

# DSCI 532

# Data Visualization 2

# 1. Intro to dashboards

## Lecture learning goals

1. Understand what dashboards are
2. Explain the advantages of using dashboards
3. Define what constitutes an effective dashboard layout
4. Explain the advantages of using interactive visualizations
5. Distinguish server side from client side interactivity

## Required activities

Before class:

- Nothing!

After class:

- [Don't rush into coding](#) Sections 7.1.1, 7.2.1, 7.2.2.
- [UX Matters](#) Sections 6, 6.1, 6.1.1 (until the first code chunk), 6.1.2.

# What is a dashboard?

(in a data science context)

# Definitions

- “A dashboard is a way of displaying various types of visual data in one place. Usually, a dashboard is intended to convey different, but related information in an easy-to-digest form. And oftentimes, this includes things like key performance indicators (KPI)s or other important business metrics that stakeholders need to see and understand at a glance.

# Definitions

- “An information management tool that visually tracks, analyzes, and displays key performance indicators, metrics, as well as key data points, allowing you to monitor the current state of your business, department, team, or specific process”

# Definitions

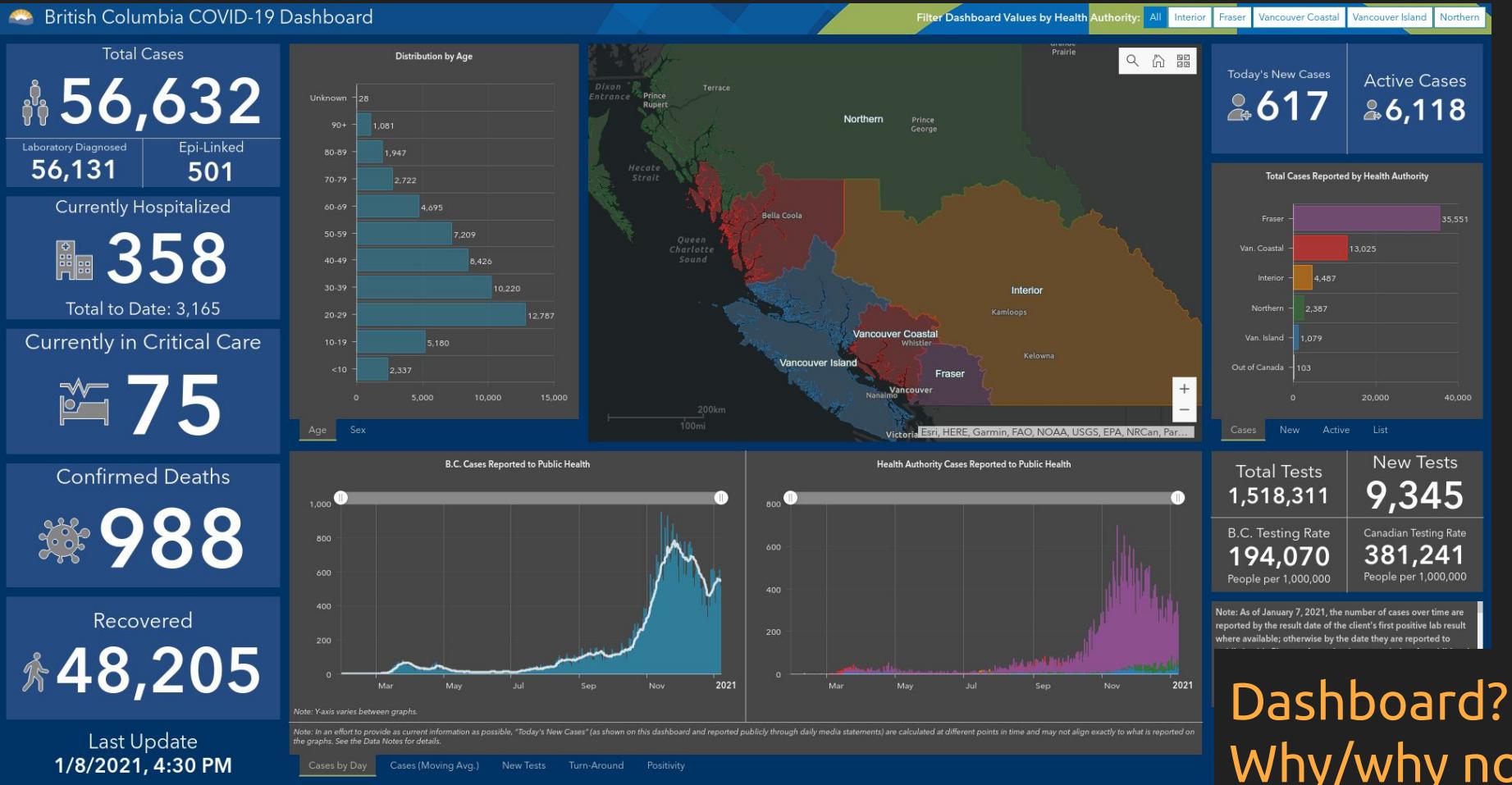
- “Dashboards are a way to monitor your business and see all your most important metrics at a glance. ... A dashboard combines on-premises and cloud data, providing a consolidated view of data.”

<https://learn.microsoft.com/en-us/power-bi/create-reports/service-dashboards#dashboard-basics>

# Definitions

- “Dashboards are tools that provide up-to-date information, using visuals to communicate the stories behind the data. They guide decision-makers through the relationships of complex, big data. They present visuals in a practical order enabling quicker understanding and appreciation of data to the business.”

Which of these are dashboards?



Dashboard?  
Why/why not?  
A. Yes   B. No

# BCCDC COVID-19 Epidemiology App

Date Range  
2020-03-01 to 2021-01-09

Select Comparison Groups:  
 Pre-selected Groups  
 Custom Groups

Select Comparison Group:  
BC Health Service Delivery Areas

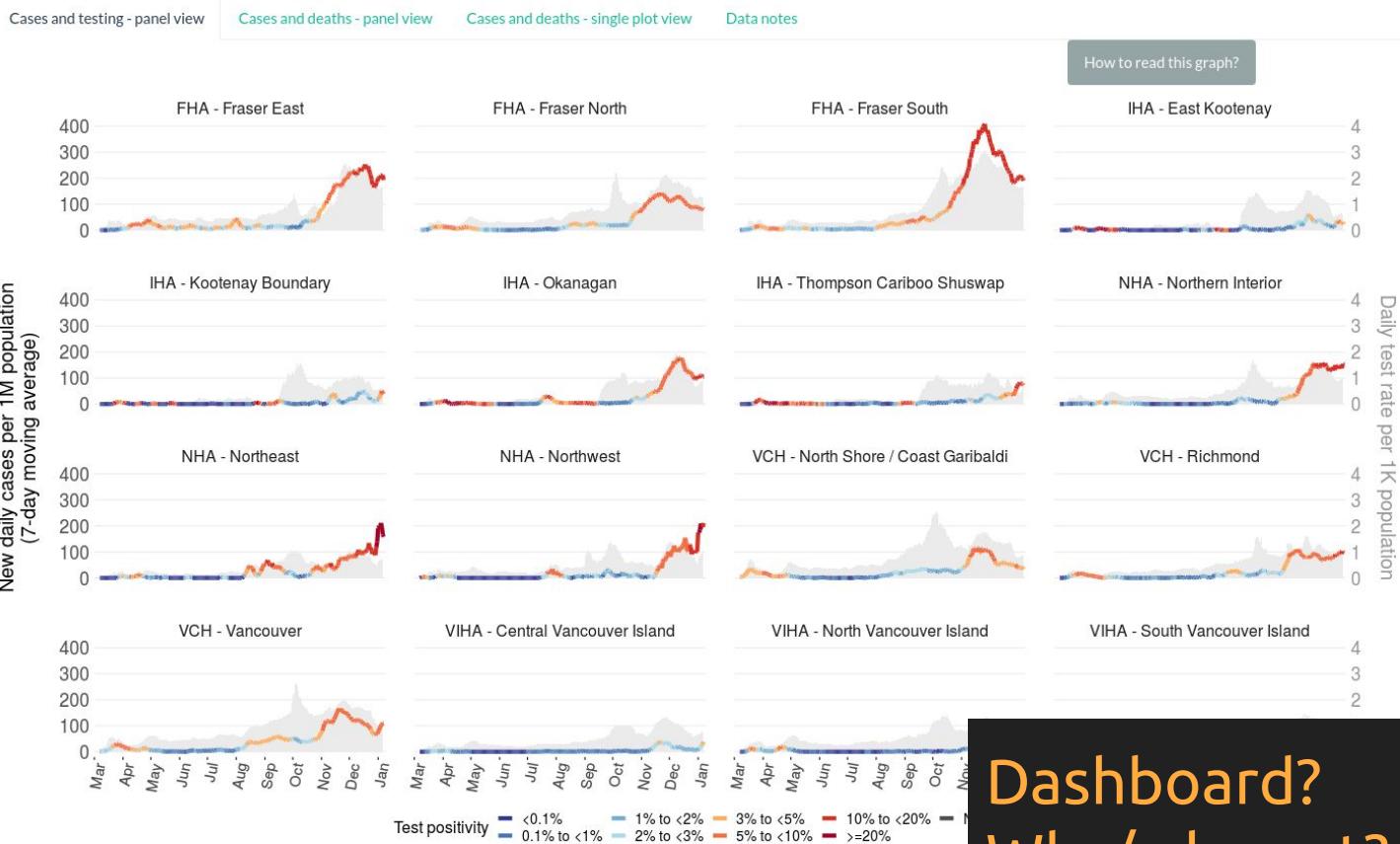
Select Y Scale  
 Single Scale  Individual Scales

Click the button below to download the figure shown:  
[Download graph](#)

For more BC data, please visit BCCDC COVID-19 data page:  
<http://www.bccdc.ca/health-info/diseases-conditions/covid-19/data>

  
BC Centre for Disease Control  
Provincial Health Services Authority

  
Provincial Health Services Authority  
Province-wide solutions. Better health.



Dashboard?  
Why/why not?

A. Yes   B. No

Cities with at least **5** breweries within **20** miles based on **all** beers.

Average rating of all beers

55%

Number of breweries nearby

45%

Closer to here  
the better

→ QUALITY

↓ QUANTITY

#### BEST CITIES

01. San Diego, CA
02. Denver, CO
03. Portland, OR
04. Santa Rosa, CA
05. Minneapolis, MN
06. Chicago, IL
07. Austin, TX
08. Seattle, WA
09. Anchorage, AK
10. St. Louis, MO
11. Bend, OR
12. Ann Arbor, MI
13. Philadelphia, PA
14. Salt Lake City, UT
15. San Francisco, CA
16. Oceanside, CA
17. Asheville, NC
18. Madison, WI
19. Richmond, VA
20. New York, NY
21. Frederick, MD
22. Washington, DC
23. Albuquerque, NM
24. Baltimore, MD
25. Columbus, OH
26. Pittsburgh, PA
27. Cincinnati, OH
28. Duluth, MN
29. Atlanta, GA
30. Dallas, TX
31. Boulder, CO
32. Wilmington, DE
33. Fort Collins, CO
34. Charlotte, NC
35. St. Paul, MN

Dashboard?  
Why/why not?  
A. Yes B. No

[HIDE FILTERS](#)

1 - 24 of 920 items

VIEW

24 ▼

SORT BY

Best Match

## AVAILABILITY

 IN STOCK

## CATEGORIES

FURNITURE

LIVING ROOM

DINING ROOM

BEDROOM

OFFICE

STORAGE &amp; ORGANISATION

ENTRYWAY

RUGS

LIGHTING

DECOR

WALL DECOR

## PRICE

\$0 \$3,000



## OFFERS

 ON SALE

## SIZE



11% OFF

**HAYDEN**  
dining chair\$89 **\$79**  
IN STOCK

45% OFF

**ROSIE**  
woven straw tote bag\$35 **\$19**  
IN STORE ONLY[CHECK IN-STORE  
AVAILABILITY](#)

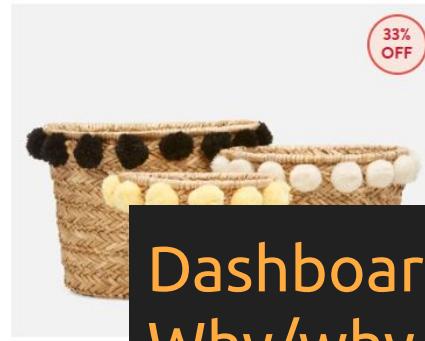
33% OFF

**BENXI**  
16-piece flatware set\$15 **\$10**  
IN STOCK

33% OFF

**BENXI**  
16-piece flatware set\$15 **\$10**  
IN STOCK

26% OFF

**PAPASAN**  
rattan accent chair\$189 **\$139**  
IN STOCK

33% OFF

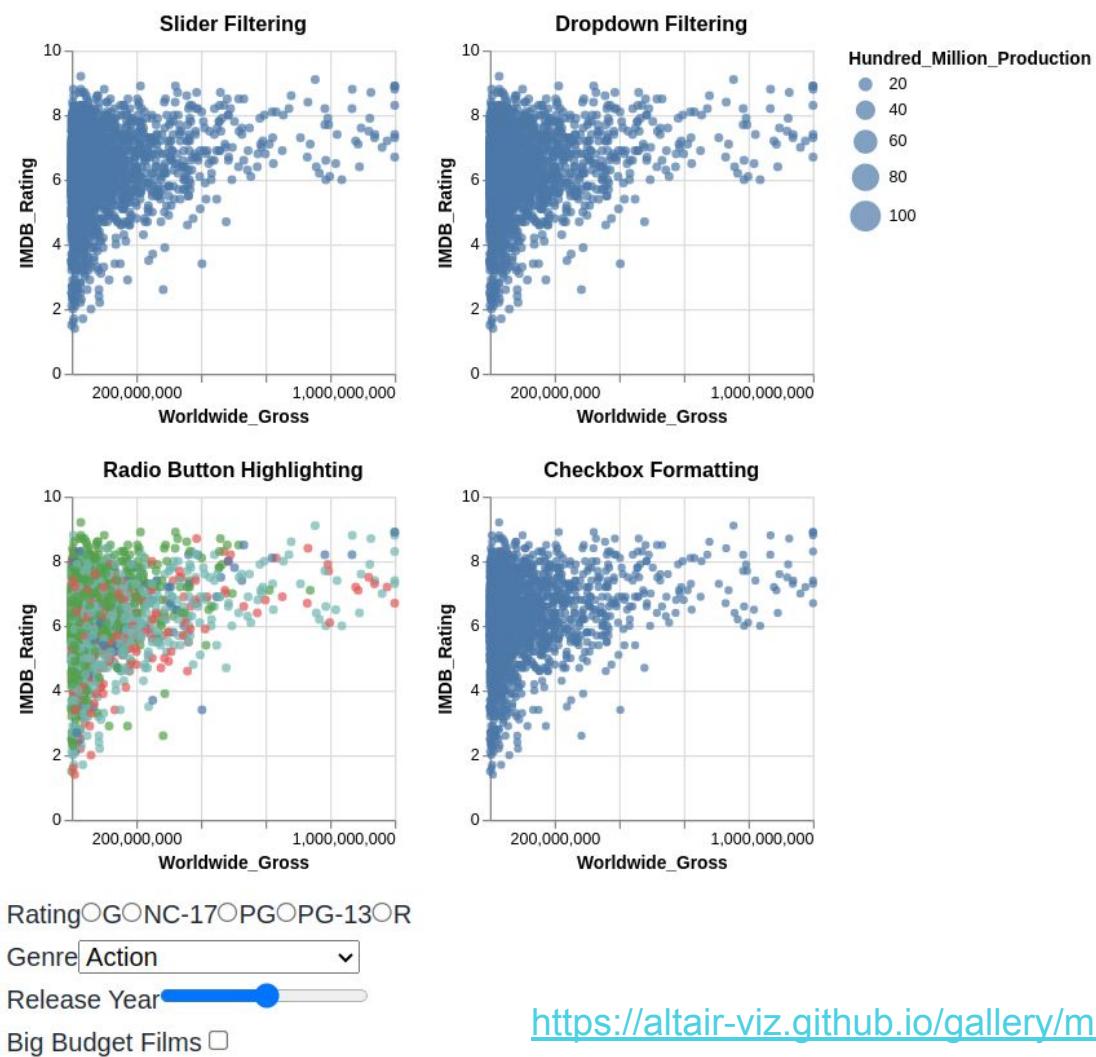
**KORB**  
set of 3 basket

Dashboard?  
Why/why not?  
A. Yes B. No

Dashboard?  
Why/why not?

A. Yes B. No

[https://altair-viz.github.io/gallery/multiple\\_interactions.html](https://altair-viz.github.io/gallery/multiple_interactions.html)



In essence, a dashboard allows for monitoring and (usually) interaction with some key information (numbers/charts).

You need to clarify with your client/boss more precisely what they want if they just ask for “a dashboard” (and iterate)

Why is it called  
“dashboard”?





DASHBOARD

532 =



# Why bother using dashboards?

(and other types of interactive viz)

1. Can allow for quicker/more accessible exploration than via code
  - o Coding is one type of interactive data exploration
  - o Can enable people without programming skills to explore data.
2. Can engage users more than static viz
  - o E.g. engaging storytelling in presentations/data journalism.
3. Can explain more information as needed
  - o When there is too much data, interactivity can allow us to look at subsets.
  - o People can be interested in different things when they look at the same data.
4. Often the interface between the data science product/model and the end user
  - o If people cannot understand how to use your application, it is not successful no matter how innovative and incredible the computation algorithms in the back-end are.

# Effective dashboard design

# 1. General points

1. Identify the purpose of the dashboard
  - Who are the stakeholders?
    - Talk to them if possible
  - Which stakeholder problem are you trying to solve?
    - Create a user story
  - How will the stakeholder interact with the dashboard
    - Eat your own dogfood (test the dashboard yourself)
2. Understand the data (EDA)
3. Choose appropriate visualizations (what we learned in 531)
4. Iterate with the stakeholders/client/manager
  - Don't try to one shot deliver

# 2. Be as concise as possible

1. Show only relevant info, not everything possible
  - a. Identify the story for your default app state
  - b. Then allow the user to explore more info as needed
2. Exactly what “concise” entails is context dependent



OUR NEW DASHBOARD HAS ALL OF THE DIFFERENT KPI'S WE CAN TRACK NOW.



WHAT'S THAT KPI TRENDING TO ZERO?



IT MEASURES HOW WELL WE UNDERSTAND THEM ALL.



# Complexity level depends on the target user



# Complexity level depends on the target user



# 3. Layout the app logically

1. Design your app in a grid layout
2. Think about the flow you want the end customer to follow
3. Place global widgets together
  - o An effective default layout is a sidebar with all global widgets
4. Place local widgets close to the plots they control (or with a clear label together with the global widgets)

# The lack of a grid layout makes this dashboard hard to read

# London

51.51 N, 0.13 W

Mon 9 Dec @ 16:02:42  
Go to Map - Go to Grid - Change City

WEATHER STATIONS (MULTIPLE SOURCES)								
STATION	WIND SPEED	WIND GUSTS	DIRECTION	TEMPERATURE	HUMIDITY	RAIN TODAY	PRESSURE	FORECAST
CASA Office: Bloomsbury W1	8 mph	9 mph	SE ↗	11.5 °C	76%	0.0 mm	1027.9 mbars	Clear Night
Lambeth Meters: Brixton SW9	4.3 mph	4.3 mph	SW ↗	11.0 °C	83%	0.0 mm	1026.4 mbars	Clear Night
Hampstead NW3	3.6 mph	3.6 mph	S ↑	9.8 °C	84%	0.0 mm	1029.0 mbars	Clear Night

WEATHER (METAR)								
London City Airport			Forecast (YAHOO! WTH)			Mon Tue		
Mostly clear			SW at 3 mph			10 C 9 C		
						Mostly Clear	Partly Cloudy	

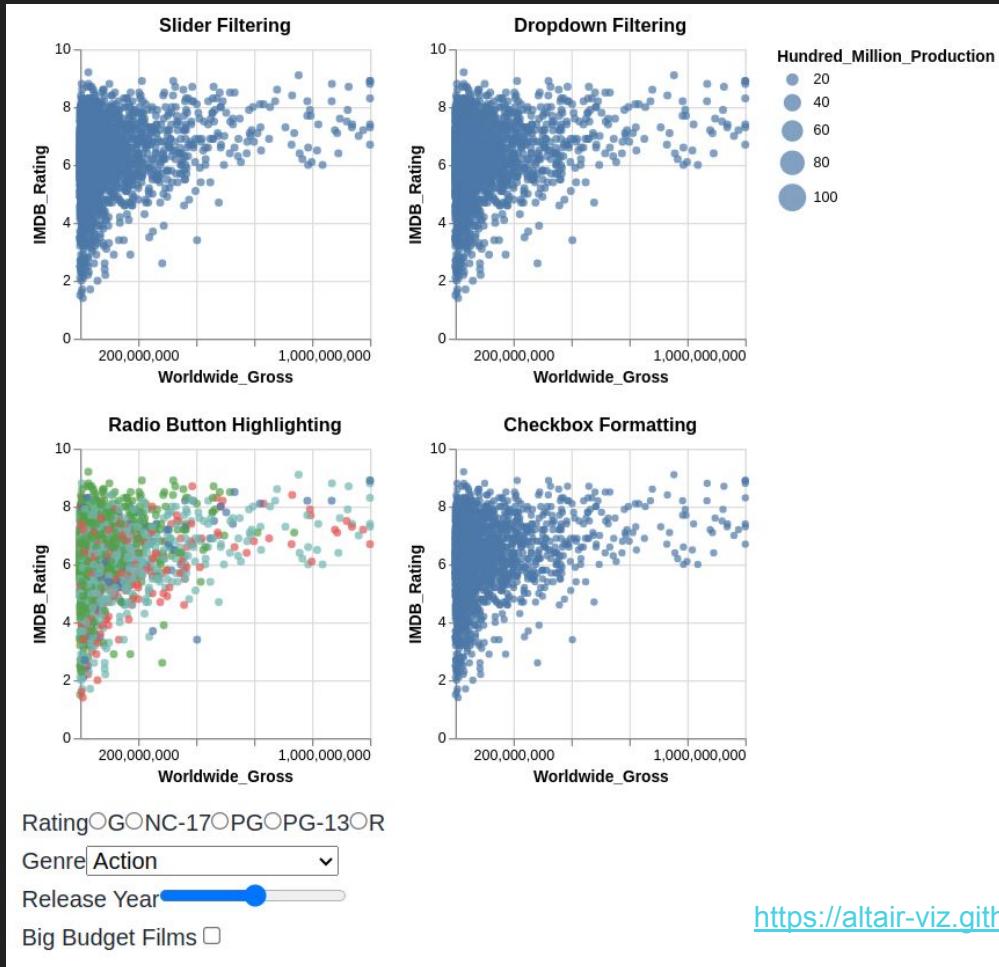
TUBE LINE STATUS (TFL)		BIKE SHARING (TFL)		IN SERVICE (TFL)		AIR POLLUTION (DEFRA)				
Bakerloo	Good Service	4.3 % Stations Full	4.9 % Stations Empty	7197 London buses	378 Underground trains	13	38	4	9	10
Central	Good Service	7354 Bikes Available	430 Bikes or Docks Faulty	Available Bikes (last 24h)		9	16	26	22	34
Circle	Good Service			N Kensington	14 40 ? 12 18					
District	Good Service									
H & C	Good Service									
Jubilee	Good Service									
Metropolitan	Good Service									
Northern	Good Service									
Piccadilly	Good Service									
Victoria	Good Service									
W & C	Good Service									
Overground	Good Service									
DLR	Good Service									

RADAR (CASA)		RIVER LEVEL (PLA)		STOCKS (YAHOO)	
CASA Office Desk	6 cpm (uncalibrated)	Thames (Tower Pier)	4.13 metres	FTSE 100 Index	6552.34 +0.35 (0.01%)

RANDOM TRAFFIC CAMERAS (TFL)				BBC LONDON NEWS (BBC)				OPENSTREETMAP UPDATES (OSM)			
Old Kent Rd/Ashley Rd		High St/Grosvenor Rd W Wickham		Rigby killer 'a soldier of Allah' Mayor bike 'scaring' claim withdrawn	Murder police found grave in garden	Cameron praises towering' Mandela	Police crackdown on pirate site ads	Third attempt to name the terraced cottages around the Green. Revert my change to terraced cottages as they get rendered with wrong address. Added Tibet Foundation, refining Name error.			

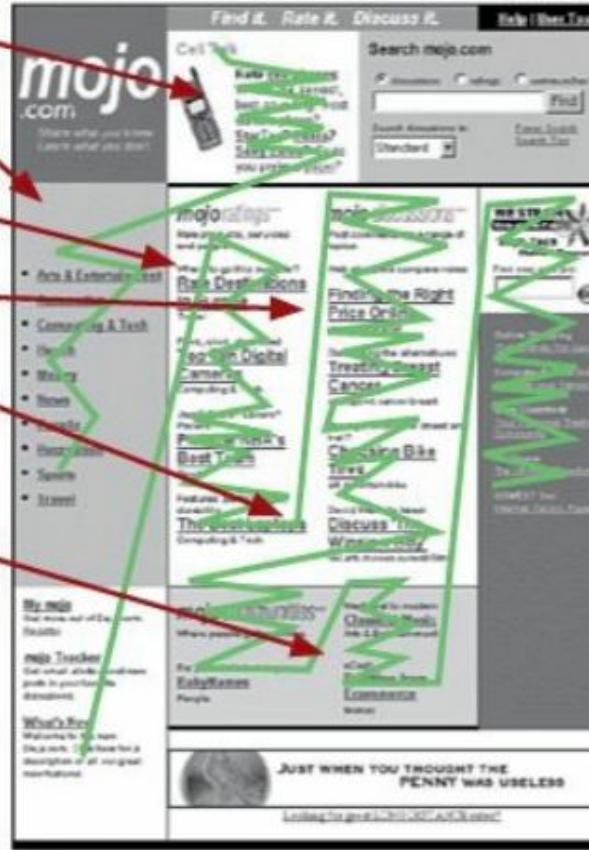
ELECTRICITY (N GRID)		MOOD (LSE HAPPINESS)		TWITTER TRENDS FOR LONDON			
Demand (Great Britain)	48211 MW	8% unhappier than the long term average for here	13% happier than the whole country right now	MPs	#NFL	Christmas	#Confident Xmas #ashes London #RIPAlexTurner #12DaysOfJonesDAY9 Waca

# It's unclear which widgets control which charts



# Think about how the audience will actually read your dashboard

## WHAT WE DESIGN FOR...



## THE REALITY...



Look around feverishly for anything that

- is interesting, or vaguely resembles what you're looking for, and
- is clickable.

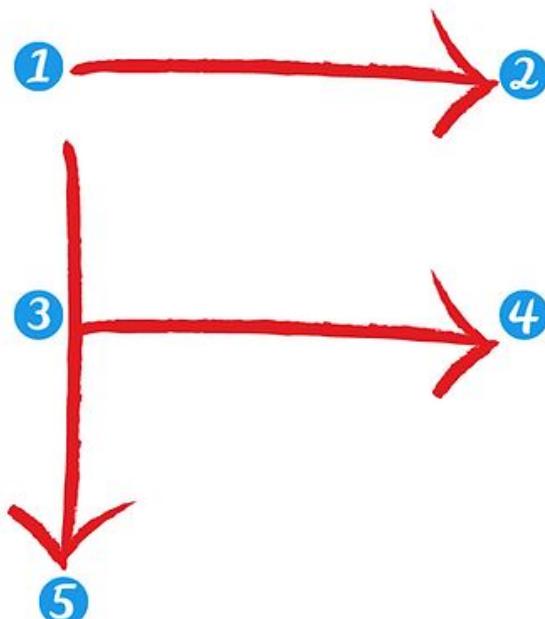
As soon as you find a halfway-decent match, click.

If it doesn't pan out, click the Back button and try again.

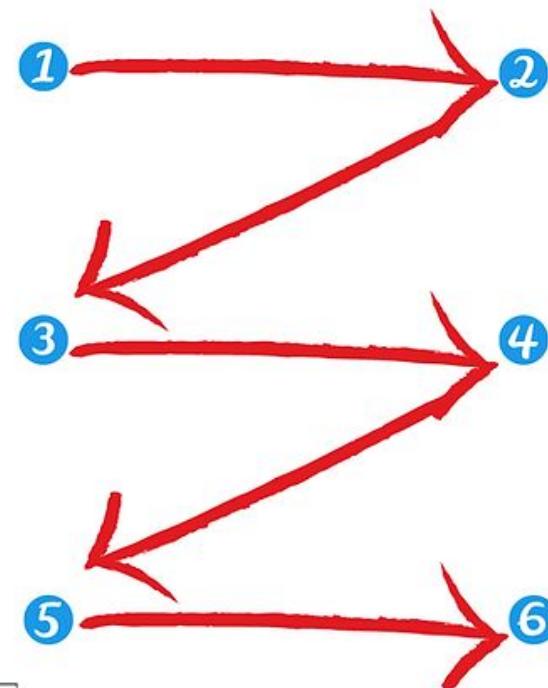
# People often read in “F” or “Z” patterns

## Layout Scanning Patterns

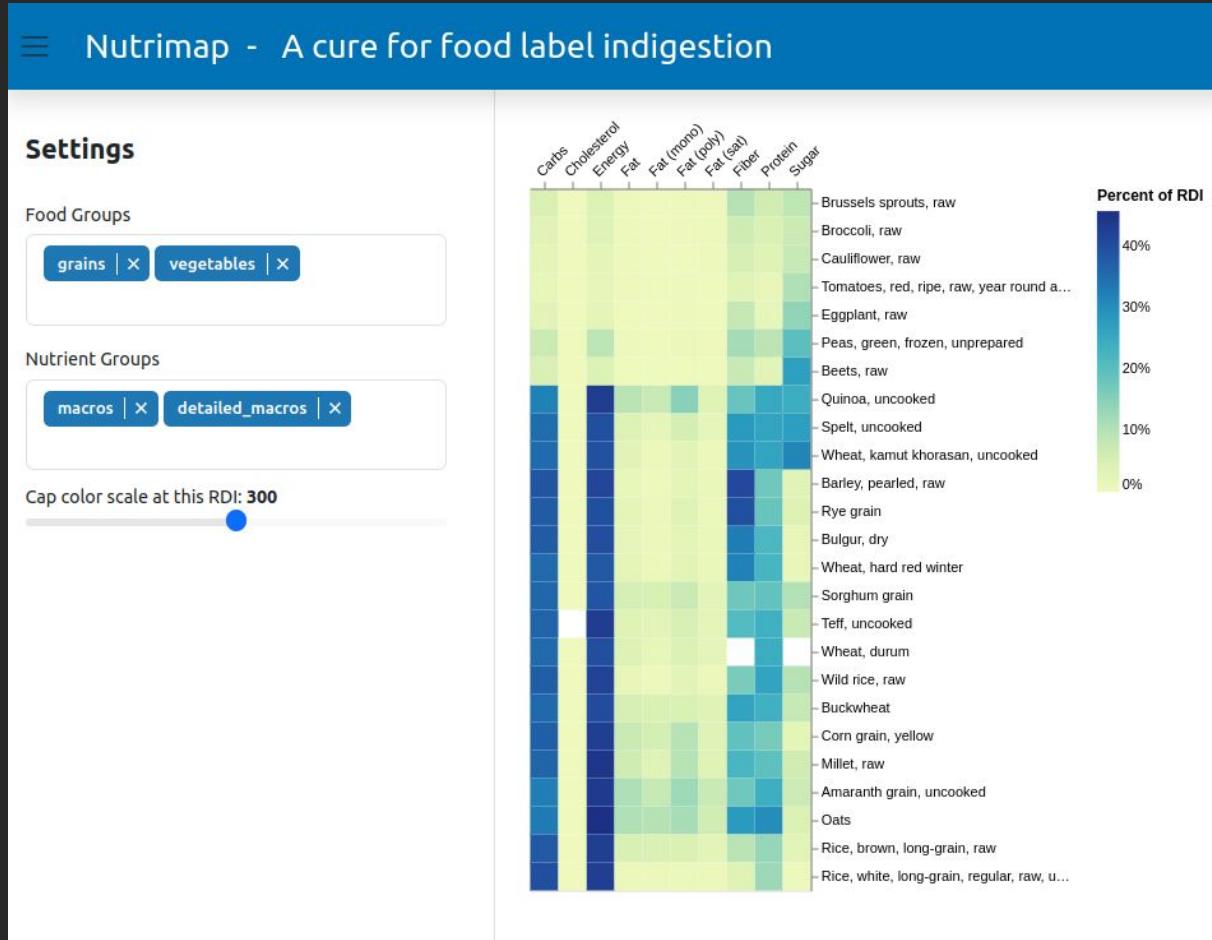
F-MOTION



Z-MOTION



# A single panel to the left with all widgets is a sensible default



## 4. Include Summaries/Key indicators

1. Include some summarized key numbers/metrics, e.g. on cards.
2. Give numbers context and labels
3. Consider text and number formatting (e.g. round many decimals)
4. Group related metrics close together

# Give labels and context to numbers (e.g. relative a previous measure or a target)

\$5K

\$5K

Revenue yesterday

▼ \$0.5K vs last week

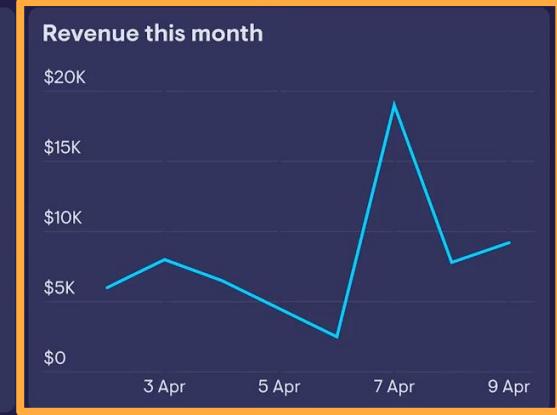
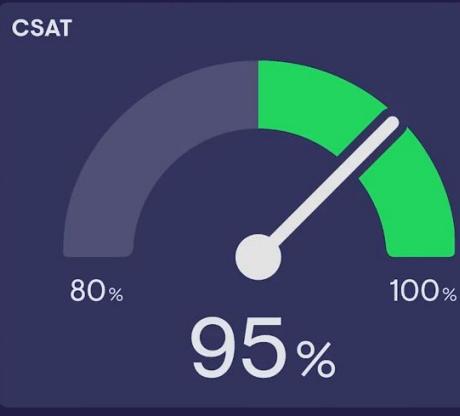
\$5K

Revenue yesterday

62%

\$8K

# Group related metrics



# Group related metrics

Revenue

\$142.4K

this month

75%

\$189.6k

\$2.4M

this year

Revenue this month

\$20K

\$15K

\$10K

\$5K

\$0

2 Apr 3 Apr 4 Apr 5 Apr 6 Apr 7 Apr 8 Apr 9 Apr

CSAT

80%

100%

95%

Orders

89.6K

this week

1,452

this year

Orders this month

150

100

50

0

2 Apr 3 Apr 4 Apr 5 Apr 6 Apr 7 Apr 8 Apr 9 Apr 10 ... 11 Apr 12 ... 13 ...

90

FRT



# 5. Misc

1. Use style sheets with premade css templates
  - Don't waste time on reinventing the wheel
2. Match layout and behavior with end user expectations
  - Reduce cognitive load by avoiding surprising use cases
    - E.g. don't use a slider to choose between categories or expect the user to start reading the app from the bottom of the page
3. Include contact info, link to source code/data, last updated timestamp

A few effective  
dashboards



# Drug Checking Results

Summary

Drug Comparison

Results Table

FILTER

Use the inputs below to filter the drug checking database results. Click on the '?' icons for more info.

TIME RANGE

01/01/2018 → 03/10/2024

2018 2019 2020 2021 2022 2023 2024

DRUG CATEGORY

Select Drug Category

TEST CITY

Select City

TEST HEALTH AUTHORITY

Select Health Authority

TEST SITE

Select Site



SAMPLES SELECTED FROM  
109917 AVAILABLE



SAMPLES OUT OF 109917 DID  
NOT MATCH EXPECTED DRUG

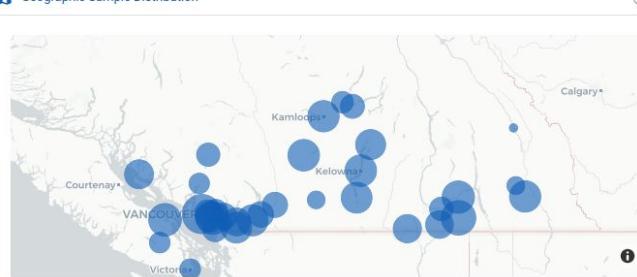


SAMPLES CONTAIN FENTANYL  
OUT OF 109917

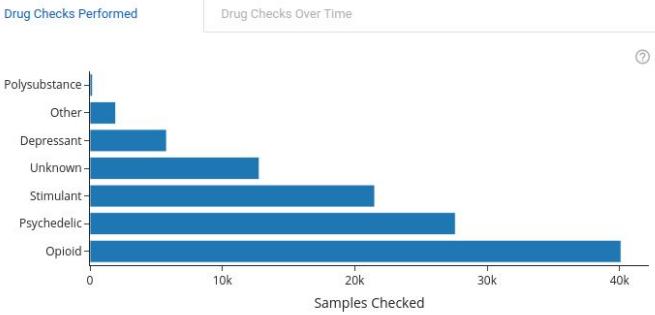


SAMPLES CONTAIN BENZODIAZEPINE  
OUT OF 109917

Geographic Sample Distribution



Drug Checks Performed



Drug Checks Over Time

Detection of Fentanyl and Benzodiazepines

Counts Trend

Fentanyl Benzo Both Neither

Expected Sample Matches

Sample Matches Over Time

Matches Expectation Yes No Not determined

Polysubstance

# FiveThreeTwo Dashboard Showcase

Hover over a thumbnail to read more

Click here to select tags. The (#) is the count of dashboards.

