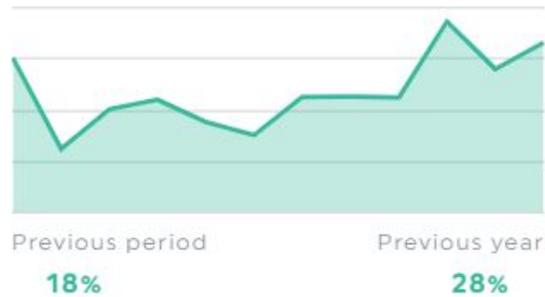
## TOTAL SESSIONS

3,344



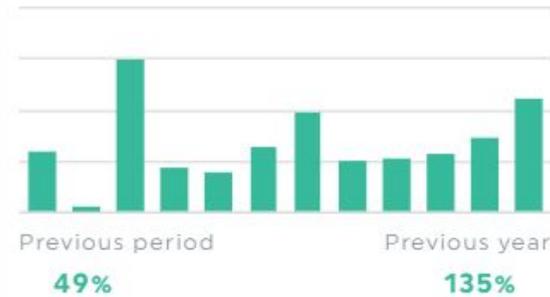
## BOUNCE RATE

82.94%



## GOAL COMPLETIONS

5,601

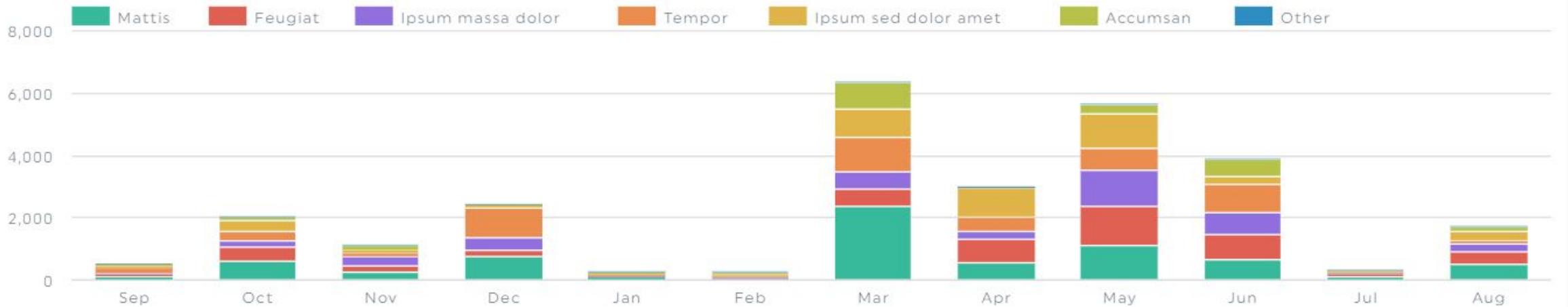


## GOAL COMPLETION RATE

51.91%



## TOP CHANNELS OVER TIME



# Online Sales of a SuperStore in India & the US



<https://www.fusioncharts.com/dev/fusiontime/fusiontime-component/tooltip-in-fusiontime>

# Static vs. Interactive Visualization

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## Static Visualization

Fixed display; no changes after rendering.

No user control over the data view.

Best suitable for print media and reports.



## Interactive Visualization

Dynamic display that responds to input.

User-driven exploration and discovery.

Essential for digital platforms and apps.

## Static charts

- + Focuses on the main message
- + Applicable for multiple media
- + More control over storytelling
- + Better for data explanation
- + Faster to make
- + Fewer accessibility issues
- Read only
- Hard to update
- Strict linear storytelling

## Interactive charts

- + Deliver multiple insights
- Limited cross-device support
- Choice overload
- + Better for data exploration
- Takes time and money
- Accessibility issues
- + More data can be shown
- + Easy to update
- + Engaging interactivity
- + Focus on details
- Complex structure

<https://www.datylon.com/blog/pros-and-cons-of-static-and-interactive-charts>

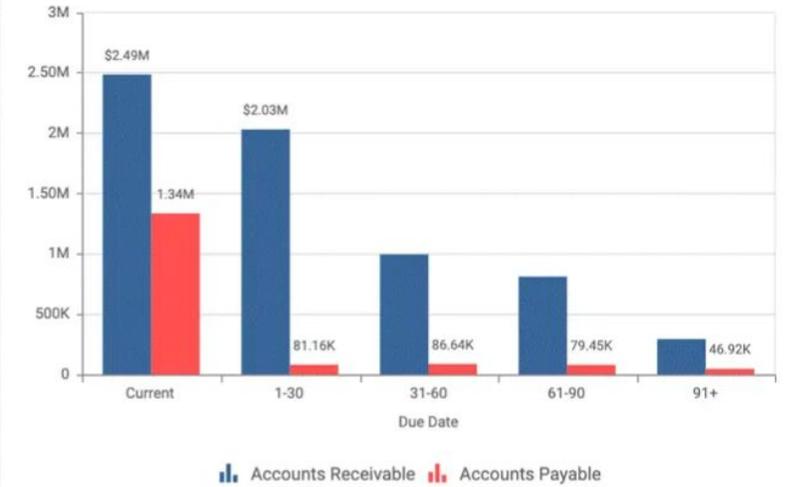
Total Accounts Receivable  
**\$6,621,280**

Total Accounts Payable  
**\$1,630,270**

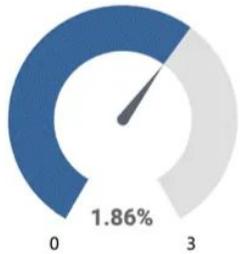
Equity Ratio  
**75.38 %**

Debt Equity  
**1.10 %**

Total Accounts Receivable and Payable Aging



Current Ratio ⓘ



DSI

[Days Sales Inventory]



DSO

[Days Sales Outstanding]

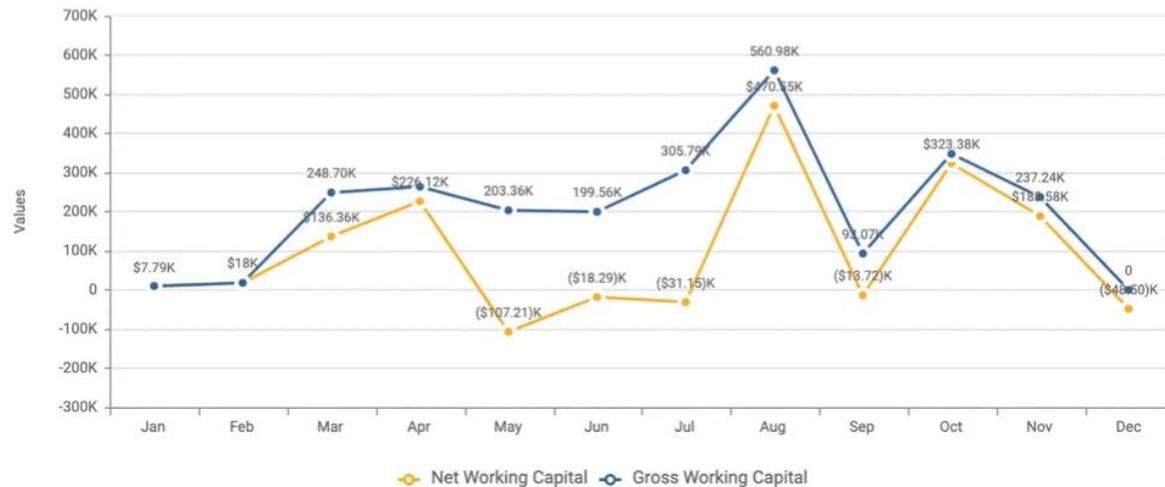


DPO

[Days Payable Outstanding]



Net Working Capital vs Gross Working Capital



Profit and Loss summary



# Why It Matters

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## Understanding

Improves data comprehension by allowing users to engage directly with the content.



## Exploration

Encourages users to investigate data layers and uncover hidden patterns or outliers.



## Clarity

Reduces information overload by letting users focus only on relevant data subsets.

# Common Interaction Techniques



**Hover (Tooltips):** Show details on demand.



**Click (Selection):** Highlight specific items.



**Filtering:** Show or hide data categories.



**Zoom & Pan:** Navigate large datasets.



**Linked Views:** Connect multiple charts.



Interaction drives engagement.

# Hover Interaction

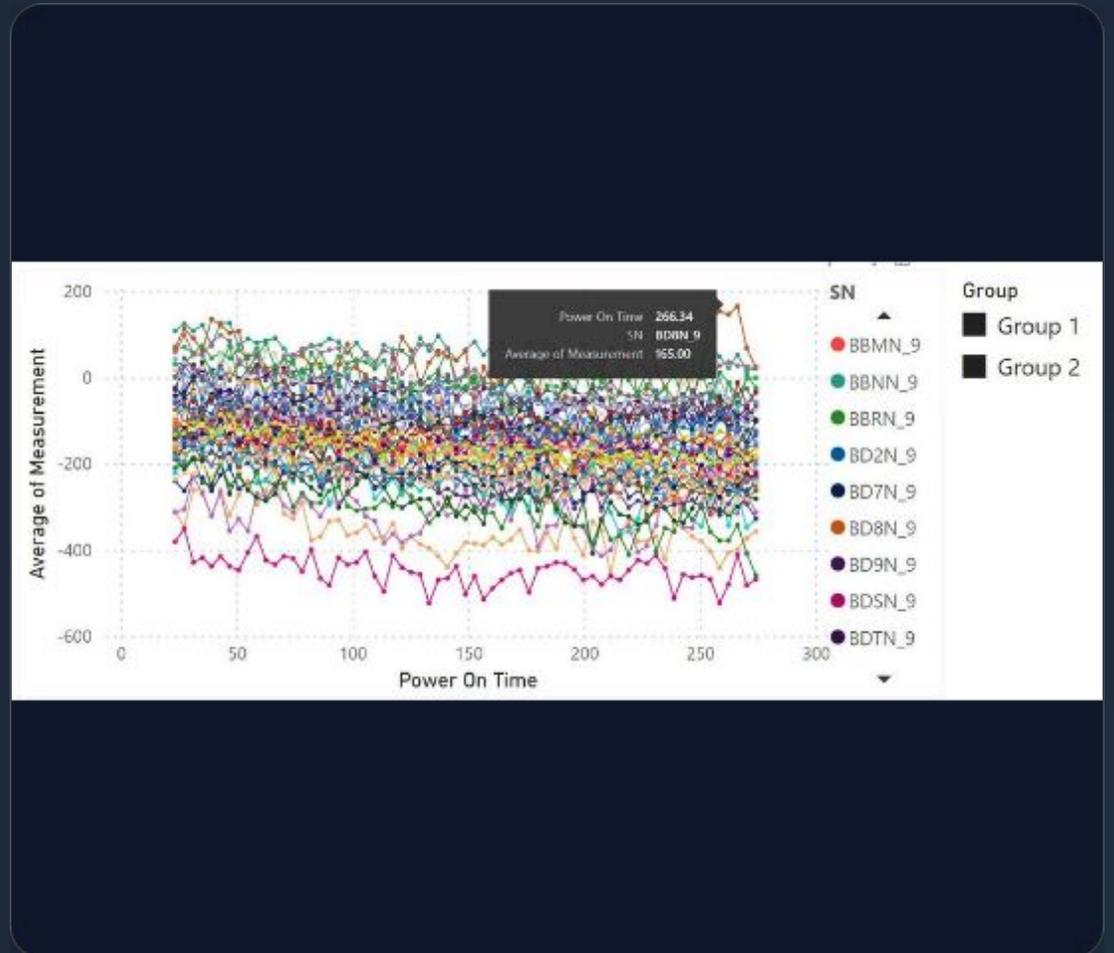
## Details on Demand

Hover interactions (tooltips) are essential for maintaining a clean interface while providing deep access to data.

 Displays additional info instantly.

 Reduces visual clutter significantly.

 Provides context without navigation.

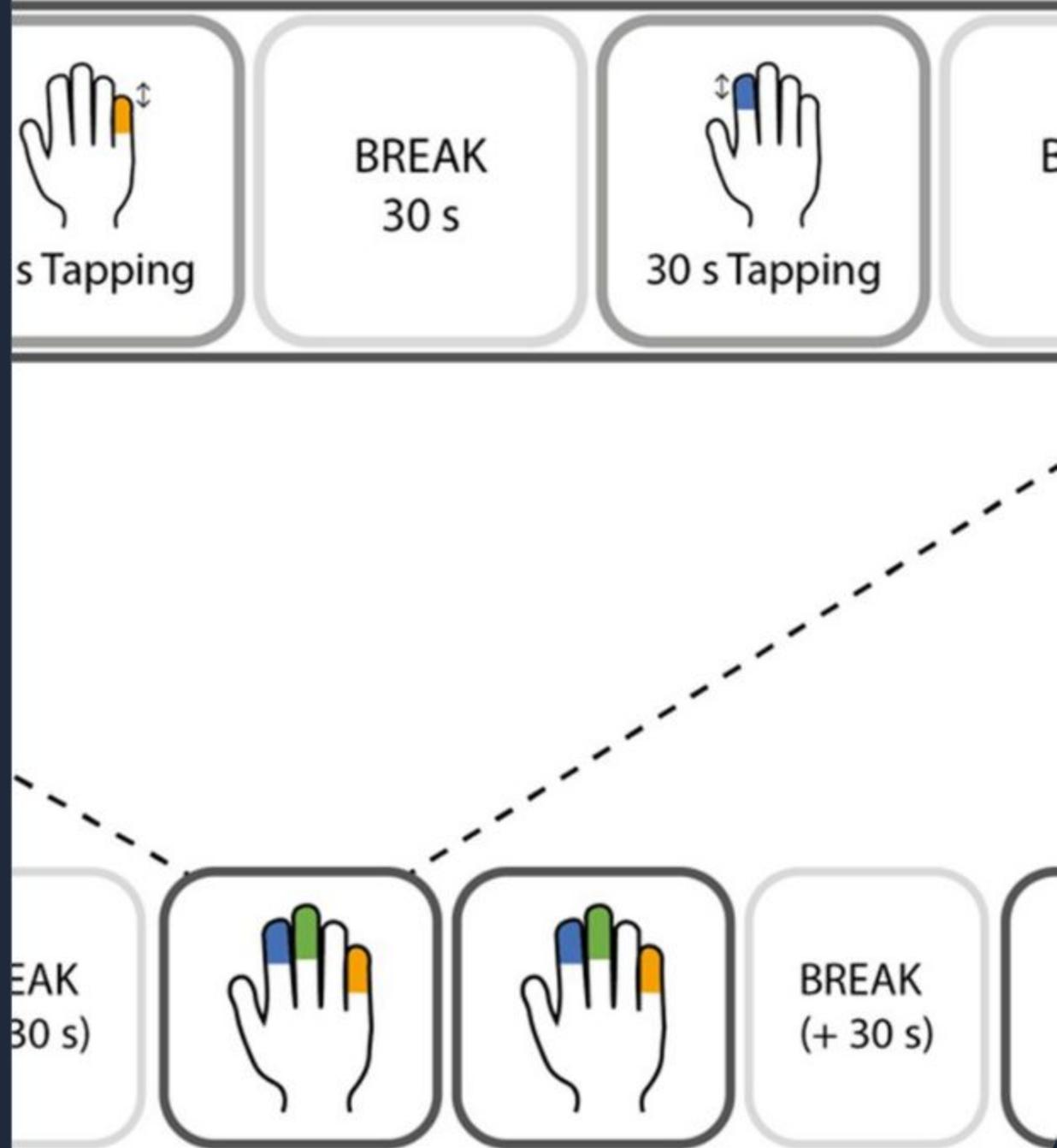


# Click & Selection

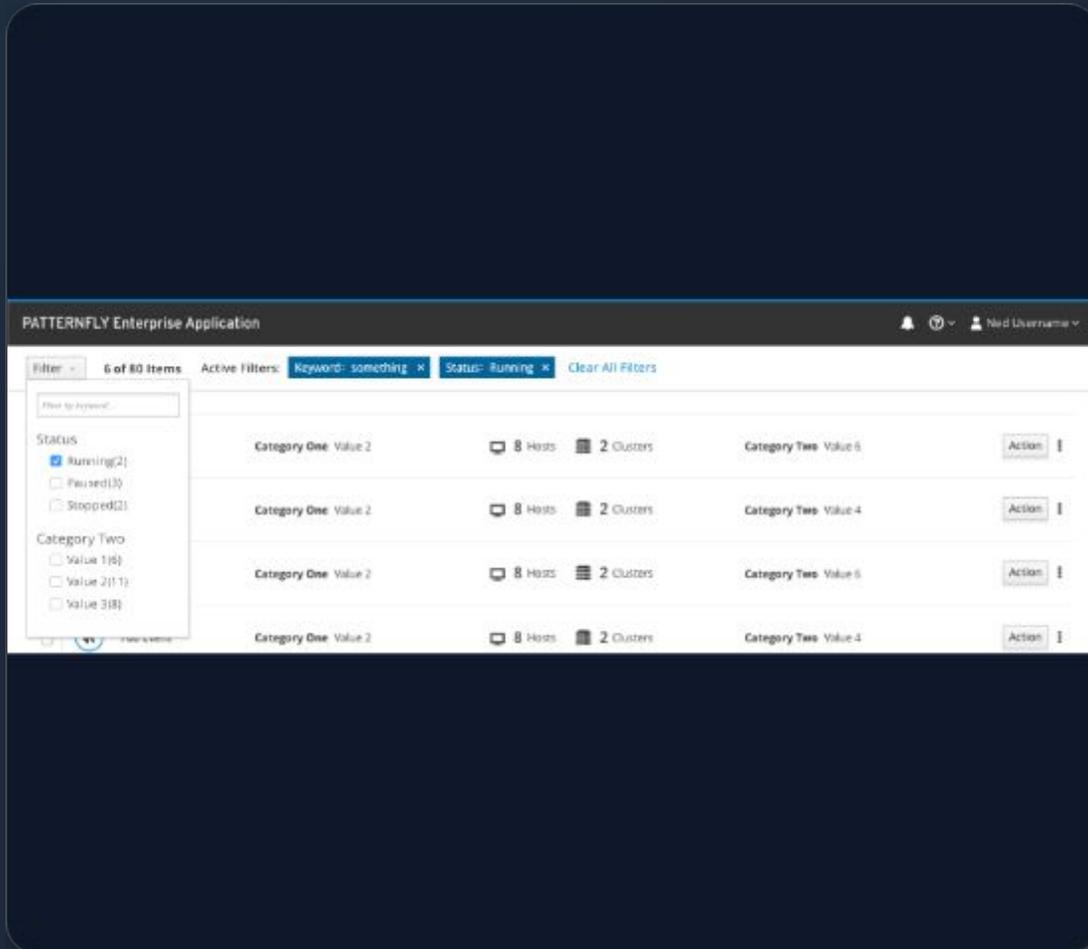
**Focus Attention:** Clicking allows users to isolate specific data points or groups for closer inspection.

**Contextual Highlighting:** Selecting an element often highlights related information across other parts of the dashboard.

**Action Trigger:** It can serve as a trigger to drill down into deeper levels of the data hierarchy.



# Filtering Interaction



## Refining the View

Filters are powerful tools that put the user in control of the dataset scope.

 Show or hide specific categories.

 Narrow down massive datasets.

 Improve clarity by removing noise.

# Zoom & Pan

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## Zoom

Allows users to focus on details by changing the scale of the view. Essential for spotting granular trends in dense data.



## Pan

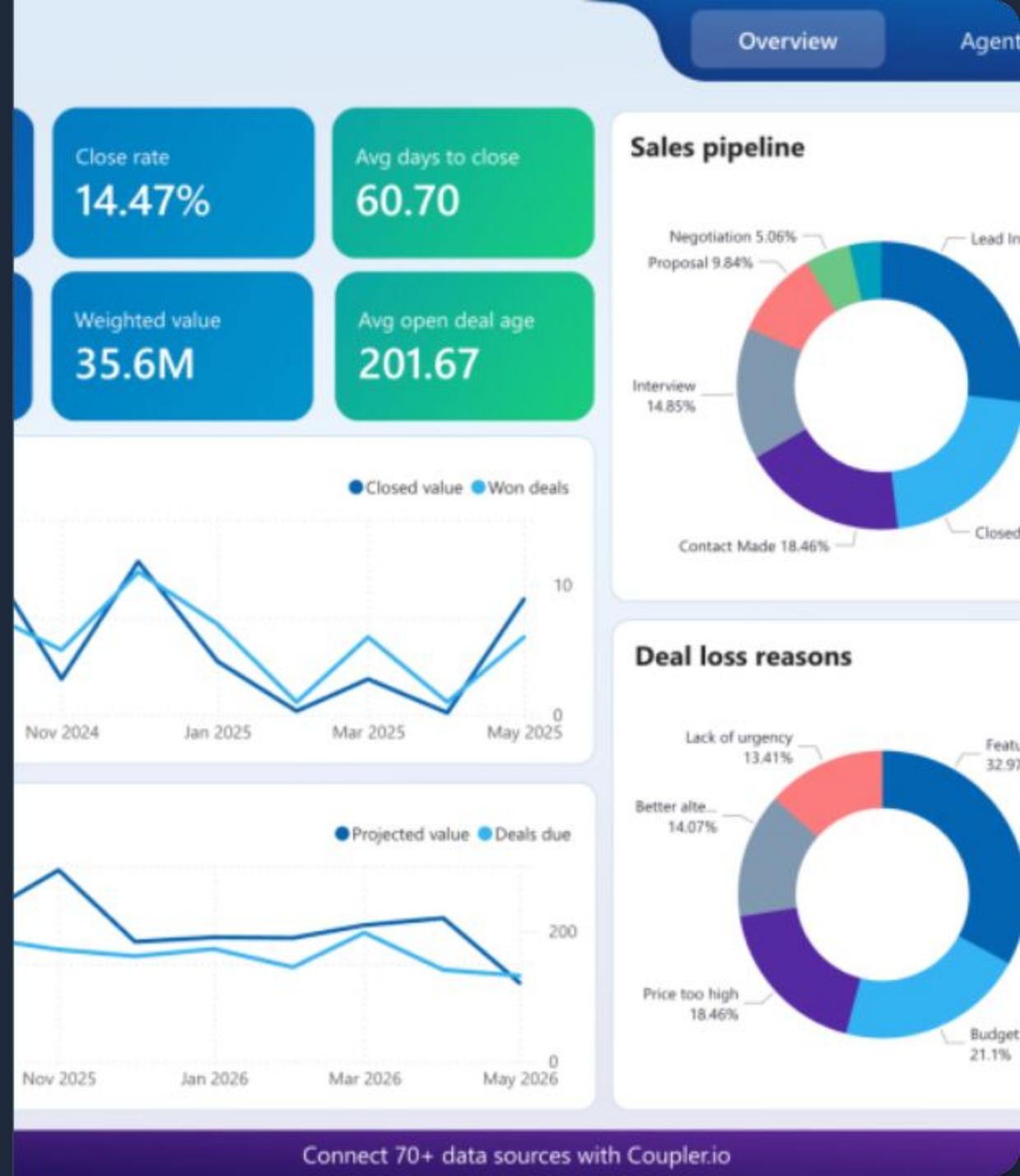
Enables movement across the data space without changing the scale. Vital for exploring maps and long time-series data.

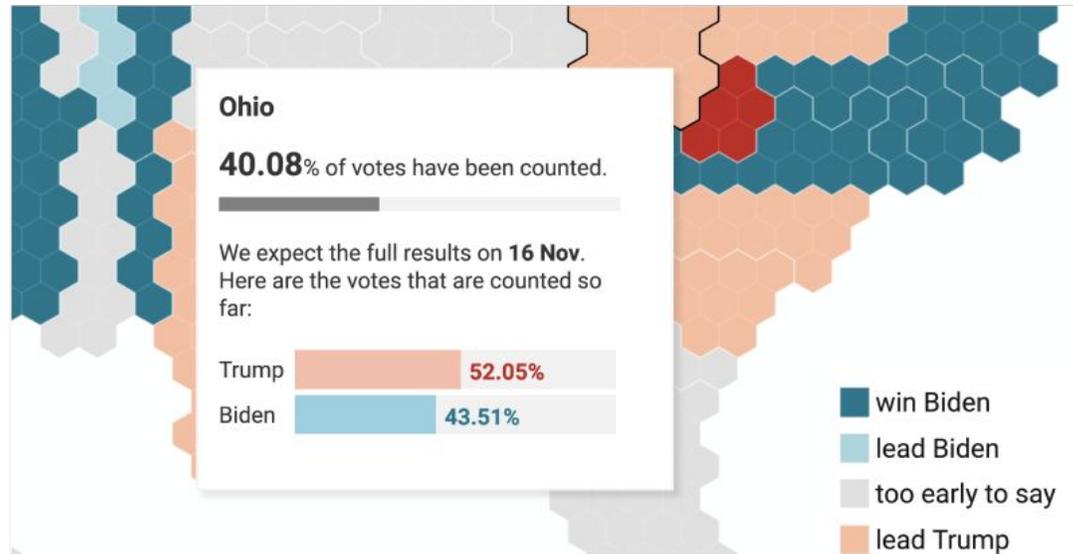
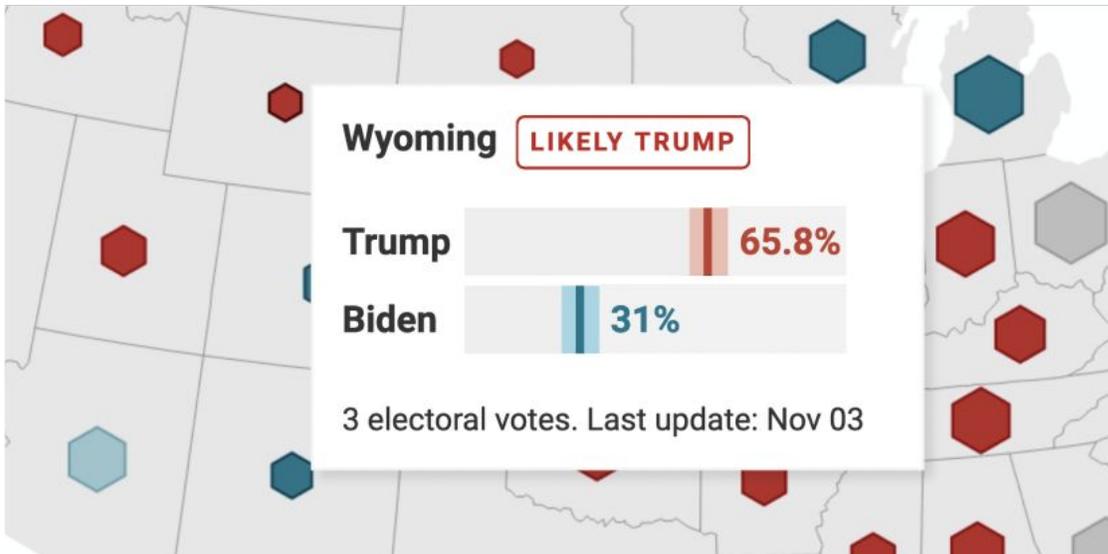
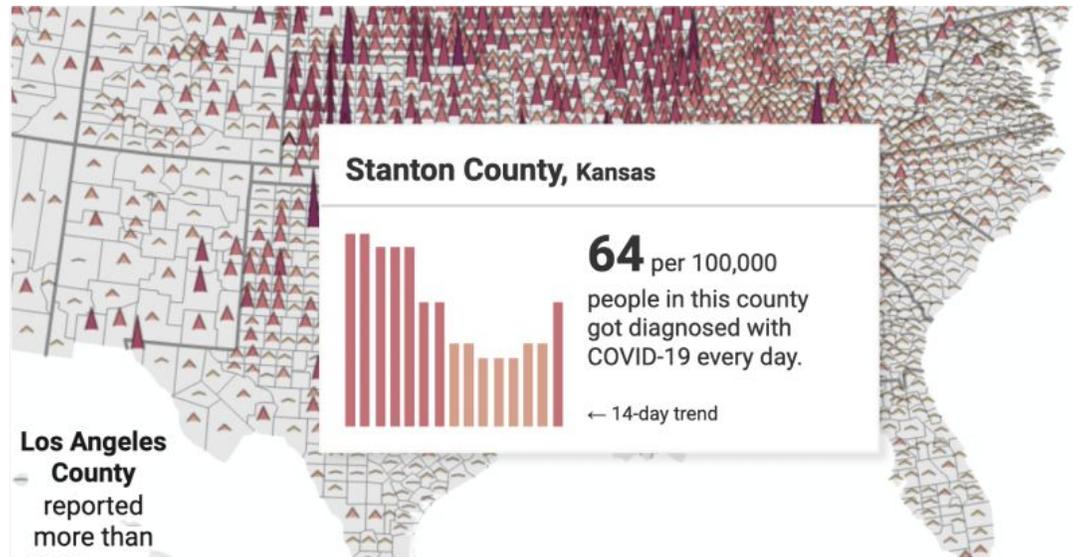
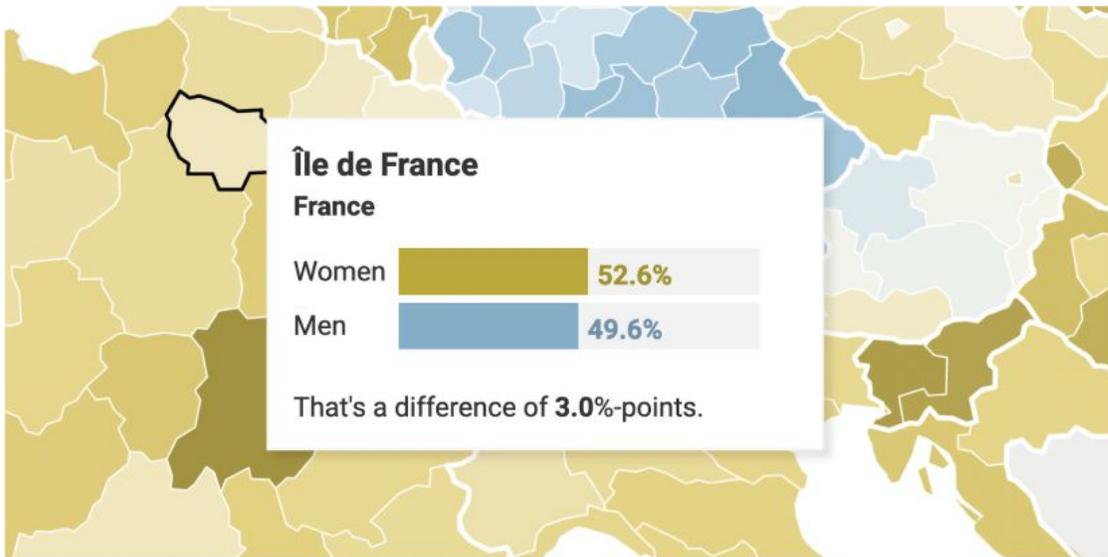
# Linked Views

**Interconnected Analysis:** Multiple visualizations are connected logically to represent different facets of the same dataset.

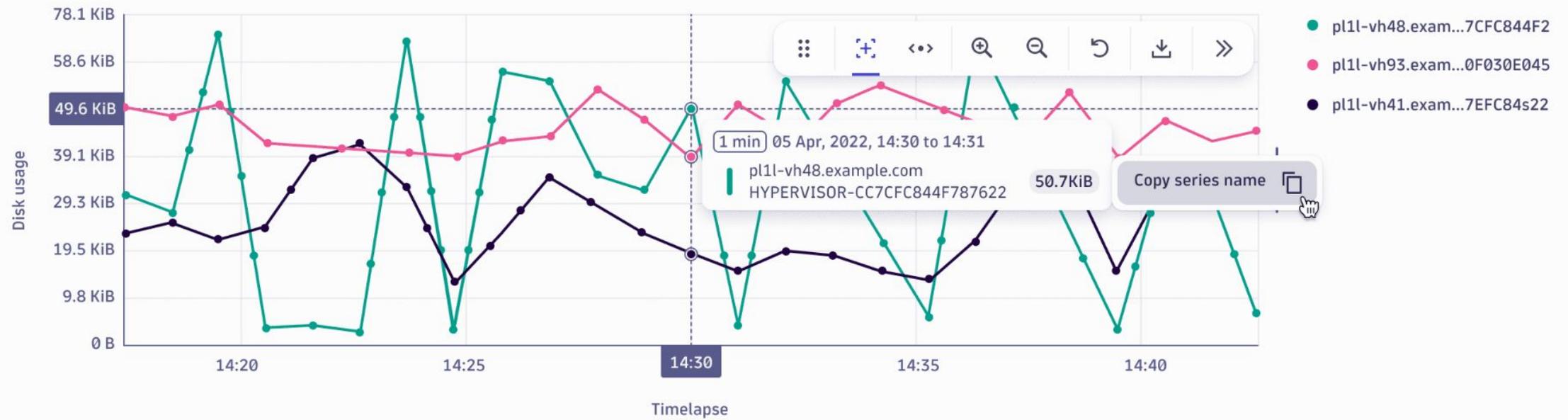
**Synchronized Updates:** Interaction in one view (e.g., selecting a geographic region) immediately filters or updates the other charts.

**Deeper Insight:** This technique supports complex relationship discovery that isn't possible with isolated charts.

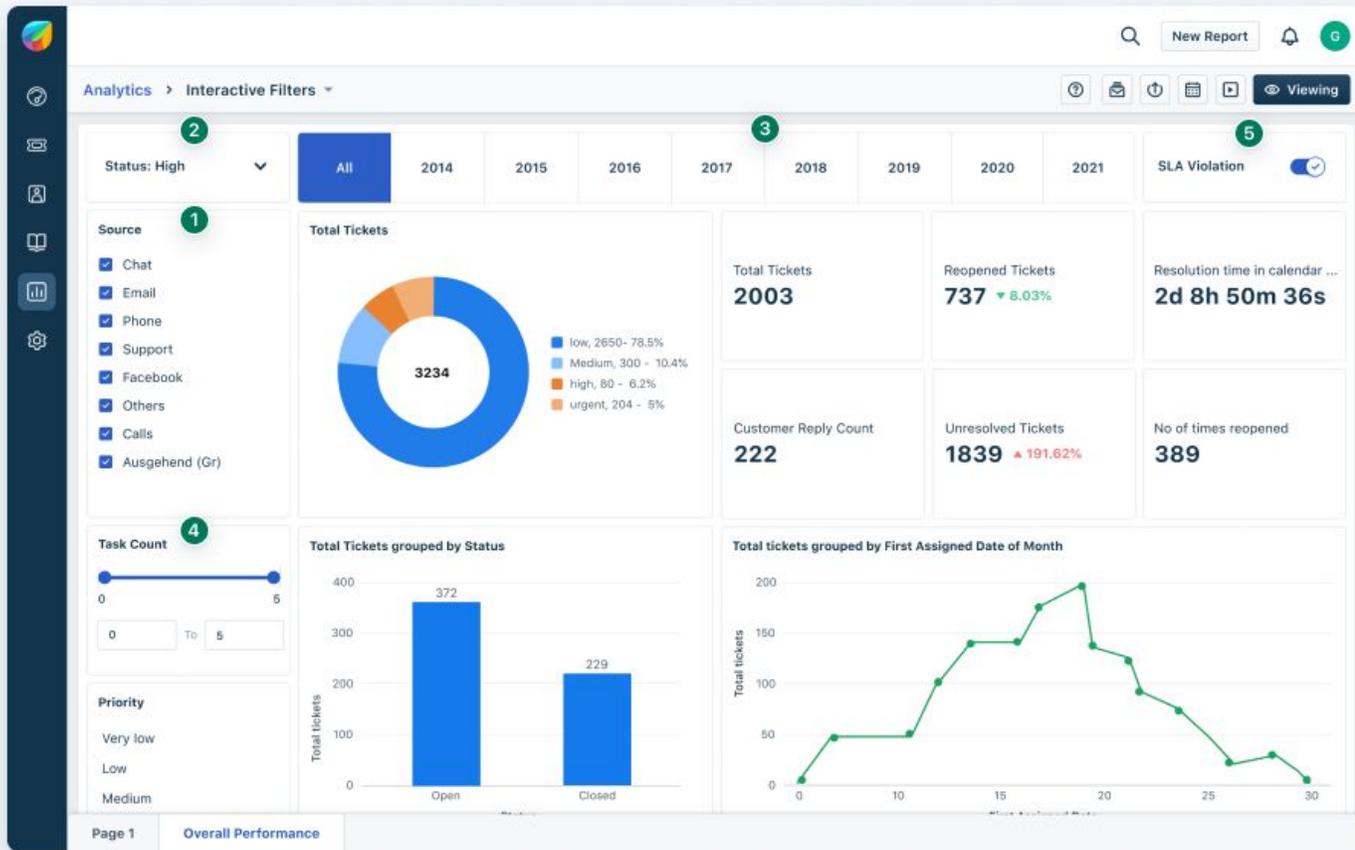




<https://academy.datawrapper.de/article/282-how-to-embed-charts-into-tooltips>



<https://docs.dynatrace.com/docs/discover-dynatrace/get-started/dynatrace-ui/interact-visualizations/common-interactions>



- 1 List
- 2 Dropdown
- 3 Button
- 4 Slider
- 5 Toggle

<https://support.freshdesk.com/support/solutions/articles/50000003907-interactive-filters-as-widgets>

# D3 gallery

Looking for a good D3 example? Here's a few (okay, 173...) to peruse.

## Animation

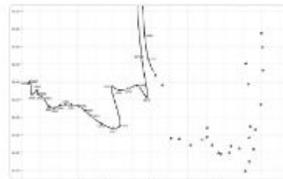
D3's [data join](#), [interpolators](#), and [easings](#) enable flexible [animated transitions](#) between views while preserving [object constancy](#).



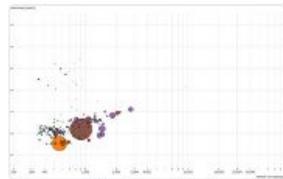
Animated treemap



Temporal force-directed gr...



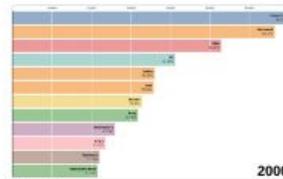
Connected scatterplot



The wealth & health of natio...



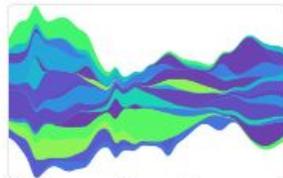
Scatterplot tour



Bar chart race



Stacked-to-grouped bars



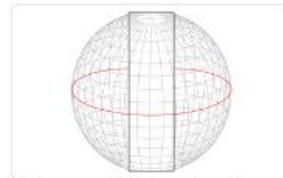
Streamgraph transitions



Smooth zooming



Zoom to bounding box



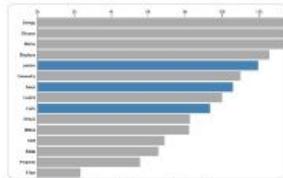
Orthographic to equirectan...



World tour



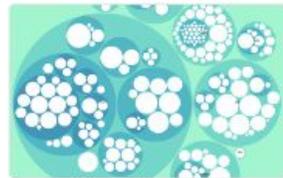
Walmart's growth



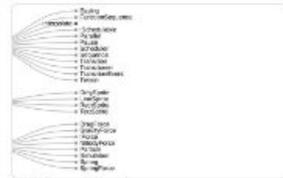
Hierarchical bar chart



Zoomable treemap



Zoomable circle packing



Collapsible tree



Zoomable icicle



[D3 gallery](#)

# Tools for Interactive Visualization

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## Dashboard Tools

Enterprise platforms like Tableau and PowerBI that offer drag-and-drop interactivity for business analytics.



## Web Libraries

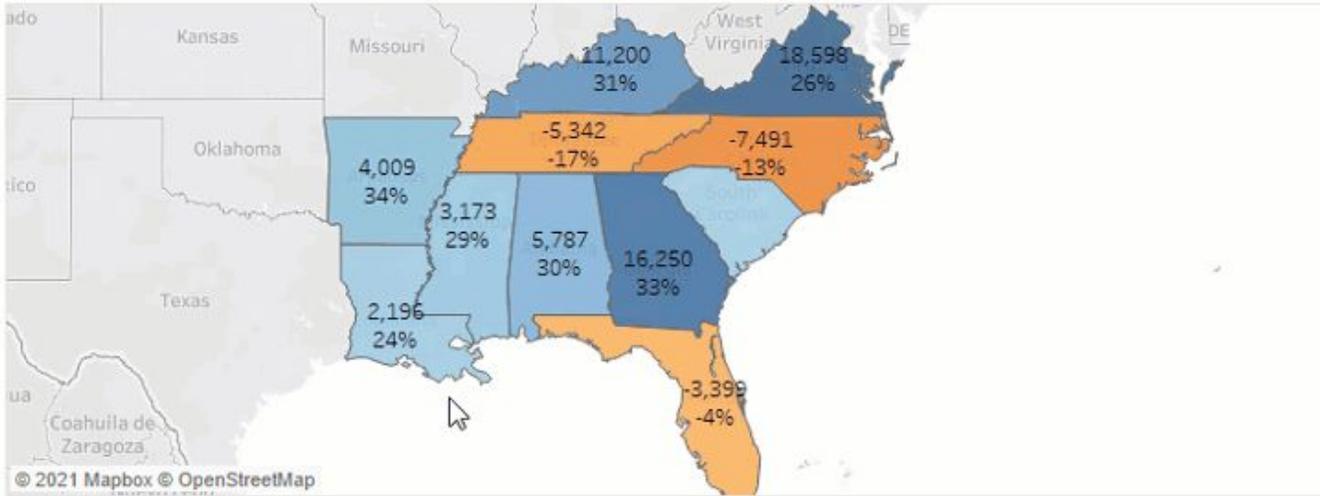
Coding frameworks like D3.js and Chart.js that provide granular control for custom web-based visualizations.



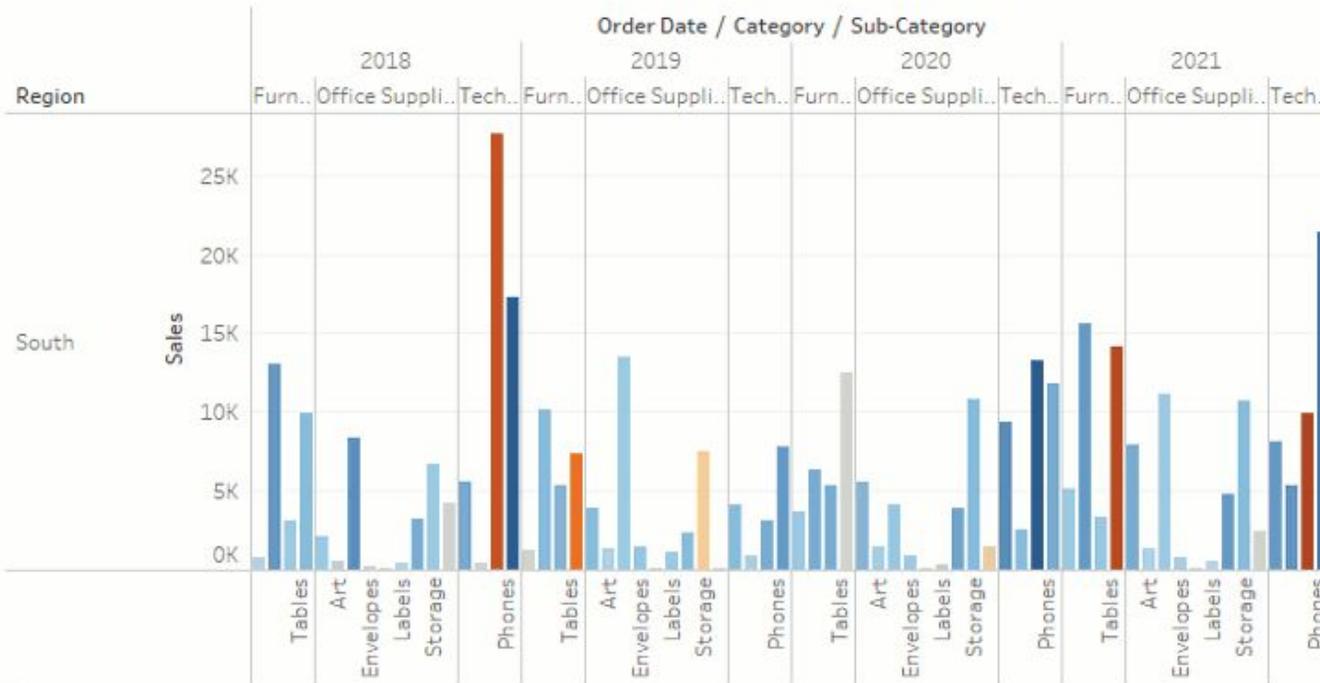
## No-Code Platforms

Tools like Flourish or Datawrapper that democratize interactive design without requiring programming skills.

## Profit Map



## Sales in the South



### Sub-Category

- (All)
- Accessories
- Appliances
- Art
- Binders
- Bookcases
- Chairs
- Copiers
- Envelopes
- Fasteners
- Furnishings

### Year of Order Date

- (All)
- 2018
- 2019
- 2020
- 2021

### Profit



### Year of Order Date

- (All)
- 2018
- 2019
- 2020
- 2021

### Sub-Category

- (All)
- Accessories
- Appliances
- Art
- Binders
- Bookcases
- Chairs
- Copiers
- Envelopes
- Fasteners

<https://help.tableau.com/current/guides/get-started-tutorial/en-us/get-started-tutorial-build.htm>

# North America Retail Supply Chain and Sales Analysis

Synopsis

Regional Analysis

Orders

## Sales

CY 733.22K | PY 609.21K

20.36% ▲



## Profit

CY 93.44K | PY 81.80K

14.24% ▲



## Orders

CY 3312 | PY 2587

28.02% ▲



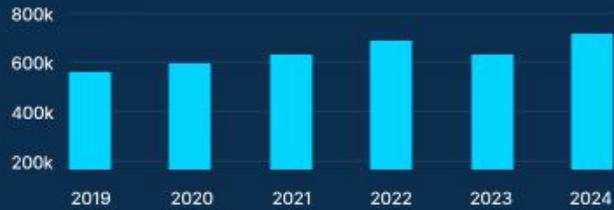
## Returns

CY 289 | PY 197

46.70% ▲



## Sales trend



## Business Overview by Regions

Region	Total Sales	Total Orders	Total Returns	Total Profit	Profit Ratio
West	725,457.82	3203	490	108,418.45	1.18
East	678,781.24	2848	149	91,522.78	1.16
South	391,721.91	1620	69	46,749.43	1.14
Central	501,239.89	2323	92	39,706.36	1.09

## Ranking Overview

Value Top  Bottom  Ranking option 3

### Metric

- Retail Sales People
- State
- City
- Customer

### Measure By

- Sales
- Profit
- Orders
- Returns

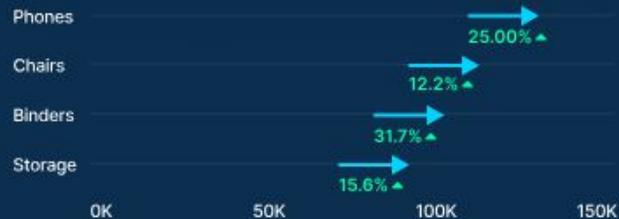
Ranking	State	Sales
457688	California	457,687.63
310876	New York	310,876.27
138642	Washington	138,641.27

## Which Segment Contributed Most Towards Total Sales?

Sum of Sales by Segment, Category and Sub-Category



## Sales Growth Analysis For Top 5 Sub Categories



# Designing for User Experience



**User-Centricity:** Prioritize the specific needs and goals of the end-user.



**Simplicity:** Keep interactions intuitive; avoid overwhelming the user with too many choices at once.



**Avoid Complexity:** Unnecessary features can confuse rather than enlighten. Good design helps users think.



# UX Principles

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## Clarity

Affordance is key. Users must immediately understand which elements are interactive and what actions are possible.



## Consistency

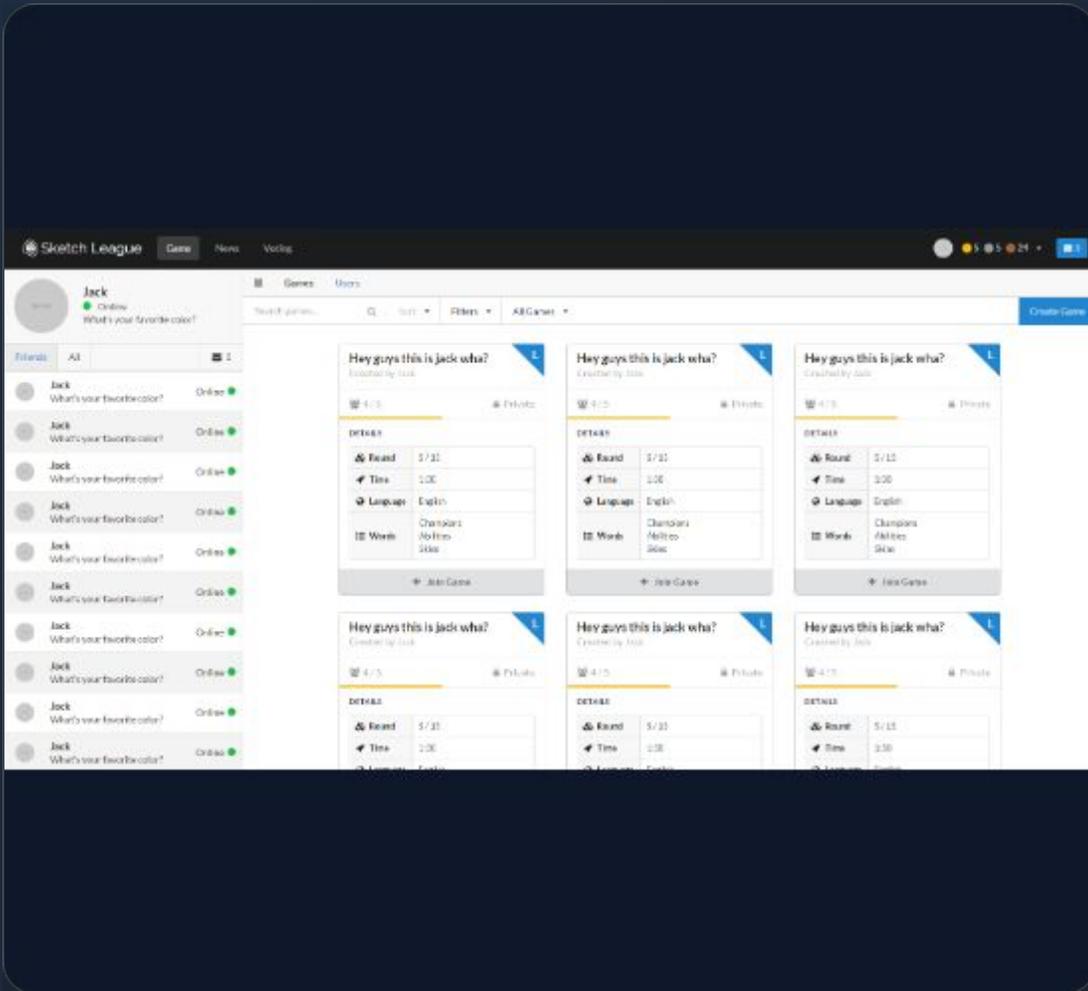
Similar interactions should yield similar results. Standardize gestures (e.g., pinch-to-zoom) to reduce the learning curve.



## Feedback

The system must respond immediately to user input (e.g., hover states, loading indicators) to confirm interaction.

# Common Design Mistakes



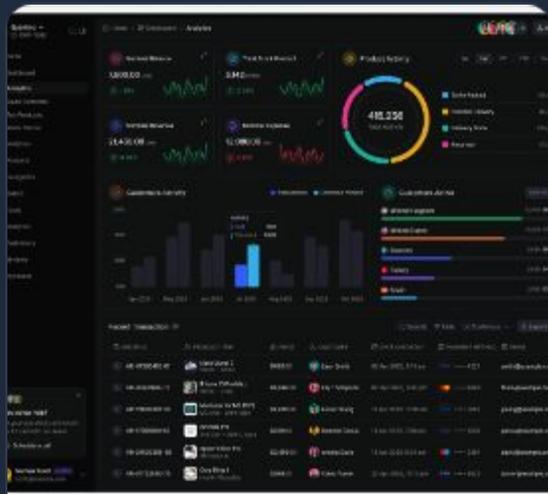
## Pitfalls to Avoid

**Option Overload:** Presenting too many controls simultaneously paralyzes the user.

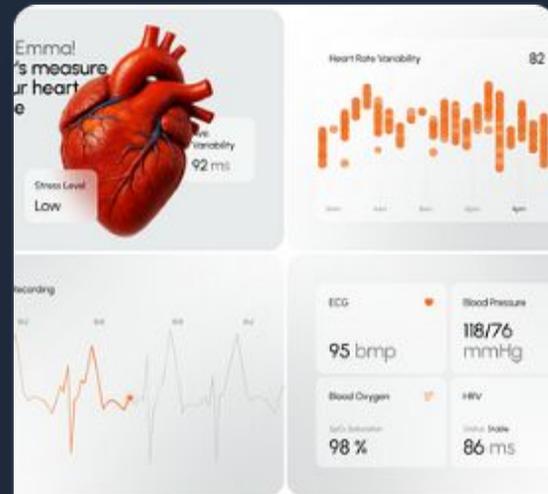
**Hidden Controls:** Vital interaction triggers shouldn't be buried in sub-menus.

**Latency:** Slow or delayed feedback breaks the flow of exploration and causes frustration.

# Real-World Applications



Business Intelligence



Health Monitoring



Weather & Traffic



Game Analytics

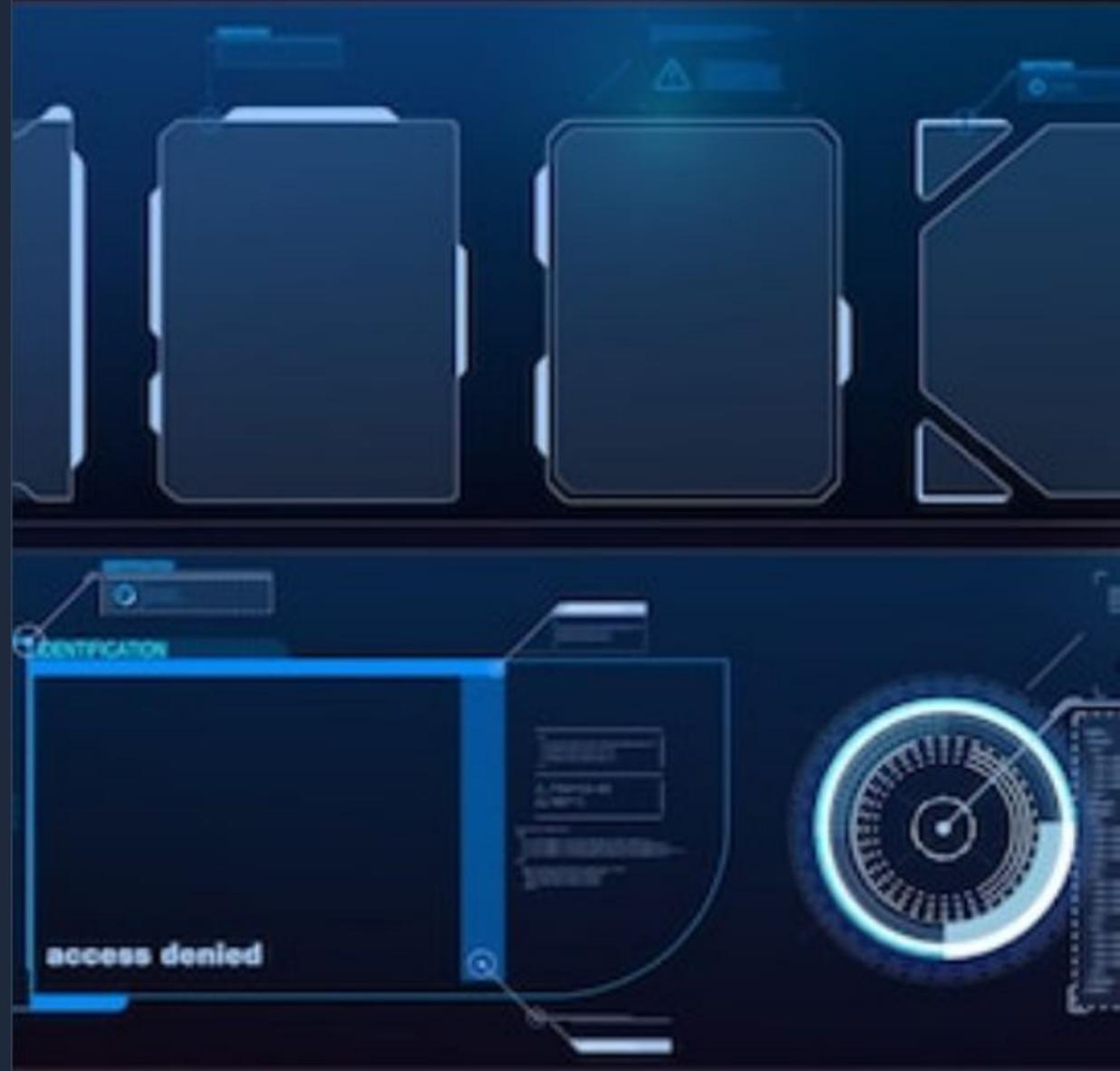
# Visualization in Games

**Player Feedback:** Interactive dashboards provide real-time statistics (K/D ratio, accuracy) to help players improve.

**Heads-Up Displays (HUD):** Vital information like health, ammo, and objectives are visualized dynamically without breaking immersion.

**Post-Game Analytics:** Detailed interactive graphs allow players to analyze their performance match by match.

D and Infographic elements



## Real-World Applications

**Visual:** COVID / weather / traffic dashboard

 <https://ourworldindata.org/coronavirus>

 <https://www.windy.com/>

 <https://www.tomtom.com/traffic-index/>

## Interactive Visualization in Games

**Visual:** Game analytics / HUD

 <https://www.gdcvault.com/>

 <https://unity.com/solutions/game-analytics>

 <https://developer.valvesoftware.com/wiki/HUD>

# Key Takeaways

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## **Active Exploration:** Interaction

- ✓ transforms passive viewers into active analysts.

## **Purposeful Design:** Every interaction

- ✓ should serve a specific goal—to clarify, filter, or reveal.

## **Balance:** The best visualizations

- ✓ balance powerful functionality with intuitive simplicity.





# Chapter Complete

Next: Practical exploration of interactive  
visualization concepts.

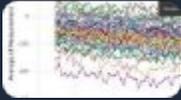
# Image Sources

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[https://cdn.prod.website-files.com/64ccd6239abfeec743815b28/667c2d80df0bb1959feec11e\\_AD\\_4nXcfOD8-sdGWnJmtInJQ4UCyIS7mY3pAv6MAyeah9WtZM9lwwl1ZrcgXFcrEWRtQi7PkbHb5N2YAt-XeHgyzcg3FXuZtBvrjwOungYS8J5G0UefllhG3UGTdfaWhFJblbWjdE22a6NUpGme-AHs7UxK1C31.png](https://cdn.prod.website-files.com/64ccd6239abfeec743815b28/667c2d80df0bb1959feec11e_AD_4nXcfOD8-sdGWnJmtInJQ4UCyIS7mY3pAv6MAyeah9WtZM9lwwl1ZrcgXFcrEWRtQi7PkbHb5N2YAt-XeHgyzcg3FXuZtBvrjwOungYS8J5G0UefllhG3UGTdfaWhFJblbWjdE22a6NUpGme-AHs7UxK1C31.png)  
Source: [www.luzmo.com](http://www.luzmo.com)

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<https://community.fabric.microsoft.com/t5/image/serverpage/image-id/1092303i2E1AE3767798CA2E/image-size/large?v=v2&px=999>  
Source: [community.fabric.microsoft.com](http://community.fabric.microsoft.com)

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[https://www.frontiersin.org/files/Articles/1427336/fnhum-18-1427336-HTML/image\\_m/fnhum-18-1427336-g001.jpg](https://www.frontiersin.org/files/Articles/1427336/fnhum-18-1427336-HTML/image_m/fnhum-18-1427336-g001.jpg)  
Source: [www.frontiersin.org](http://www.frontiersin.org)

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<https://pf3.patternfly.org/v3/pattern-library/forms-and-controls/checkbox-filter/img/checkbox-filter-example.png>  
Source: [pf3.patternfly.org](http://pf3.patternfly.org)

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<https://blog.coupler.io/wp-content/uploads/2025/04/pipedrive-crm-dashboard-power-bi-1024x576.png>  
Source: [blog.coupler.io](http://blog.coupler.io)

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<https://www.justinmind.com/wp-content/uploads/2018/12/6-best-practices-for-Dashboard-Design-Justinmind-header.png>

Source: [www.justinmind.com](http://www.justinmind.com)

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<https://i.sstatic.net/bYbe9.png>

Source: [ux.stackexchange.com](http://ux.stackexchange.com)

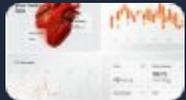
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<https://cdn.dribbble.com/userupload/43507872/file/original-df7180b18e97f8487d50bd65cba0a013.png>

Source: [dribbble.com](http://dribbble.com)

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Source: [dribbble.com](http://dribbble.com)

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[https://www.climate.gov/sites/default/files/2021-08/DatasetGallery\\_radar-data-map\\_thumb\\_16x9.jpg](https://www.climate.gov/sites/default/files/2021-08/DatasetGallery_radar-data-map_thumb_16x9.jpg)

Source: [www.climate.gov](http://www.climate.gov)

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<https://preview.redd.it/the-after-match-stats-screen-is-legit-one-of-the-best-v0-8rb3rar1ecpf1.png?width=1080&crop=smart&auto=webp&s=d186661158459ab72ce904995acb26ee5ea2ac3c>

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