Data Visualization

GEOG50 | 42/32

Roger Beecham

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GEOG50 | 42/32 : Data Visualization

By – Roger Beecham

Information Visualization Blogs

- eagereyes — Robert Kosara's influential blog. Kosara is Senior Research Scientist at Tableau Research and previously Associate Professor of Computer Science at UNC Charlotte.
- flowingdata — Nathan Yau, a former statistics PhD from UCLA, has maintained a data vis blog and online training materials for some time.
- chartable — A blog written by people at Datawrapper, a visualization tool aimed at those publishing online content.
- data stories — Podcast led by Enrico Bertini and Moritz Stefaner.

Conferences

- IEEE VIS — *The* conference at which leading Data Visualization work is published through a special issue of Transactions on Visualization & Computer Graphics.
- OpenVis Conf — New, exciting conference. Presenters are academics and practitioners work at the leading-edge of data visualization. Videos of talks from previous conferences are published online. From the 2018 conference, I'd recommend Matt Kay's on Uncertainty Visualization, Maarten Lambrechts' Xenographics and Heather Krause's F-Word.

Readings

- Heer, J., Bostock M. & Ogievetsky, V. (2010) A tour through the visualization zoo. An excellent introduction to the DNA of data graphics — the mappings between visual characteristics and properties of data that define particular 'species' of visualization. Changing these mappings results in different graphic types : bar chart, scatter plot, pie chart, etc..
- Meirelles, I. (2013) Design for Information: An Introduction to the Histories, Theories, and Best Practices Behind Effective Information Visualizations. Contains excellent examples and advice on designing graphics. The explanations of principles developed from knowledge of perception and cognition are especially good.
- Meyer, M. & Fisher, D. (2018) Making Data Visual, *O'Reilly*. I've only read a sample chapter, but it's written by highly respected InfoVis profs and has a great ambition: *If you're a data scientist trying to navigate the murky space between data and insight, this practical book shows you how to make sense of your data through high-level questions, well-defined data analysis tasks, and visualizations to clarify understanding and gain insights along the way.*
- Munzner, T. (2014) Visualization Analysis & Design, *CRC Press*. Tamara Munzner, Professor of Information Visualization at University of British Columbia, provides a systematic and empirically-grounded framework for thinking about visualization. Available as an e-book via the University of Leeds Library. Chapters 2 and 5 are worth special consideration.

dataset 1		dataset 2		dataset 3		dataset 4	
x1	y1	x2	y2	x3	y3	x4	y4
10.00	8.04	10.00	9.14	10.00	7.46	8.00	6.58
8.00	6.95	8.00	8.14	8.00	6.77	8.00	5.76
13.00	7.58	13.00	8.74	13.00	12.74	8.00	7.71
9.00	8.81	9.00	8.77	9.00	7.11	8.00	8.84
11.00	8.33	11.00	9.26	11.00	7.81	8.00	8.47
14.00	9.96	14.00	8.10	14.00	8.84	8.00	7.04
6.00	7.24	6.00	6.13	6.00	6.08	8.00	5.25
4.00	4.26	4.00	3.10	4.00	5.39	19.00	12.50
12.00	10.84	12.00	9.13	12.00	8.15	8.00	5.56
7.00	4.82	7.00	7.26	7.00	6.42	8.00	7.91
5.00	5.68	5.00	4.74	5.00	5.73	8.00	6.89

dataset 1		dataset 2		dataset 3		dataset 4	
x1	y1	x2	y2	x3	y3	x4	y4
10.00	8.04	10.00	9.14	10.00	7.46	8.00	6.58
8.00	6.95	8.00	8.14	8.00	6.77	8.00	5.76
13.00	7.58	13.00	8.74	13.00	12.74	8.00	7.71
9.00	8.81	9.00	8.77	9.00	7.11	8.00	8.84
11.00	8.33	11.00	9.26	11.00	7.81	8.00	8.47
14.00	9.96	14.00	8.10	14.00	8.84	8.00	7.04
6.00	7.24	6.00	6.13	6.00	6.08	8.00	5.25
4.00	4.26	4.00	3.10	4.00	5.39	19.00	12.50
12.00	10.84	12.00	9.13	12.00	8.15	8.00	5.56
7.00	4.82	7.00	7.26	7.00	6.42	8.00	7.91
5.00	5.68	5.00	4.74	5.00	5.73	8.00	6.89

dataset 1		dataset 2		dataset 3		dataset 4	
x1	y1	x2	y2	x3	y3	x4	y4
10.00	8.04	10.00	9.14	10.00	7.46	8.00	6.58
8.00	6.95	8.00	8.14	8.00	6.77	8.00	5.76
13.00	7.58	13.00	8.74	13.00	12.74	8.00	7.71
9.00	8.81	9.00	8.77	9.00	7.11	8.00	8.84
11.00	8.33	11.00	9.26	11.00	7.81	8.00	8.47
14.00	9.96	14.00	8.10	14.00	8.84	8.00	7.04
6.00	7.24	6.00	6.13	6.00	6.08	8.00	5.25
4.00	4.26	4.00	3.10	4.00	5.39	19.00	12.50
12.00	10.84	12.00	9.13	12.00	8.15	8.00	5.56
7.00	4.82	7.00	7.26	7.00	6.42	8.00	7.91
5.00	5.68	5.00	4.74	5.00	5.73	8.00	6.89
Mean 9.00	7.50	9.00	7.50	9.00	7.50	9.00	7.50

	dataset 1		dataset 2		dataset 3		dataset 4	
	x1	y1	x2	y2	x3	y3	x4	y4
	10.00	8.04	10.00	9.14	10.00	7.46	8.00	6.58
	8.00	6.95	8.00	8.14	8.00	6.77	8.00	5.76
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	11.00	8.33	11.00	9.26	11.00	7.81	8.00	8.47
	14.00	9.96	14.00	8.10	14.00	8.84	8.00	7.04
	6.00	7.24	6.00	6.13	6.00	6.08	8.00	5.25
	4.00	4.26	4.00	3.10	4.00	5.39	19.00	12.50
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	5.00	5.68	5.00	4.74	5.00	5.73	8.00	6.89
Mean	9.00	7.50	9.00	7.50	9.00	7.50	9.00	7.50
Variance	11.00	4.13	11.00	4.13	11.00	4.12	11.00	4.12

	dataset 1		dataset 2		dataset 3		dataset 4	
	x1	y1	x2	y2	x3	y3	x4	y4
	10.00	8.04	10.00	9.14	10.00	7.46	8.00	6.58
	8.00	6.95	8.00	8.14	8.00	6.77	8.00	5.76
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	6.00	7.24	6.00	6.13	6.00	6.08	8.00	5.25
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	5.00	5.68	5.00	4.74	5.00	5.73	8.00	6.89
Mean	9.00	7.50	9.00	7.50	9.00	7.50	9.00	7.50
Variance	11.00	4.13	11.00	4.13	11.00	4.12	11.00	4.12
Correlation	0.82		0.82		0.82		0.82	

	dataset 1		dataset 2		dataset 3		dataset 4	
	x1	y1	x2	y2	x3	y3	x4	y4
	10.00	8.04	10.00	9.14	10.00	7.46	8.00	6.58
	8.00	6.95	8.00	8.14	8.00	6.77	8.00	5.76
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	6.00	7.24	6.00	6.13	6.00	6.08	8.00	5.25
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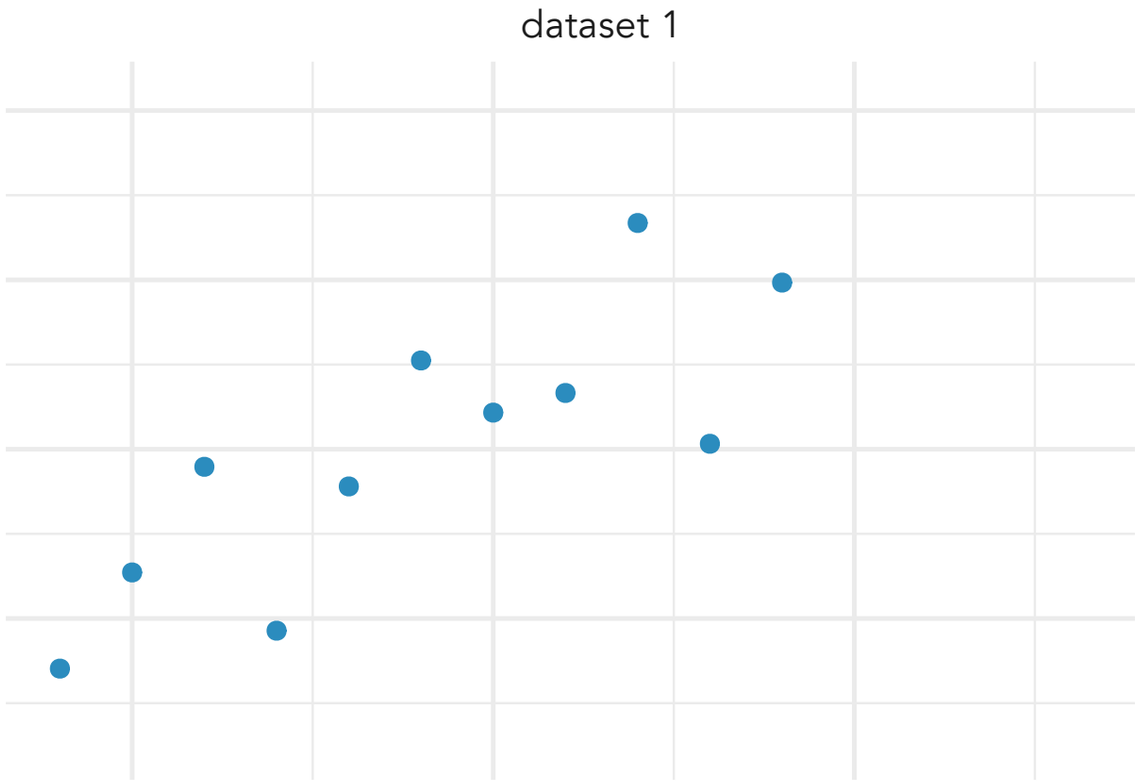
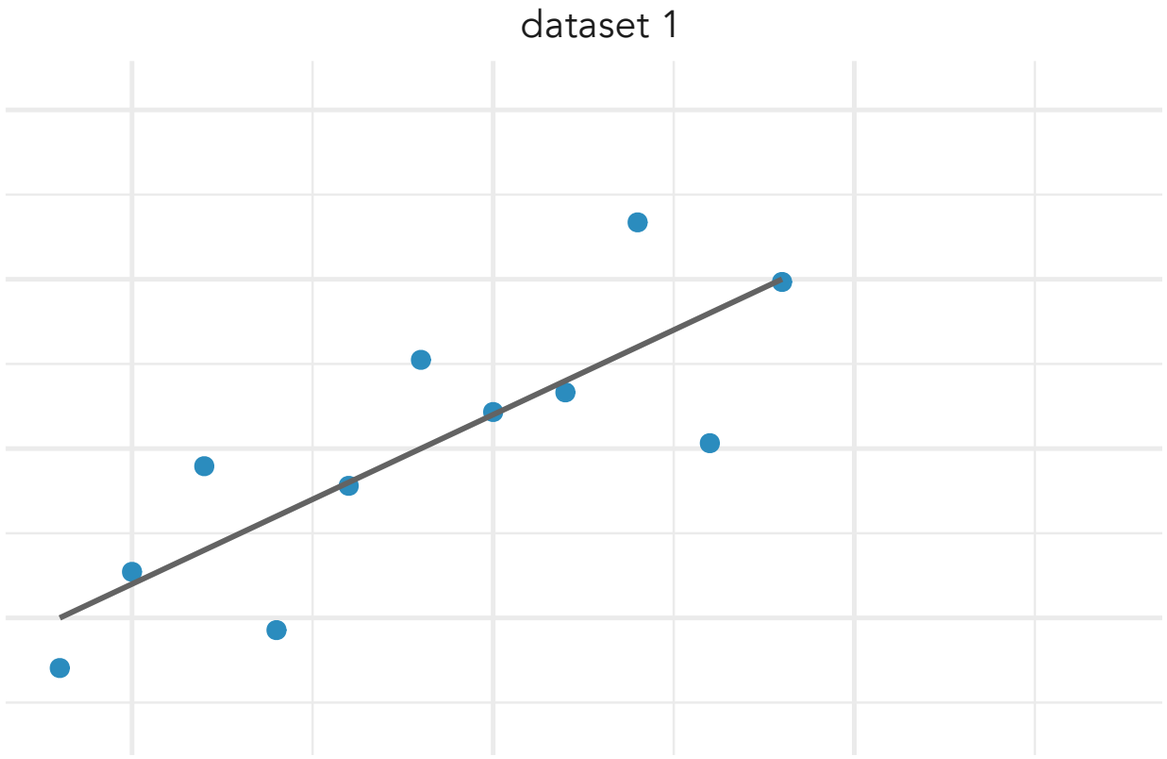
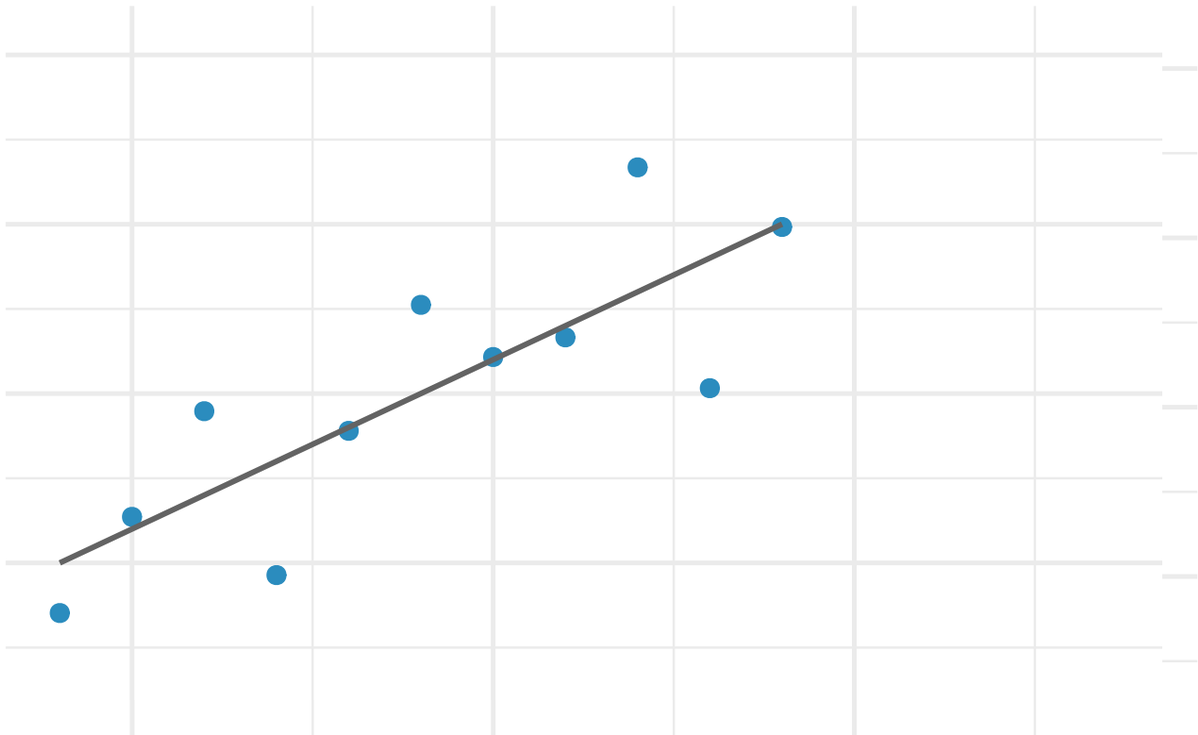
Mean	9.00	7.50	9.00	7.50	9.00	7.50	9.00	7.50
Variance	11.00	4.13	11.00	4.13	11.00	4.12	11.00	4.12
Correlation	0.82		0.82		0.82		0.82	


dataset 1


dataset 1

dataset 1



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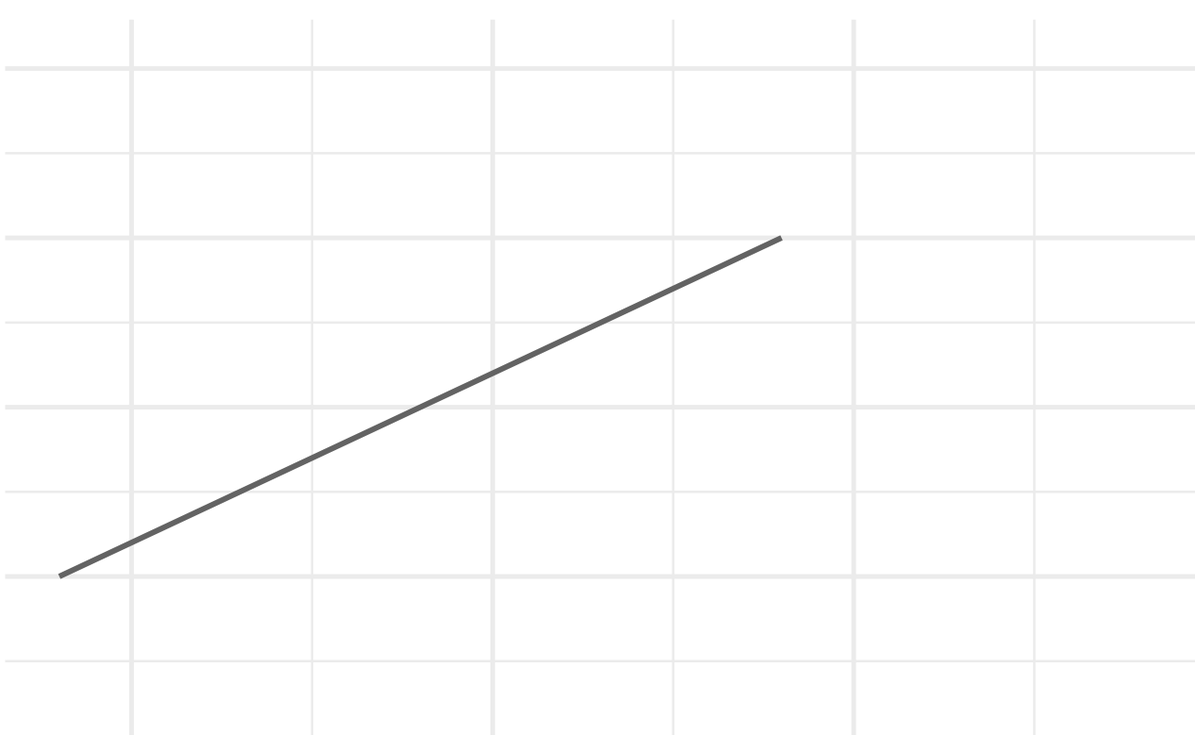

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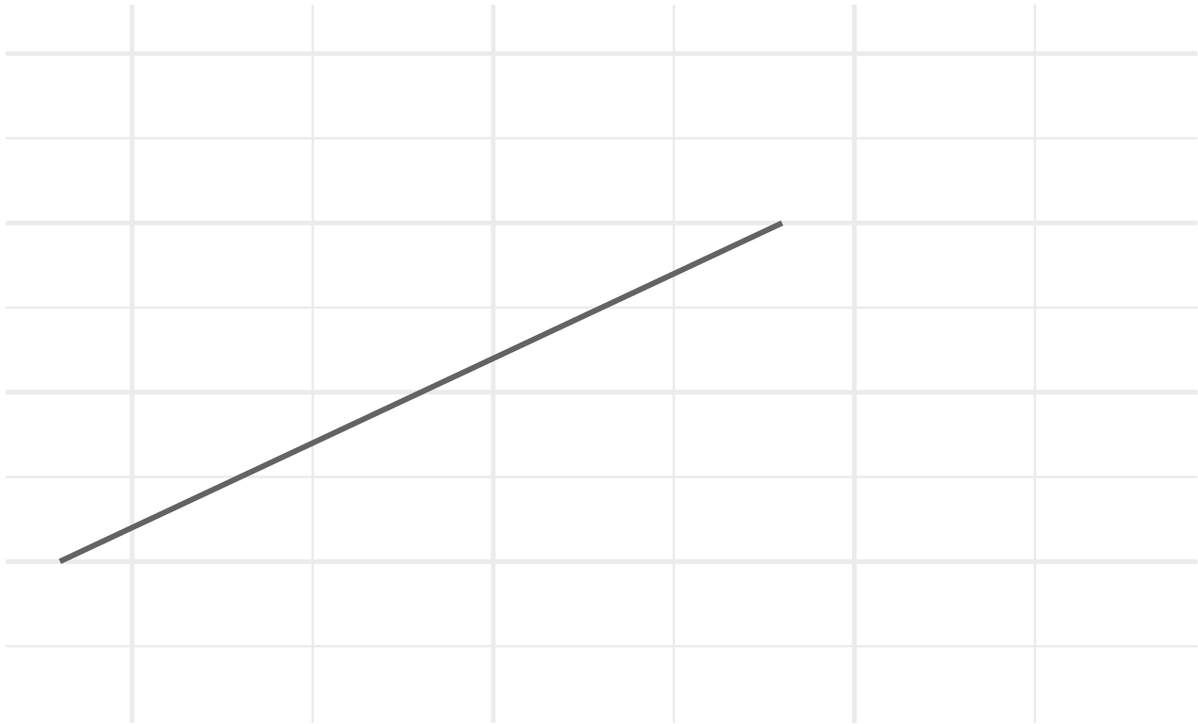

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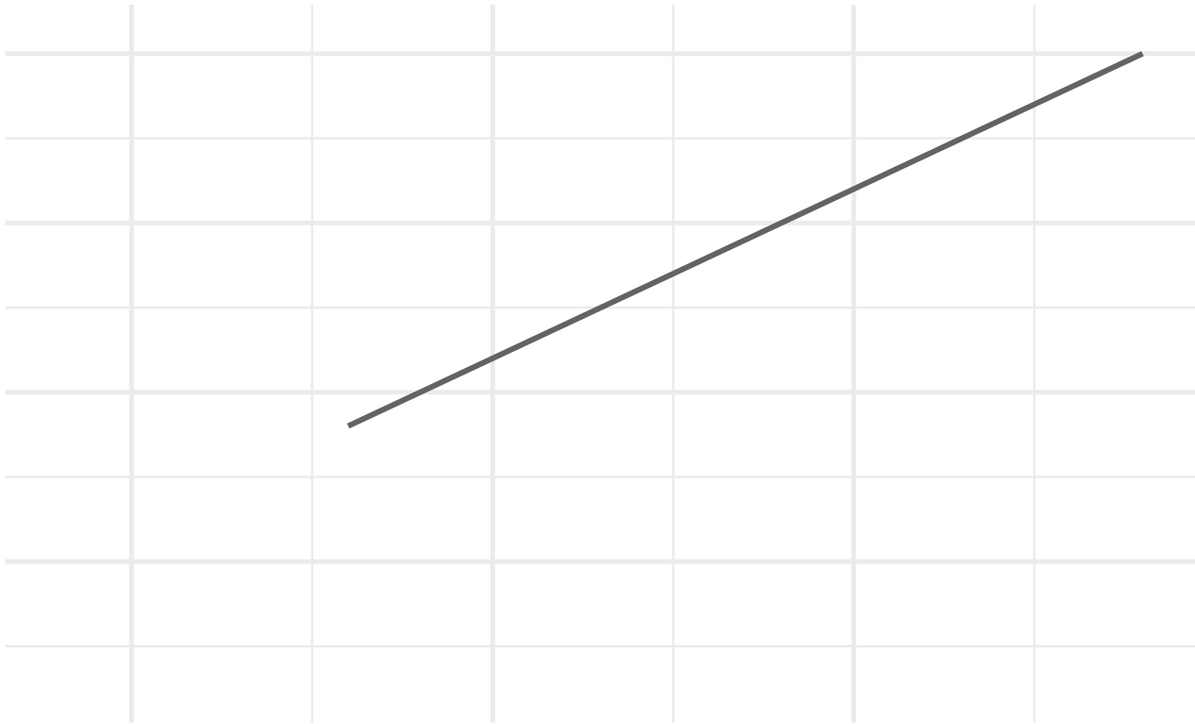

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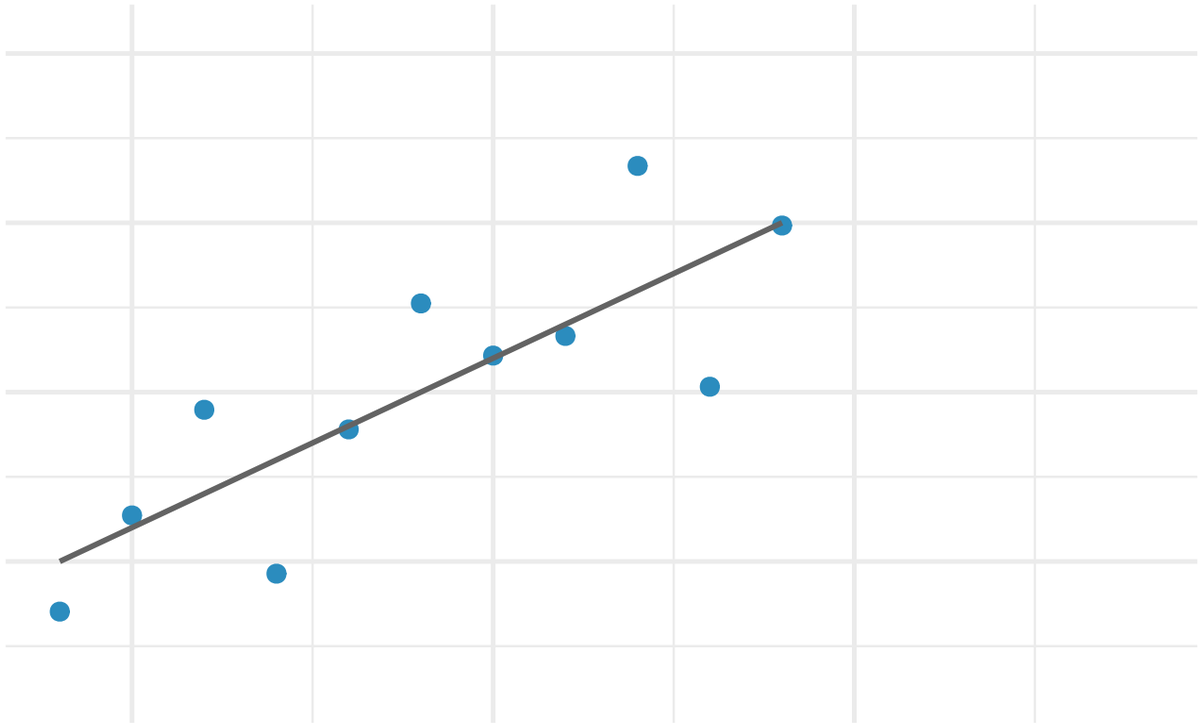

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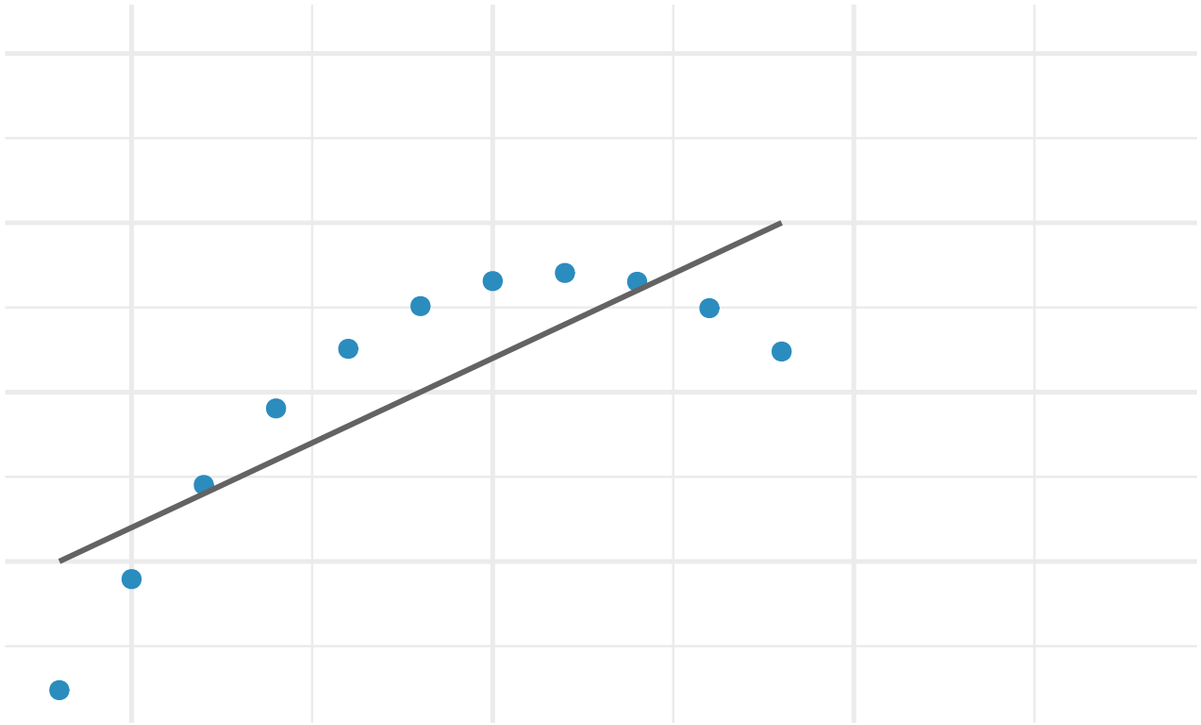

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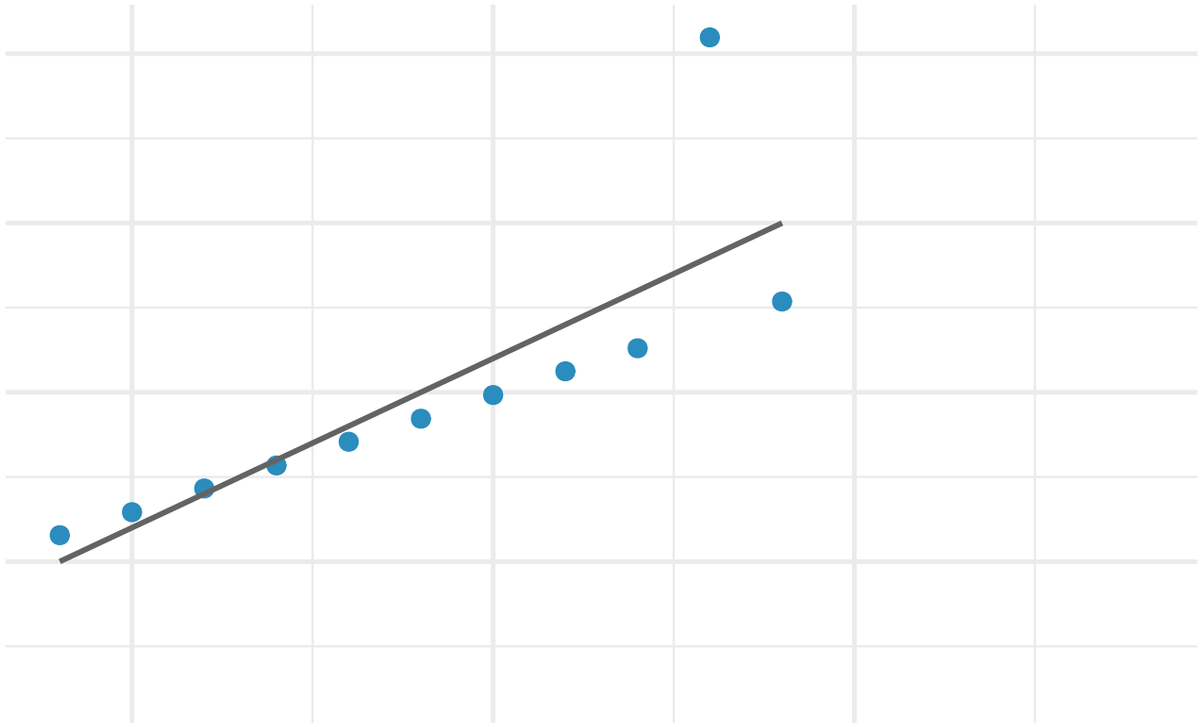

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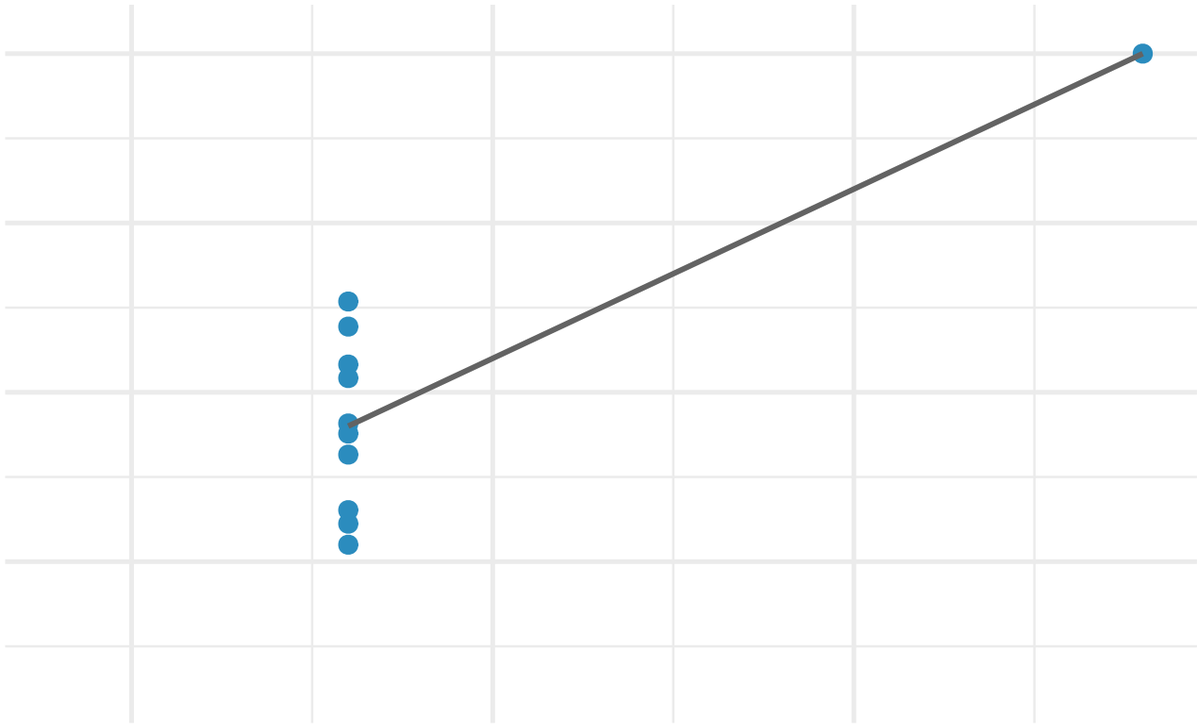
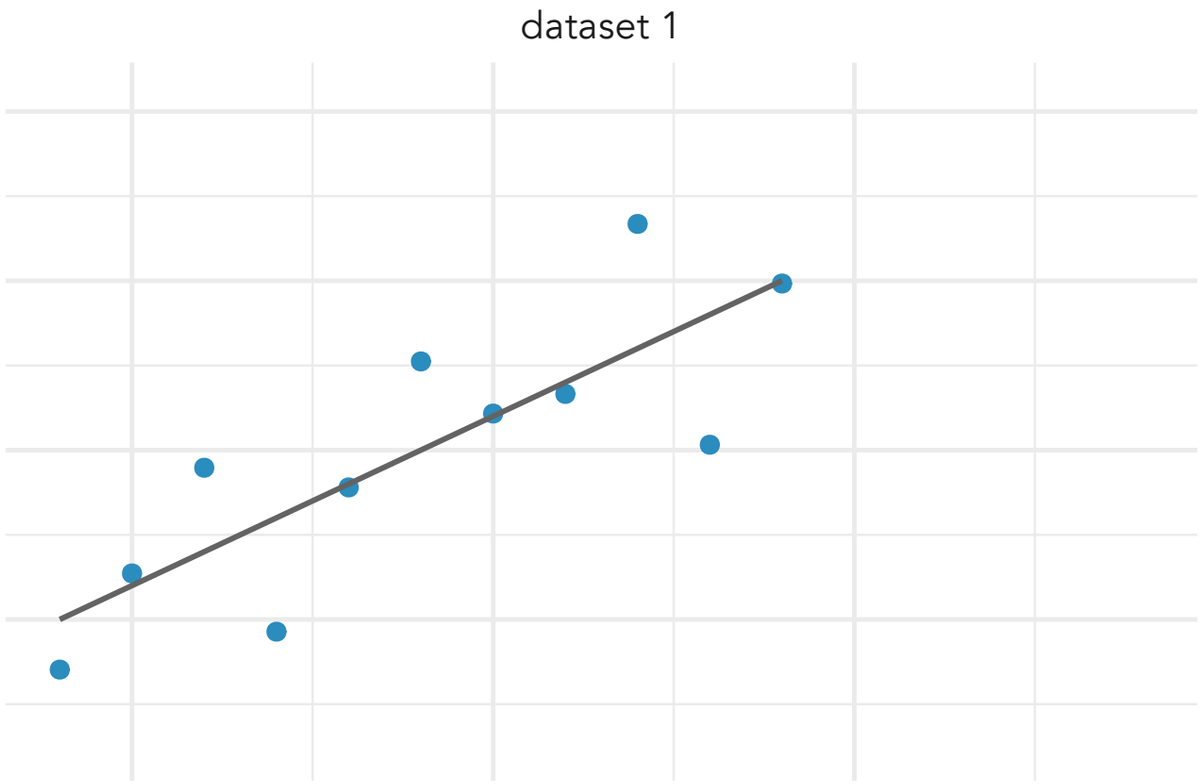
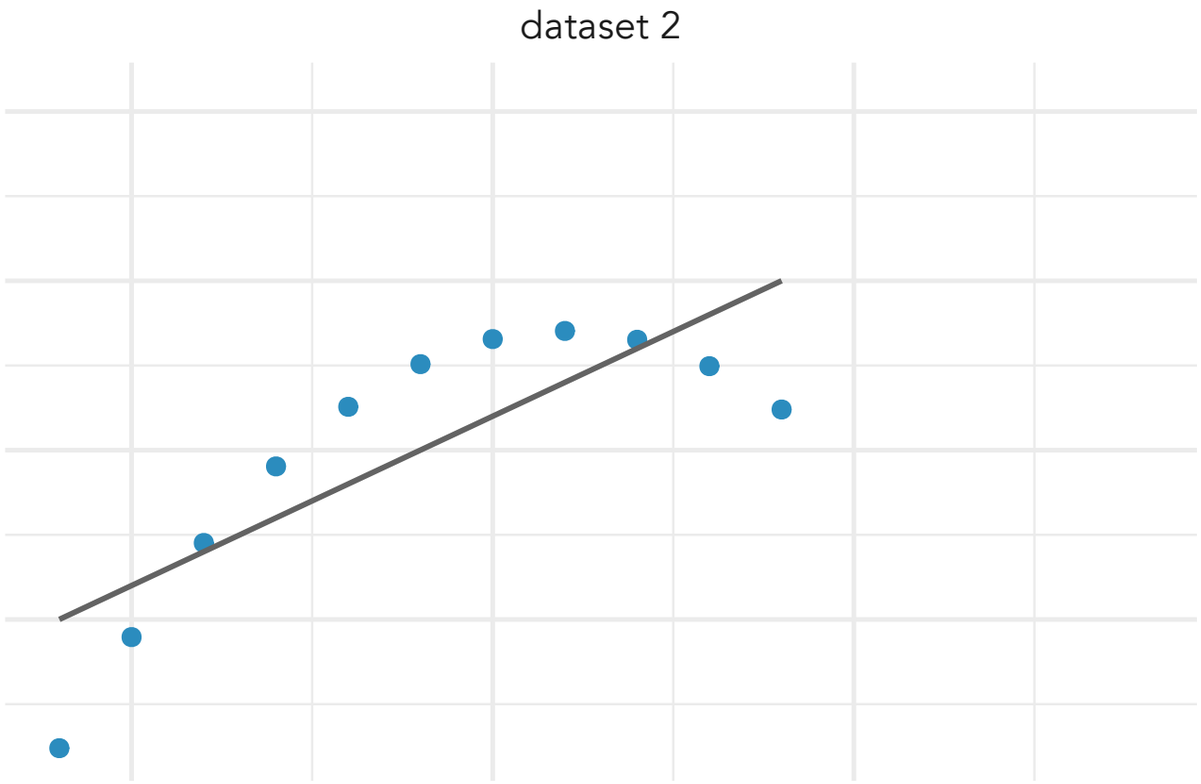
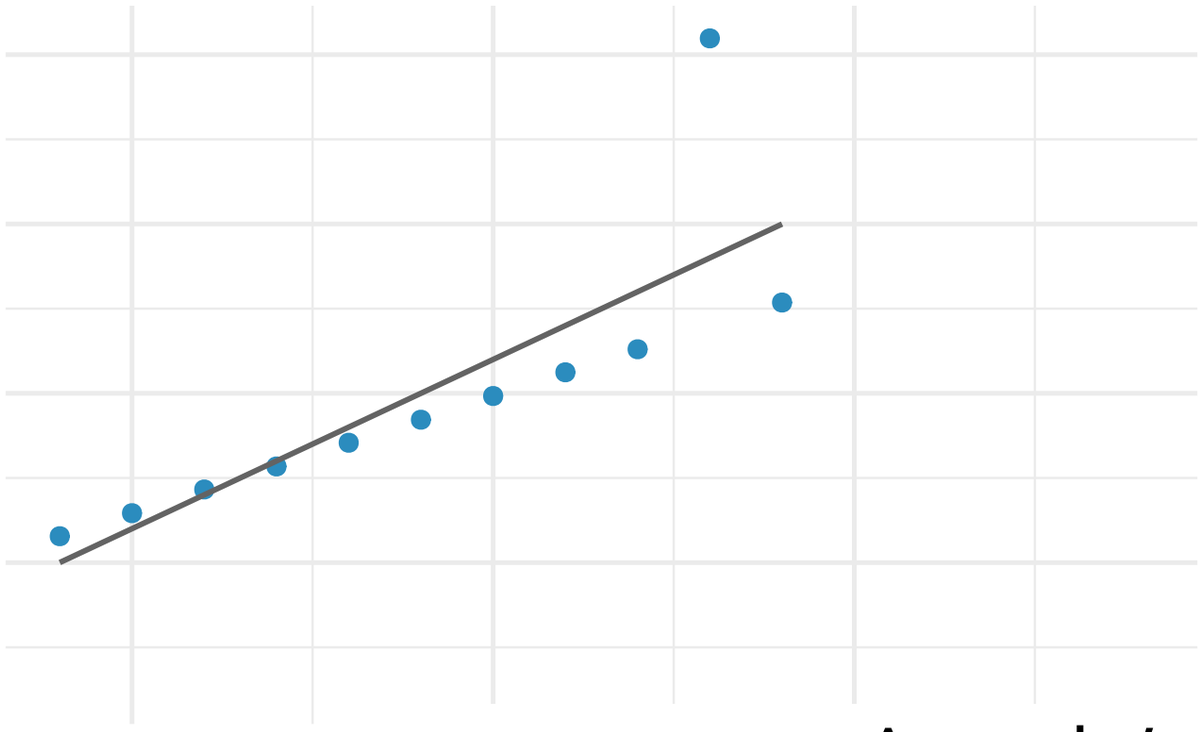
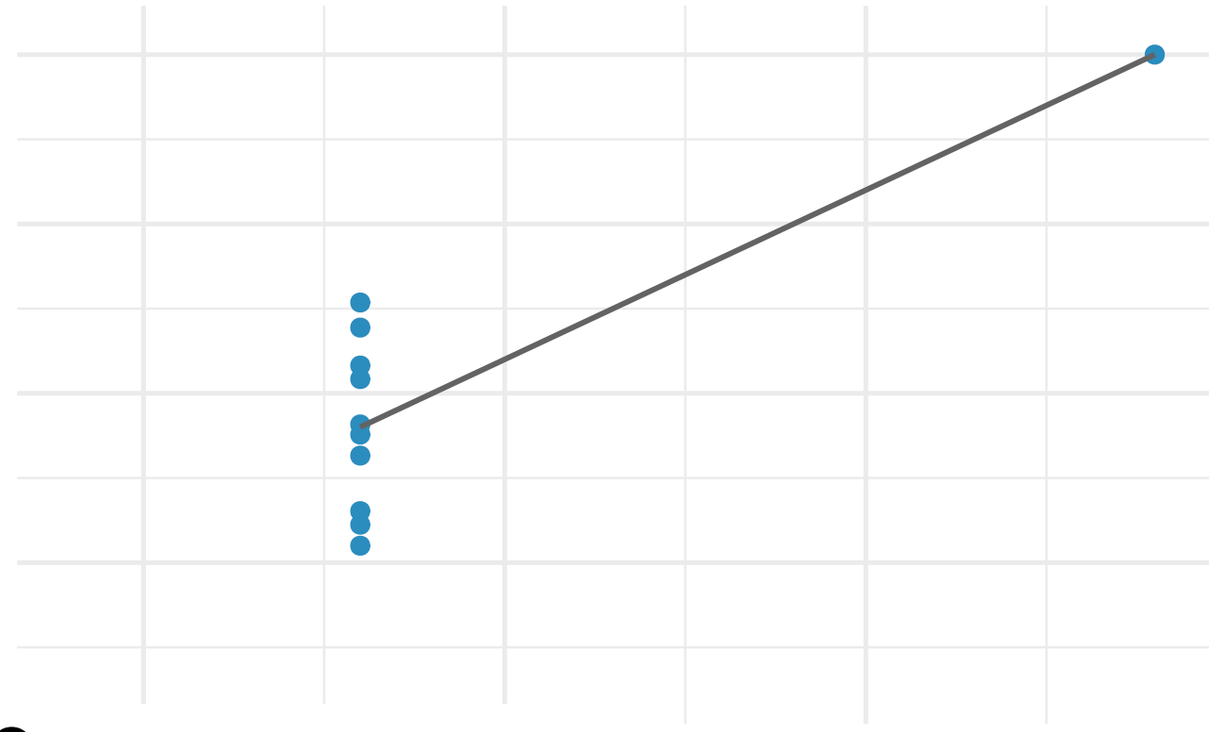








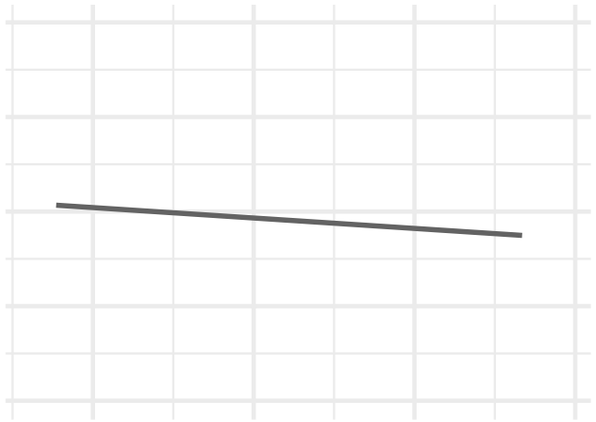


Anscombe's Quartet

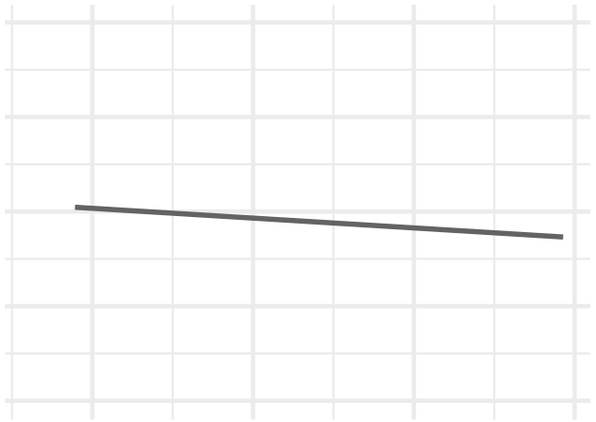
Francis Anscombe, 1973

away

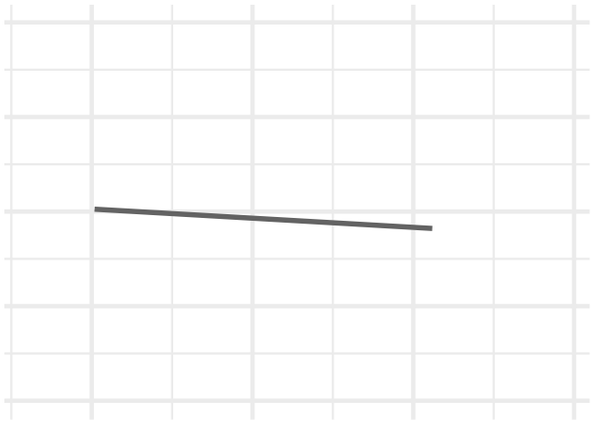
bullseye



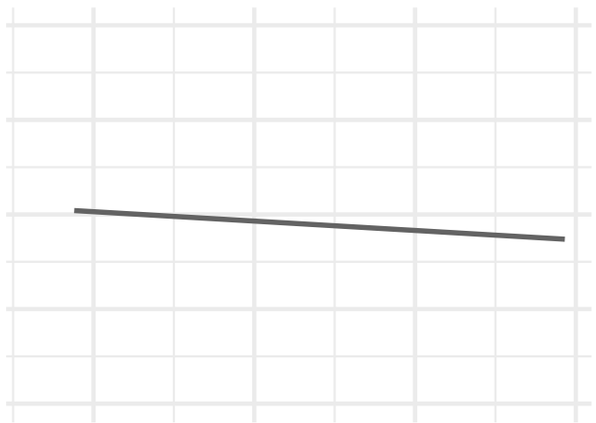
dino



dots



h_lines



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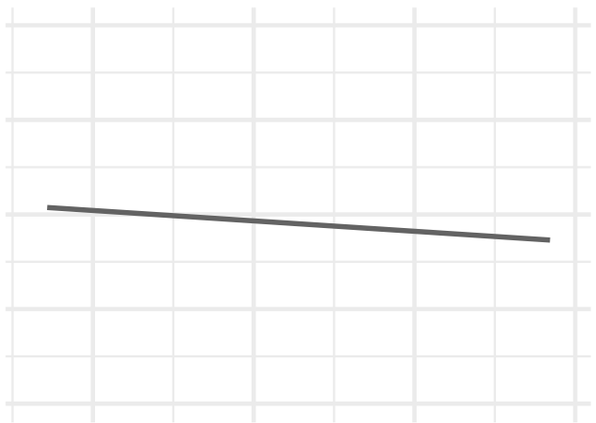
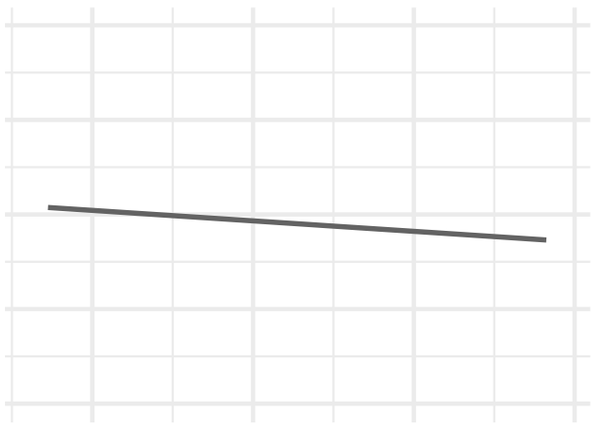
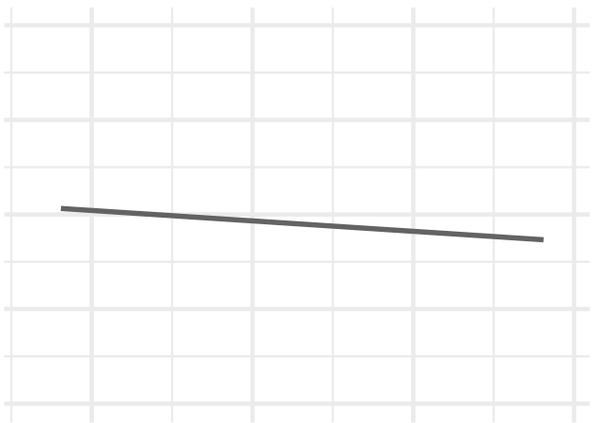


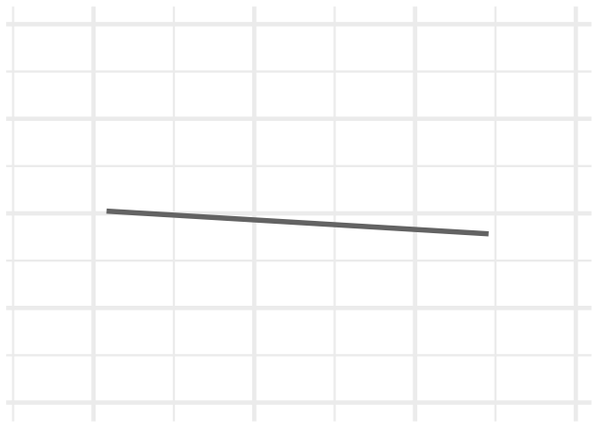
slant_down



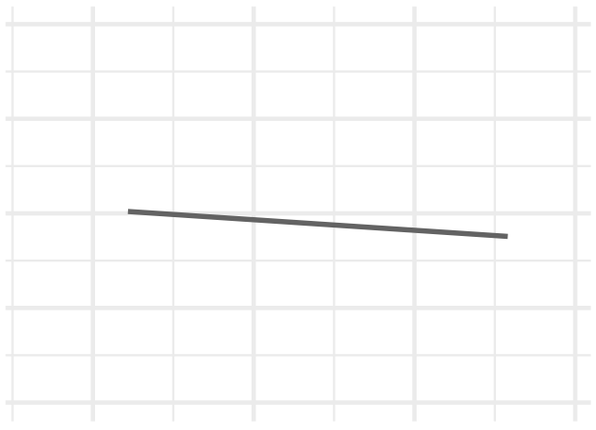
slant_up



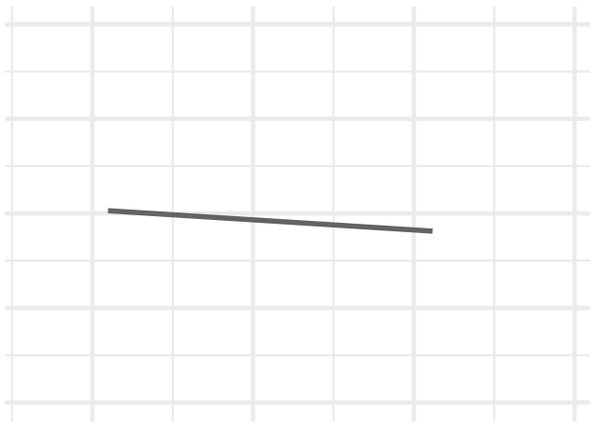
star



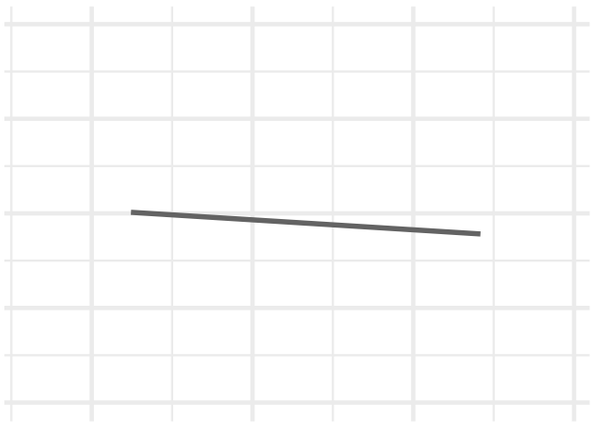
v_lines

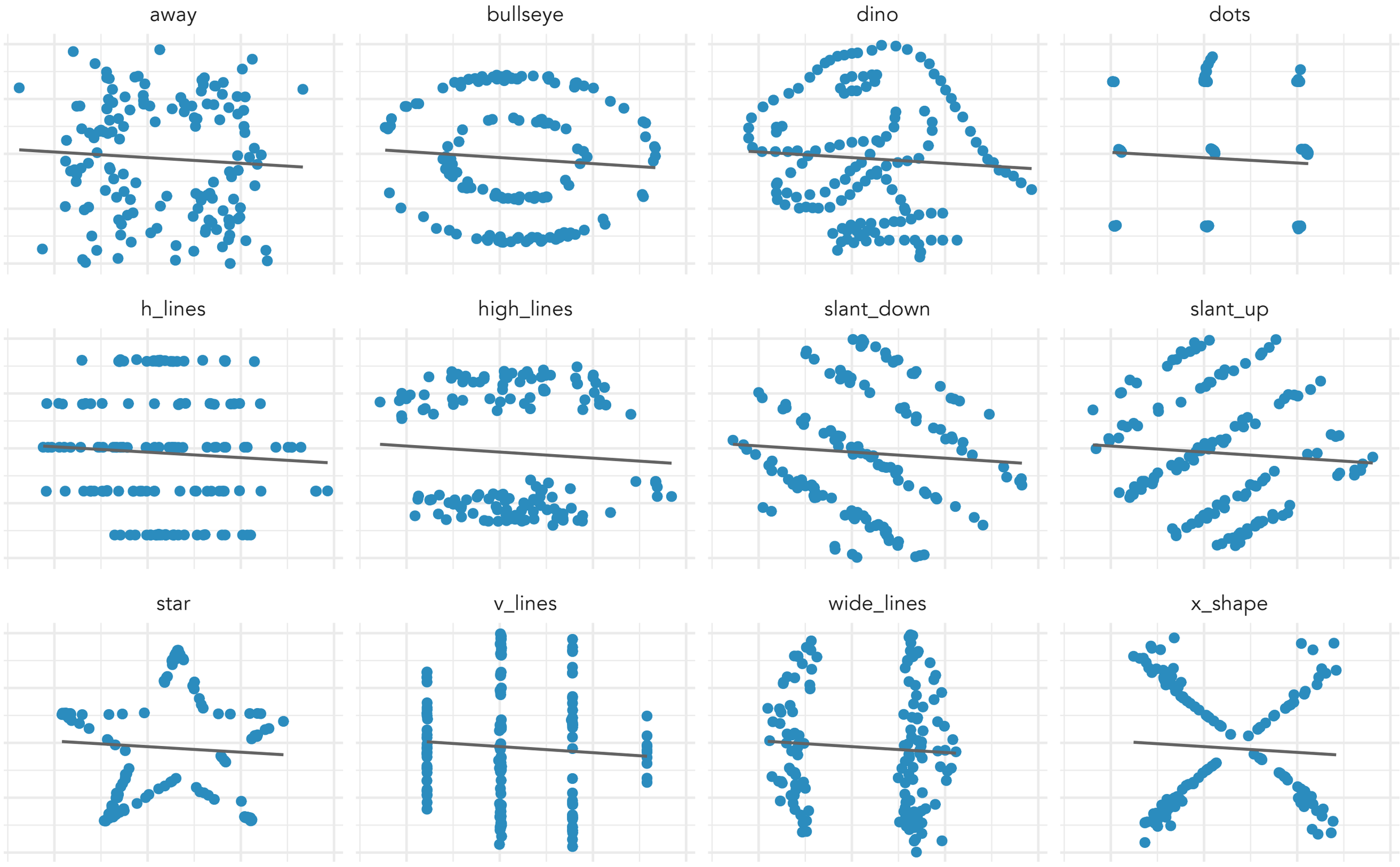


wide_lines

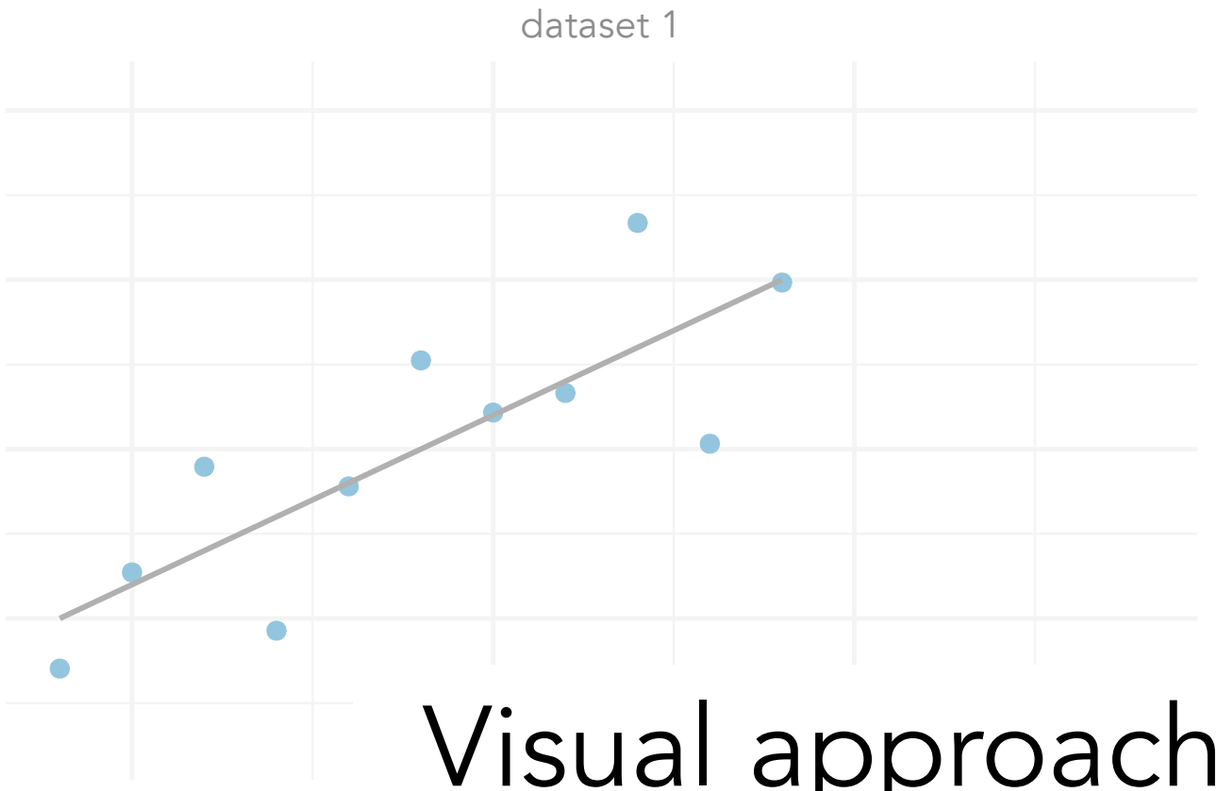


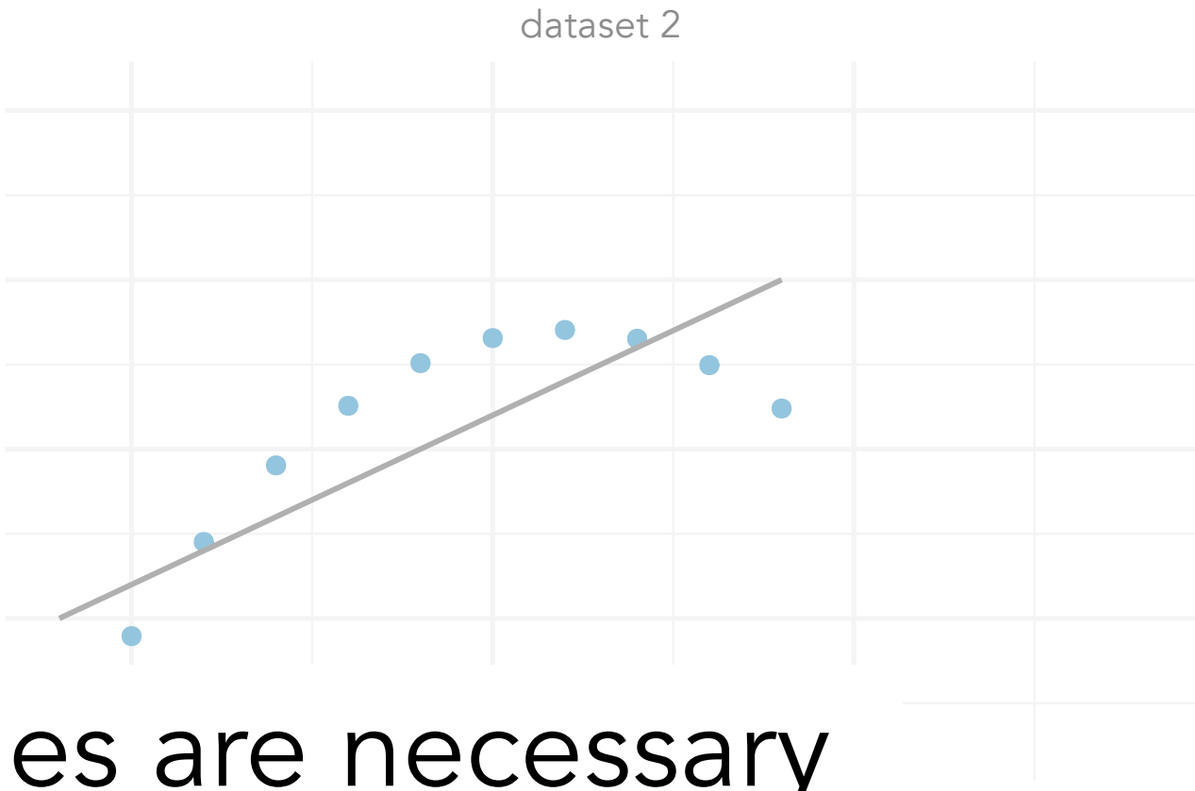
x_shape



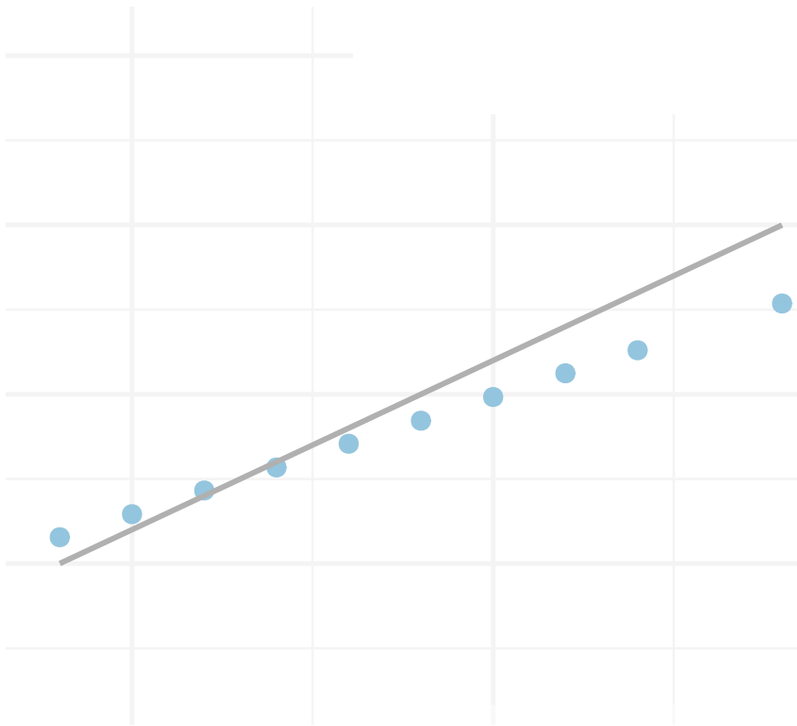


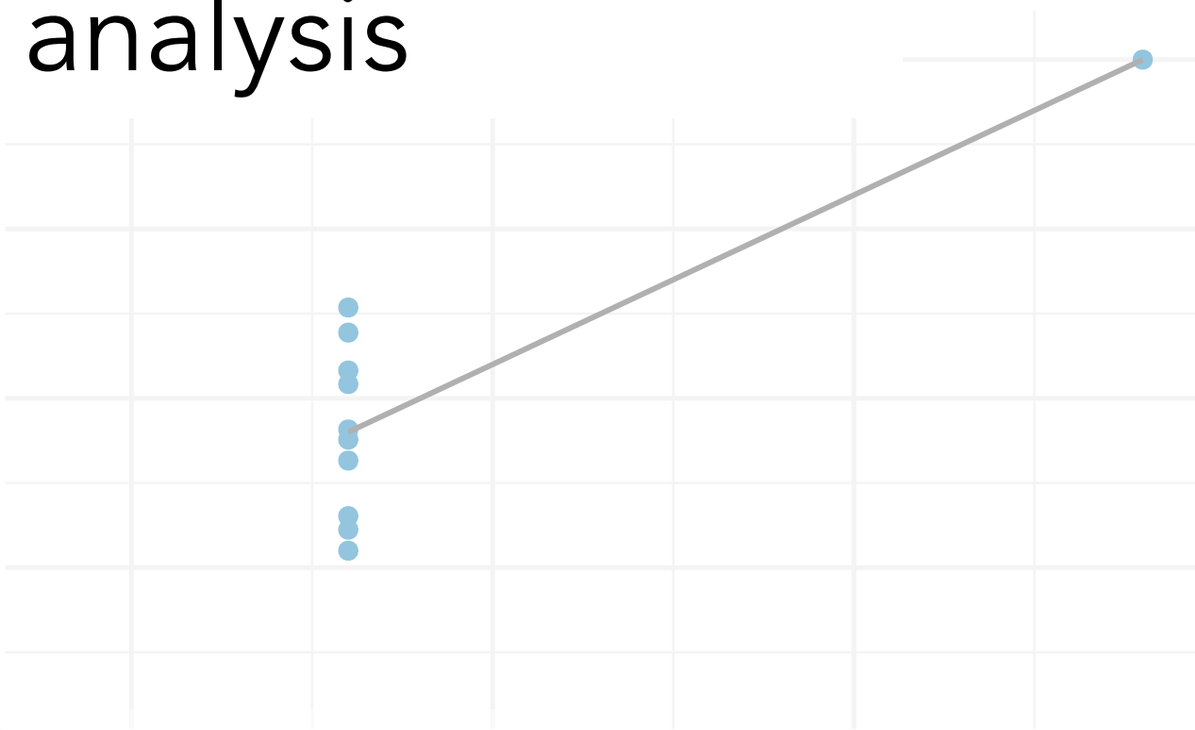
Matejka and Fitzmaurice, 2017





Visual approaches are necessary to data analysis





Anscombe's Quartet

Francis Anscombe, 1973

Visual approaches are necessary to **modern** data analysis

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Visualization is fundamental to meeting the unprecedented challenges and exploiting the wonderful opportunities of the ever-expanding deluge of data confronting virtually every field

Jim Hollan, UC San Diego

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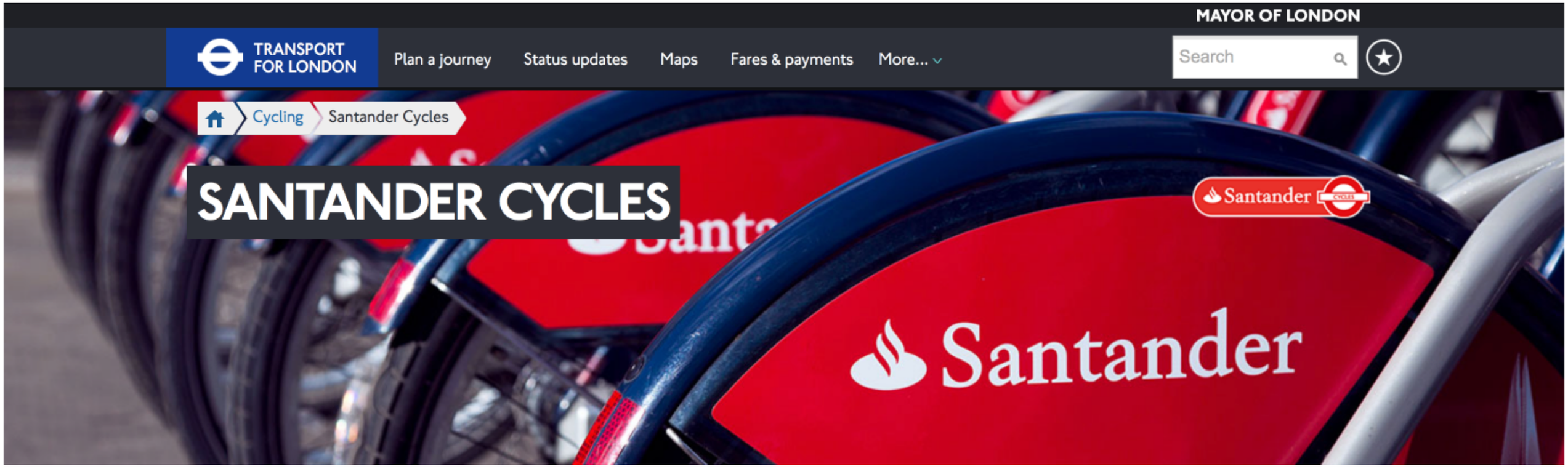
Jim Hollan, UC San Diego

Nowadays visualization is one of the key ways, in which scientific discoveries and advances in collective understanding are made.

Therefore, those scientists, researchers, data explorers, and analysts who rely in their everyday work on producing visualizations and generating images, should have some acquaintance with the most rudimentary ABC of good design practice.

Marek Kultys, Independent Designer



Journeys

memberID	isMember	oTime	dTime	oStati	dStati	bikeID
INTEGER	BOOLEAN	DATETIME	DATETIME	INTEGE	INTEGE	INTEGER
#####	1	30/07/10 03:35	30/07/10 03:41	308	308	1396
#####	1	30/07/10 04:05	30/07/10 04:21	290	286	2017
#####	1	30/07/10 04:22	30/07/10 04:42	81	174	738
#####	1	30/07/10 04:37	30/07/10 04:47	14	14	2992
#####	1	30/07/10 04:39	01/08/10 04:10	169	169	2786
.	.	.	.	.	.	.
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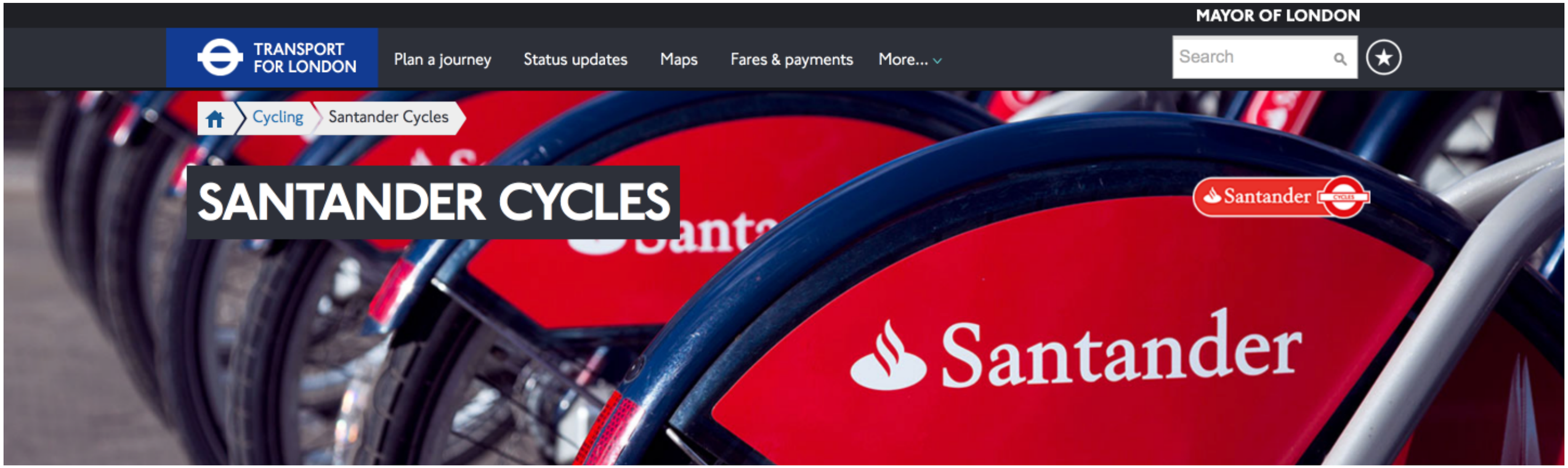
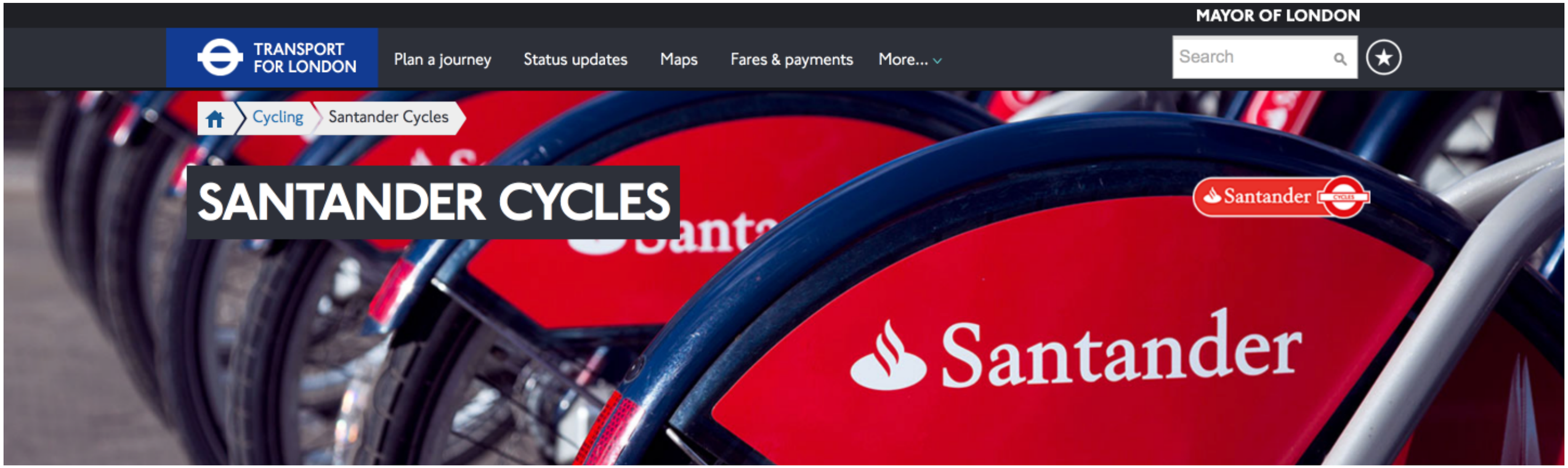
.	.	.	.	.	.	.

~ 60 million by 2017



Summary statistics



Summary statistics

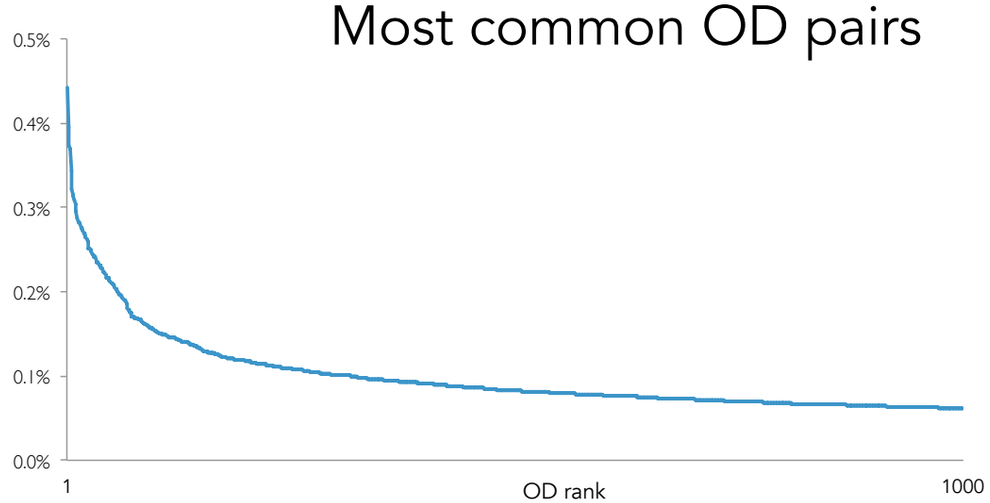
~ 10 million in 2017

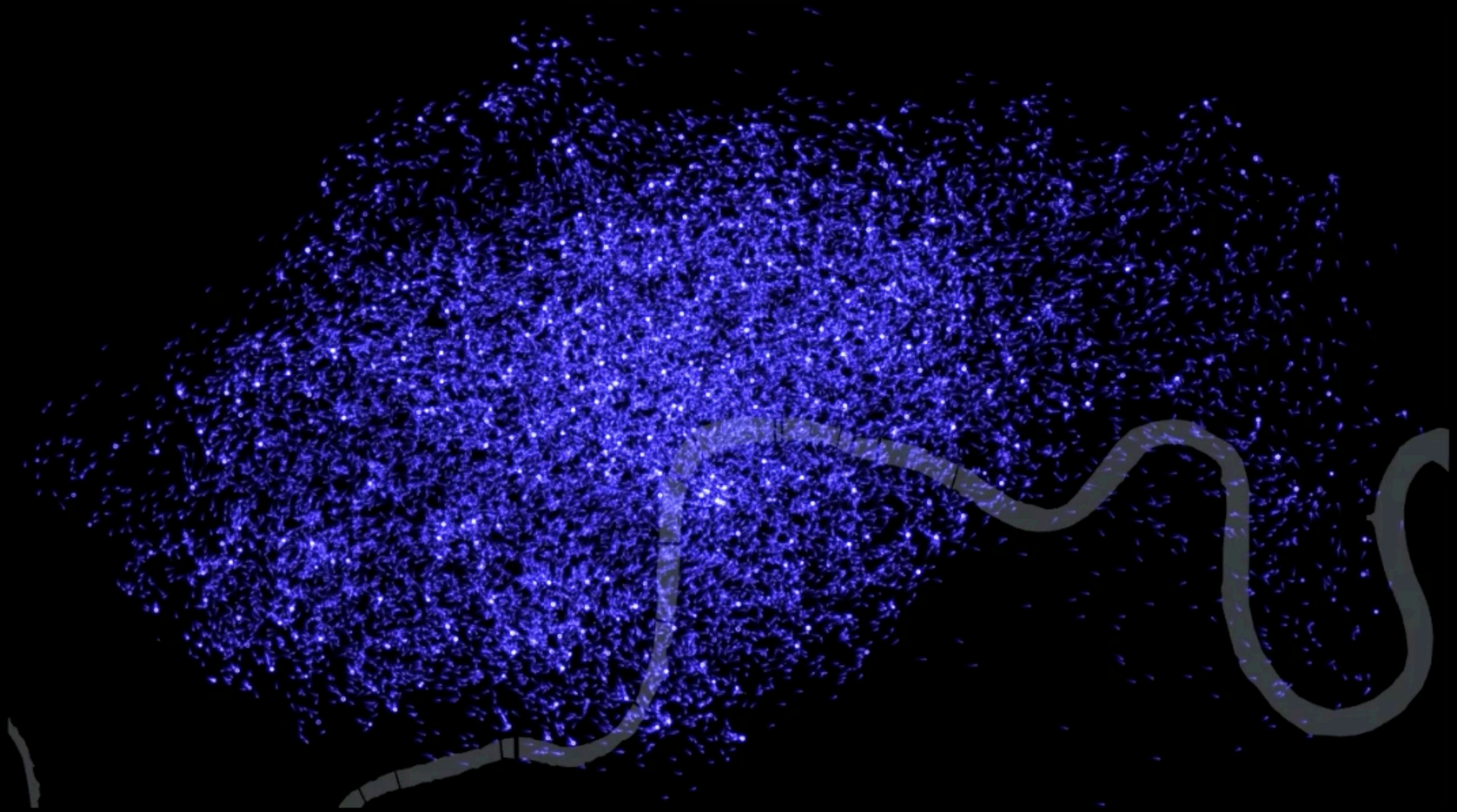
Modal day of week : Wed-Thu

Modal month of year : Jun-Jul

Average Travel Time : 8 mins

Most common OD pairs

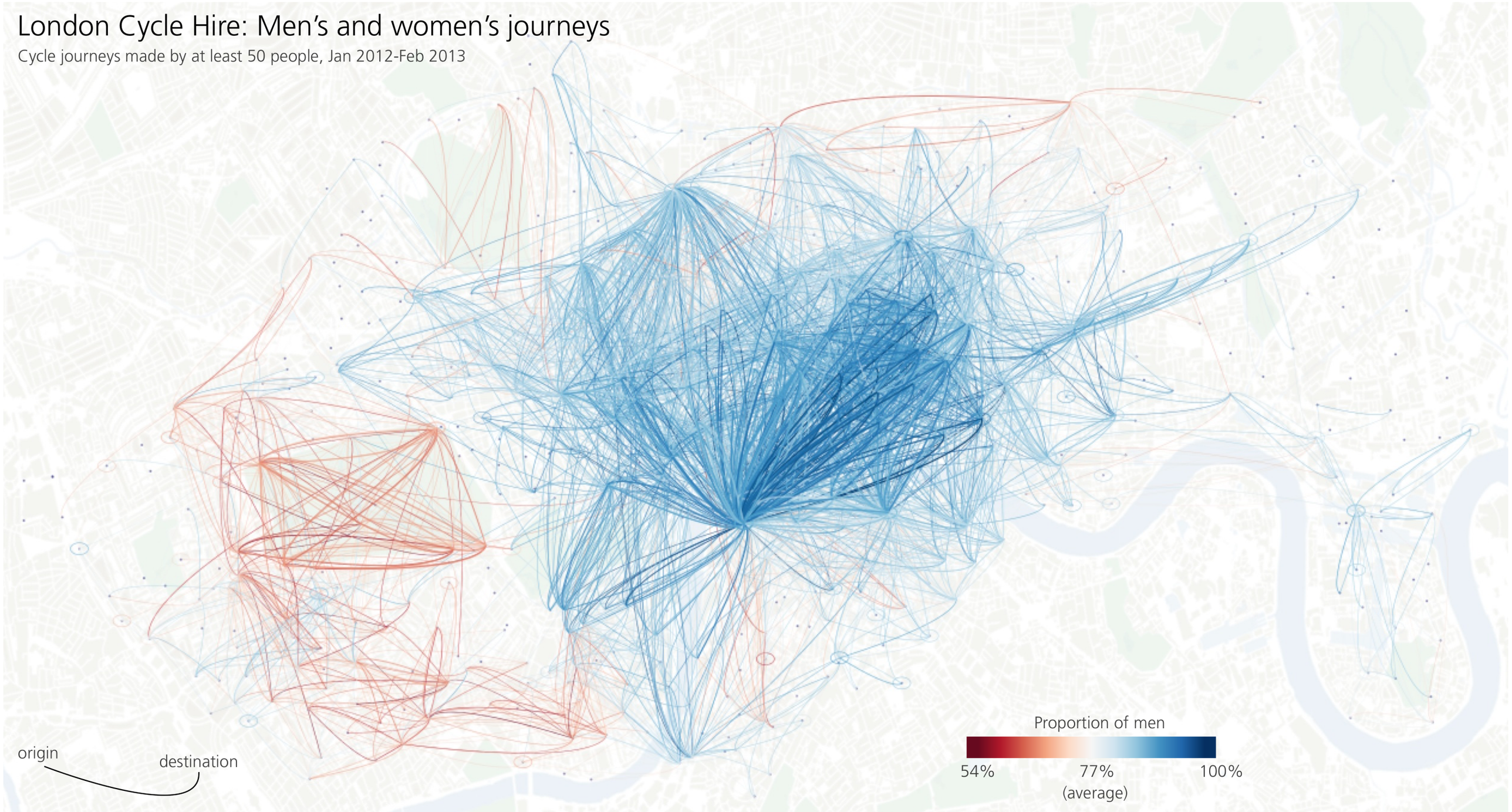




Jo Wood

London Cycle Hire: Men's and women's journeys

Cycle journeys made by at least 50 people, Jan 2012-Feb 2013



Beecham and Wood, 2014

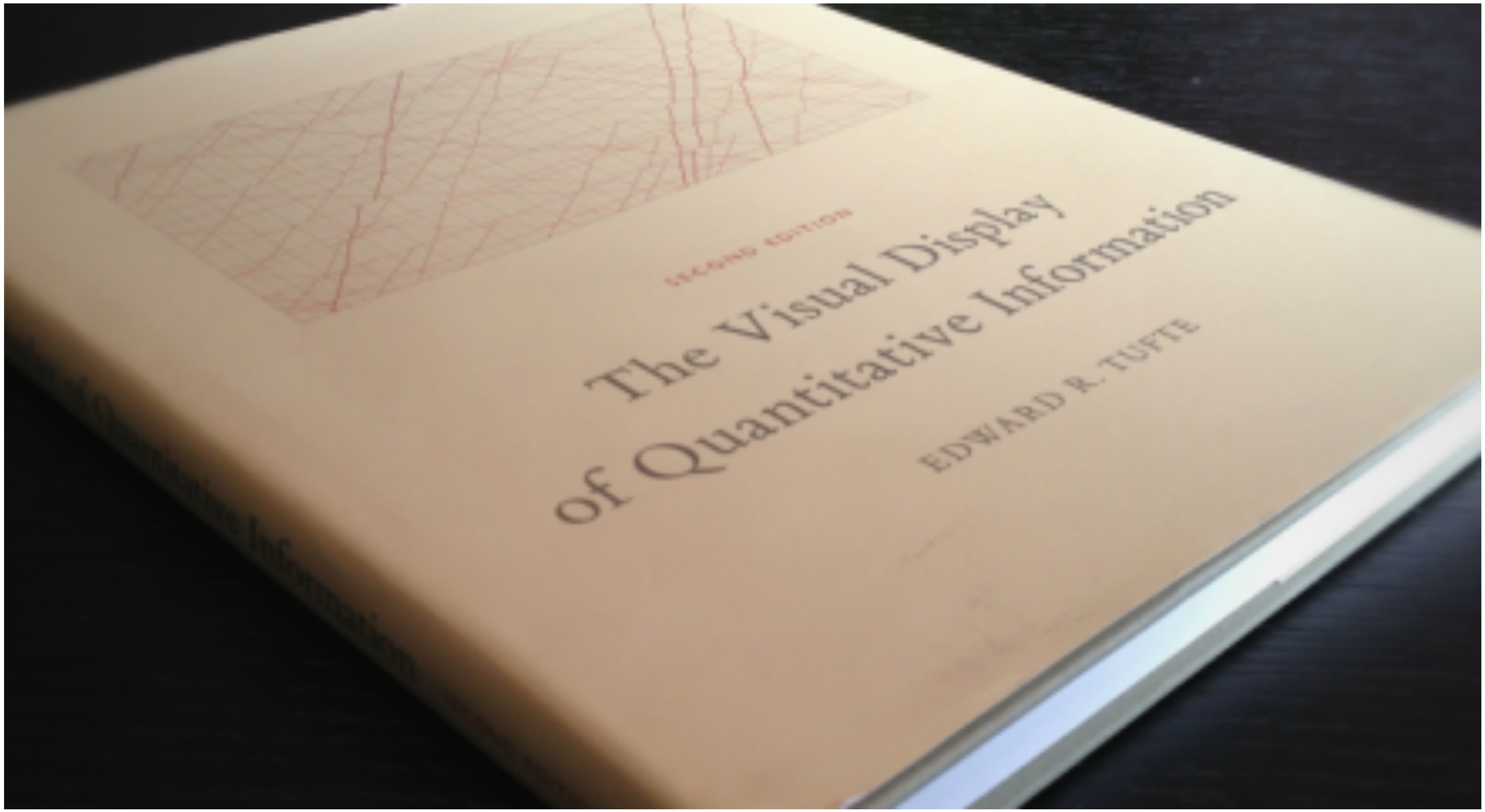
Session Outcomes

Appreciate core principles of data visualization design

Employ these principles when critiquing data graphics

Create effective data visualizations using software built on these principles

Characteristics of effective data graphics



Tufte, Edward R. (2001), The Visual Display of Quantitative Information,
Graphics Press, Cheshire, Connecticut

Effective data graphics should

1. Show the data

2. Induce the viewer to think about the substance of the data

3. Avoid distorting what the data have to say

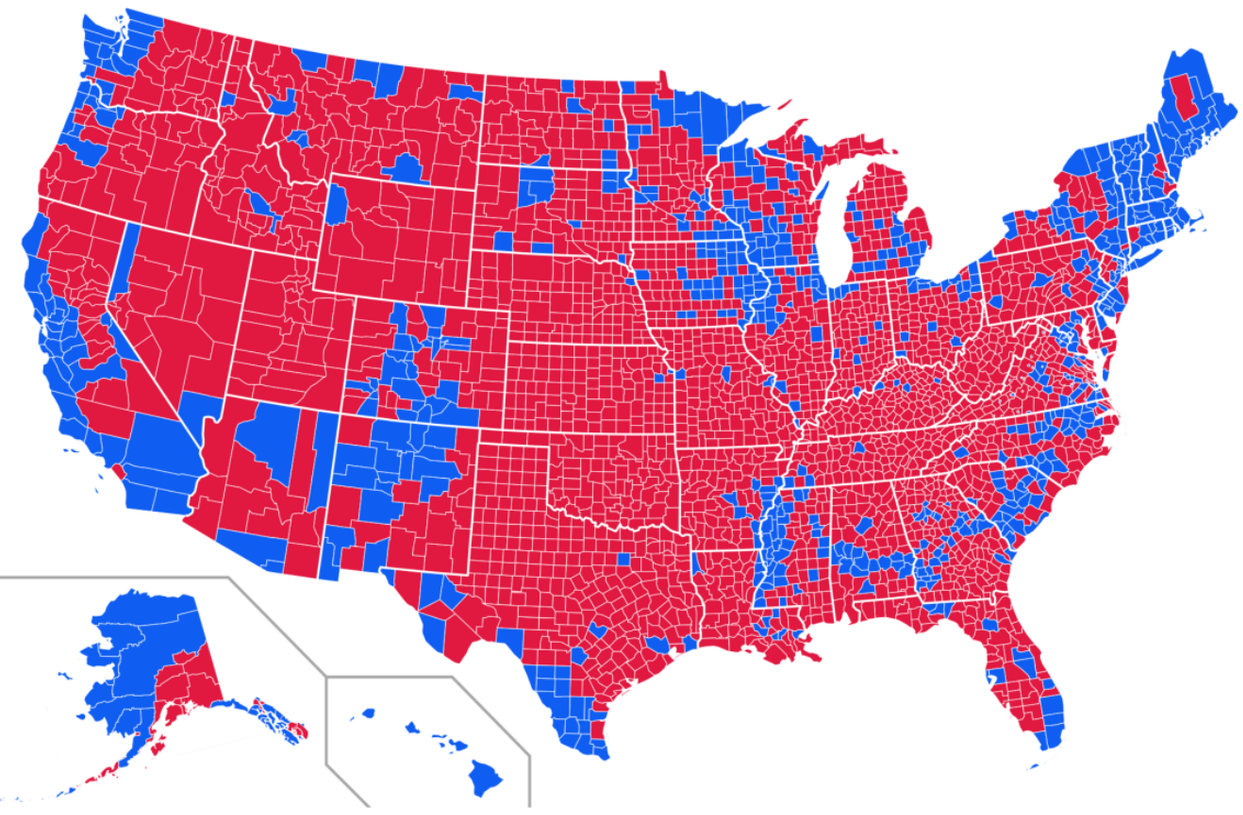
4. Present many numbers in a small space

5. Make large data sets coherent

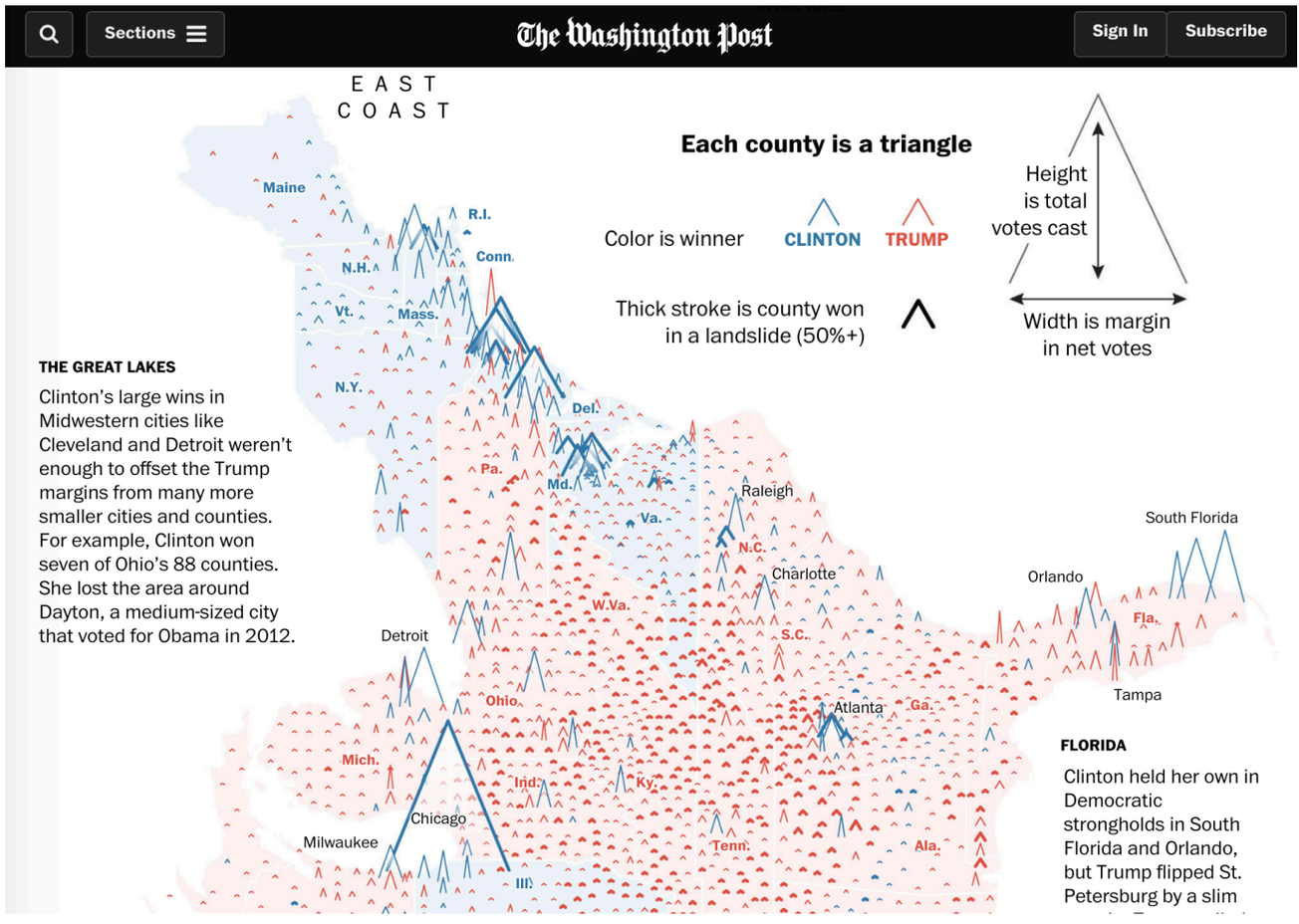
6. Encourage the eye to compare different pieces of data

7. Reveal the data at several levels of detail
from a broad overview to a fine structure

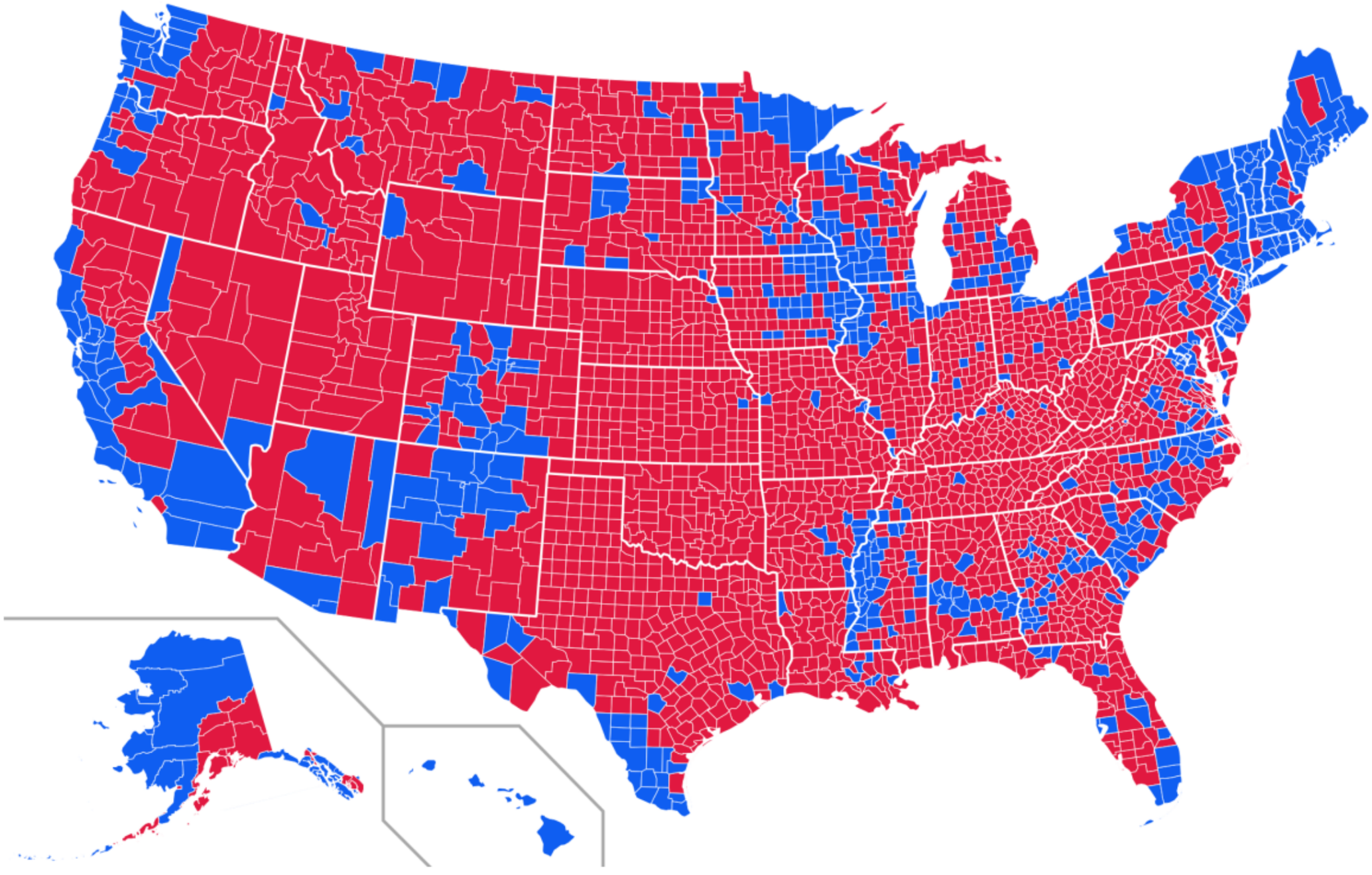
Tufte (2001: 13)



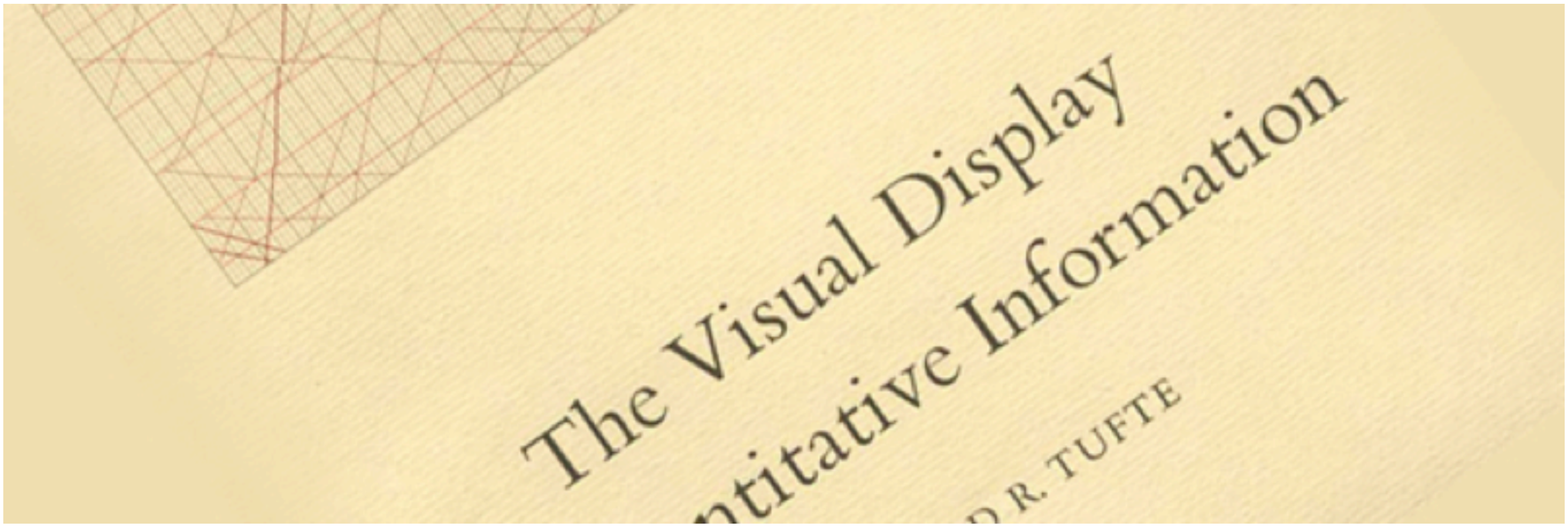
Natalie Schmidt, on Medium



Lazaro Gamio and Dan Keating, Washington Post



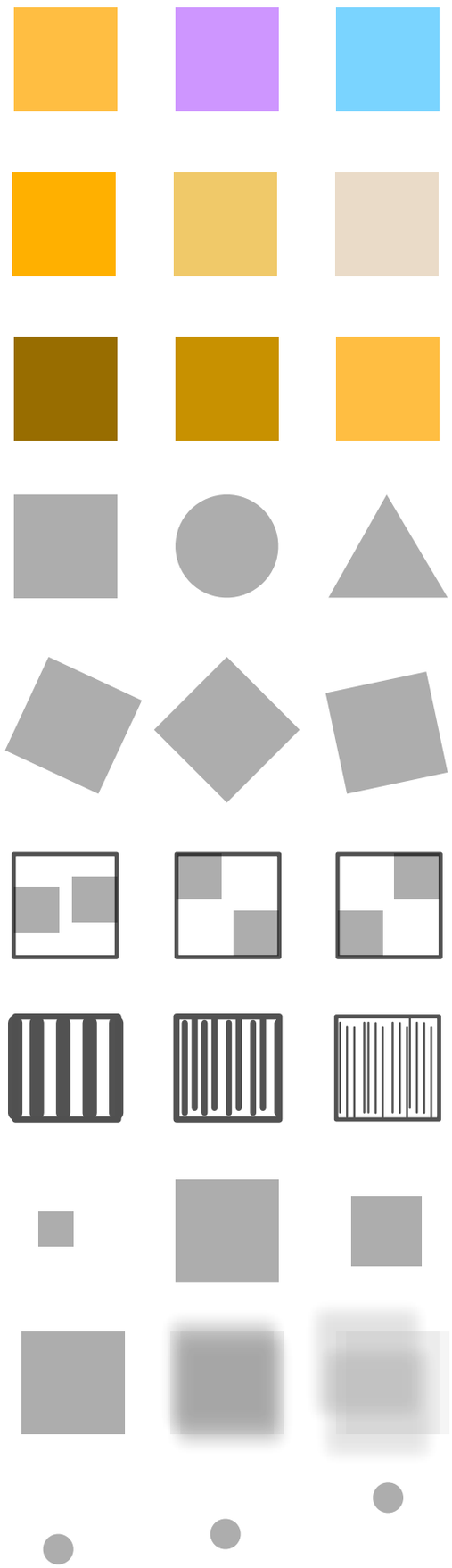
Natalie Schmidt, on Medium



Data graphics visually display measured quantities by means of the combined use of points, lines, a coordinate system, numbers, symbols, words, shading, and color.

Tufte, 2001

Visual variables | channels



Hue

Saturation

Brightness

Shape

Orientation

Arrangement

Texture

Size

Focus

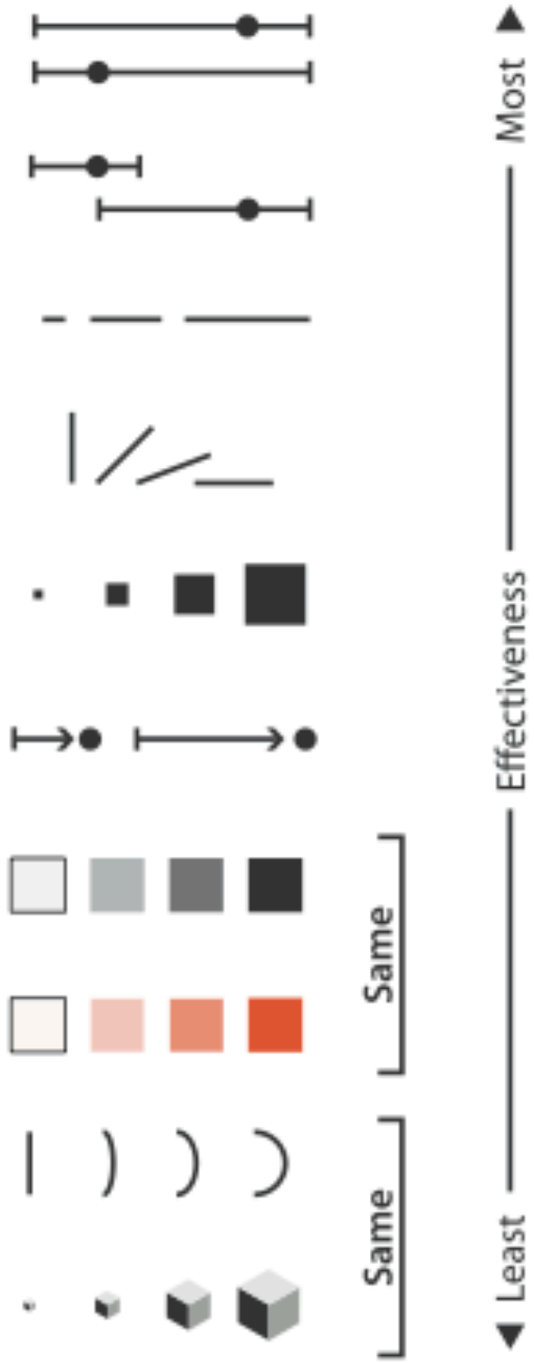
Location

Bertin, 1983

Channels: Expressiveness Types and Effectiveness Ranks

Magnitude Channels: Ordered Attributes

- Position on common scale
- Position on unaligned scale
- Length (1D size)
- Tilt/angle
- Area (2D size)
- Depth (3D position)
- Color luminance
- Color saturation
- Curvature
- Volume (3D size)



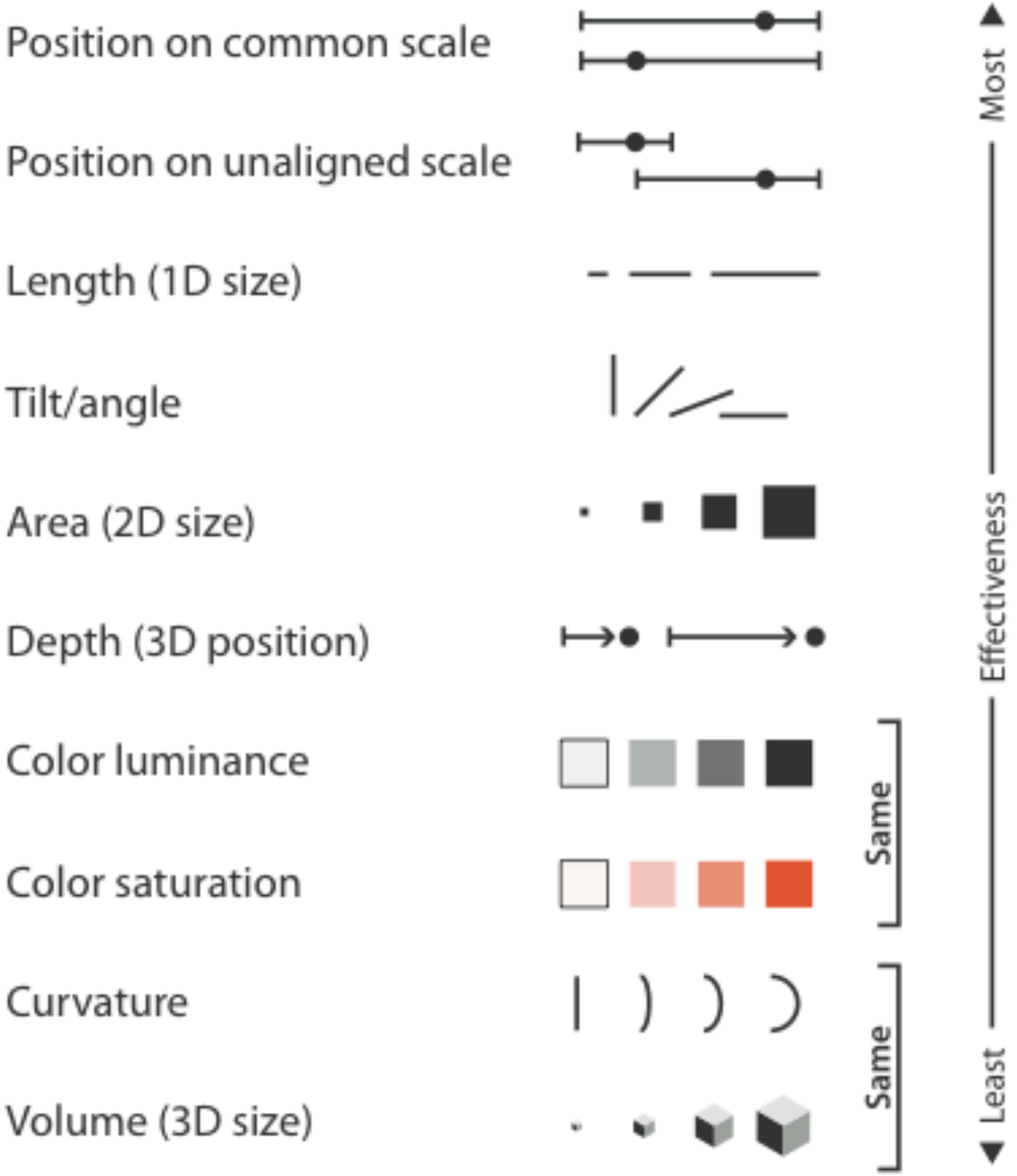
Identity Channels: Categorical Attributes

- Spatial region
- Color hue
- Motion
- Shape

Munzner, 2014
Visualization , Analysis & Design

Channels: Expressiveness Types and Effectiveness Ranks

Magnitude Channels: Ordered Attributes



Quantitative
ratio, interval

Ordered

Munzner, 2014
Visualization , Analysis & Design

Channels: Expressiveness Types and Effectiveness Ranks

Magnitude Channels: Ordered Attributes

- Position on common scale
- Position on unaligned scale
- Length (1D size)
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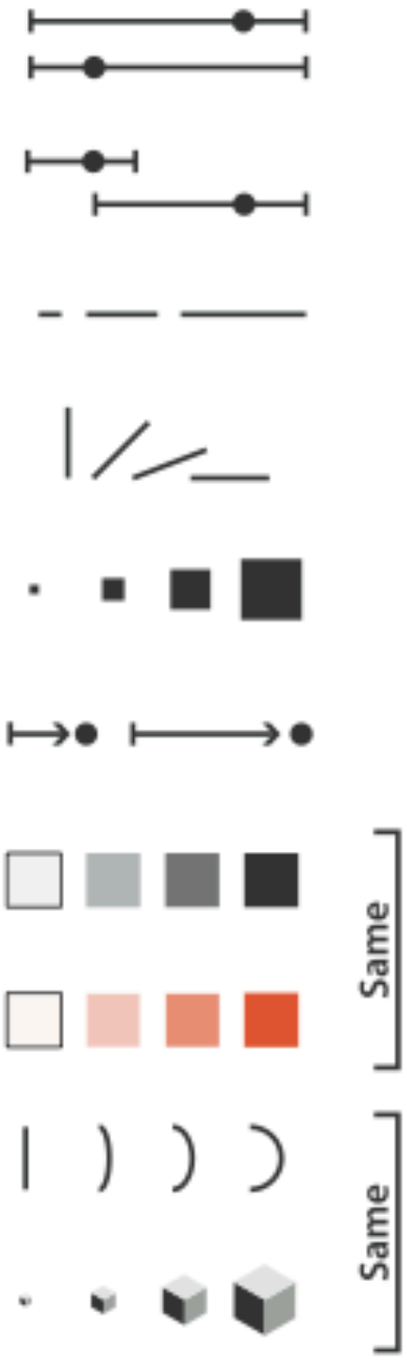
- Depth (3D position)
- Color luminance
- Color saturation
- Curvature
- Volume (3D size)



Identity Channels: Categorical Attributes

- Spatial region
- Color hue
- Motion
- Shape

Quantitative
ratio, interval

Ordered

Selective / associative
nominal

Munzner, 2014
Visualization , Analysis & Design

Selective | Associative

Selective | Associative

How many **3**s do you see?

visual channel : none

Selective | Associative

How many **3**s do you see?

37655418

44812212

82453219

visual channel : none

Position on common scale

Position on unaligned scale

Length (1D size)

Tilt/angle

Area (2D size)

Depth (3D position)

Color luminance

Color saturation

Curvature

Volume (3D size)

Same

Same

Spatial region

Color hue

Motion

Shape

Position on common scale

Position on unaligned scale

Length (1D size)

Tilt/angle

Area (2D size)

Depth (3D position)

Color luminance

Color saturation

Curvature

Volume (3D size)

Same

Same

Spatial region

Color hue

Motion

Shape

Position on common scale

Position on unaligned scale

Length (1D size)

Tilt/angle

Area (2D size)

Depth (3D position)

Color luminance

Color saturation

Curvature

Volume (3D size)

Same

Same

Spatial region

Color hue

Motion

Shape

Selective | Associative

How many **3**s do you see?

5 1 3 7 5 5 2 0 2 1 2 2 8 1 4 7 2 0 4 0 4 4 4 9 1 0 9 4 6 2 9 1 1 9 0 7 8 8 3 6

8 6 2 4 4 1 7 4 6 2 5 0 5 9 2 1 4 1 2 3 8 9 7 9 6 2 1 5 7 0 0 9 0 0 4 7 8 1 9 6

1 0 7 9 0 7 8 0 1 1 5 4 7 5 8 6 2 1 9 3 9 0 2 1 5 3 1 0 1 9 6 1 7 9 7 7 1 2 8 1

2 9 6 6 0 1 5 6 9 4 1 2 6 9 6 9 7 6 0 9 0 8 1 2 6 4 1 1 8 5 5 4 6 7 0 1 4 5 4 0

visual channel : tilt

Position on common scale

Position on unaligned scale

Length (1D size)

Tilt/angle

Area (2D size)

Spatial region

Color hue

Motion

Shape

Depth (3D position)

Color luminance

Color saturation

Curvature

Volume (3D size)

Same

Same

Selective | Associative

How many **3**s do you see?

visual channel : 2d area

Selective | Associative

How many **3**s do you see?

1810717433286272787460422968772440752976

54811142964070781150798525994462628501593

17345262307897020748986297926928792163280

79214526976251429102804255966003128888064

visual channel : 2d area

Position on common scale

Position on unaligned scale

Length (1D size)

Tilt/angle

Area (2D size)

Depth (3D position)

Color luminance

Color saturation

Curvature

Volume (3D size)

Same

Same

Spatial region

Color hue

Motion

Shape

Position on common scale

Position on unaligned scale

Length (1D size)

Tilt/angle

Area (2D size)

Depth (3D position)

Color luminance

Color saturation

Curvature

Volume (3D size)

Same

Same

Spatial region

Color hue

Motion

Shape

Selective | Associative

How many **3**s do you see?

visual channel : colour hue

How many **3**s do you see?

610769284896869017670265017617578745634 5

9780626329887764469901984705424752344798

0664496467397202750182422702604445869905

8823510829259850681970141671149024760092

visual channel : colour hue

Position on common scale

Position on unaligned scale

Length (1D size)

Tilt/angle

Area (2D size)

Depth (3D position)

Color luminance

Color saturation

Curvature

Volume (3D size)

Same

Same

Spatial region

Color hue

Motion

Shape

Selective | Associative

How many **3**s do you see?

visual channel : spatial region

How many **3**s do you see?

33333

1992449260184678298245575745669544099480

5222862564278801424772108748670942271244

5907108580647580921567267712806201969450

2265619091605667699221779518552055 6

visual channel : spatial region

Quantity | Magnitude

Position on common scale

Position on unaligned scale

Length (1D size)

Tilt/angle

Area (2D size)

Depth (3D position)

Color luminance

Color saturation

Curvature

Volume (3D size)

Same

Same

Spatial region

Color hue

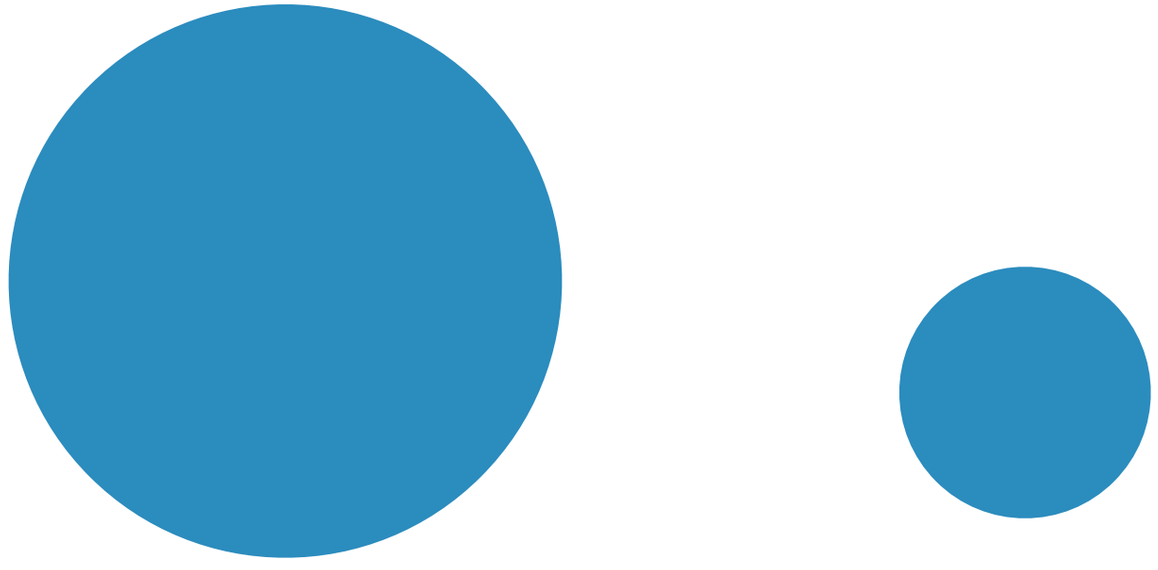
Motion

Shape

What proportion of the area of the larger circle does the smaller circle take up?

via Jason Dykes

What proportion of the area of the larger circle does the smaller circle take up?



visual channel : 2d area

via Jason Dykes

Position on common scale

Position on unaligned scale

Length (1D size)

Tilt/angle

Area (2D size)

Depth (3D position)

Color luminance

Color saturation

Curvature

Volume (3D size)

Same

Same

Spatial region

Color hue

Motion

Shape

Quantity | Magnitude

What proportion of the longer line does the smaller line account for?

visual channel : 2d area

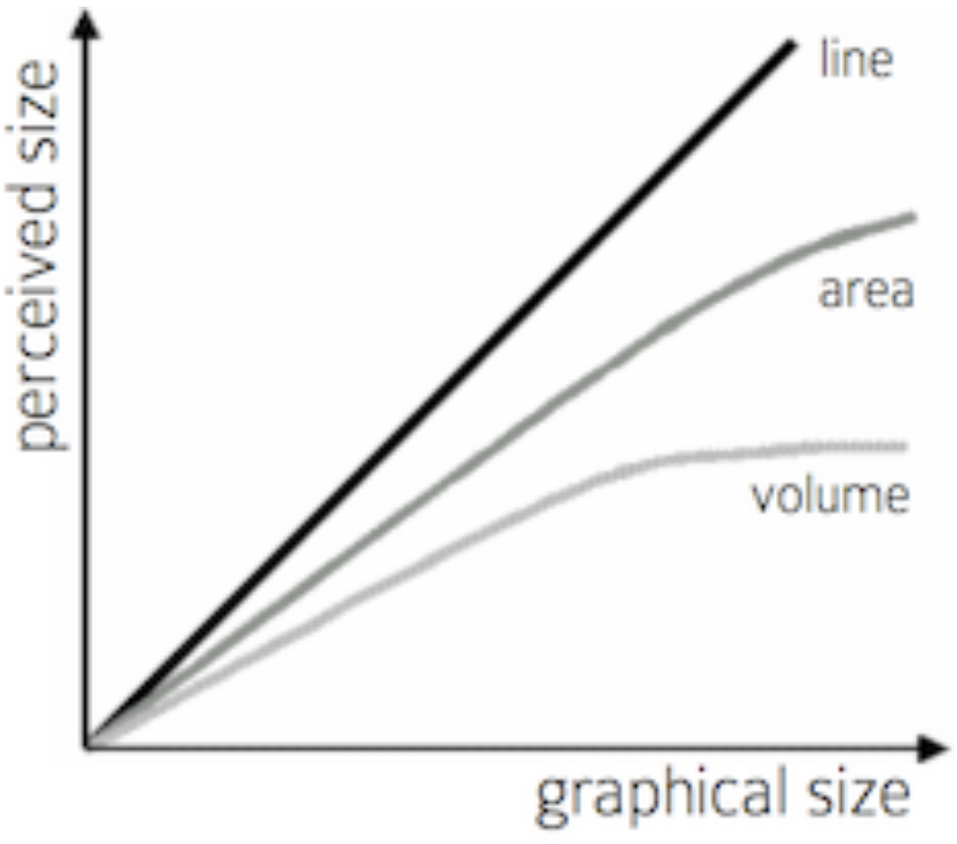
via Jason Dykes

What proportion of the longer line does the smaller line account for?

visual channel : 2d area

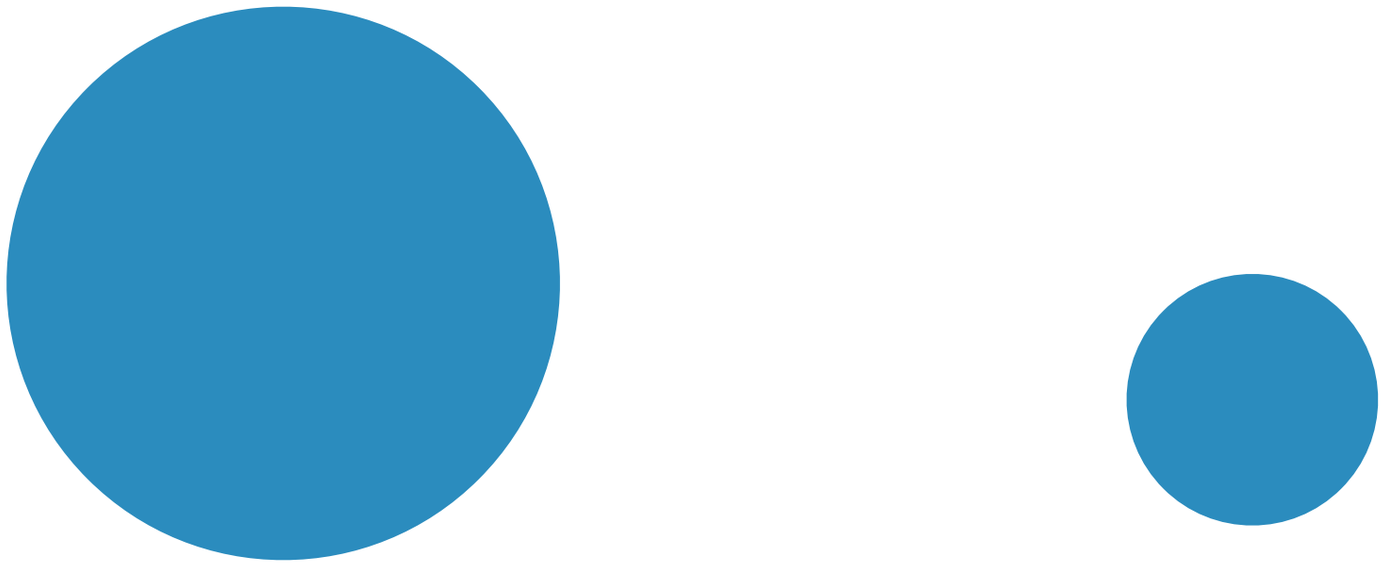
via Jason Dykes

What proportion of the area of the larger circle does the smaller circle take up?



visual channel : 2d area

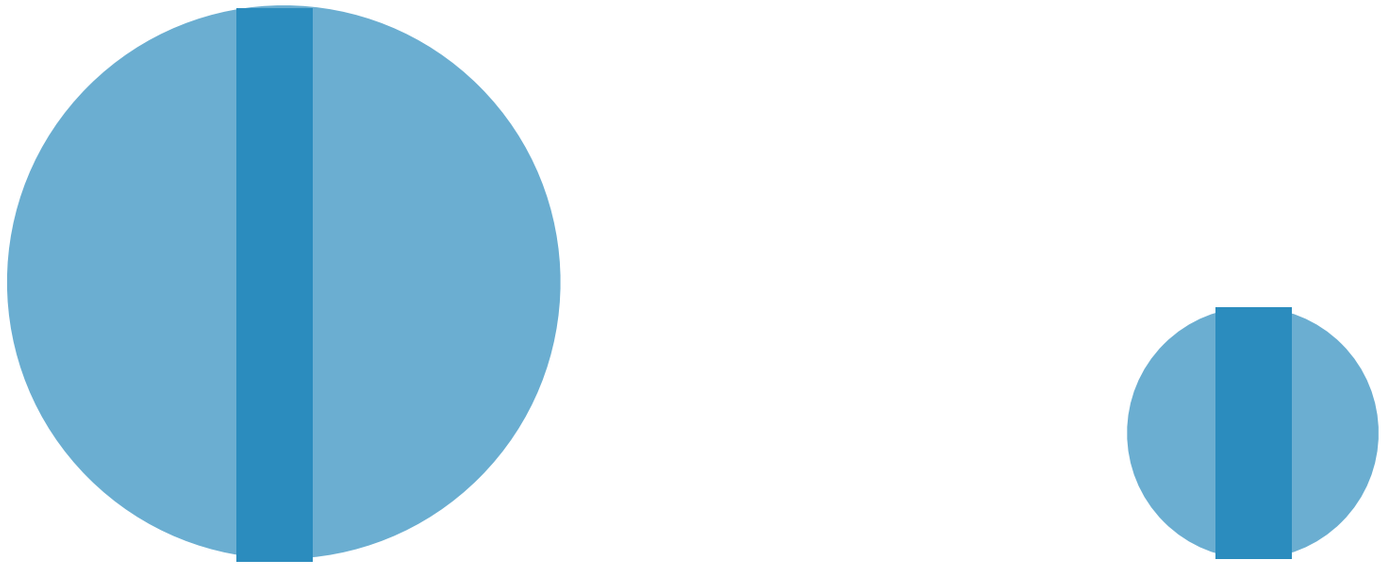
What proportion of the area of the larger circle does the smaller circle take up?



visual channel : 2d area

via Jason Dykes

What proportion of the area of the larger circle does the smaller circle take up?



visual channel : 2d area

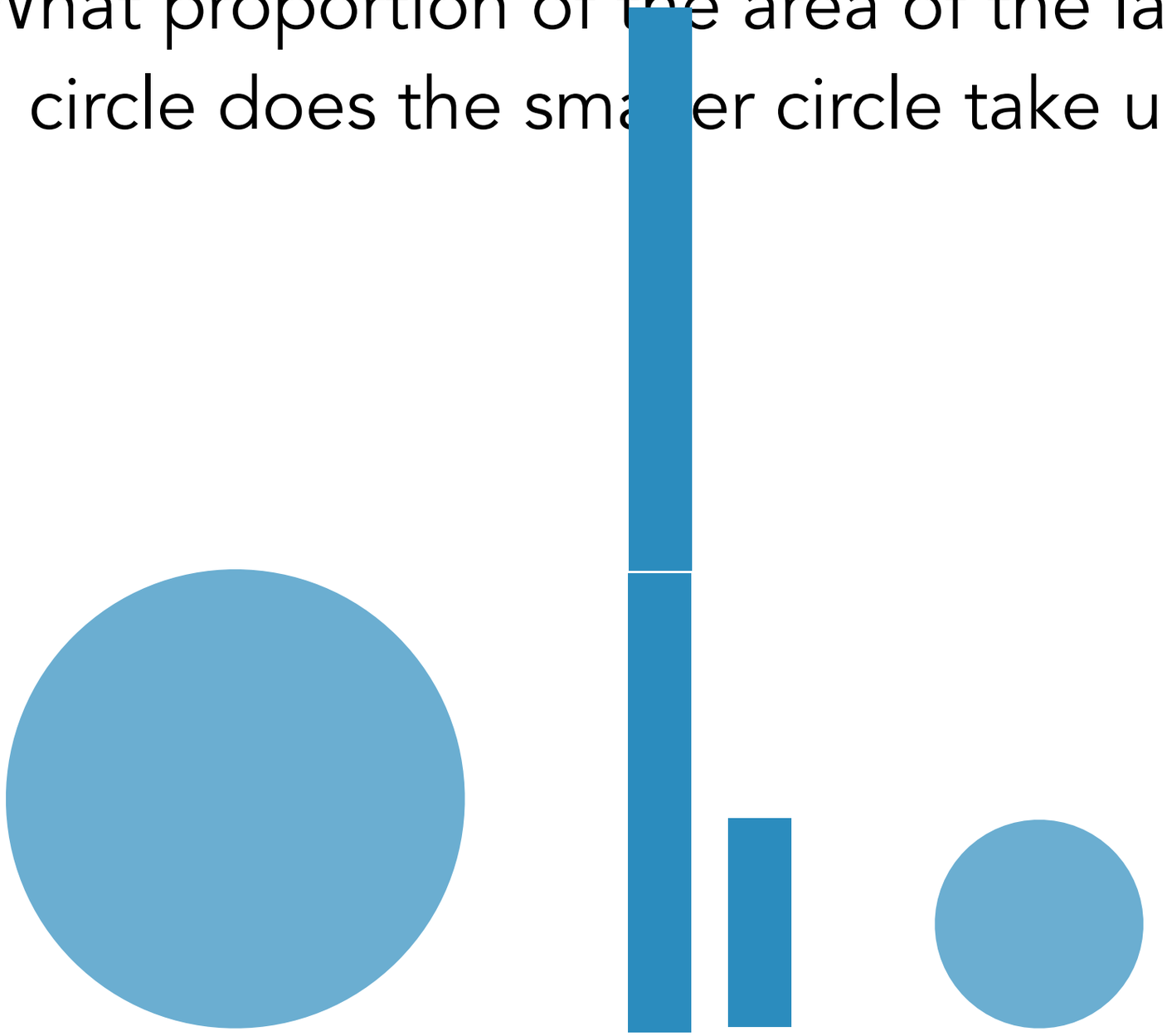
via Jason Dykes

What proportion of the area of the larger circle does the smaller circle take up?

visual channel : 2d area

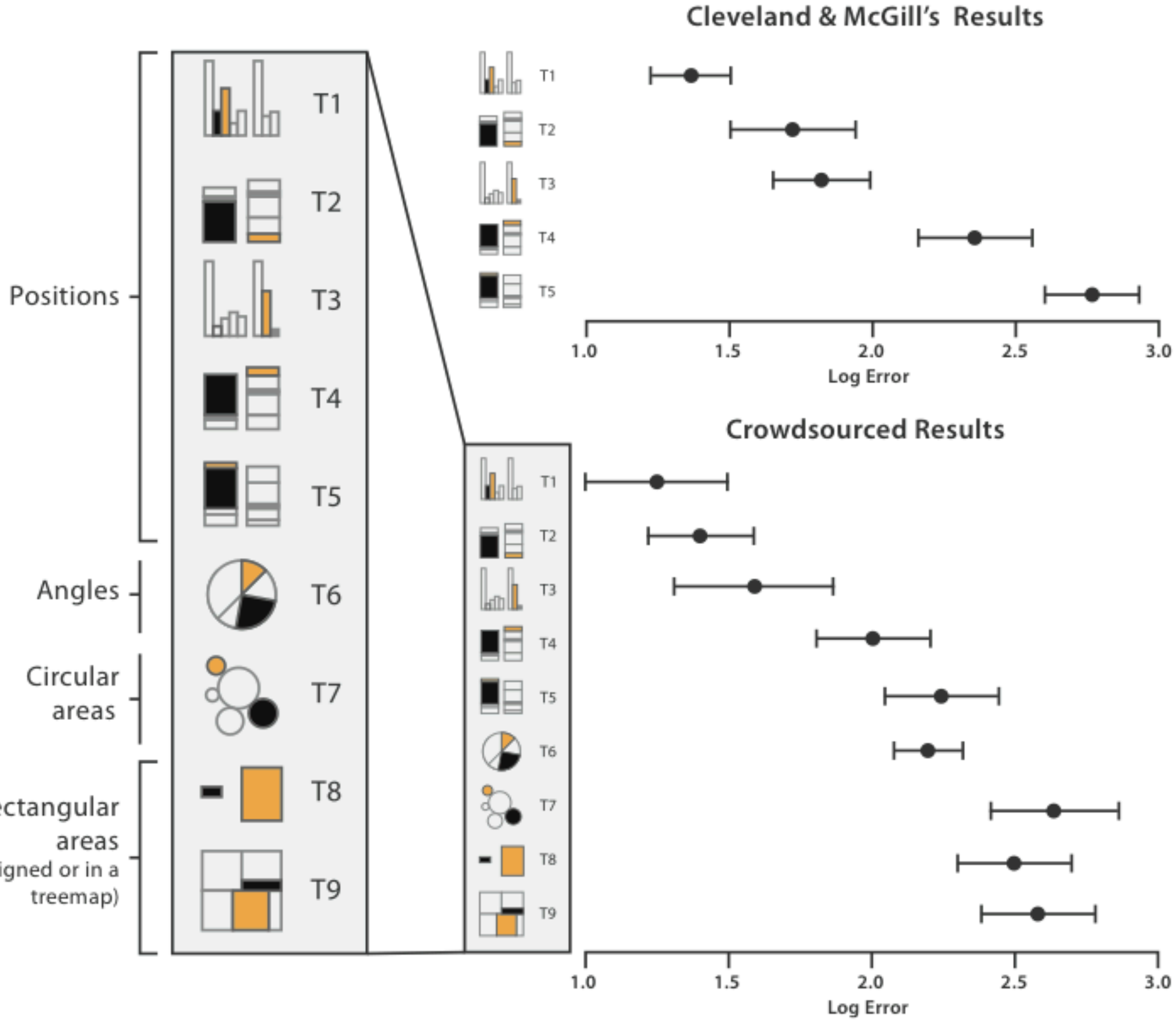
via Jason Dykes

What proportion of the area of the larger circle does the smaller circle take up?



visual channel : 2d area

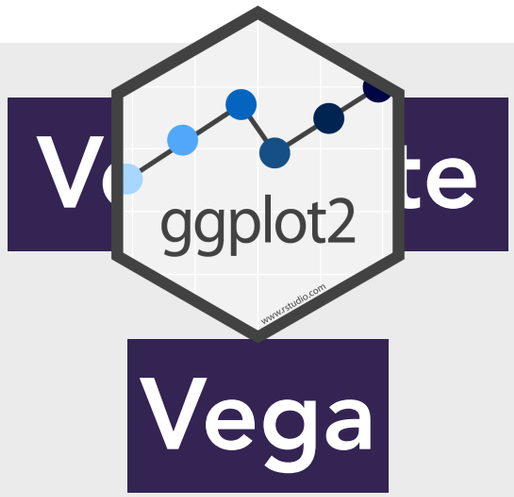
via Jason Dykes



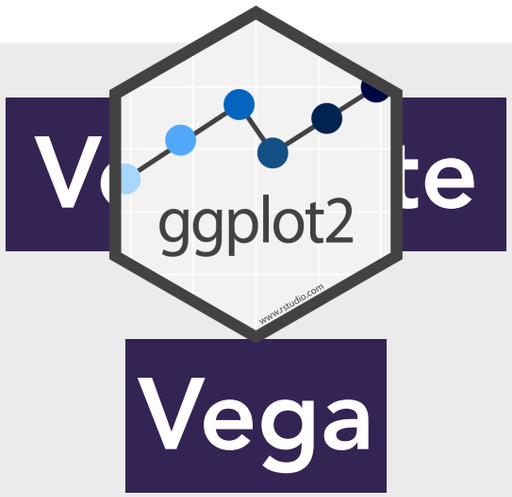
Heer & Bostock 2010

Vega-Lite

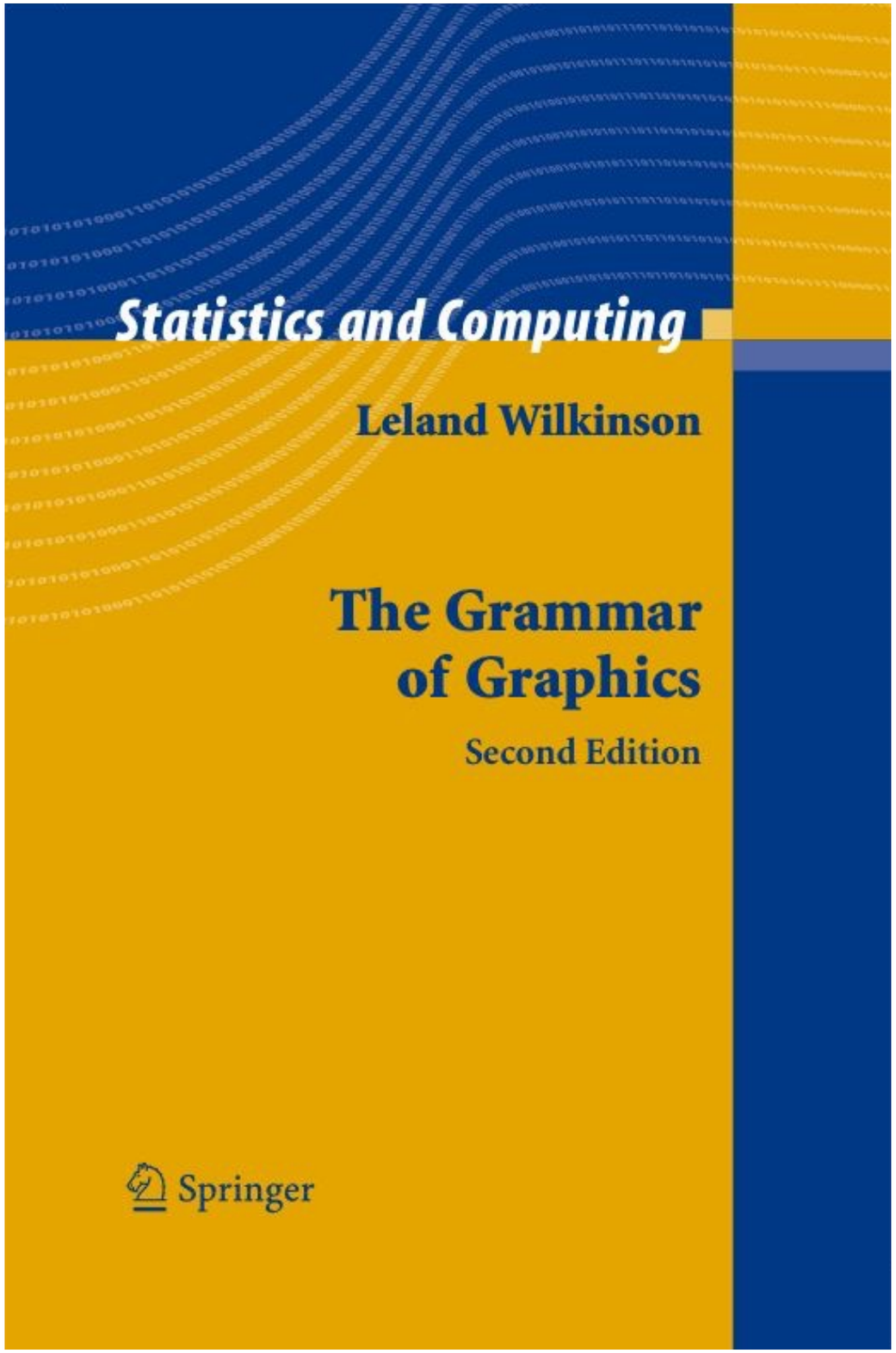
Vega


ggplot2
www.rstudio.com
Vega


p5*


ggplot2
www.rstudio.com
Vega


p5*



Data

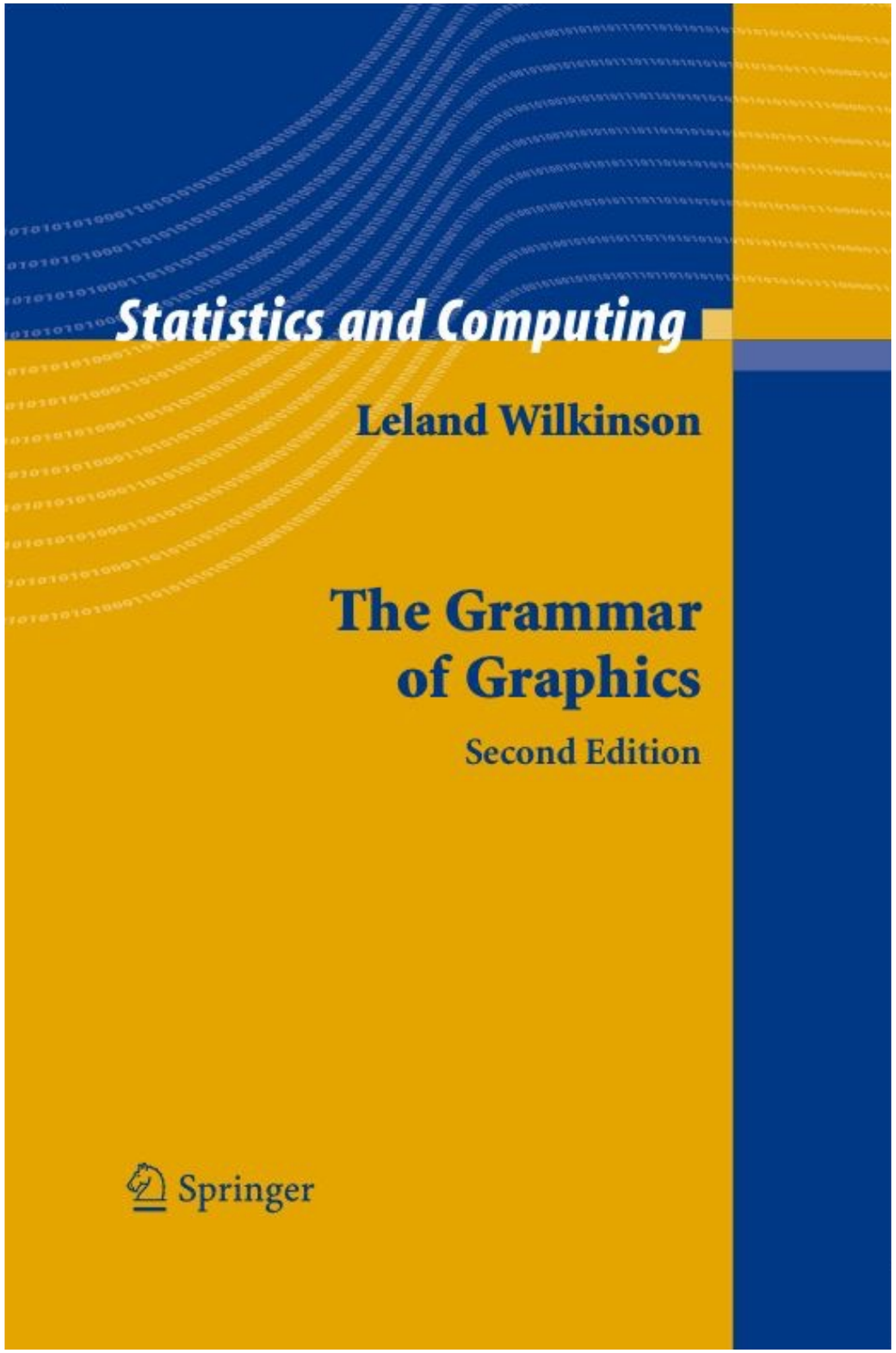
Transformation

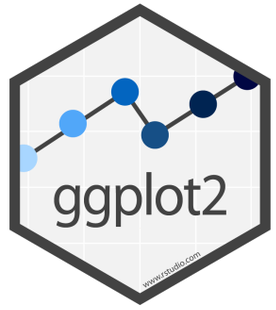
Element

Scale

Guide

Coord


Statistics and Computing
Leland Wilkinson
The Grammar of Graphics
Second Edition
Springer


ggplot2


Vega-Lite

Data	static or data source
Transform	filter, aggregation, binning
Mark	circle, line, bar, shape
Encoding	mapping between data and mark properties (size, colour, position)
Scale	functions that map data values to visual values (automatic)
Guides	axes and legends

Demo

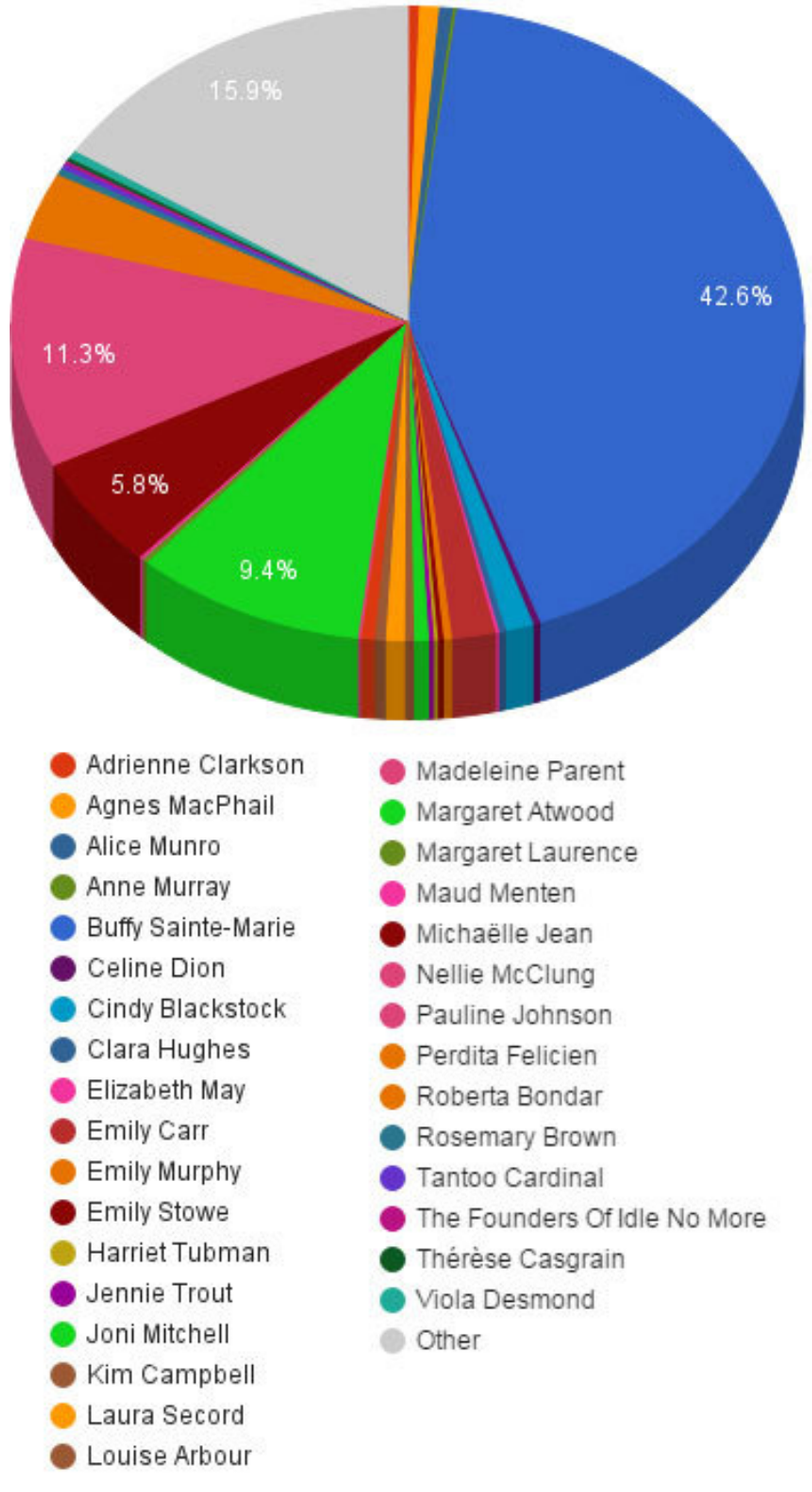
Break

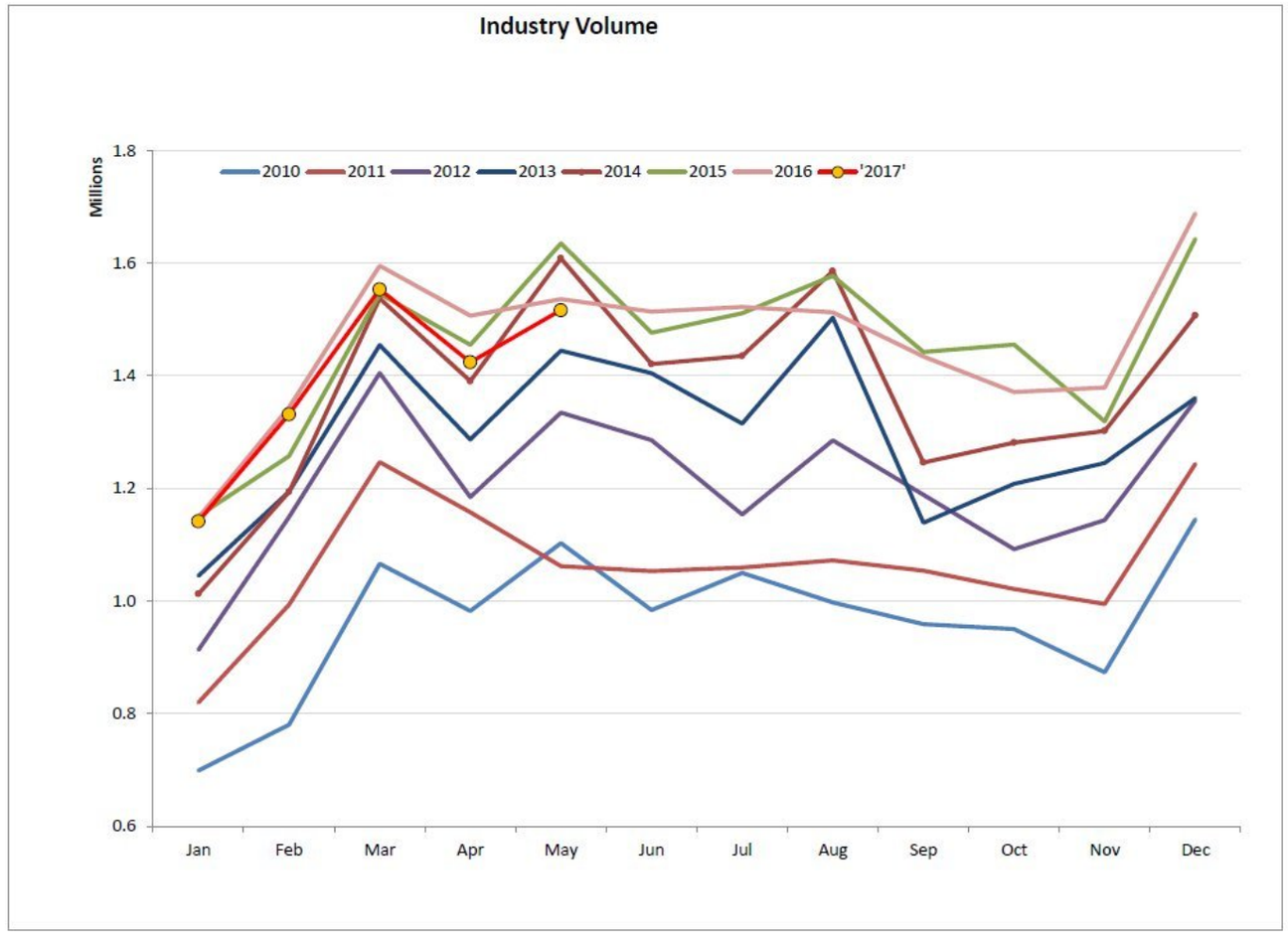
Part 2 : visualization guidelines

Part 2 : visualization guidelines

WTF Visualizations

Visualizations that make no sense.

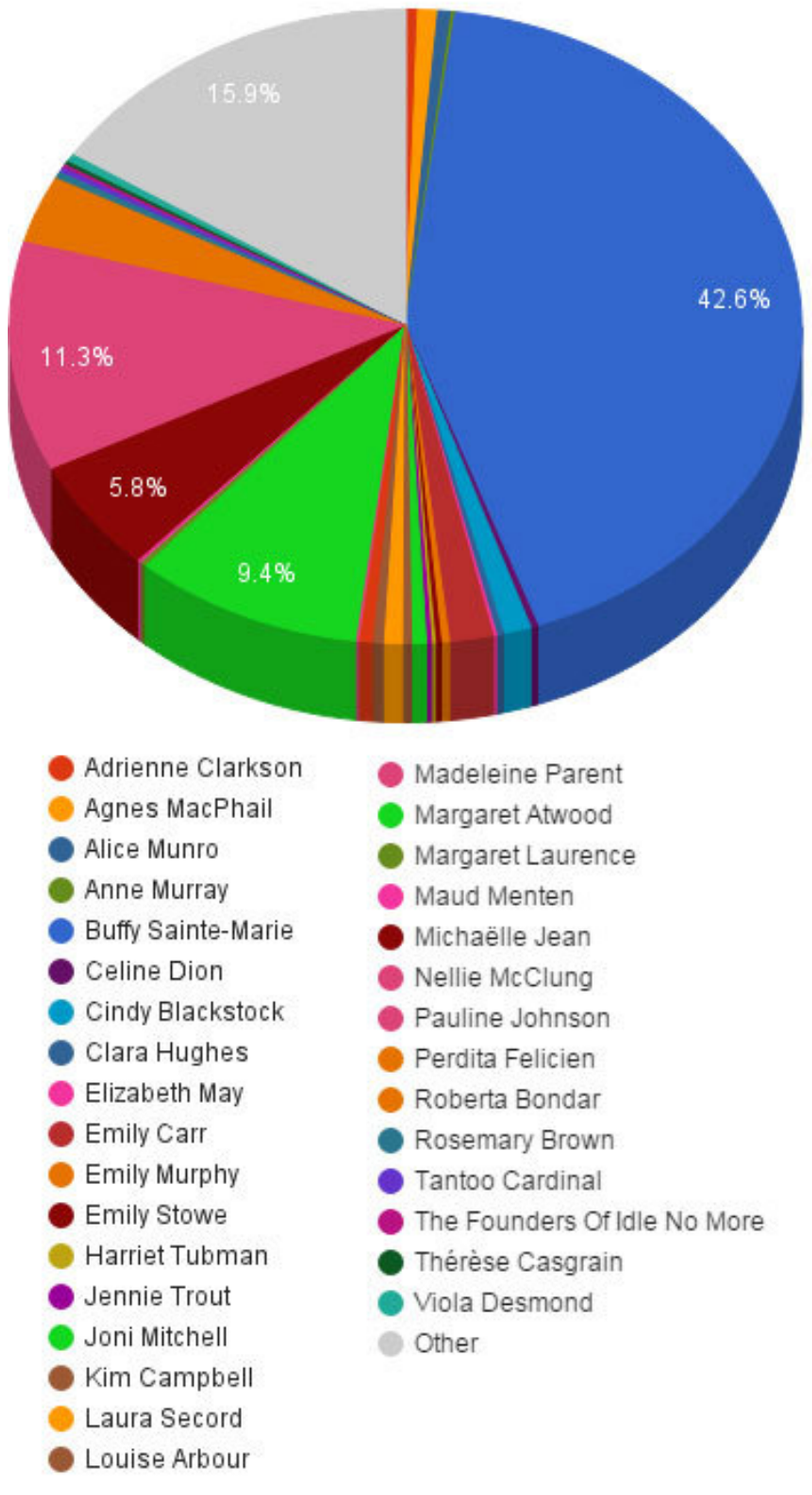




http://viz.wtf

WTF Visualizations

Visualizations that make no sense.



http://viz.wtf

Road Safety Data

Published by: Department for Transport
Last updated: 31 October 2017
Topic: Transport
Licence: Open Government Licence

Summary

These files provide detailed road safety data about the circumstances of personal injury road accidents in GB from 1979, the types (including Make and Model) of vehicles involved and the consequential casualties. The statistics relate only to personal injury accidents on public roads that are reported to the police, and subsequently recorded, using the STATS19 accident reporting form.

View full summary

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View full summary

Road Safety Data

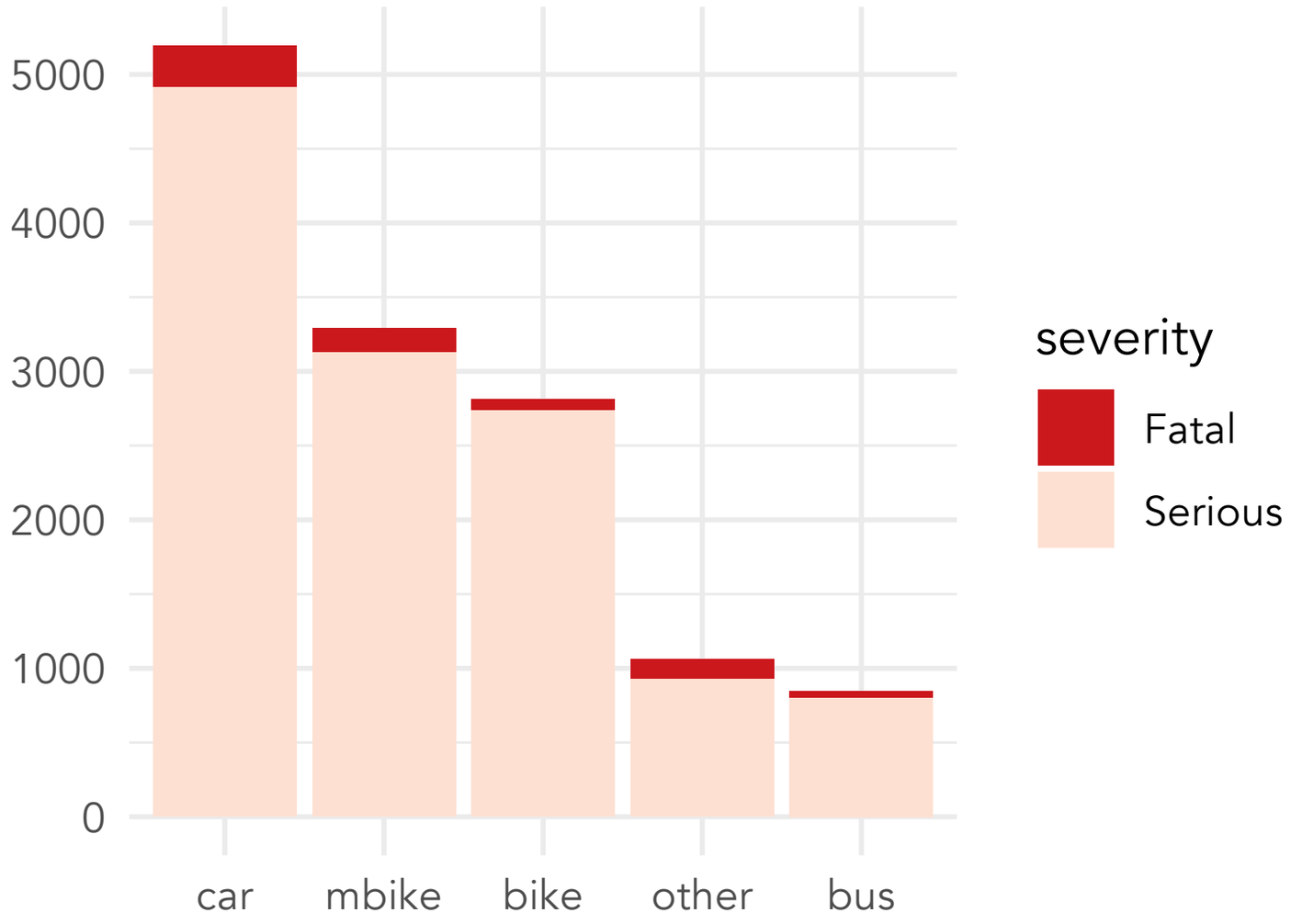
Severity of casualty	Date	Day of we	Hour of da	Local authority	Vehicle type
Serious	15/01/10	Friday	16	Kensington and Ch	Motorcycle over 125cc and up to 500cc
Serious	13/01/10	Wednesday	17	Kensington and Ch	Taxi/Private hire car
Serious	18/01/10	Monday	7	Kensington and Ch	Motor cycle 125cc and under
Serious	18/01/10	Monday	7	Kensington and Ch	Motor cycle 125cc and under
Serious	17/01/10	Sunday	0	Kensington and Ch	Car
Serious	12/01/10	Tuesday	23	Kensington and Ch	Motorcycle over 500cc
Serious	28/01/10	Thursday	23	Kensington and Ch	Car
Serious	29/01/10	Friday	8	Kensington and Ch	Moped
Serious	31/01/10	Sunday	0	Kensington and Ch	Car

circumstances of personal injury road accidents in GB from 1979, the types (including Make and Model) of vehicles involved and the consequential casualties. The statistics relate only to personal injury accidents on public roads that are reported to the police, and subsequently recorded, using the STATS19 accident reporting form.

View full summary

Guideline 1 : match visual channel to data type

Guideline 1 : match visual channel to data type



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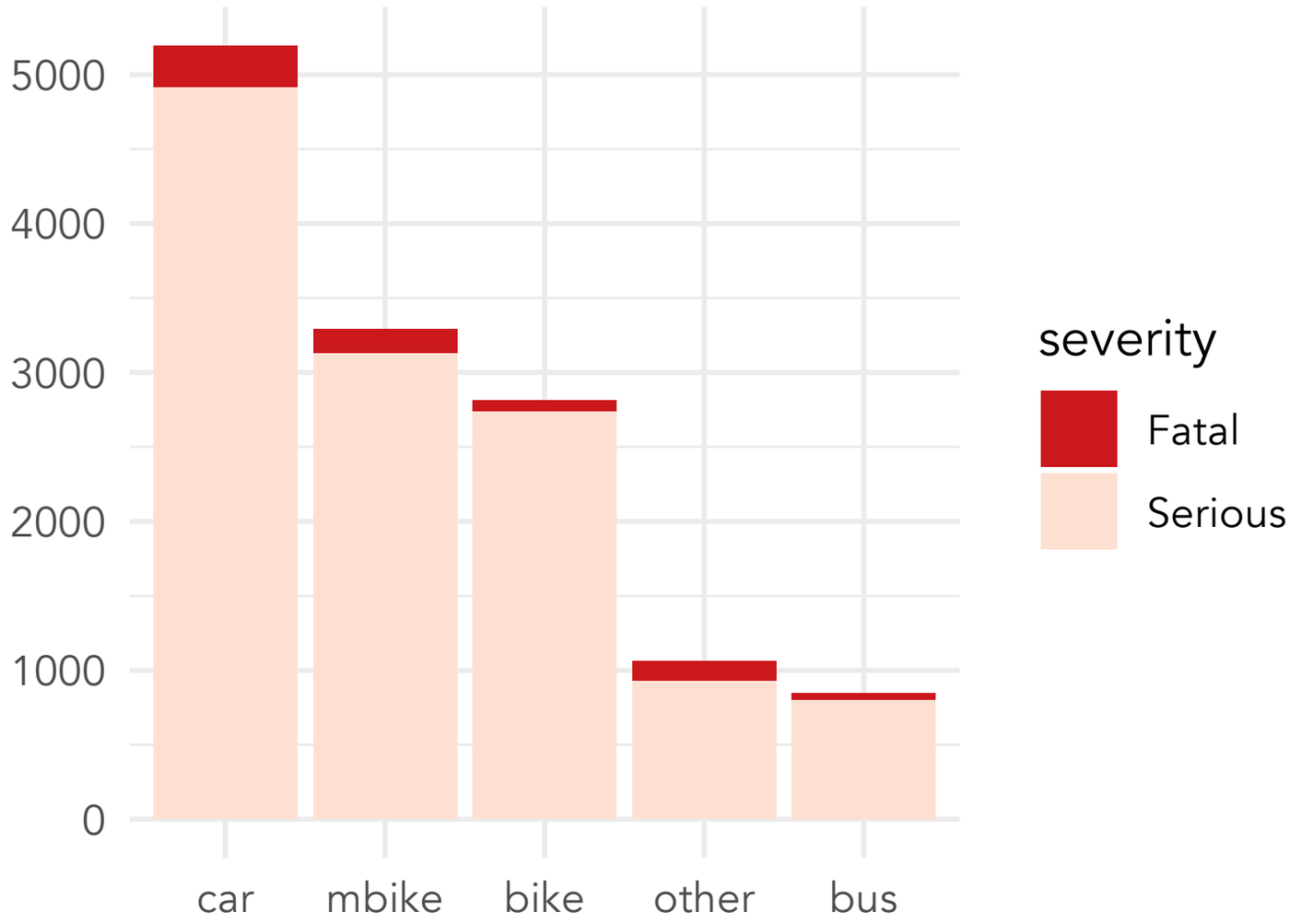
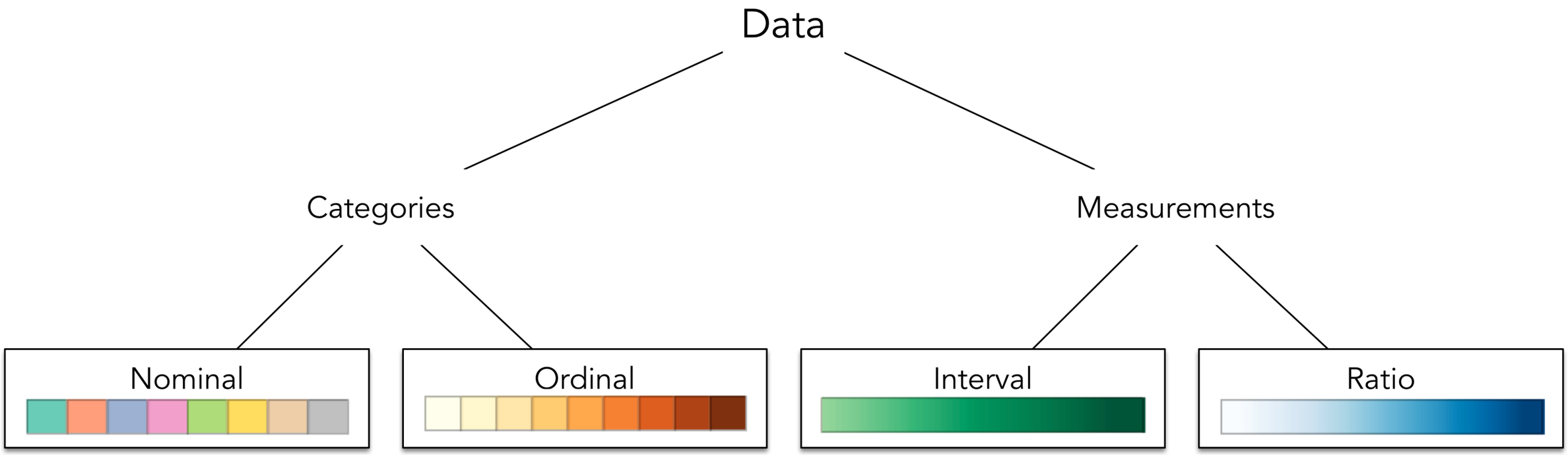
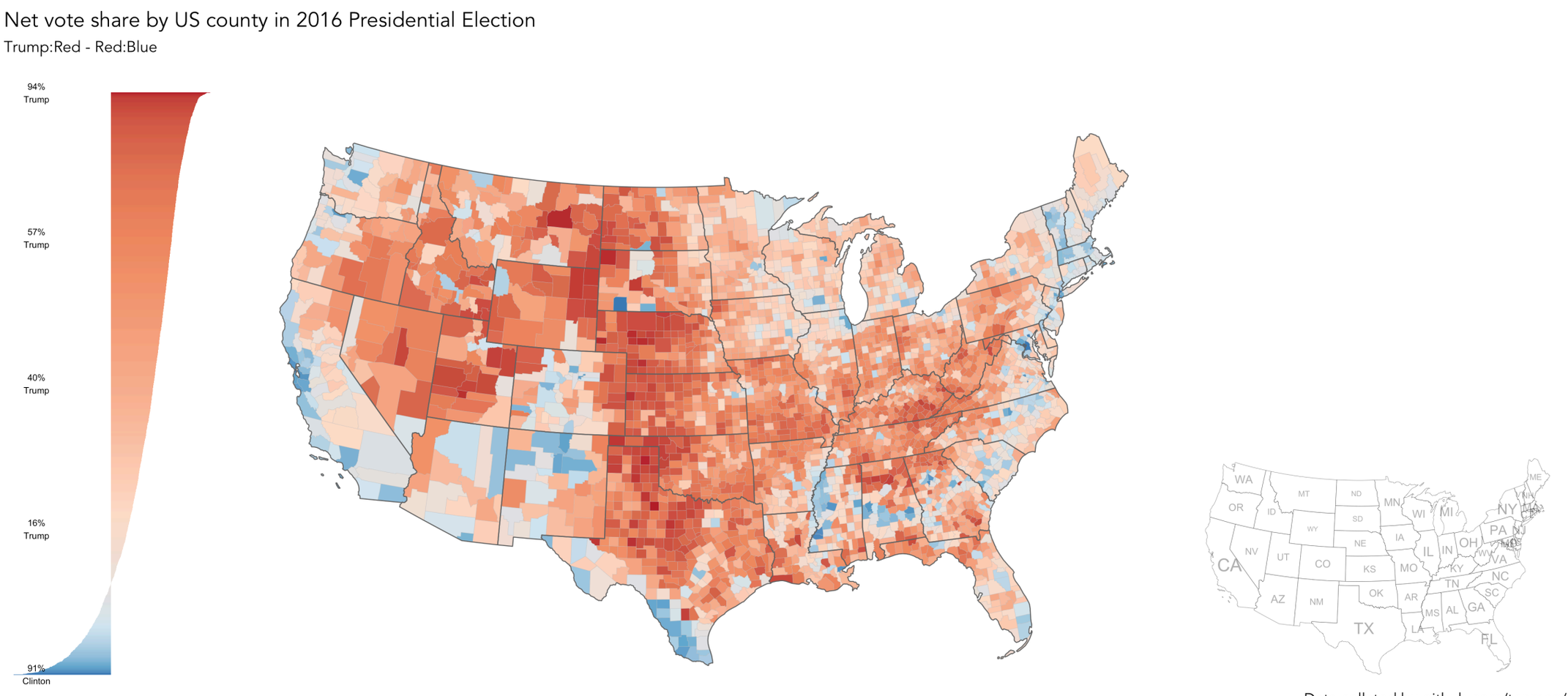


dimension	type	visual channel
casualty count	ratio	length (bar height)
casualty count by mode	ordinal	position (x-axis)
casualty severity	ordinal	colour lightness

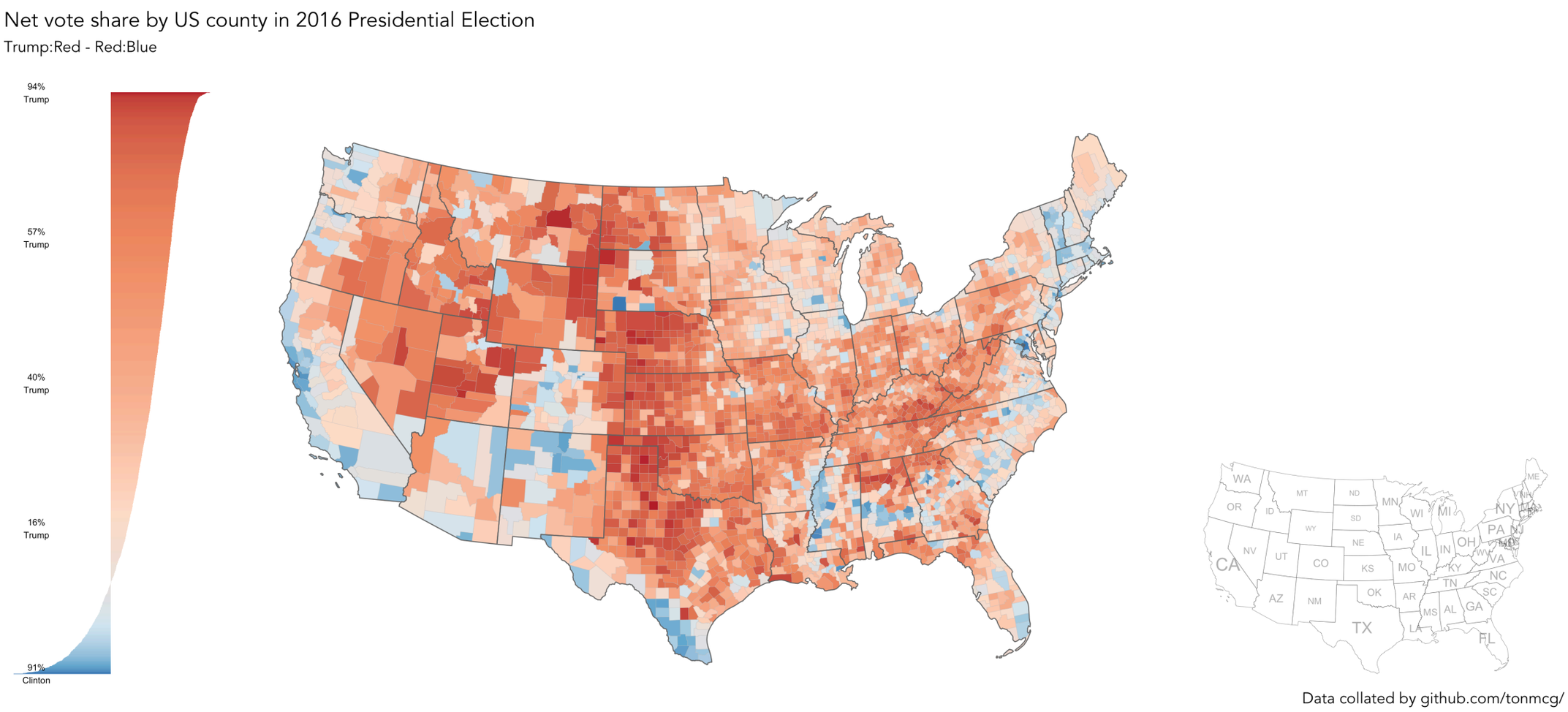
Guideline 1 : match visual channel to data type



Guideline 1 : match visual channel to data type

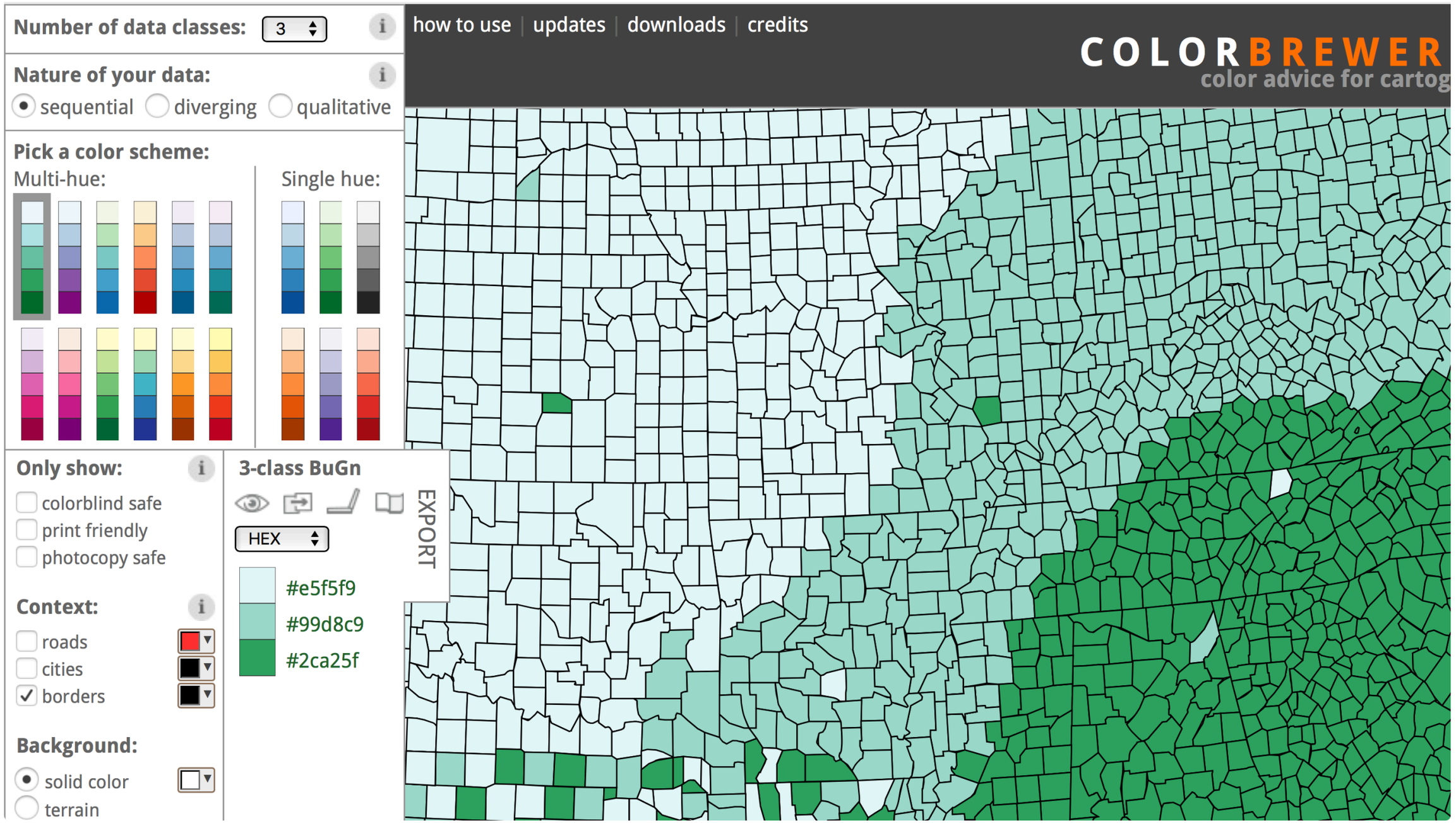


Guideline 1 : match visual channel to data type



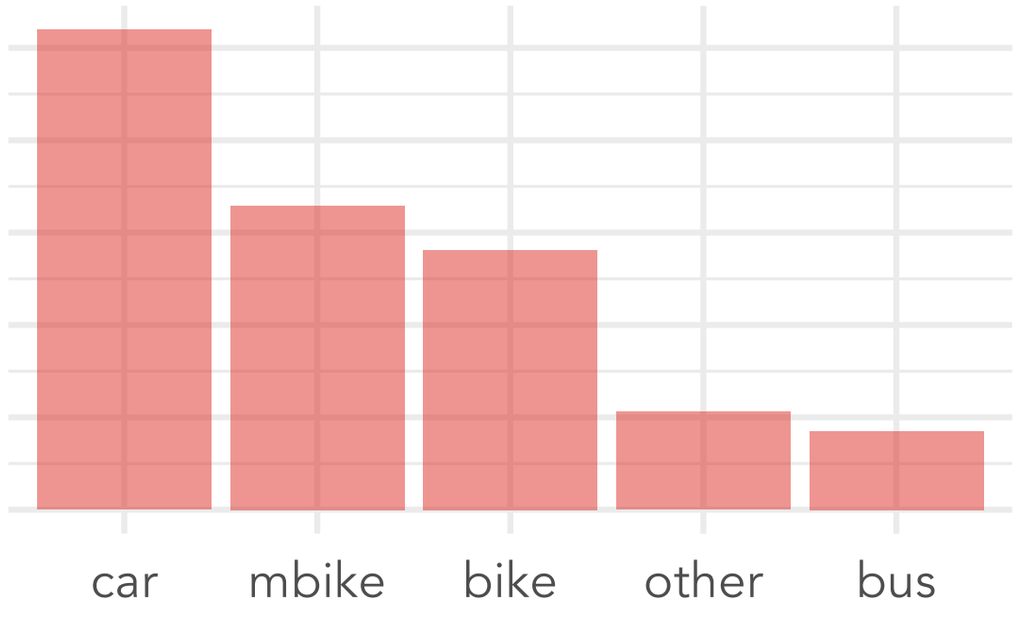
dimension	type	visual channel
majority Clinton|Trump	nominal	colour hue (red|blue)
majority size	ratio	colour lightness

Guideline 1 : match visual channel to data type

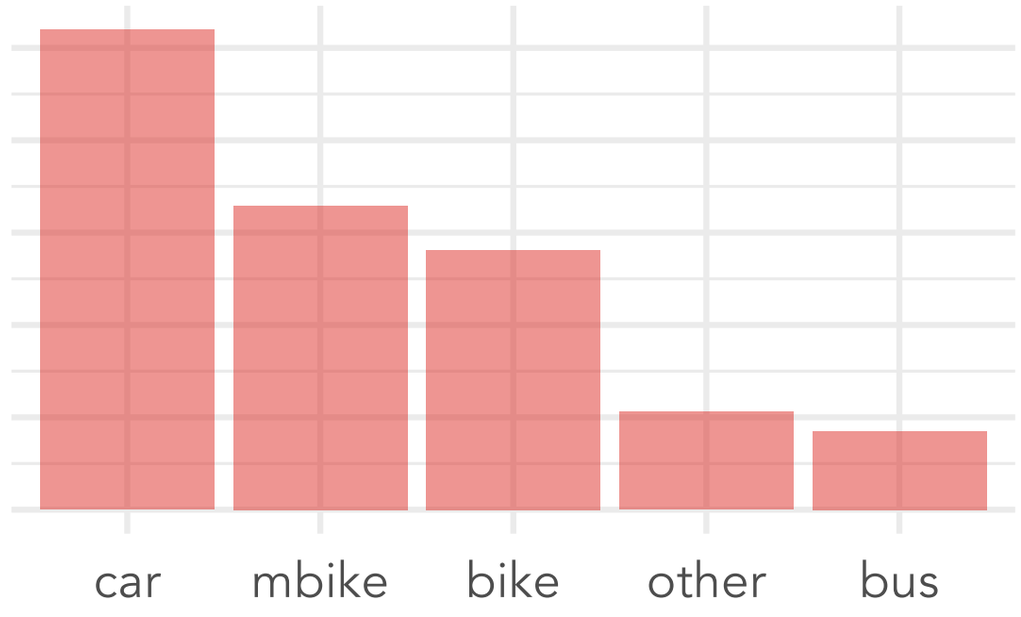


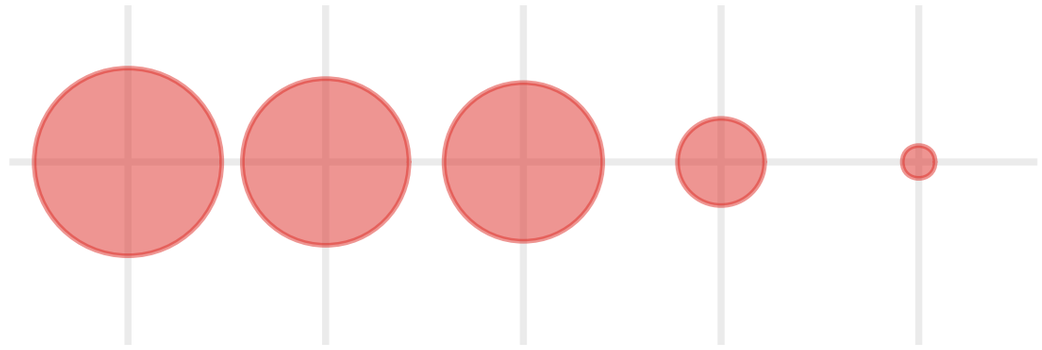
Guideline 2 : exploit our cognitive abilities

Guideline 2 : exploit our cognitive abilities

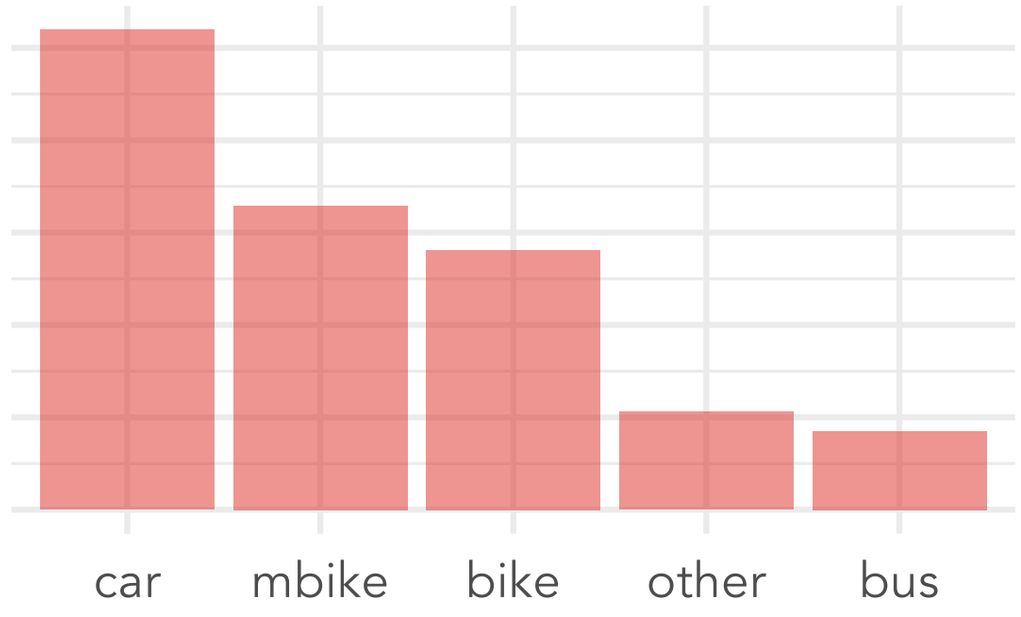


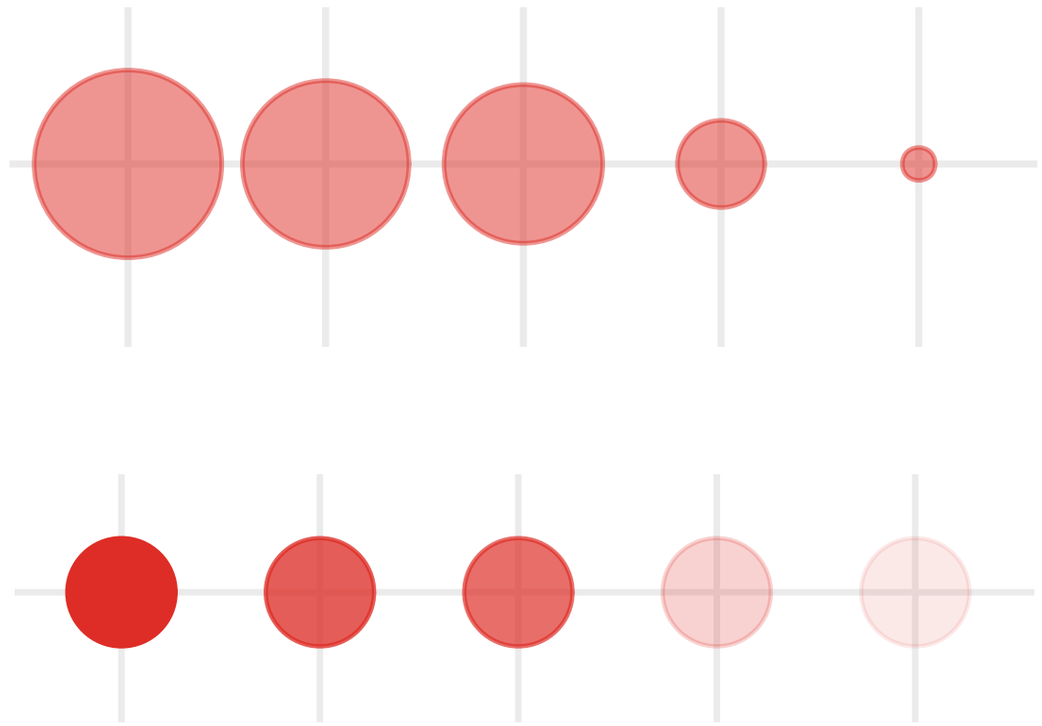
Guideline 2 : exploit our cognitive abilities



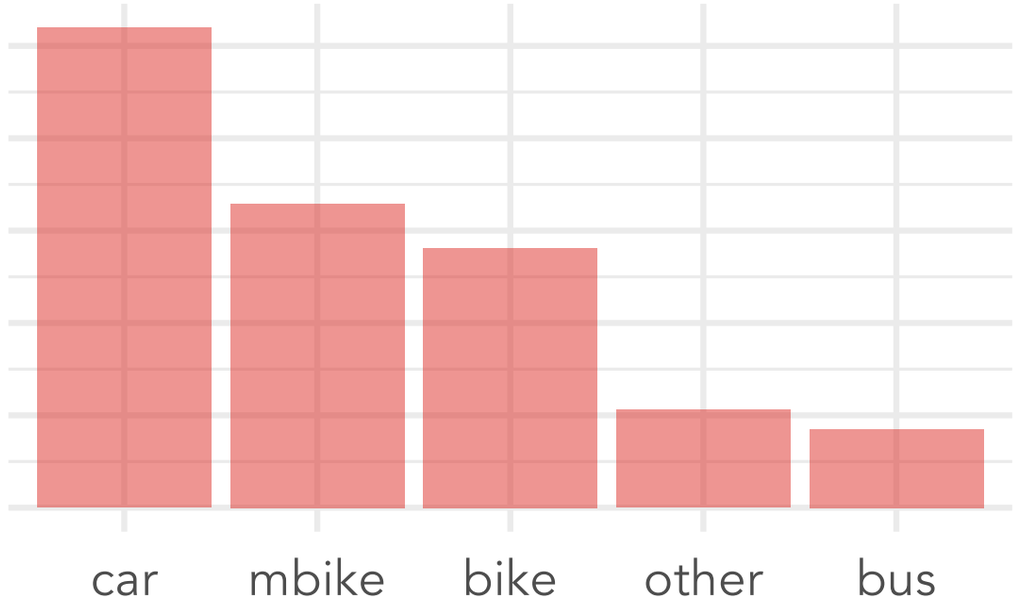


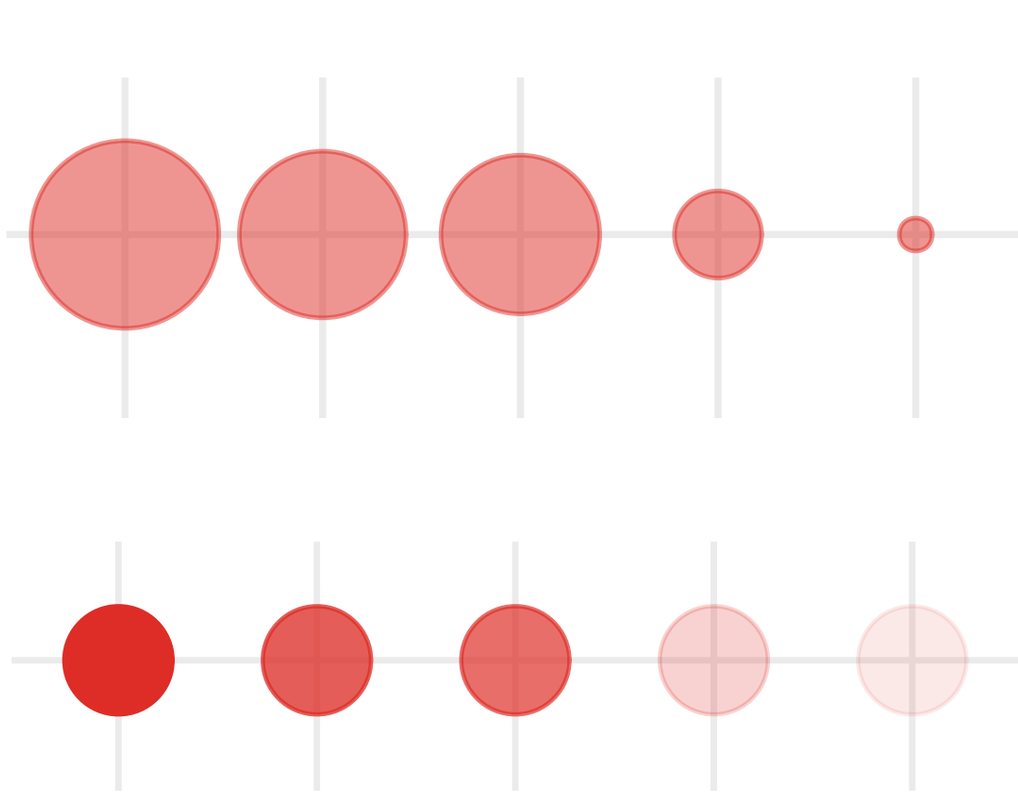
Guideline 2 : exploit our cognitive abilities





Guideline 2 : exploit our cognitive abilities





Position on common scale

Position on unaligned scale

Length (1D size)

Tilt/angle

Area (2D size)

Depth (3D position)

Color luminance

Color saturation

Curvature

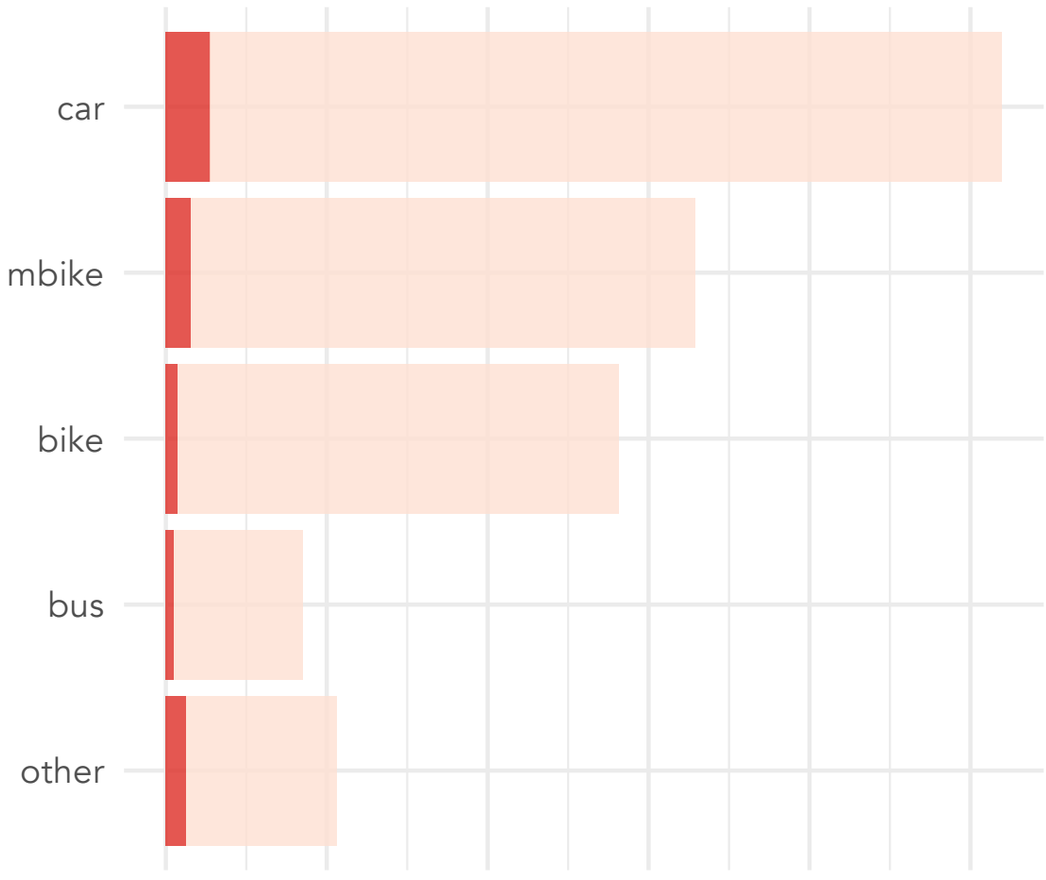
Volume (3D size)

Same

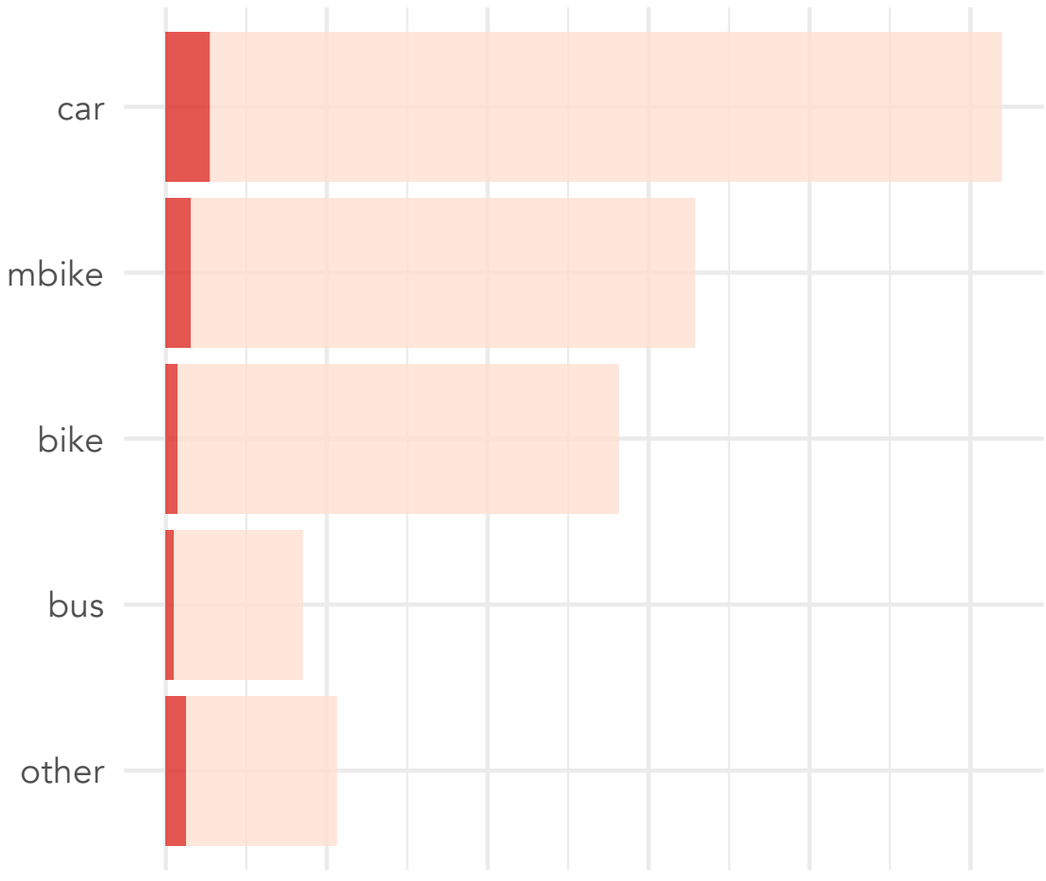
Same

Guideline 3: use layout to encourage comparison

Guideline 3: use layout to encourage comparison

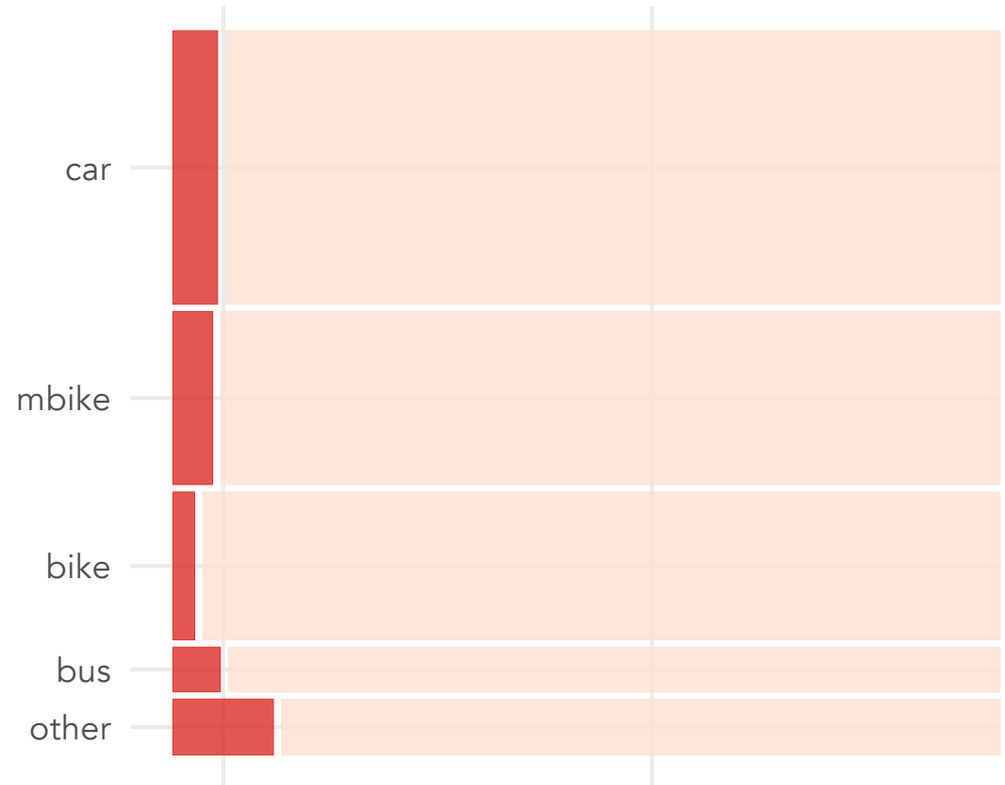


Guideline 3: use layout to encourage comparison



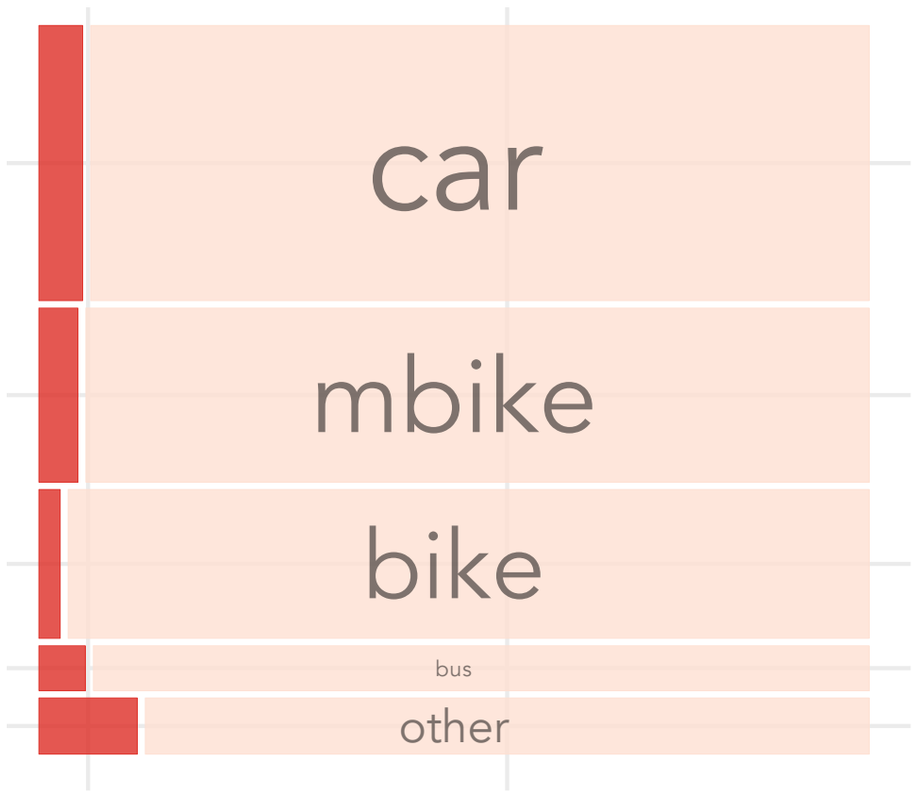

```
 width : fatal+serious freq
height : not encoded
 order : travel mode (freq)
```

Guideline 3: use layout to encourage comparison



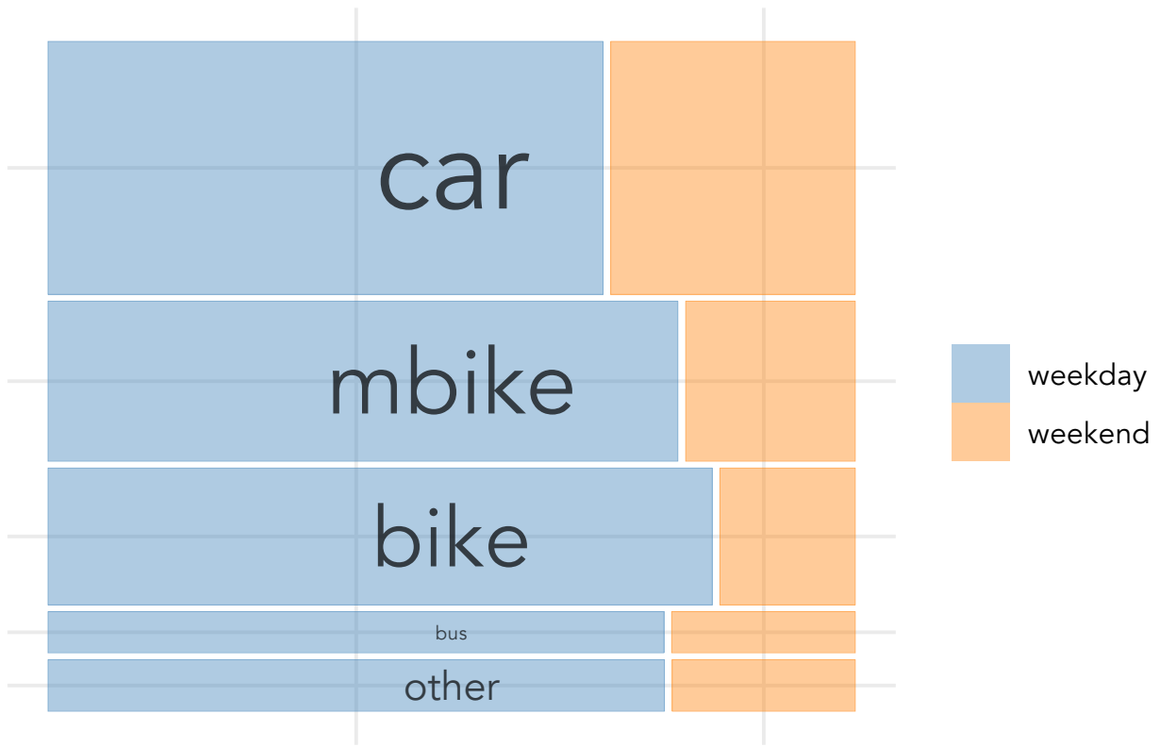

```
 width : proportion serious | fatal
height : travel mode freq
 order : travel mode (freq)
```

Guideline 3: use layout to encourage comparison



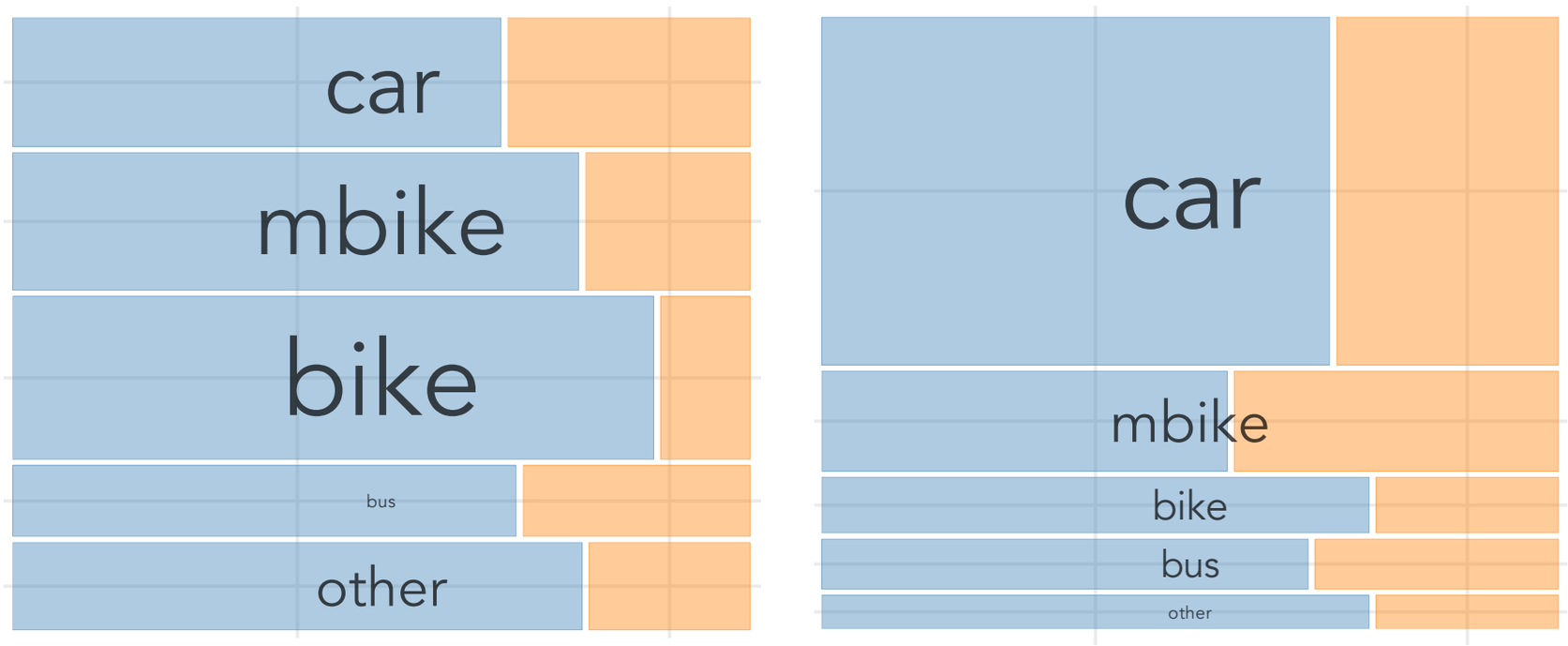

```
 width : proportion serious | fatal
height : travel mode freq
 order : travel mode (freq)
```

Guideline 3: use layout to encourage comparison




```
 width : proportion weekday | weekend
height : travel mode freq
 order : travel mode (freq)
```

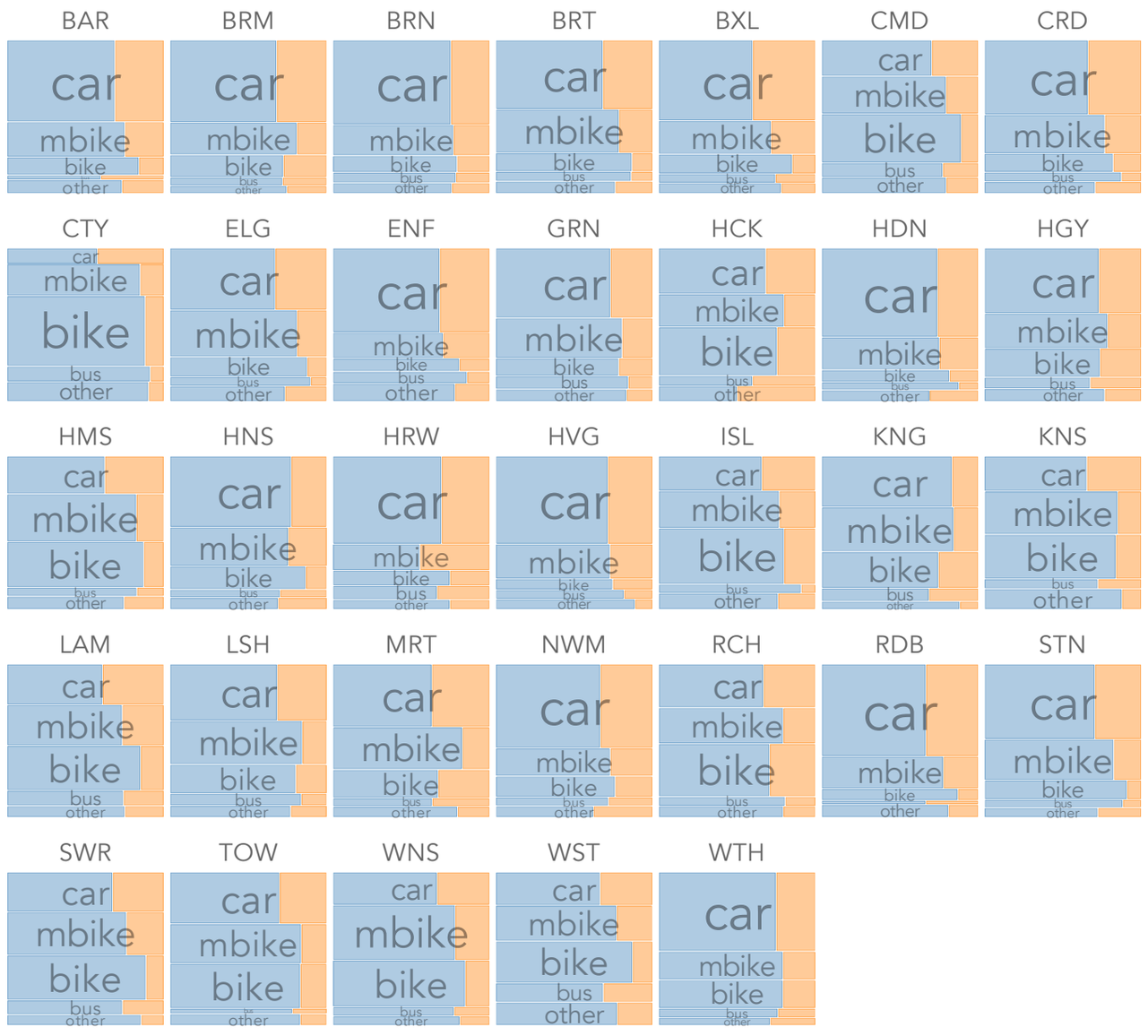
Guideline 3: use layout to encourage comparison



Westminster Harrow

```
 width : proportion weekday | weekend
height : travel mode freq
 order : travel mode (freq)
 facet : borough (select)
```

Guideline 3: use layout to encourage comparison



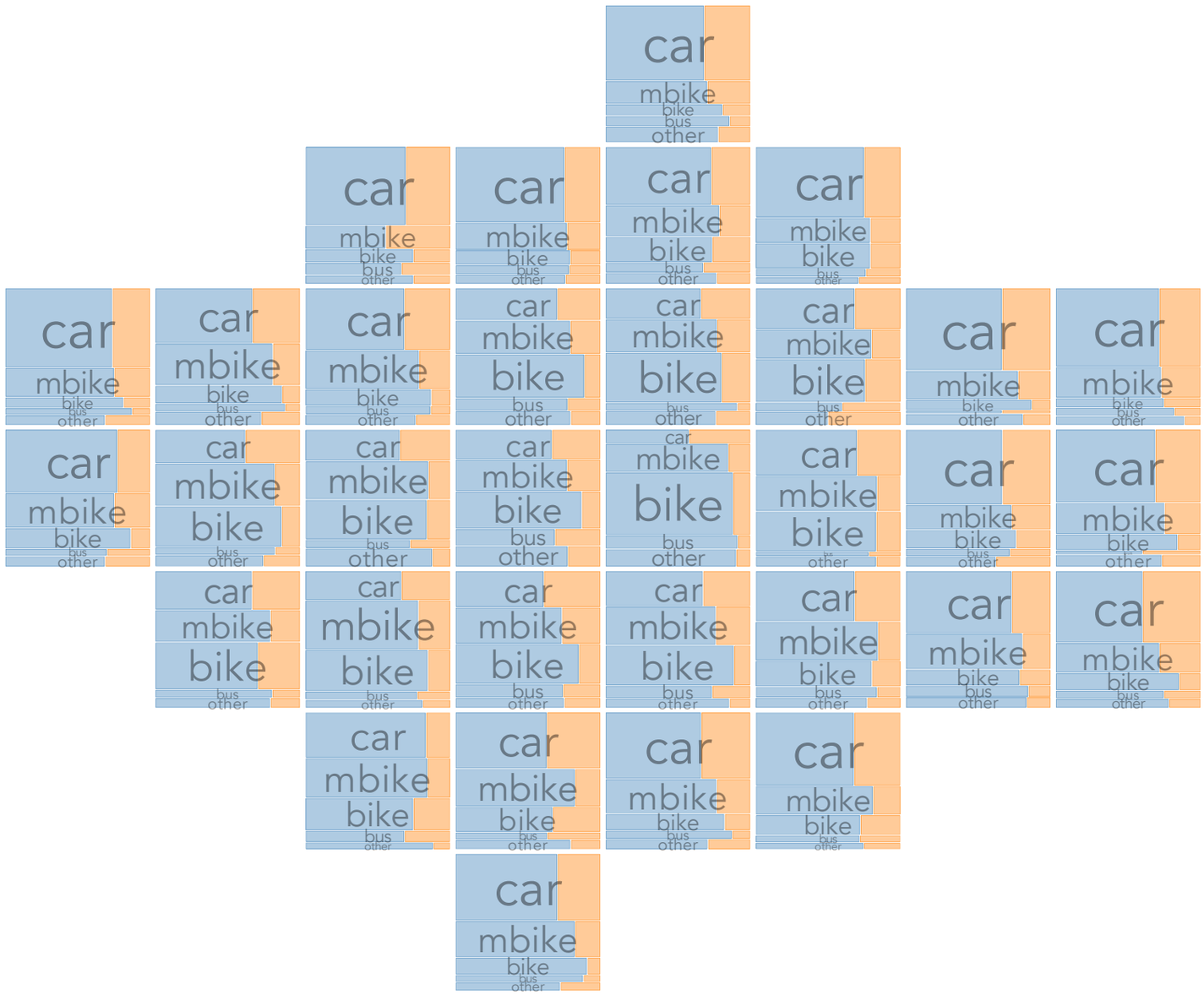
width : proportion weekday | weekend

height : travel mode freq

order : travel mode (freq)

facet : borough alphabetical

Guideline 3: use layout to encourage comparison



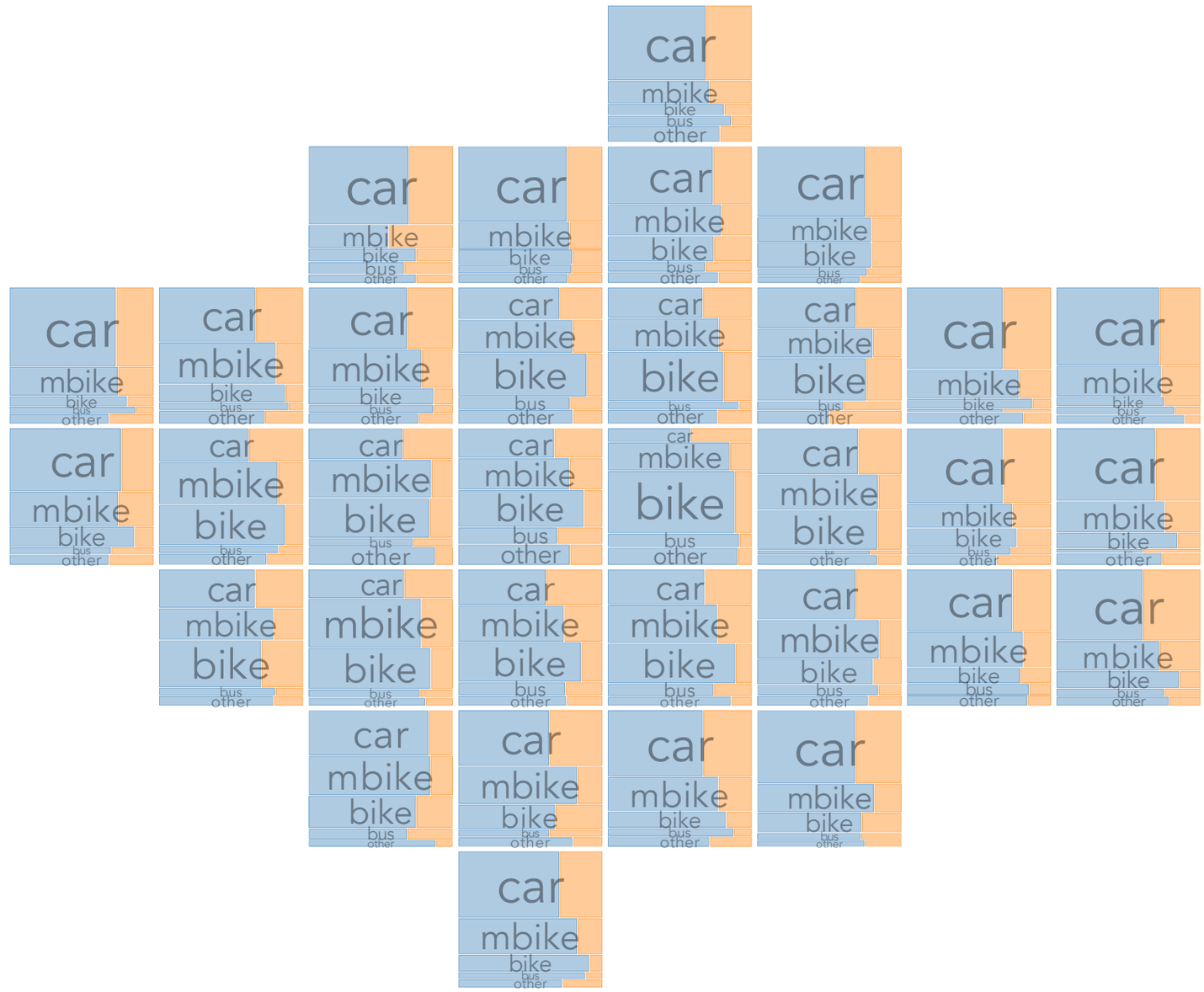
width : proportion weekday | weekend

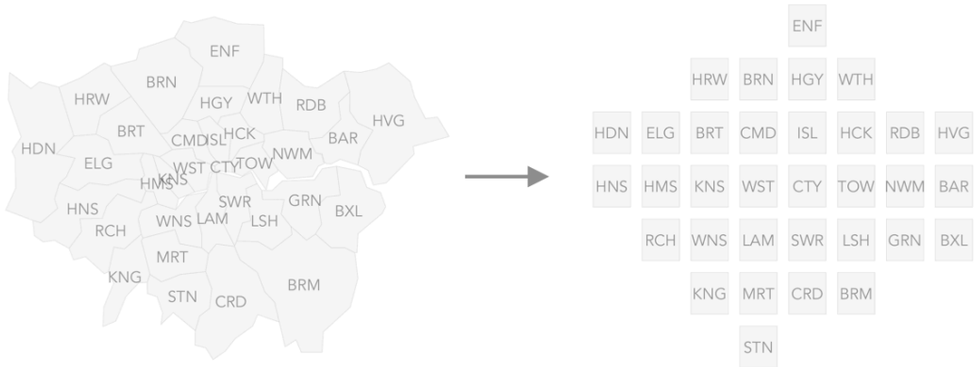
height : travel mode freq

order : travel mode (freq)

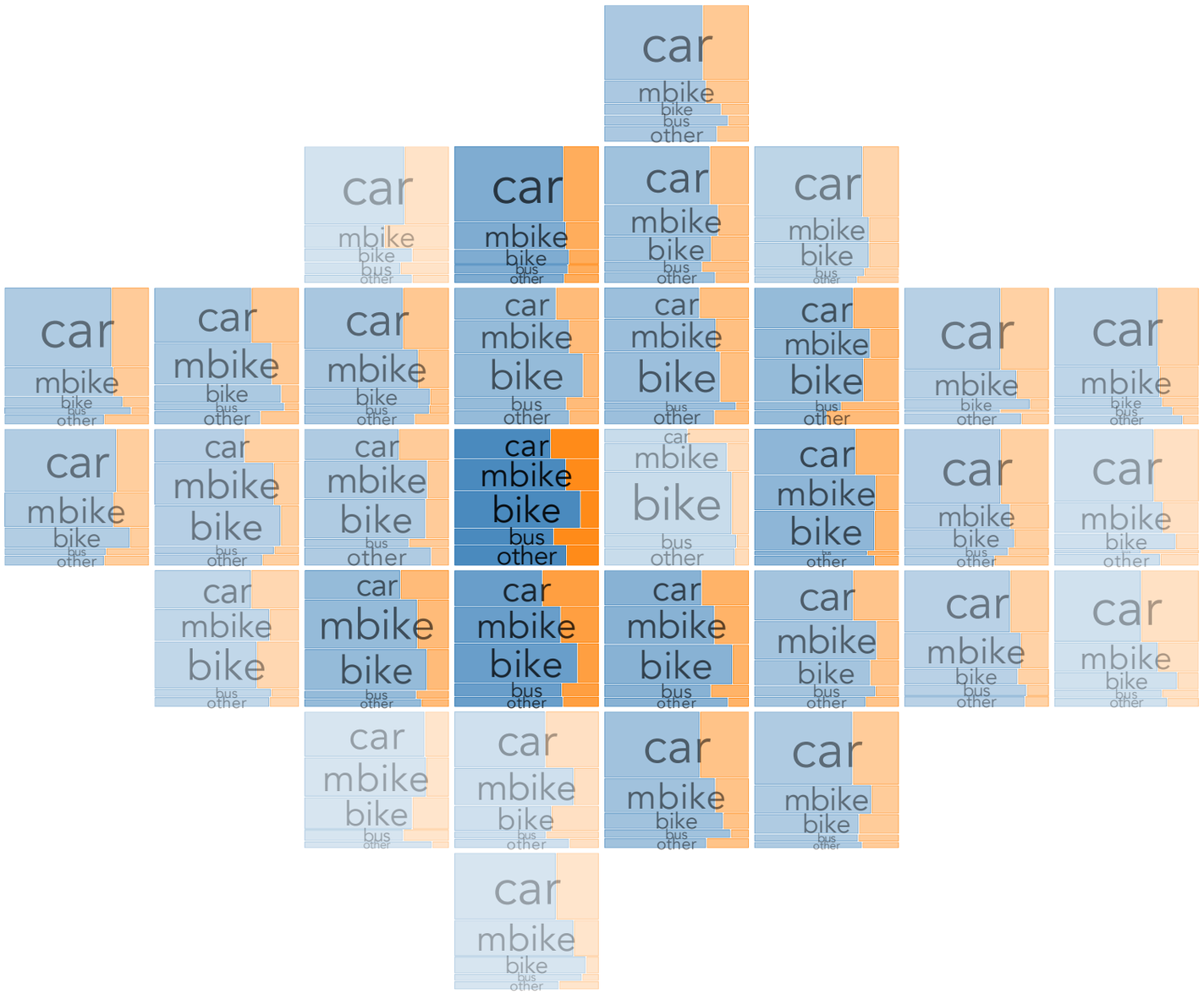
facet : borough semi-geo position

Guideline 3: use layout to encourage comparison





Guideline 3: use layout to encourage comparison



width : proportion weekday | weekend

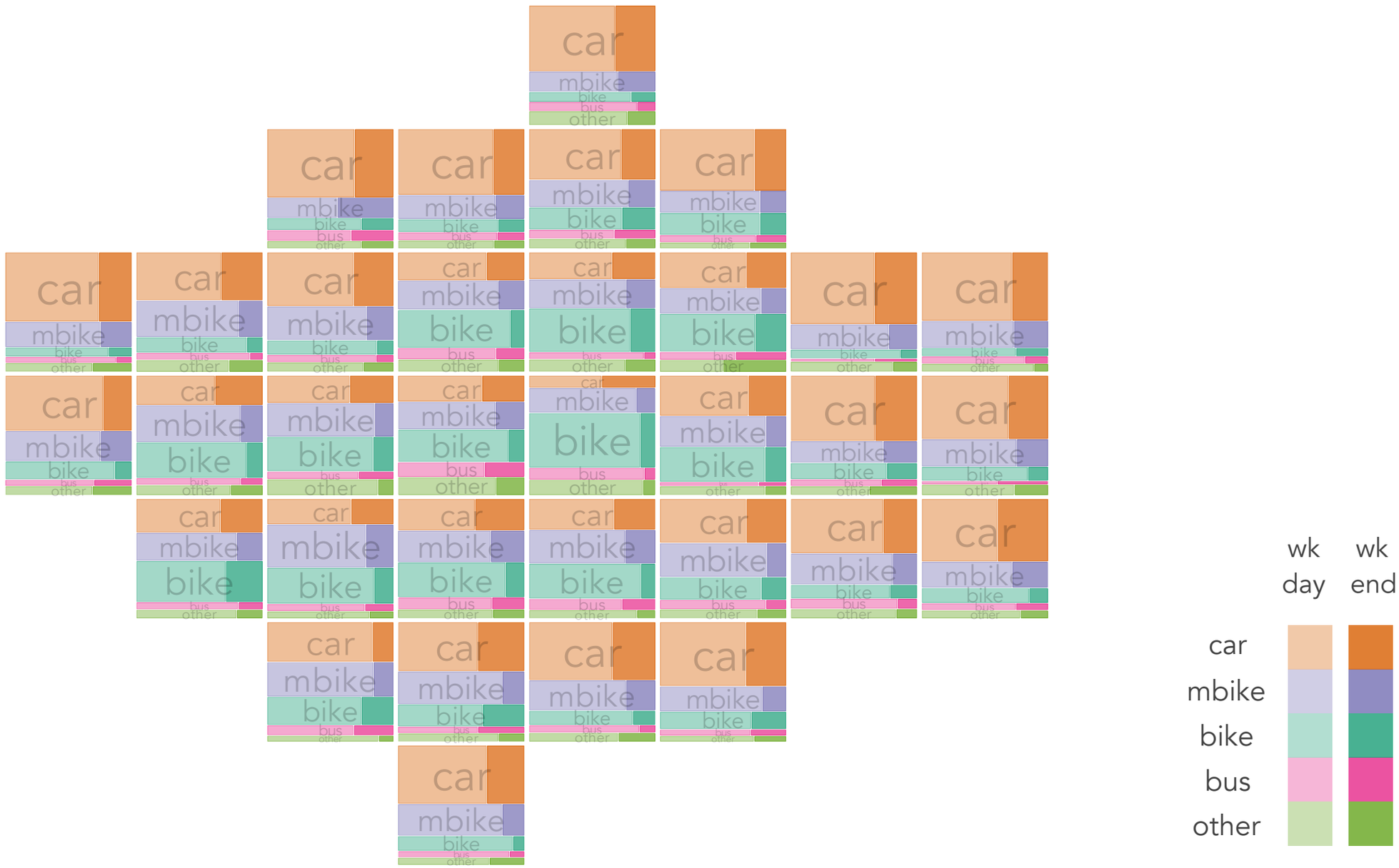
height : travel mode freq

order : travel mode (freq)

facet : borough semi-geo position

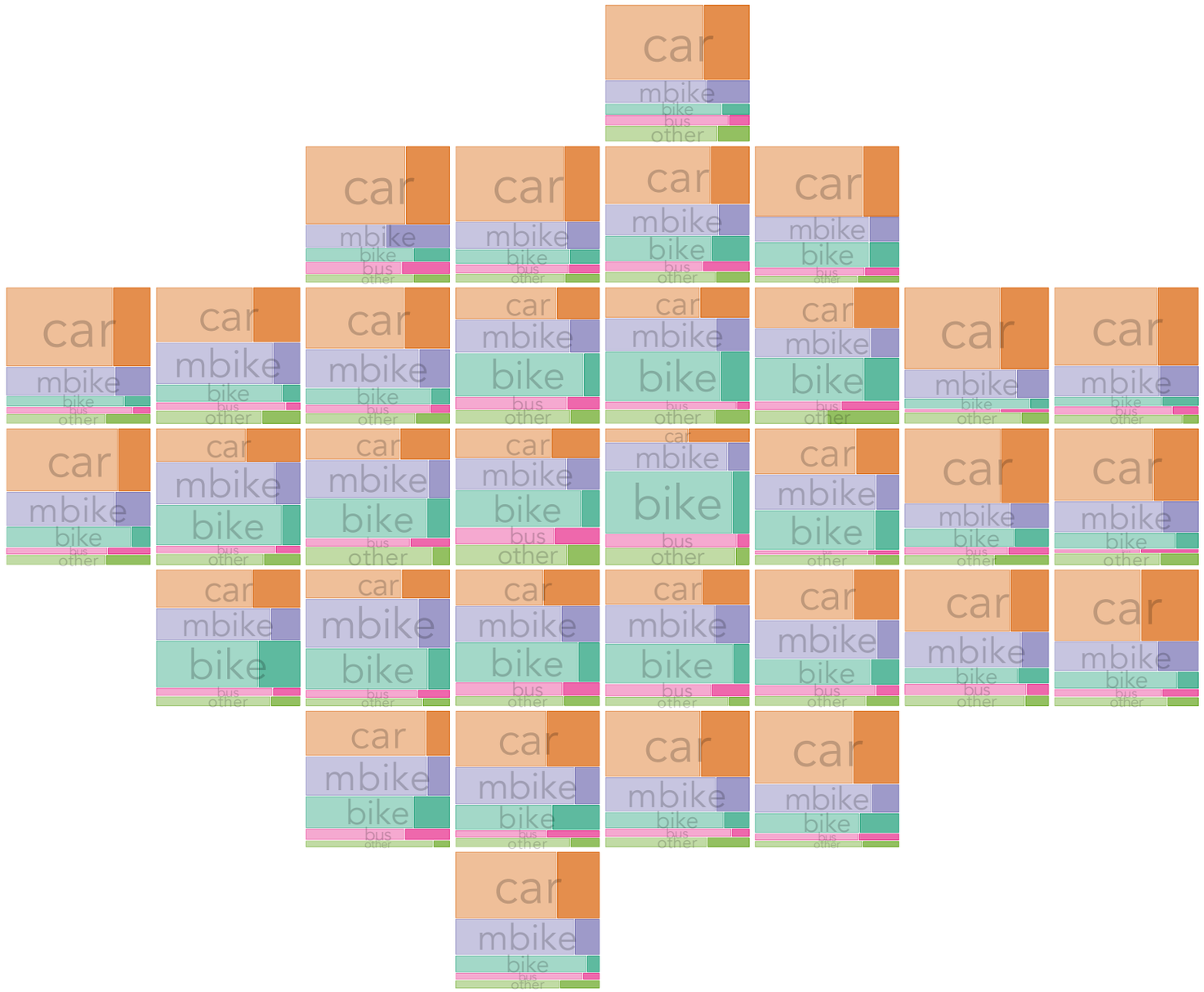
lightness : total accidents

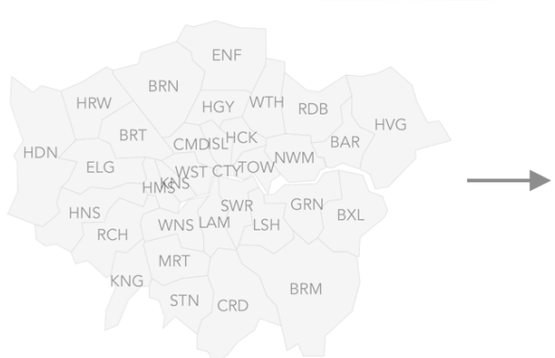
Guideline 3: use layout to encourage comparison

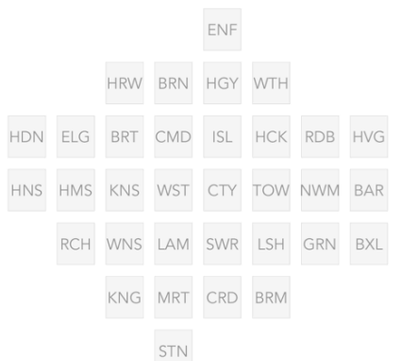


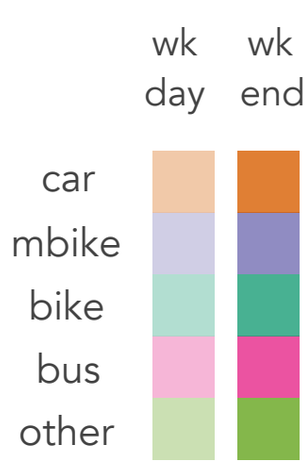

```
    width : proportion weekday | weekend
   height : travel mode freq
    order : travel mode (freq)
    facet : borough semi-geo position
lightness : weekday / weekend
      hue : vehicle
```

Guideline 3: use layout to encourage comparison









Guideline 4 : emphasise the important de-emphasize the unimportant

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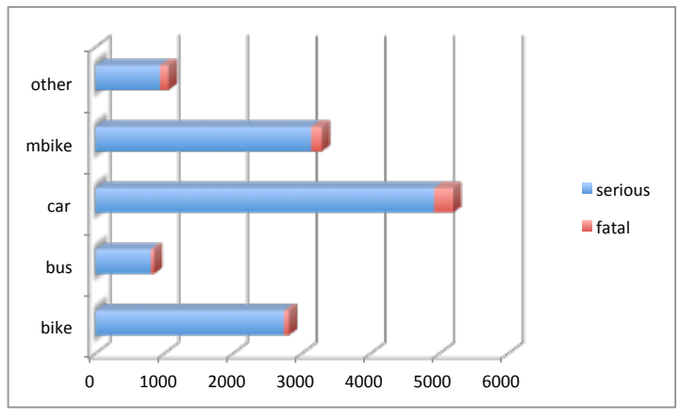
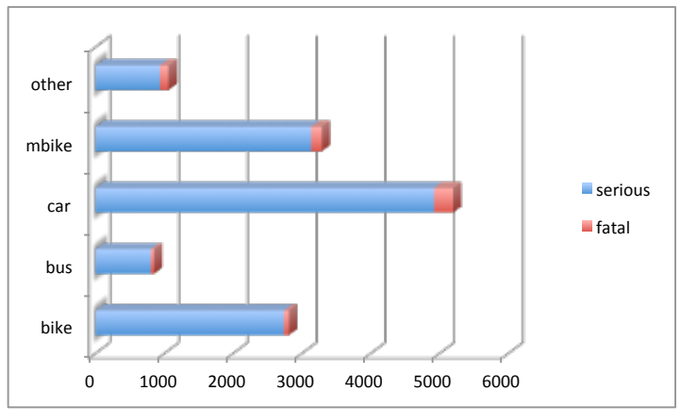
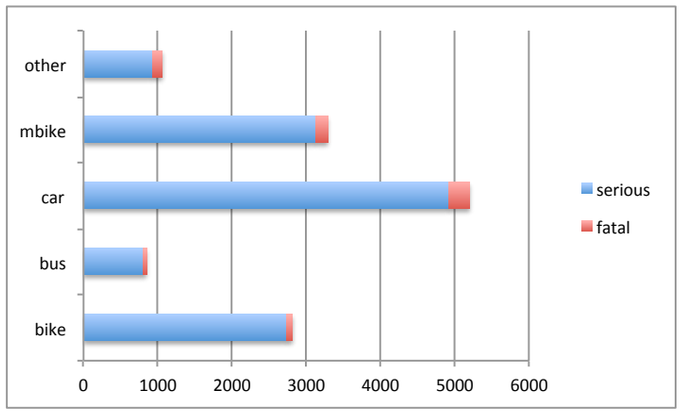


a bad excel default

Guideline 4 : emphasise the important de-emphasize the unimportant

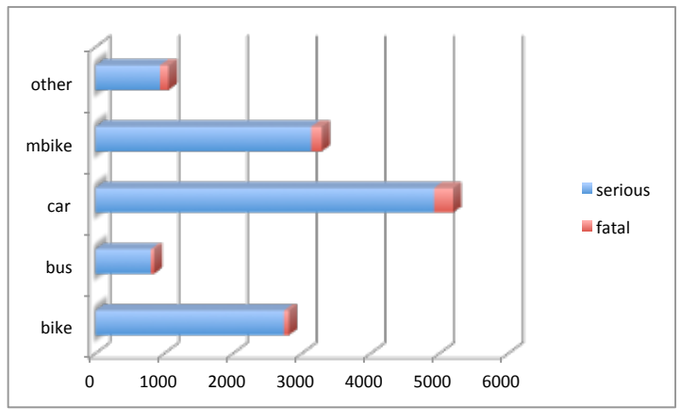


a bad excel default

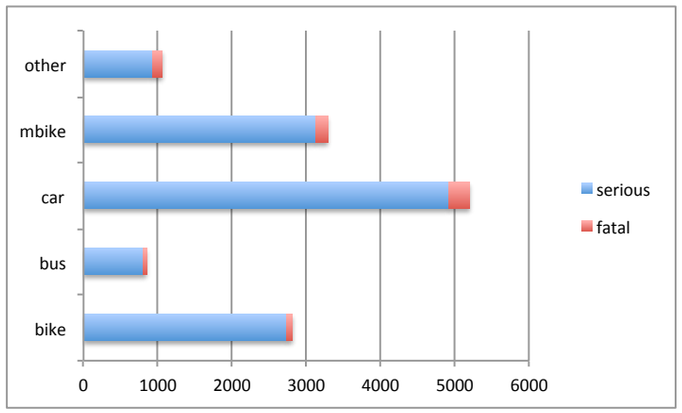


remove pointless 3d

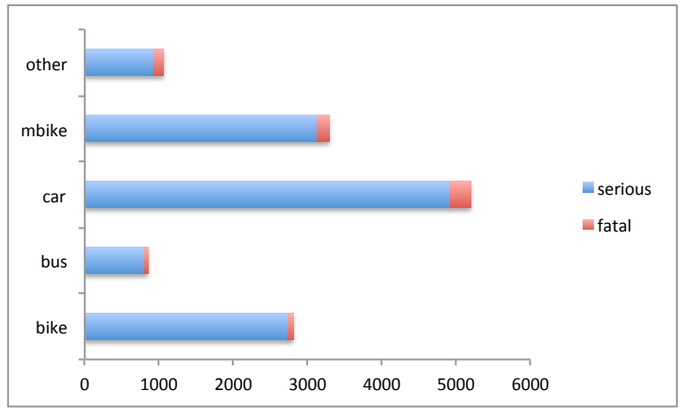
Guideline 4 : emphasise the important de-emphasize the unimportant



a bad excel default

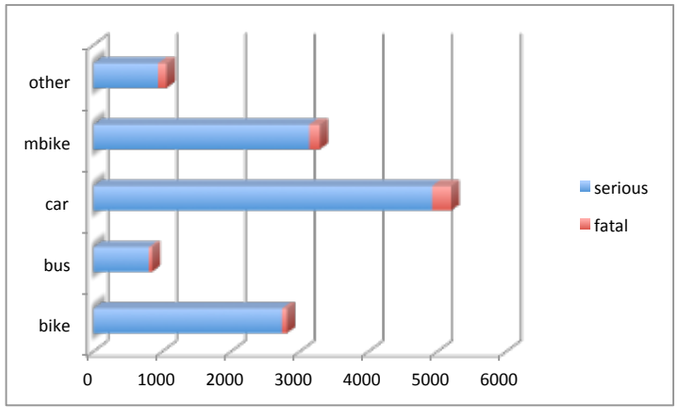


remove pointless 3d

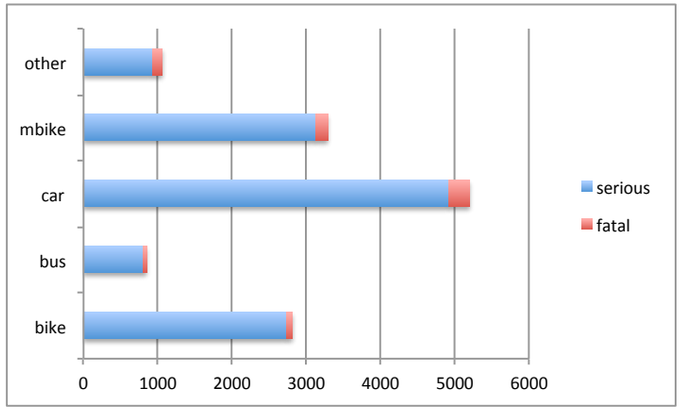


remove reference lines

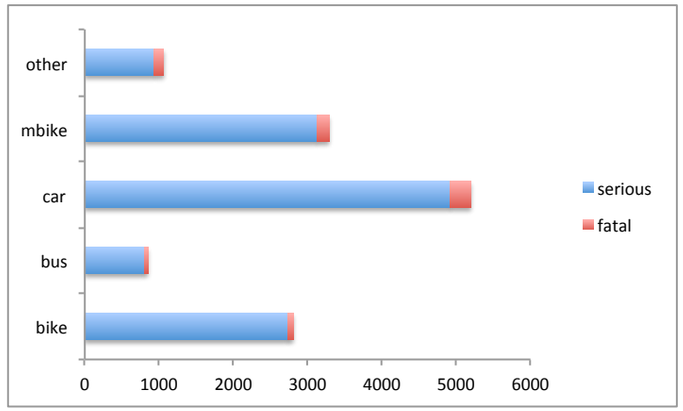
Guideline 4 : emphasise the important de-emphasize the unimportant



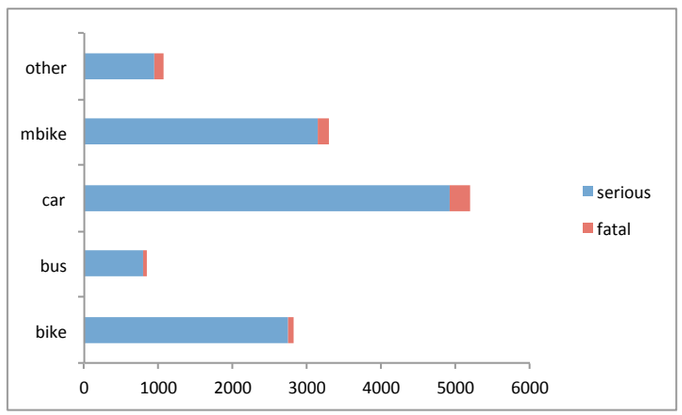
a bad excel default



remove pointless 3d

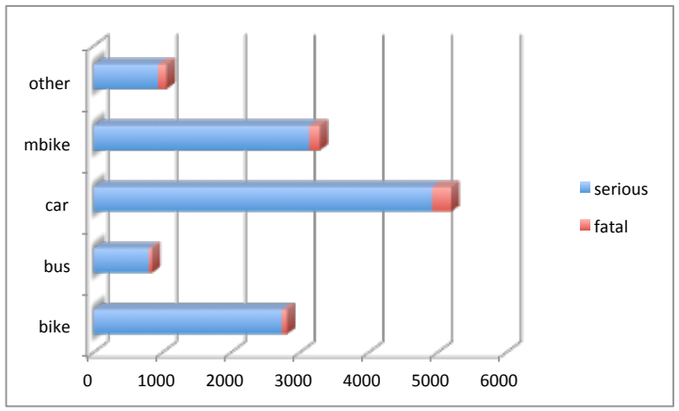


remove reference lines

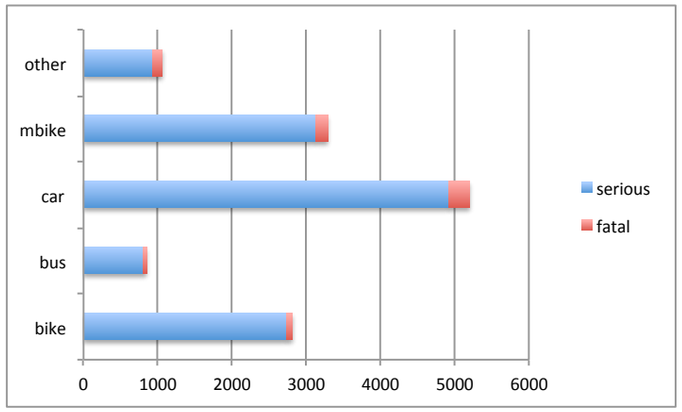


remove bar shadow and gradient

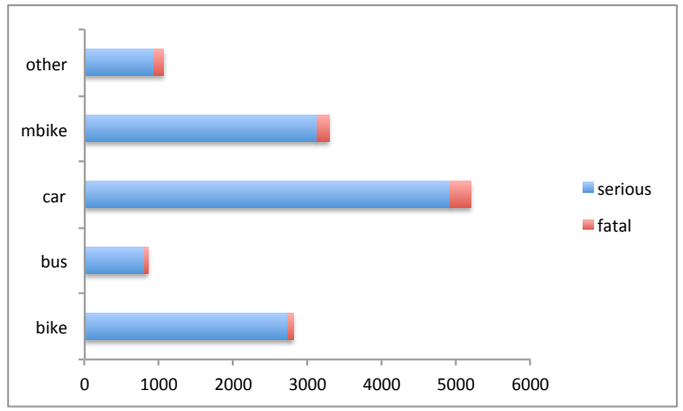
Guideline 4 : emphasise the important de-emphasize the unimportant



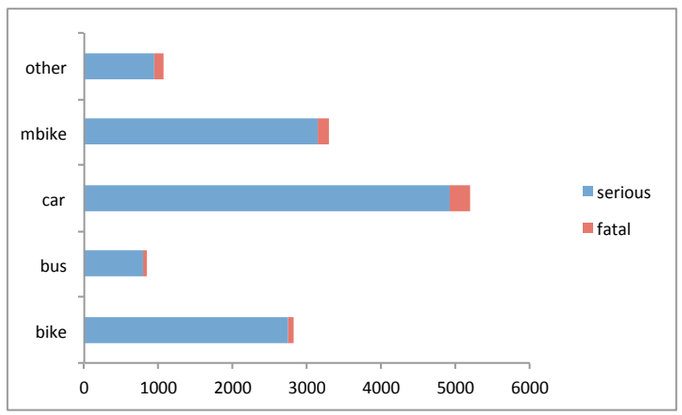
a bad excel default



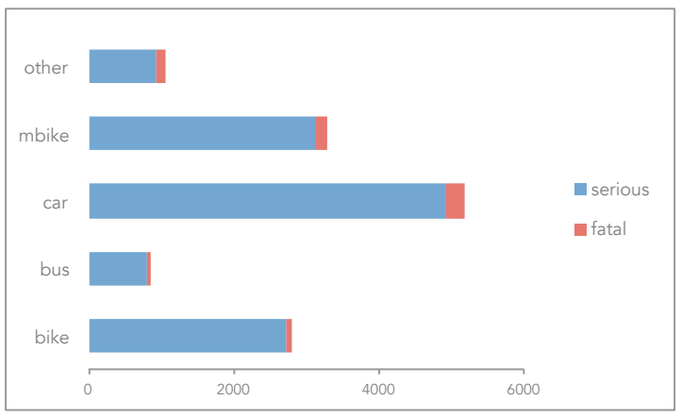
remove pointless 3d



remove reference lines

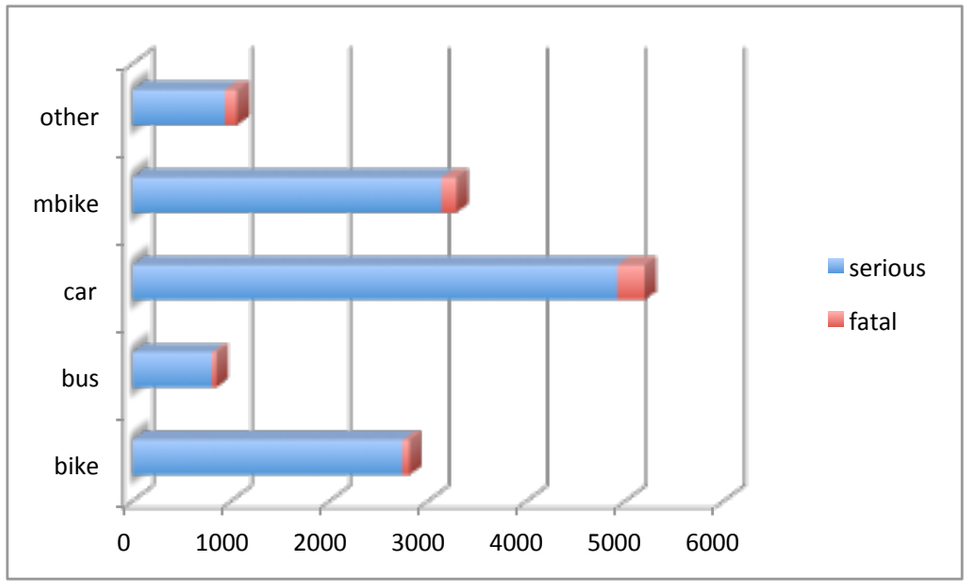


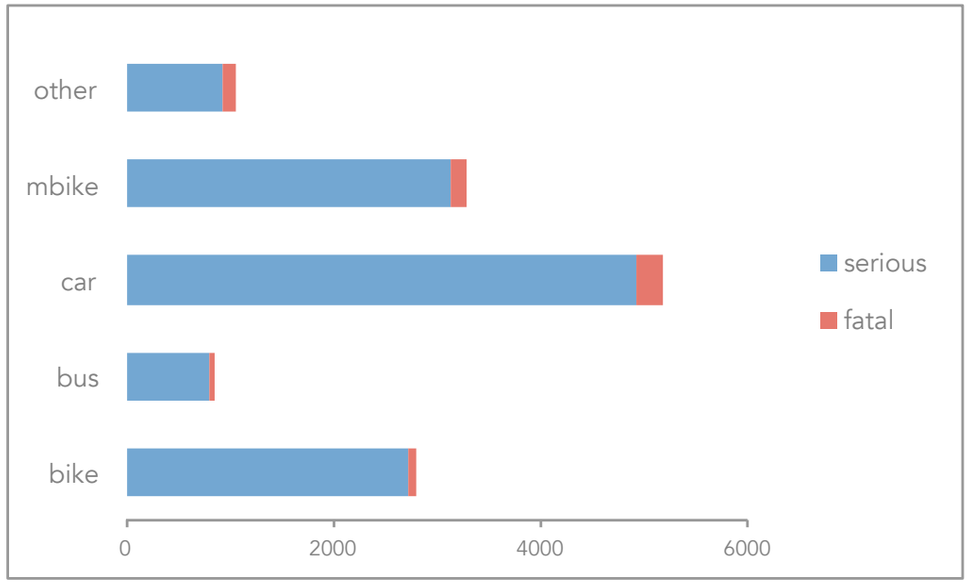
remove bar shadow and gradient



emphasise data, de-emphasise axes

Guideline 4 : emphasise the important de-emphasize the unimportant





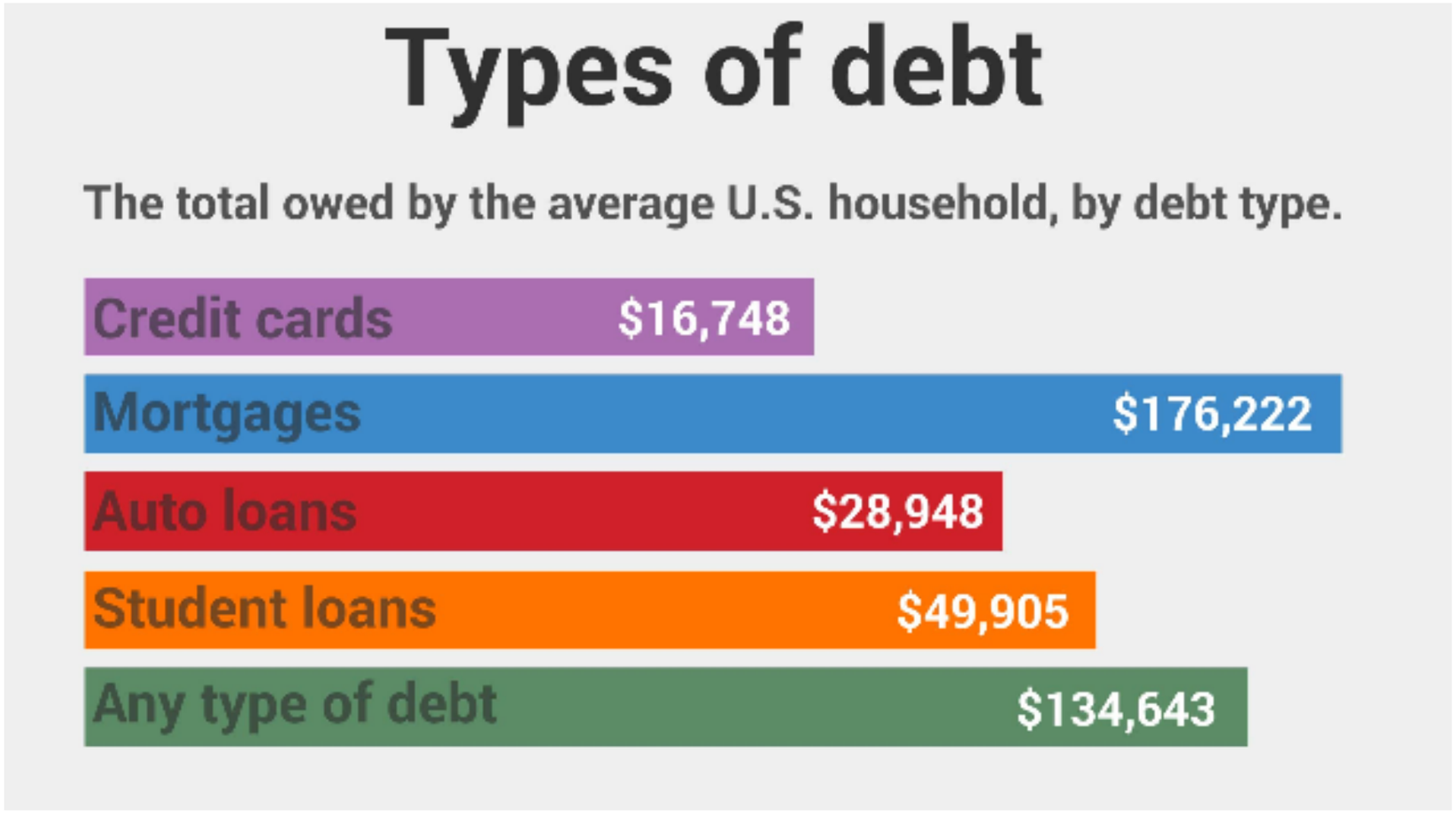
Data-Ink ratio = data ink : total ink in graphic

Tufte 2001

Guideline 5 : don’t lie

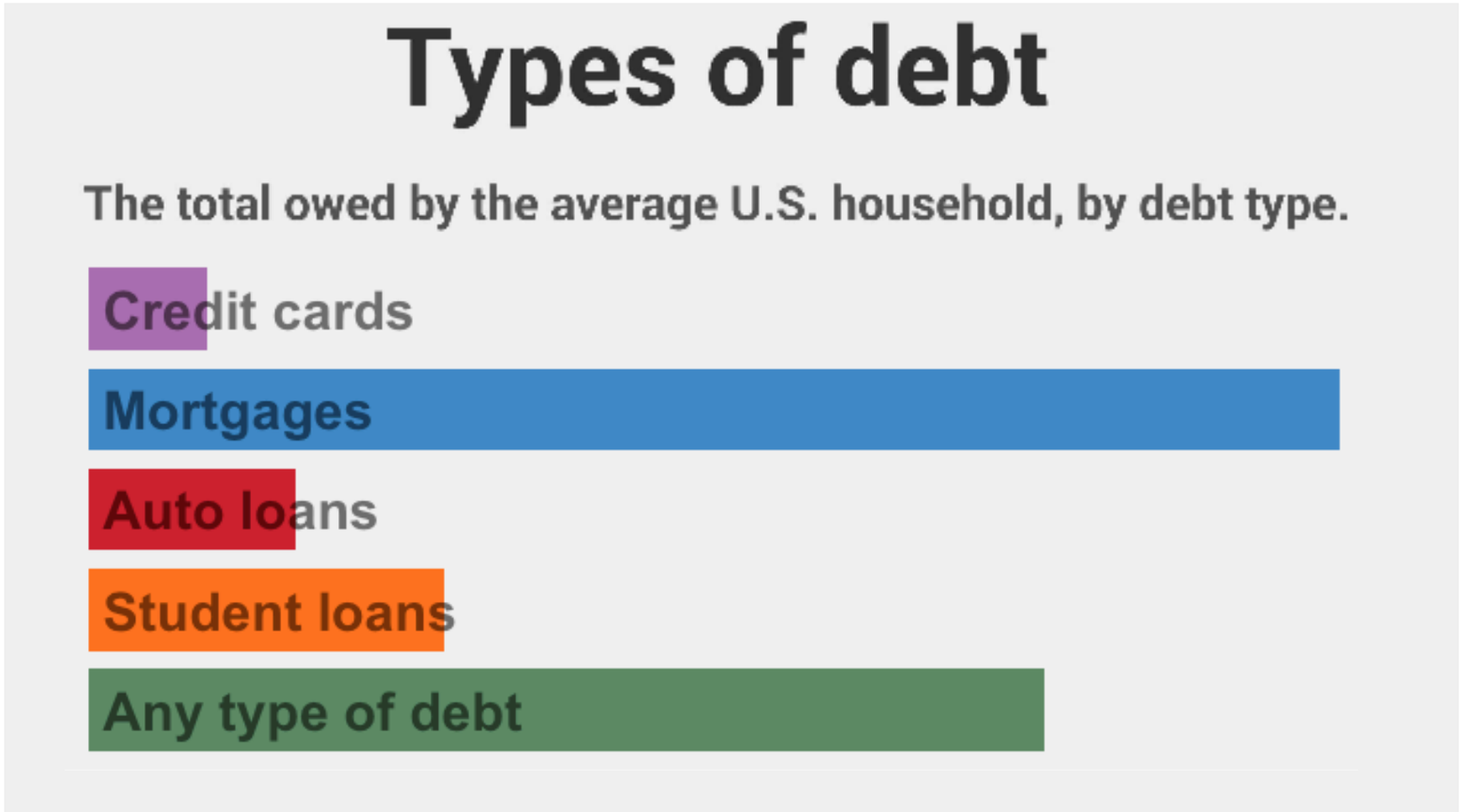
http://viz.wtf

Guideline 5 : don’t lie



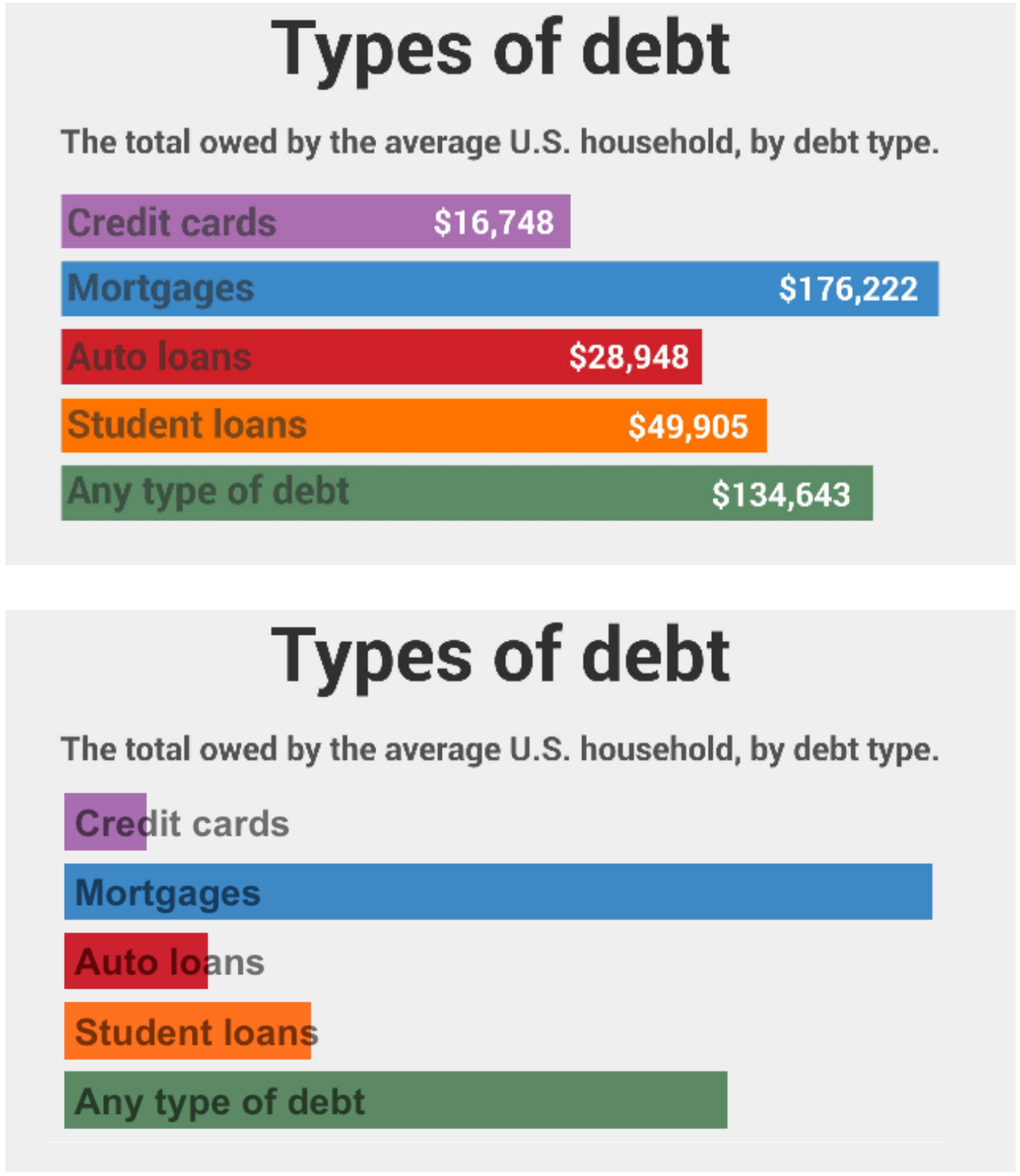
http://viz.wtf

Guideline 5 : don’t lie



http://viz.wtf

Guideline 5 : don’t lie



http://viz.wtf

Guideline 5 : don’t lie

Graphical integrity and the lie factor

The representation of numbers as physically measured on the surface of the graphic itself, should be directly proportional to the numerical quantities represented

$$\text{Lie Factor} = \frac{\text{size of effect shown in graphic}}{\text{size of effect in data}}$$

Tufte 2001 : 77

Guideline 5 : don’t lie

$$\text{Lie Factor} = \frac{\text{size of effect shown in graphic}}{\text{size of effect in data}}$$

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via Jason Dykes

Guideline 5 : don't lie

$$\text{Lie Factor} = \frac{\text{size of effect shown in graphic}}{\text{size of effect in data}}$$

via Jason Dykes

Guideline 5 : don't lie

$$\text{Lie Factor} = \frac{\text{size of effect shown in graphic}}{\text{size of effect in data}}$$

gap = 20 pixels
red = €4.8 / px
blu = €6.1 / px

gap should be …
1.6 pixels
gap is …
20 pixels
20 / 1.6 =

x13!

via Jason Dykes

Practical session :

Complete Tableau page in advance

GEOG50 | 32/42 : Data Visualization

By – Roger Beecham

Mon 5th Nov	1400-1530	Lecture : Visualization Fundamentals
	1530-1545	*Break*
	1545-1630	Lecture : Visualization Guidelines
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Tue 6th Nov	0930-1230	Lab : GIS, RBDM, Env Water Consultancy, Centre for Doctoral Training (CDT)
Wed 7th Nov	0930-1230	Lab : CAMS 1
	1330-1630	Lab : CAMS2, SSP, Data Science & Analytics