

Data visualization

Msc Finance & Big Data

mscfinance-big-data-viz.github.io

Ano Kuhanathan, Ph.D.

La mètis & Neoma

Jan 9, 2020

1

Course overview

2

Setup & Some tips

3

What is Data viz and why does it matters?

4

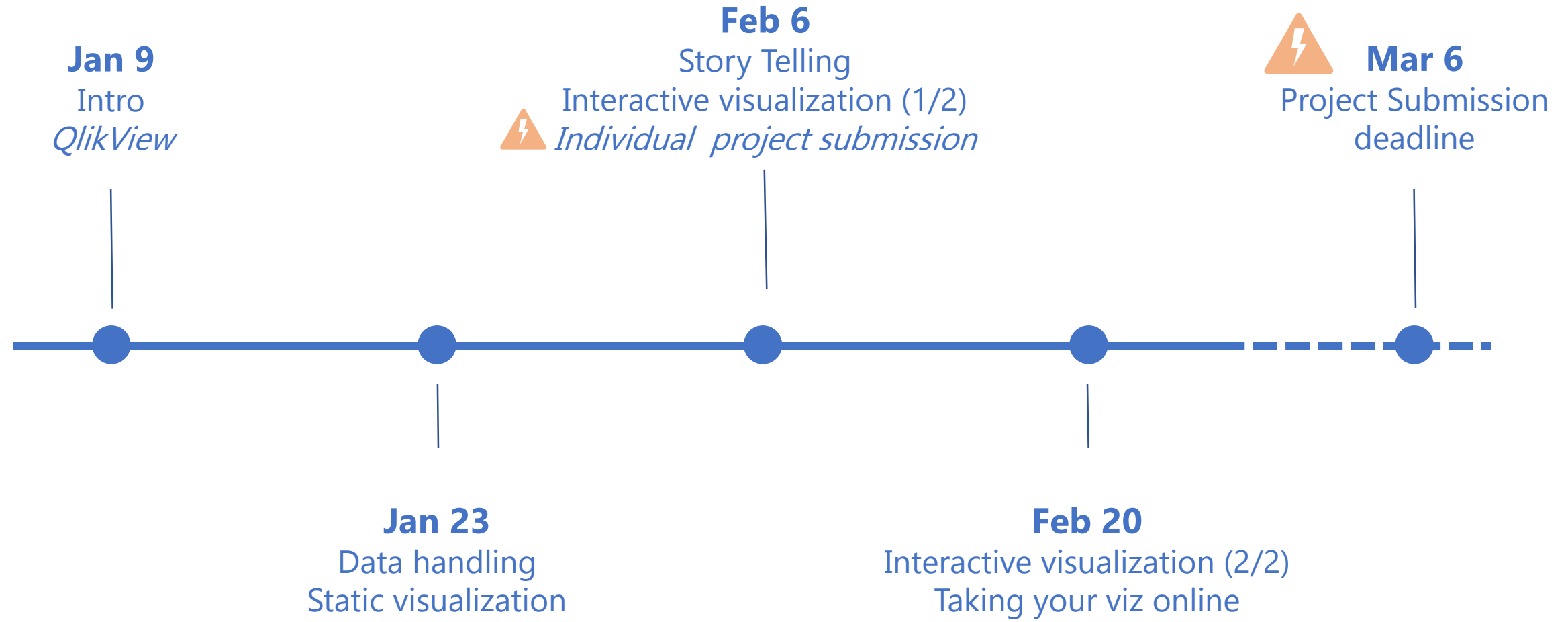
Skills, Workflow & Tools

5

Some principles

6

Getting familiar with Qlik



Course Grading
25% Individual Project
75% Final Project (teams of 2)



- The course website can be accessed here:
mscfinance-big-data-viz.github.io
- All assignments will be due on the course's GitHub

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- Install Anaconda on your computer
 - If you don't, you'll have to install manually python, a notebook and many basic libraries (NumPy, Pandas etc.)



- We will mostly work within a notebook
 - You can choose Jupyter (included in Anaconda) or Zeppelin



- Leverage your GitHub
 - Make all your projects open source
 - Include the link on your CV / LinkedIn



- Stack Overflow is your friend
- Don't copy/paste too much code - we can tell
- Pay attention - viz is wrongly thought as the poor cousin of Data Science

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Why do we need visualization ?

Only about 5% of our cognitive activity is conscious

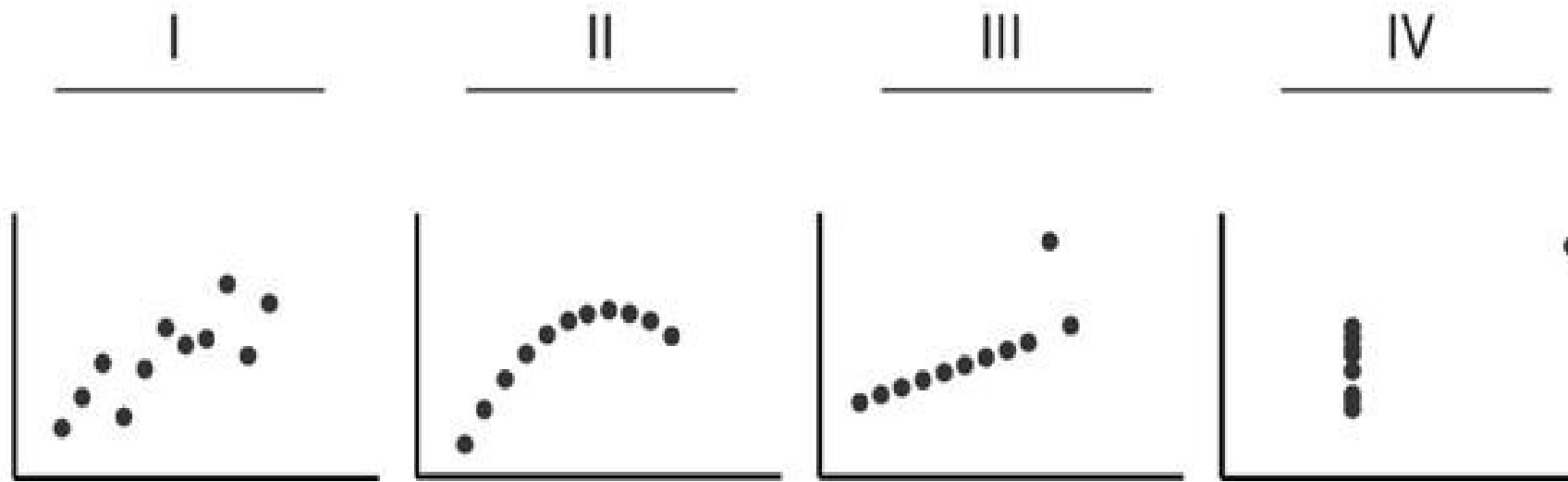
| | | | |
|--------|--------|--------|--------|
| green | blue | yellow | blue |
| blue | red | yellow | red |
| yellow | yellow | green | red |
| yellow | green | blue | yellow |
| green | red | blue | green |
| blue | yellow | blue | red |

Further reading :Malcolm Gladwell, "Blink"

Why do we need visualization ?

| I | | II | | III | | IV | |
|----|-------|----|------|-----|-------|----|------|
| x | y | x | y | x | y | x | y |
| 10 | 8.04 | 10 | 9.14 | 10 | 7.46 | 8 | 6.58 |
| 8 | 6.95 | 8 | 8.14 | 8 | 6.77 | 8 | 5.76 |
| 13 | 7.58 | 13 | 8.74 | 13 | 12.74 | 8 | 7.71 |
| 9 | 8.81 | 9 | 8.77 | 9 | 7.11 | 8 | 8.84 |
| 11 | 8.33 | 11 | 9.26 | 11 | 7.81 | 8 | 8.47 |
| 14 | 9.96 | 14 | 8.10 | 14 | 8.84 | 8 | 7.04 |
| 6 | 7.24 | 6 | 6.13 | 6 | 6.08 | 8 | 5.25 |
| 4 | 4.26 | 4 | 3.10 | 4 | 5.39 | 19 | 12.5 |
| 12 | 10.84 | 12 | 9.13 | 12 | 8.15 | 8 | 5.56 |
| 7 | 4.82 | 7 | 7.26 | 7 | 6.42 | 8 | 7.91 |
| 5 | 5.68 | 5 | 4.74 | 5 | 5.73 | 8 | 6.89 |

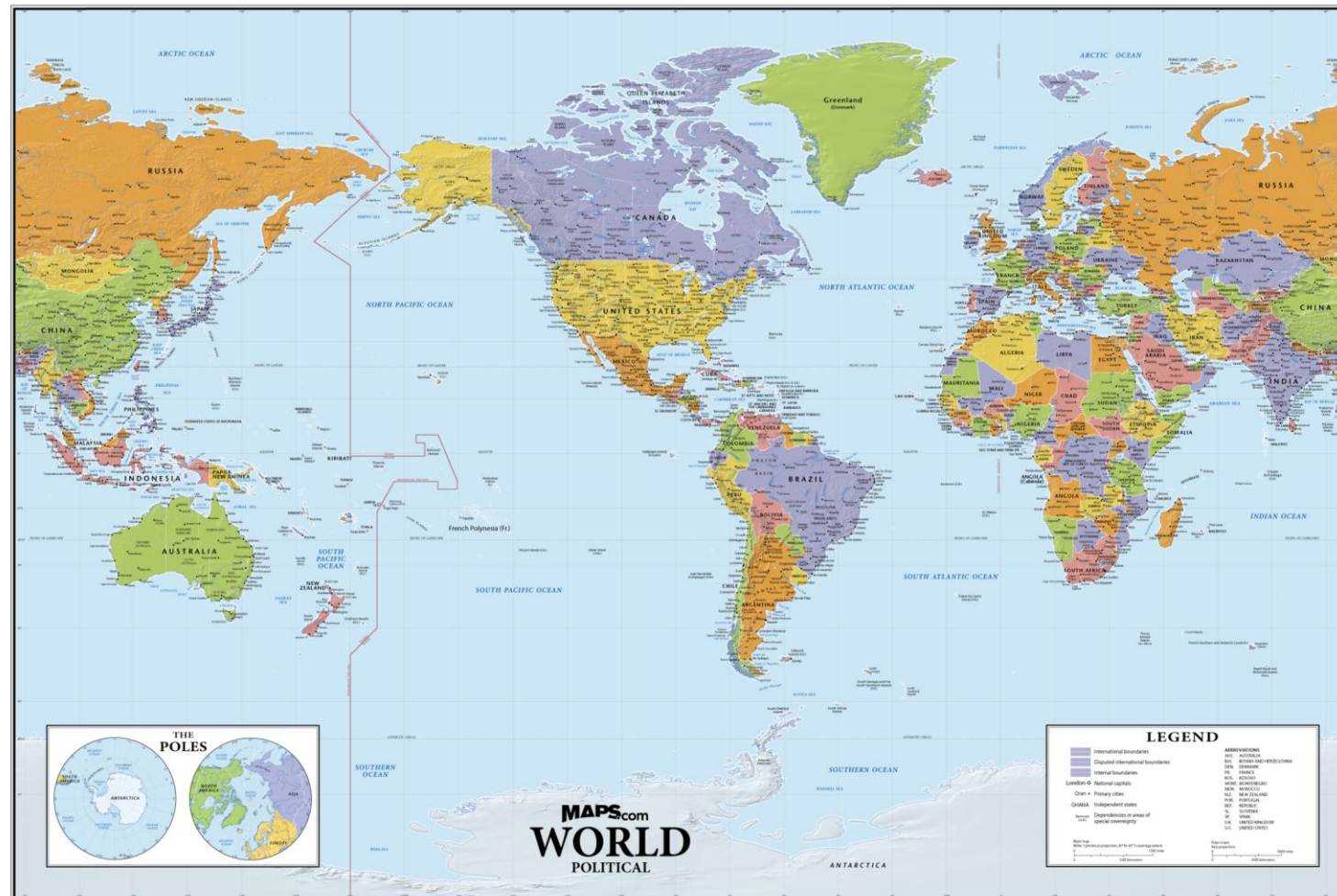
Why do we need visualization ?



It's never (or rarely) about the data...

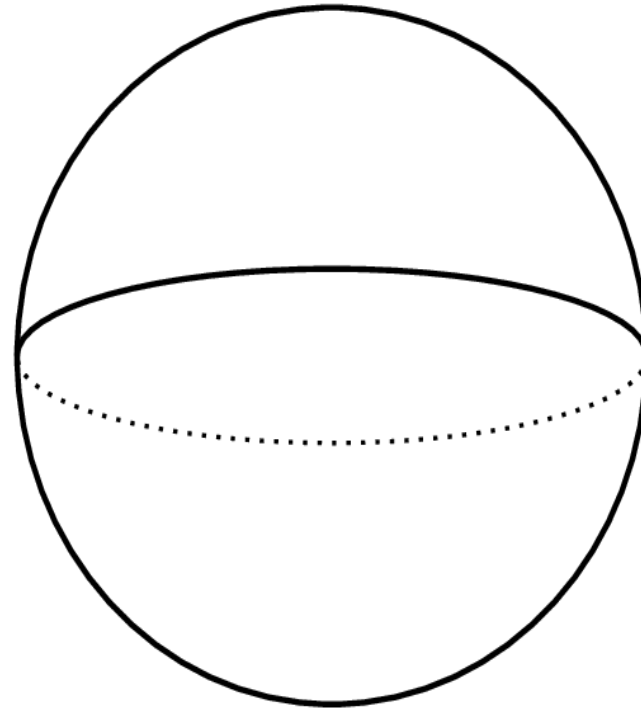
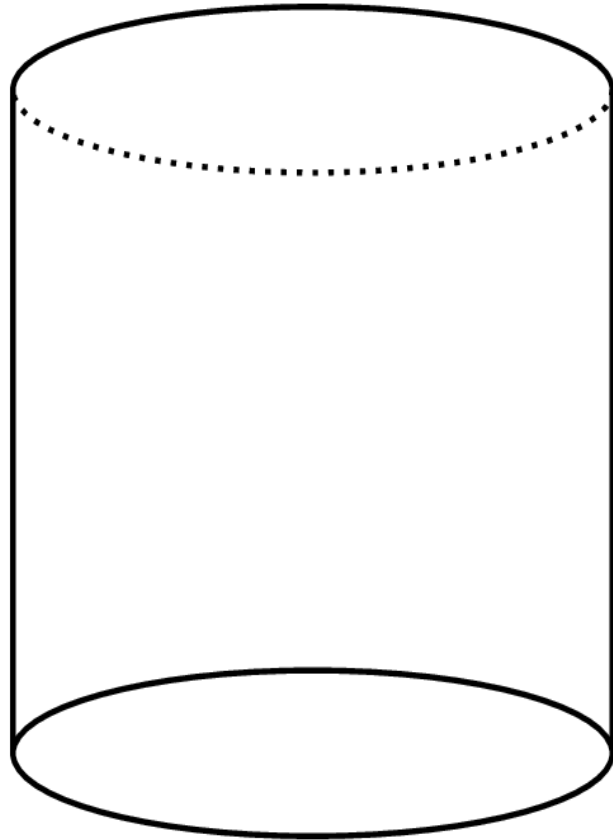


It's never (or rarely) about the data...



It's never (or rarely) about the data...

Easy to
represent
in 2D



Tougher
nut to
crack

PETERS WORLD MAP

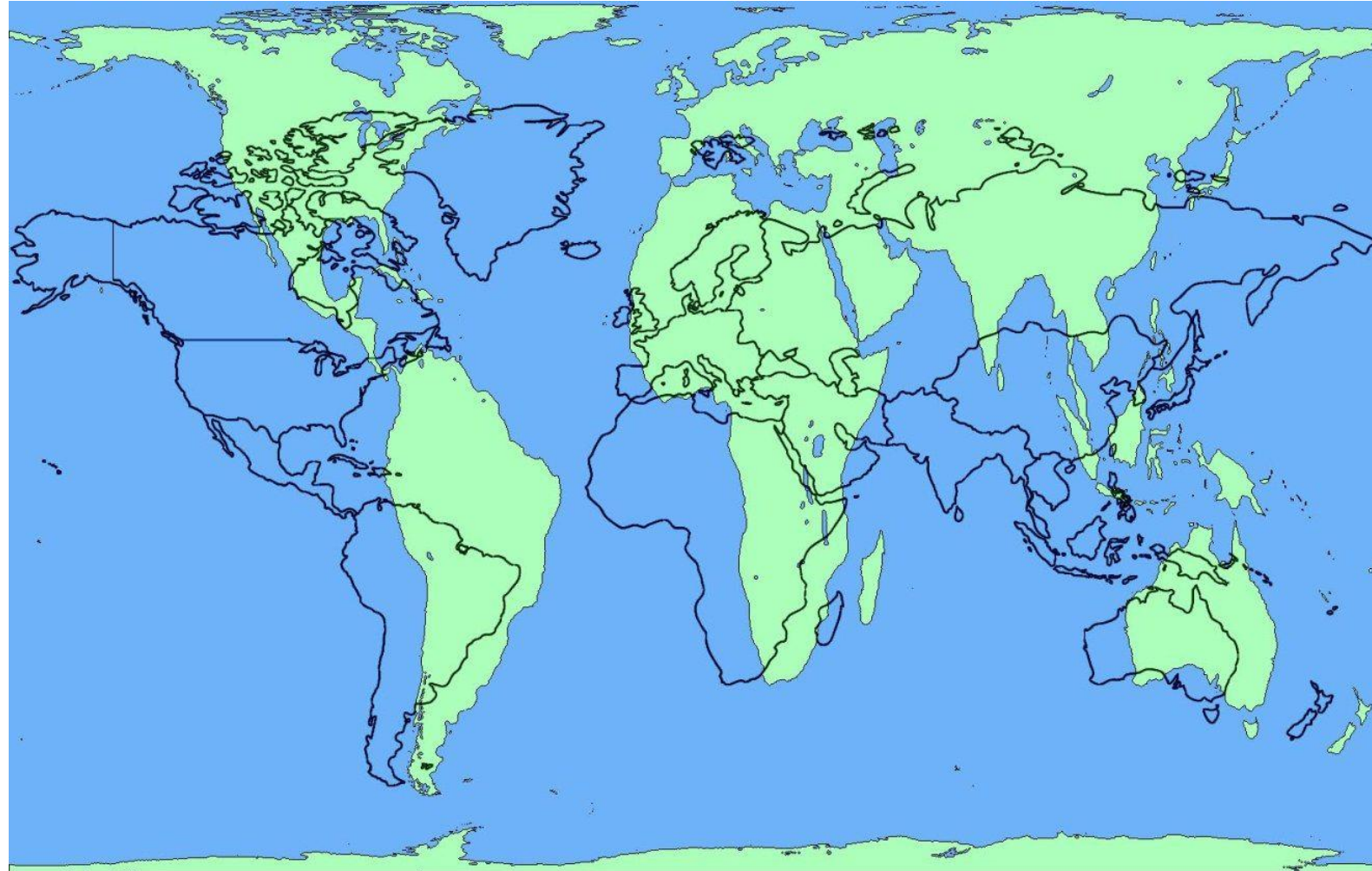
The map shows the world in a cylindrical projection, which is more accurate than the Mercator map, especially in the high latitudes. The map is color-coded by continent: North America (green), South America (green), Africa (orange), Europe (yellow), Asia (green), Australia (yellow), and Antarctica (white). Major cities and countries are labeled. The map includes a title block in the bottom left corner with text about the map's accuracy and scale. Below the title block are five small inset maps showing different projections: Mercator, Robinson, Mollweide, Peters, and a comparison of the Peters map with a traditional map. The bottom left corner features the Oxford Cartographers logo.

AREA SCALE 1:1,000,000,000

One inch equals 160,934,733 centimeters (6,334,792 inches). One centimeter equals 0.3937 inches. One inch equals 2.54 centimeters. One mile equals 1,609.34 meters. One kilometer equals 0.621371 miles. One nautical mile equals 1.852 kilometers. One degree equals 60 minutes. One minute equals 60 seconds. One second equals 60 thirds. One third equals 60 fourths. One fourth equals 60 fifths. One fifth equals 60 sixths. One sixth equals 60 sevenths. One seventh equals 60 eighths. One eighth equals 60 ninths. One ninth equals 60 tenths. One tenth equals 60 hundredths. One hundredth equals 60 thousandths. One thousandth equals 60 ten-thousandths. One ten-thousandth equals 60 hundred-thousandths. One hundred-thousandth equals 60 millionths. One millionth equals 60 billionths. One billionth equals 60 trillionths. One trillionth equals 60 quadrillionths. One quadrillionth equals 60 quintillionths. One quintillionth equals 60 sextillionths. One sextillionth equals 60 septillionths. One septillionth equals 60 octillionths. One octillionth equals 60 nonillionths. One nonillionth equals 60 decillionths. One decillionth equals 60 undecillionths. One undecillionth equals 60 duodecillionths. One duodecillionth equals 60 tredecillionths. One tredecillionth equals 60 quattuordecillionths. One quattuordecillionth equals 60 quindecillionths. One quindecillionth equals 60 sexdecillionths. One sexdecillionth equals 60 septendecillionths. One septendecillionth equals 60 octodecillionths. One octodecillionth equals 60 nineteenthillionths. One nineteenthillionth equals 60 twentiethillionths. One twentiethillionth equals 60 twenty-firstillionths. One twenty-firstillionth equals 60 twenty-secondillionths. One twenty-secondillionth equals 60 twenty-thirdillionths. One twenty-thirdillionth equals 60 twenty-fourthillionths. One twenty-fourthillionth equals 60 twenty-fifthillionths. One twenty-fifthillionth equals 60 twenty-sixthillionths. 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One one hundred and eight billionth equals 60 one hundred and nine billionths. One one hundred and nine billionth equals 60 one hundred and ten billionths. One one hundred and ten billionth equals 60 one hundred and eleven billionths. One one hundred and eleven billionth equals 60 one hundred and twelve billionths. One one hundred and twelve billionth equals 60 one hundred and thirteen billionths. One one hundred and thirteen billionth equals 60 one hundred and fourteen billionths. One one hundred and fourteen billionth equals 60 one hundred and fifteen billionths. One one hundred and fifteen billionth equals 60 one hundred and sixteen billionths. One one hundred and sixteen billionth equals 60 one hundred and seventeen billionths. One one hundred and seventeen billionth equals 60 one hundred and eighteen billionths. One one hundred and eighteen billionth equals 60 one hundred and nineteen billionths. One one hundred and nineteen billionth equals 60 one hundred and twenty billionths. 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Two hundred and six billionth equals 6

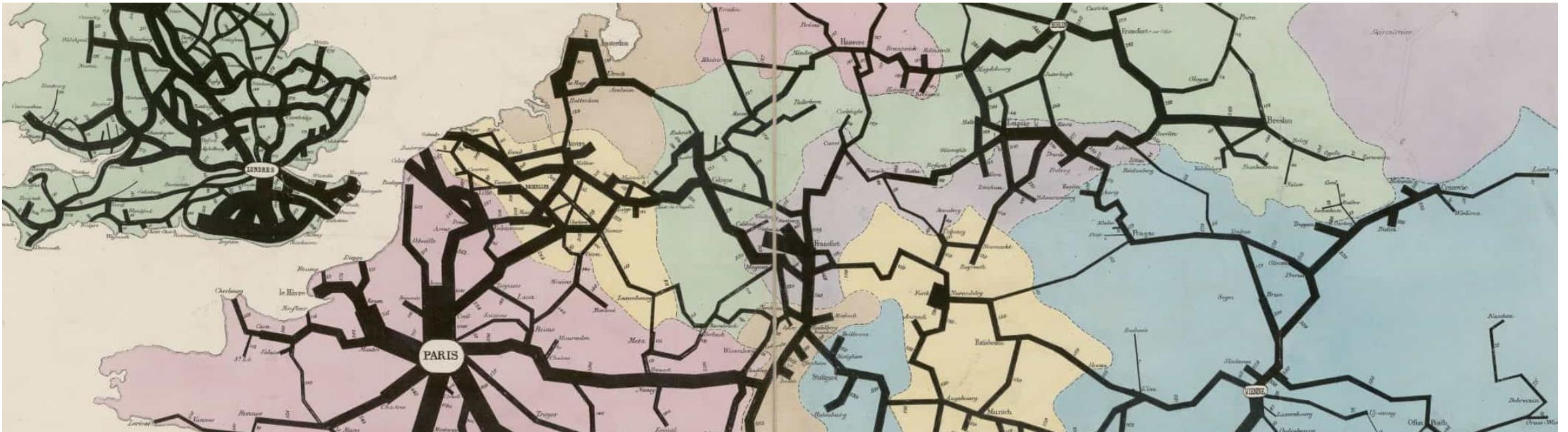
It's about the story...

Peters vs
Mercator



Visualization is not a new field

From 1840 Minard's flows visualization



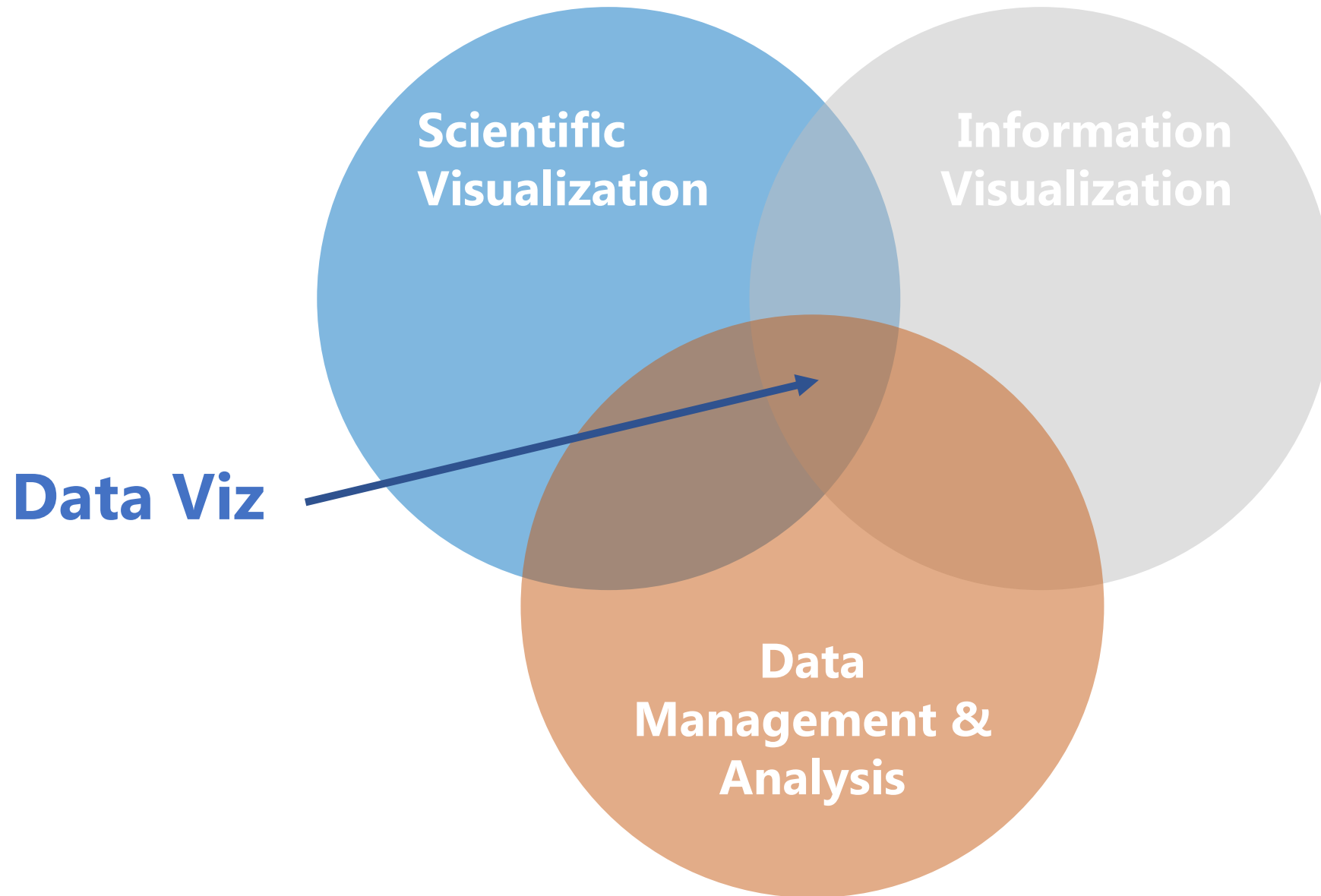
European railways Minard's flows map, 1846

Viz helped solve famous problems

1850's London Cholera Epidemic

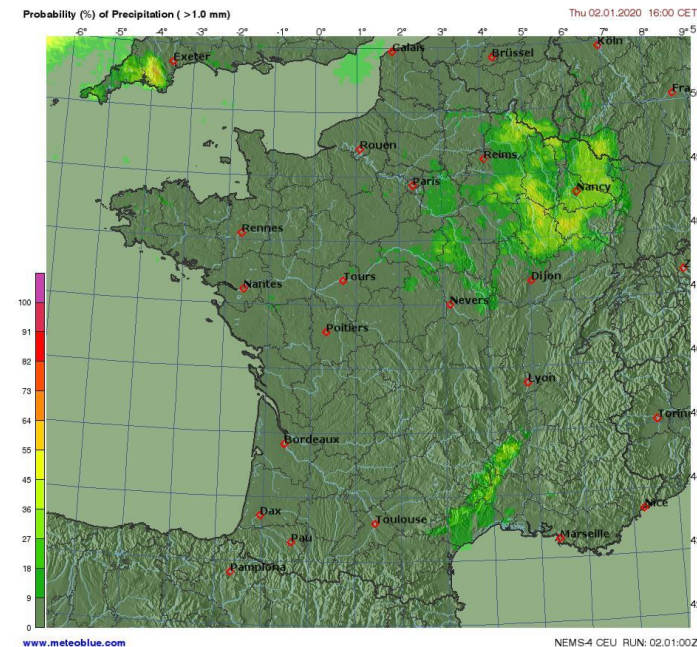
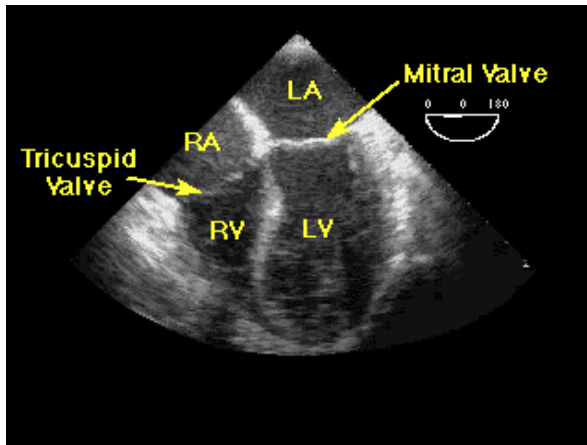


John Snow (1854)



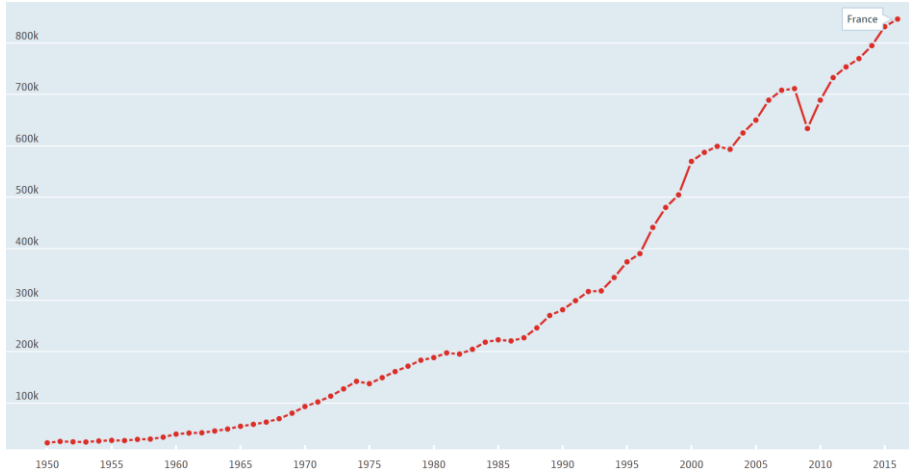
Scientific visualization

- Scientific phenomena x Visualization
- Spatial representation is given and obeys norms



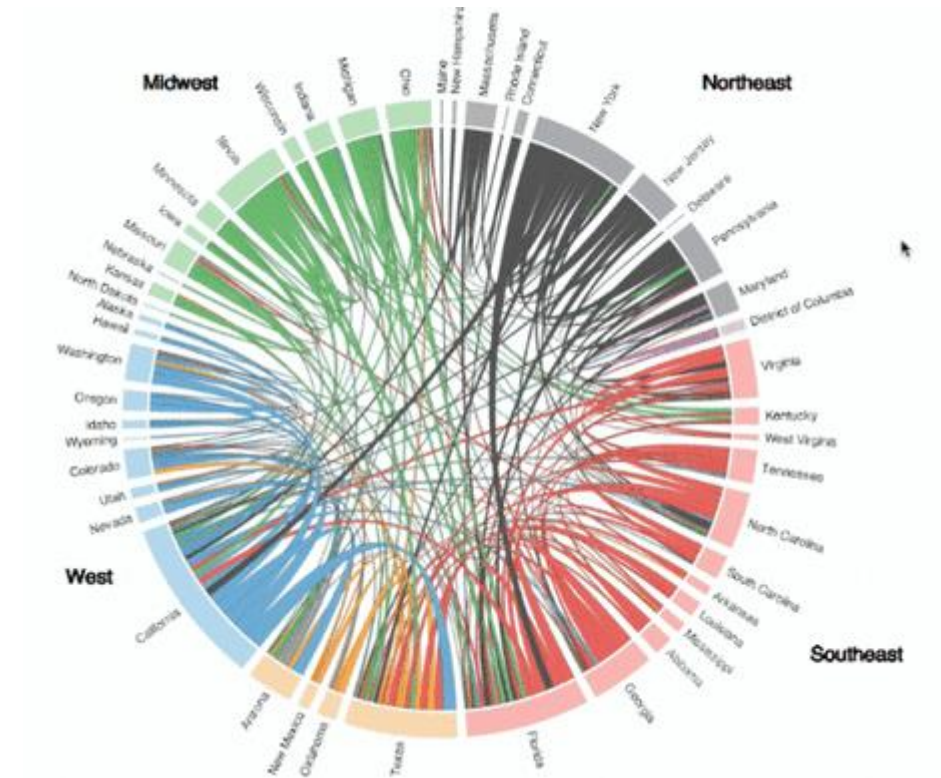
Information visualization

- Any information x Visualization
- Spatial representation is chosen



Data visualization

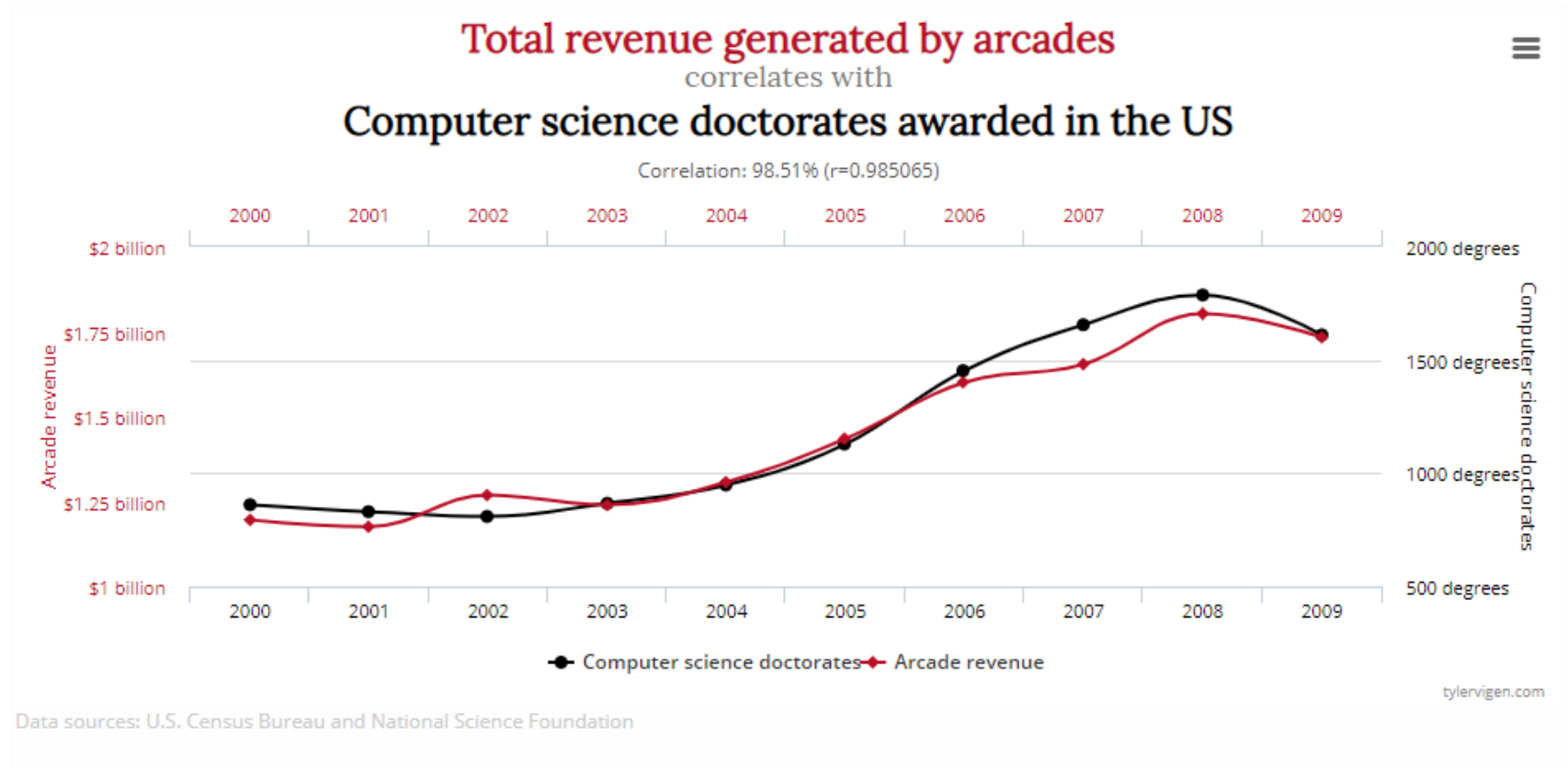
- Any information x Visualization
- Spatial representation is chosen
- Analytical approach
- Interactive interface



Great power comes with great responsibilities



As Data
Analysts/Scientist you
have a duty of scientific
honesty/truthfulness



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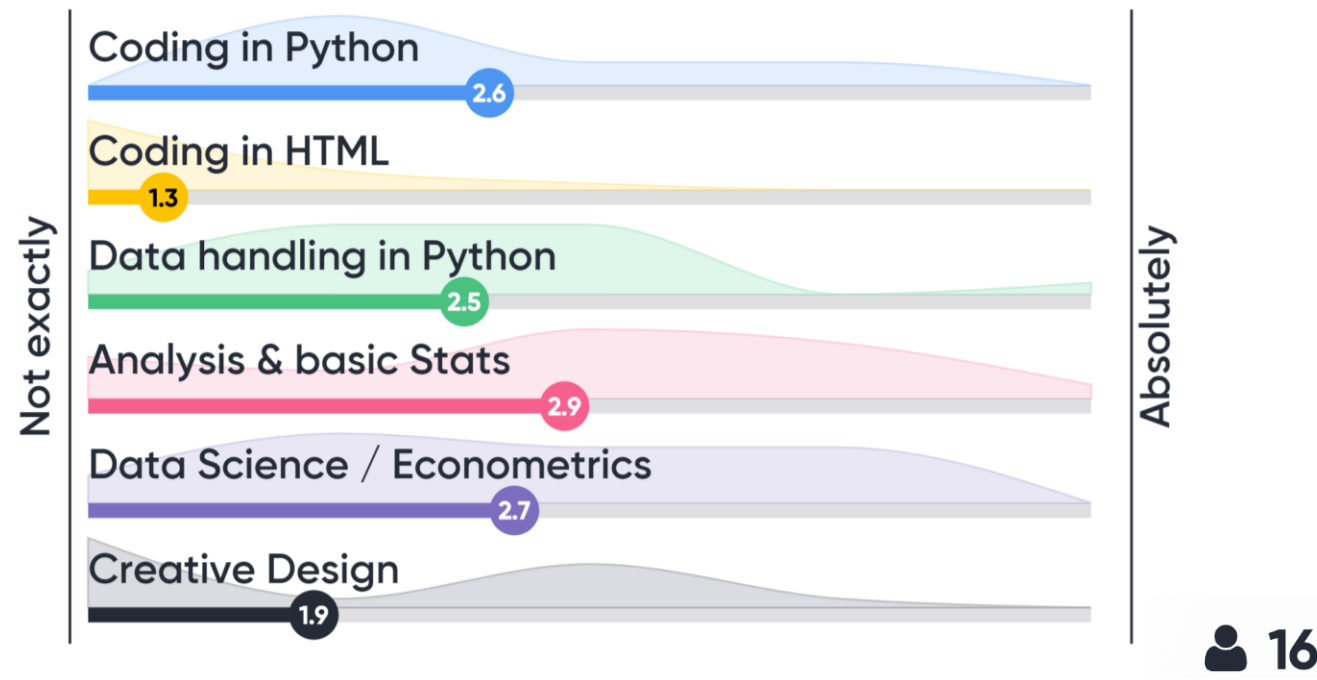
What do you need to master?

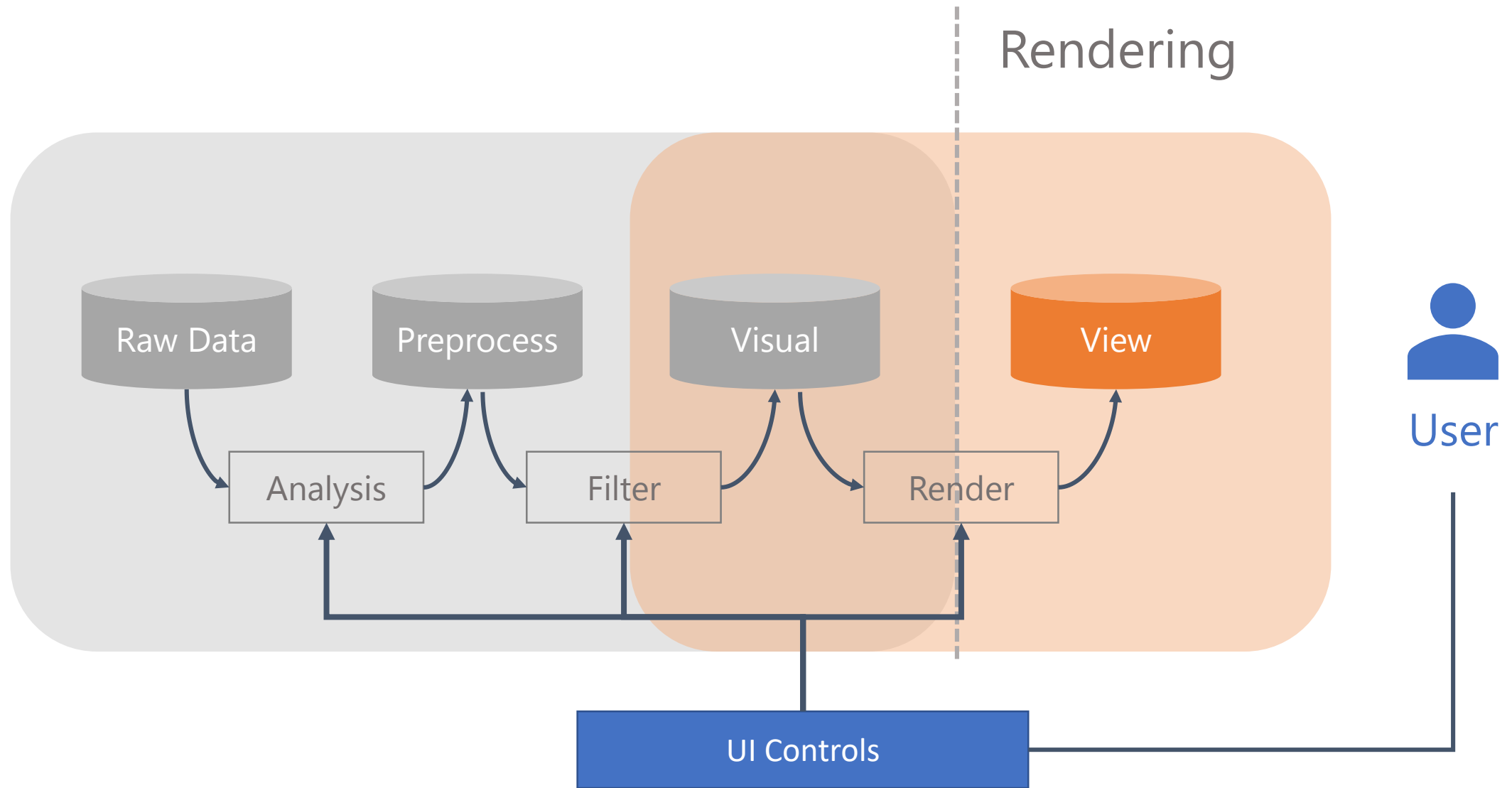
- Mathematics ✓
- Statistics ✓
- Data handling – *We'll go through some basics*
- Data analysis – *We'll go through some basics*
- Data science – *We'll go through some basics*
- Coding (Python, JS, HTML) – *You should already be on the right track*
- Proficiency in visualization solutions – *You've come to the right place !*
- Aesthetics/Design – *We'll try to get you on the right track*

Self assessment

Go to **www.menti.com** and use the code **49 67 97**

I'm awesome in





What can help us achieve great viz ?

BI Software ✓

- Tableau
- Power BI
- Qlik
- FineReport
- etc.

Javascript

- D3.js
- HighCharts
- Echarts
- etc.

Python ✓

- Matplotlib
- Seaborn
- Plotly
- etc.

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How many 8s can you count ?

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

How many 8s now ?

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

How many 8s now ?

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

How many 8s now ?

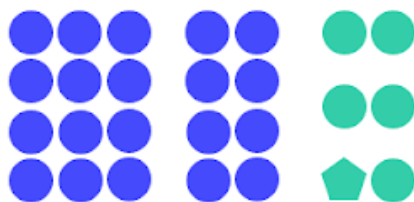
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| 4 | 2 | 6 | 5 | 2 | 4 | 1 | 4 | 0 | 3 | 7 | 5 |
| 5 | 0 | 6 | 0 | 5 | 2 | 5 | 3 | 4 | 4 | 0 | 4 |
| 0 | 4 | 1 | 7 | 6 | 7 | 7 | 1 | 2 | 0 | 9 | 4 |
| 1 | 9 | 4 | 9 | 6 | 3 | 9 | 3 | 6 | 9 | 1 | 3 |
| 1 | 5 | 6 | 5 | 2 | 6 | 0 | 1 | 2 | 6 | 3 | 1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

Gestalt Principles

1. PROXIMITY ✓

Elements which are close together seem to be a group



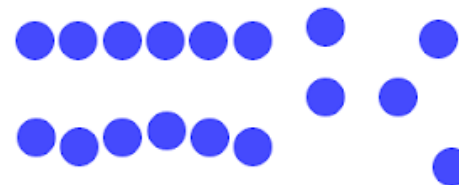
2. CLOSURE

The human brain ignores gaps and tries to understand the bigger context



5. CONTINUITY

Elements which are ordered in a line or curve seem to be a group



6. FIGURE & GROUND

The human brain instinctively recognizes if something is in the fore- or background



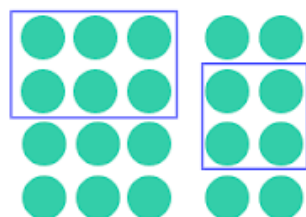
3. SIMILARITY ✓

Elements which look similar seem to be a group



4. COMMON REGION ✓

Elements which are close together seem to be a group



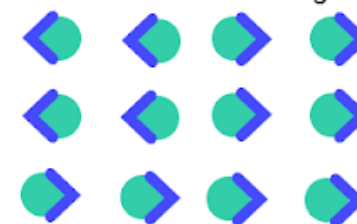
7. SYMMETRY

Symmetric elements give the human brain the feeling that everything is ordered



8. COMMON FATE

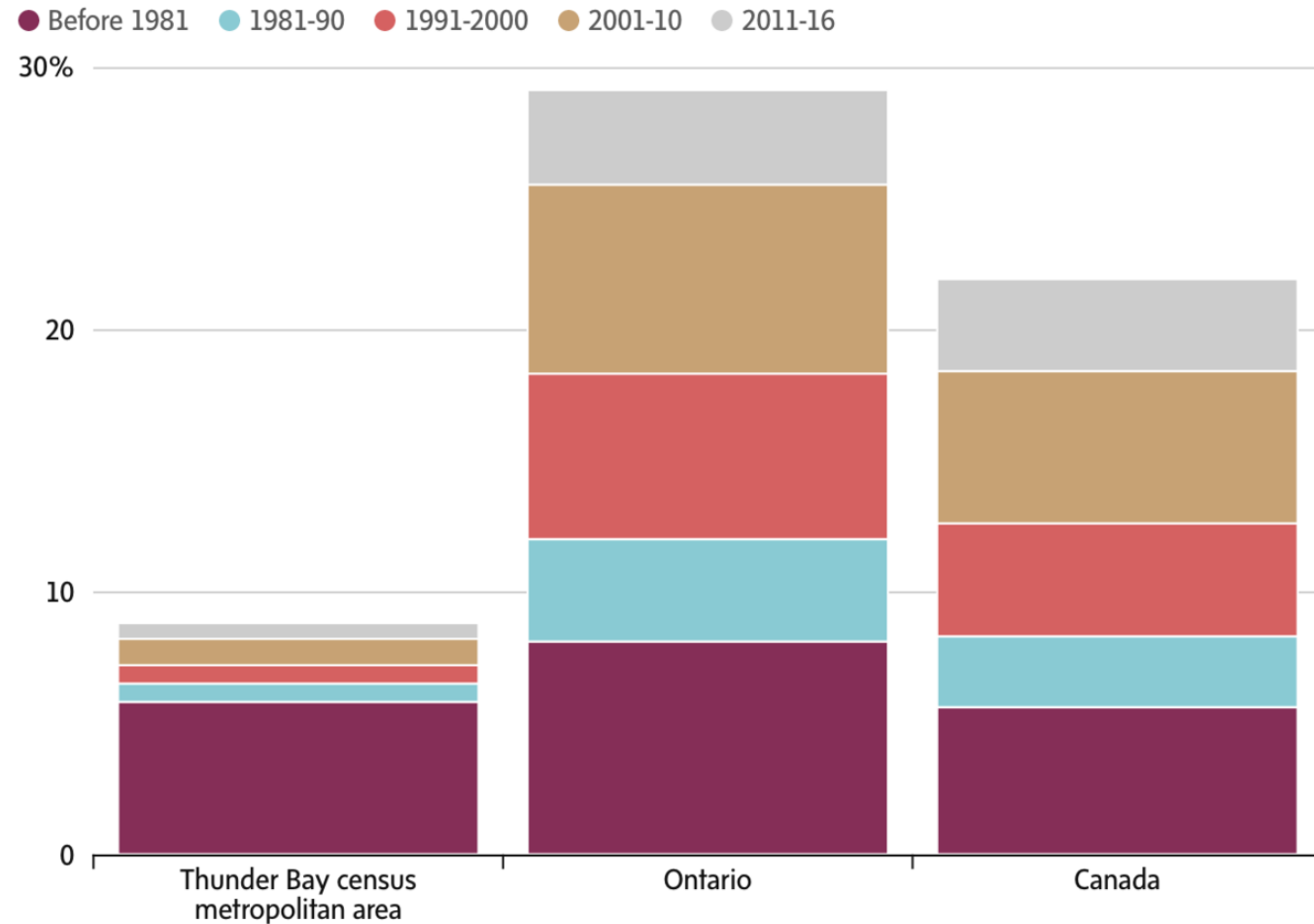
Elements which move in the same direction seem to be a group



Source : <https://uxcam.com/blog/8-gestalt-principles-design-infographic/>

#Fail

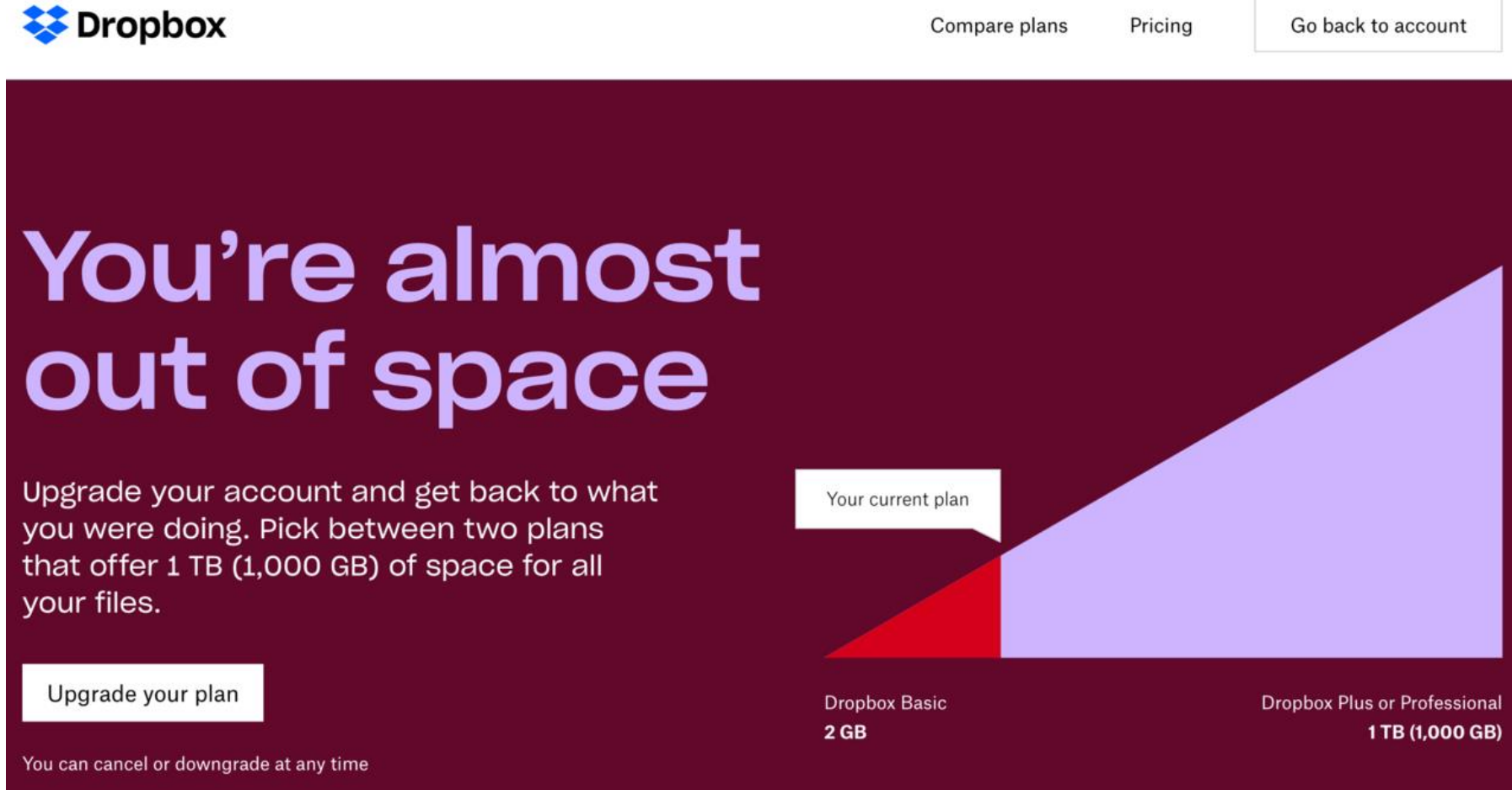
Immigrants as a percentage of population in 2016, by period of immigration



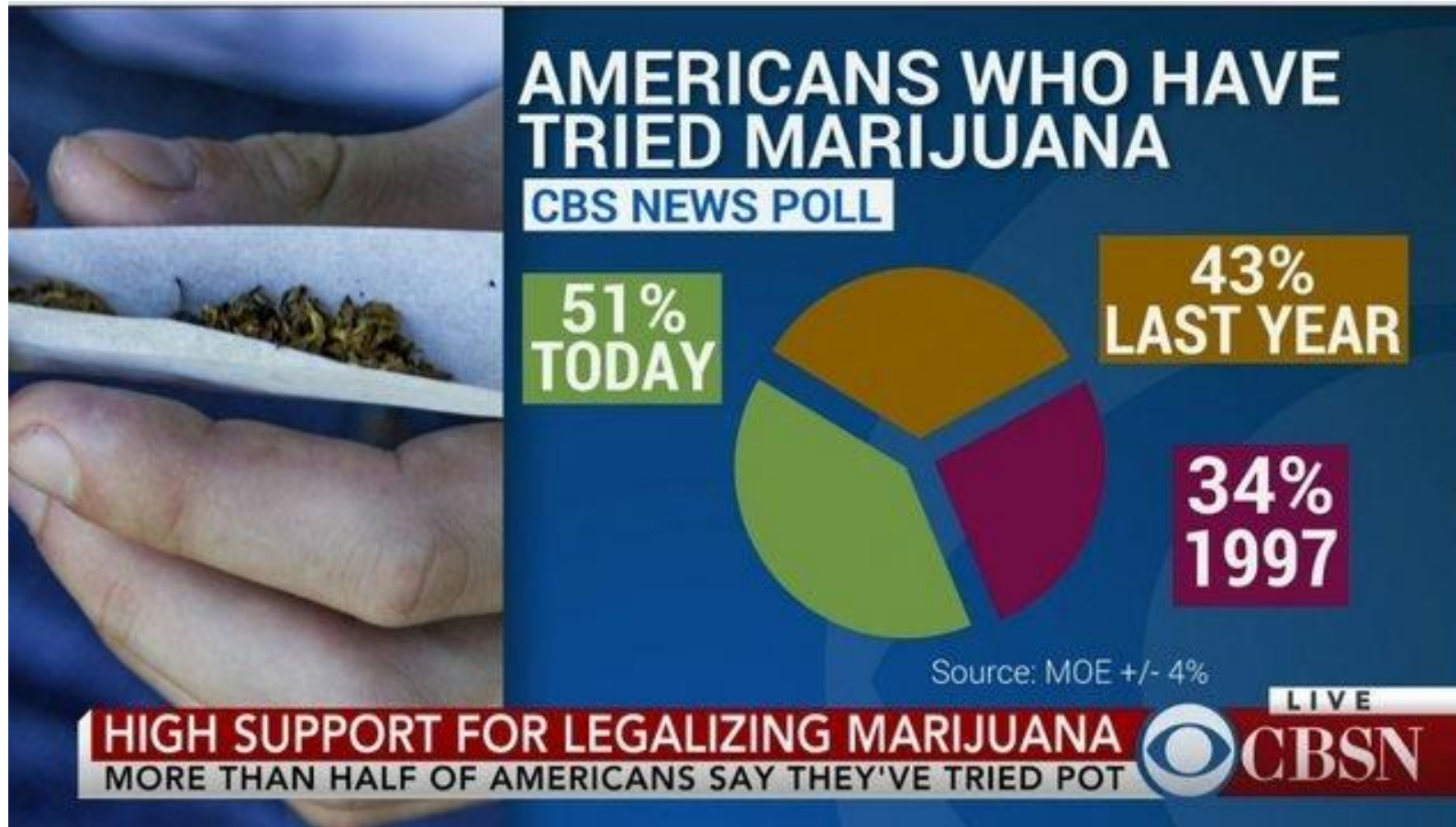
THE GLOBE AND MAIL, SOURCE: STATSCAN

DATA SHARE

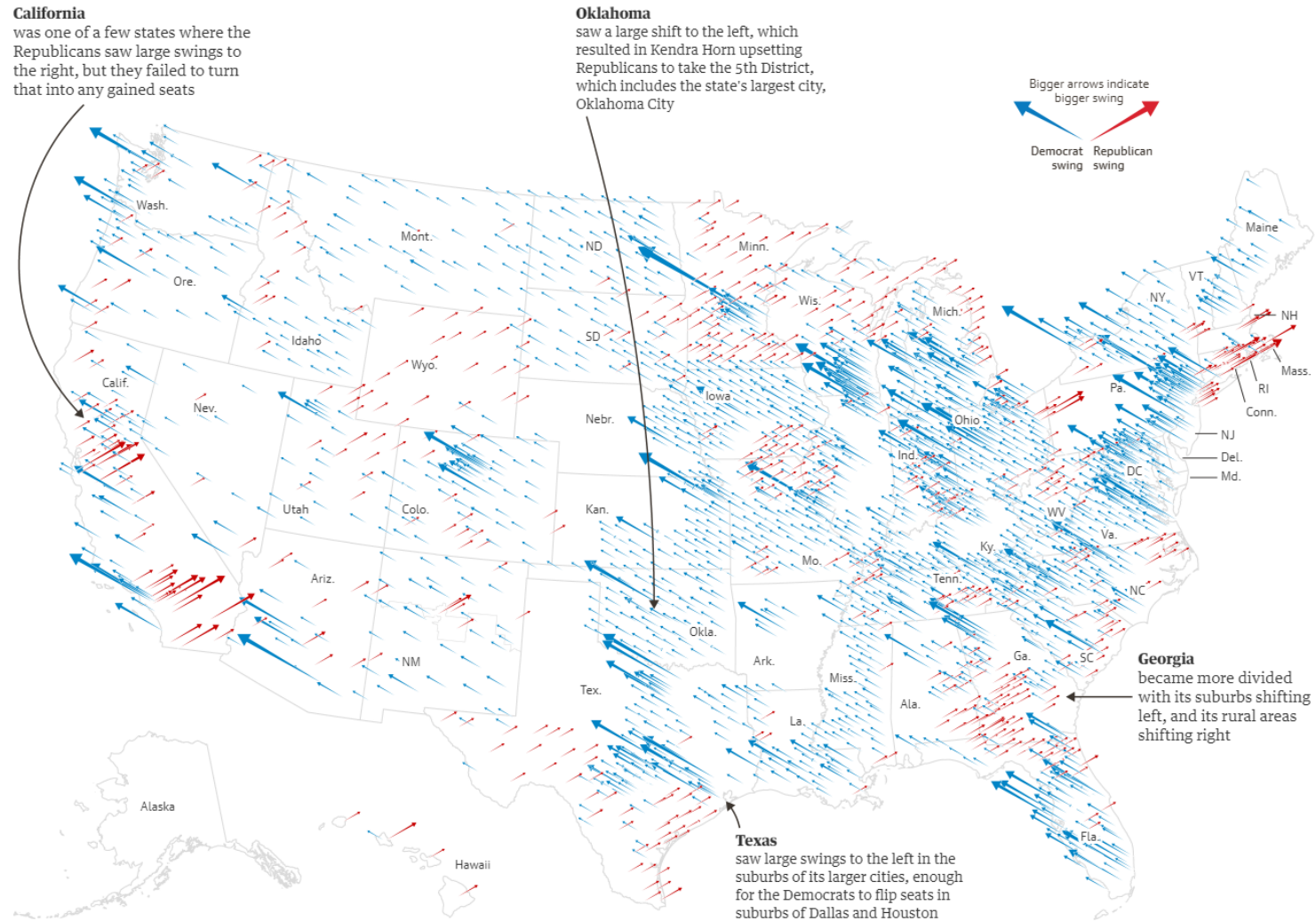
#Fail



#Fail

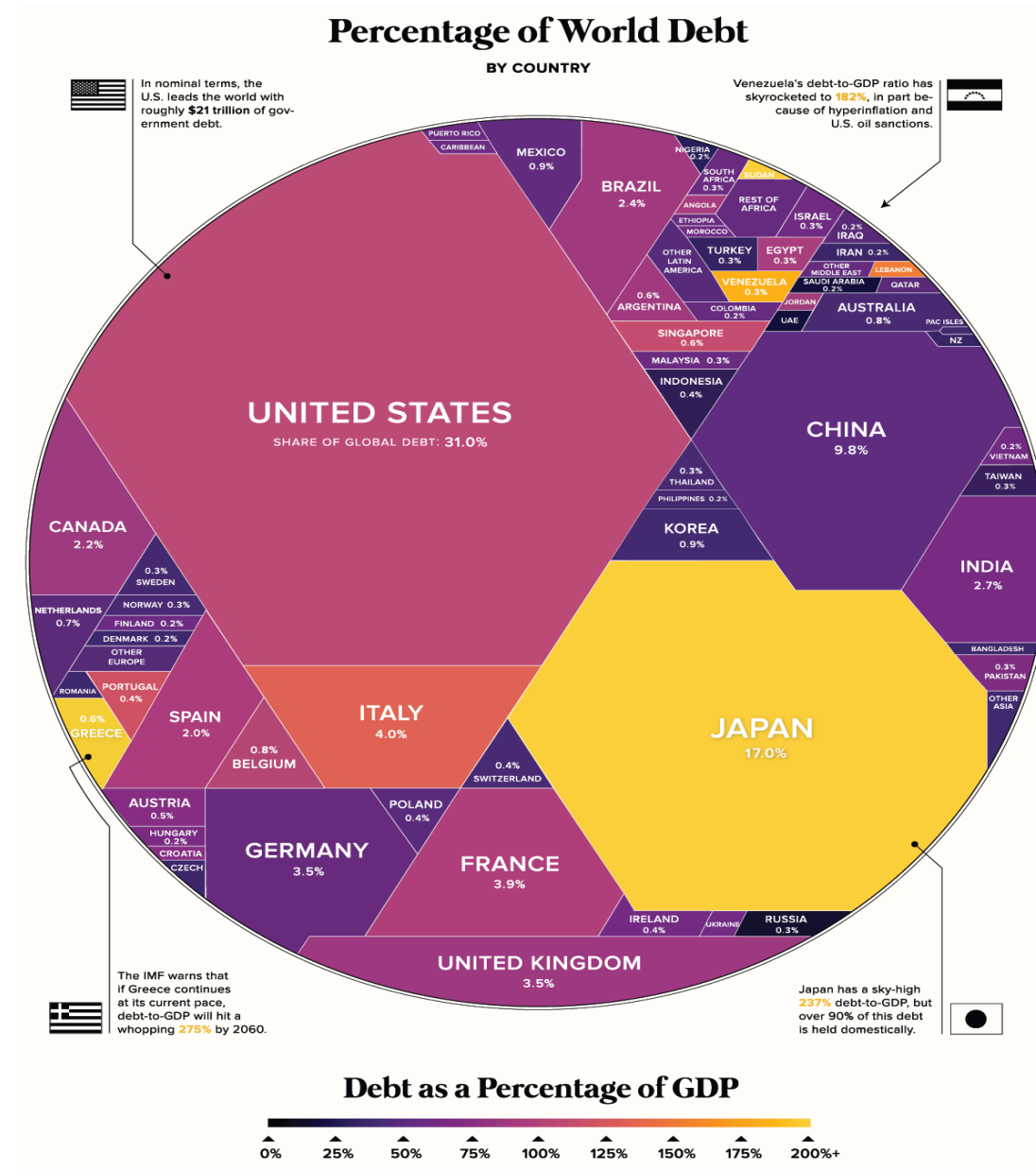


#Nice



Source :
<https://www.theguardian.com/us-news/ng-interactive/2018/nov/07/blue-wave-or-blue-ripple-a-visual-guide-to-the-democrats-gains>

#Nice



#Nice

<https://projects.fivethirtyeight.com/p-hacking/>

<https://projects.christianlaesser.com/travel-visa-inequality/>

Where you can get some inspiration

[fivethirtyeight.com](https://www.fivethirtyeight.com/)

[Visualcapitalist.com](https://www.visualcapitalist.com/)

[NYTimes.com](https://www.nytimes.com/)

[Guardian.com](https://www.guardian.com/)

Source : <https://uxcam.com/blog/8-gestalt-principles-design-infographic/>

1

Course overview

2

Setup & Some tips

3

What is Data viz and why does it matters?

4

Skills, Workflow & Tools

5

Some principles

6

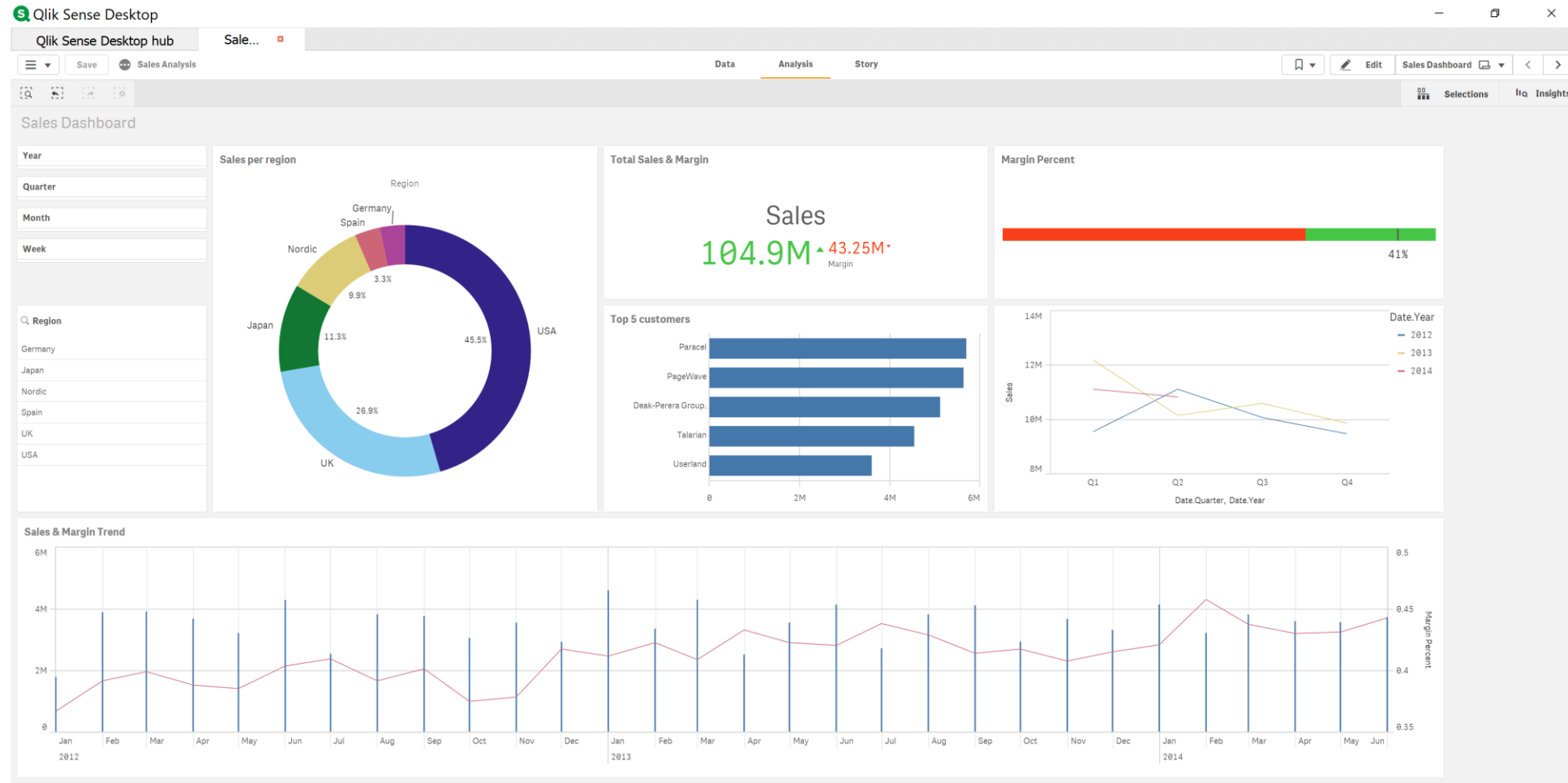
Getting familiar with Qlik

Let's build a dashboard together

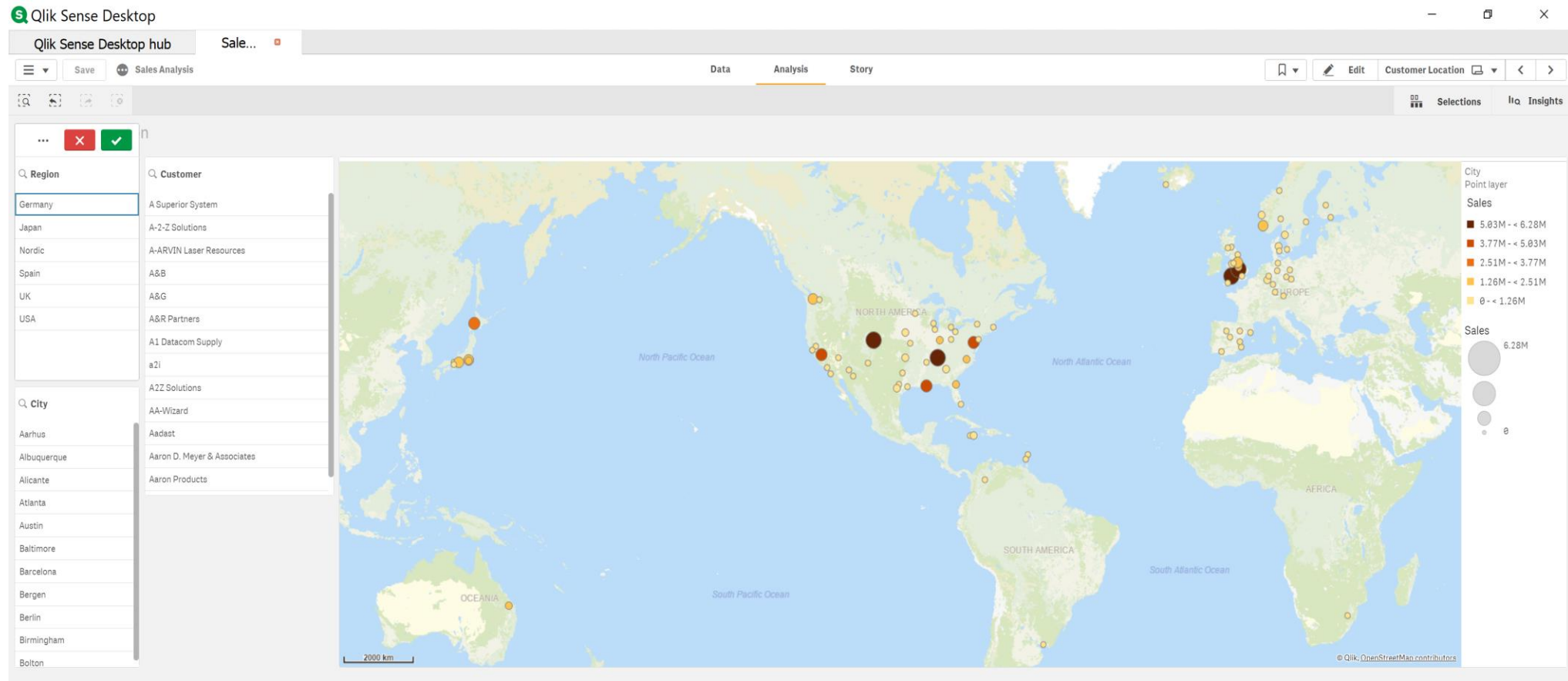
Data available here:

<https://github.com/mscfinance-big-data-viz/session-01>

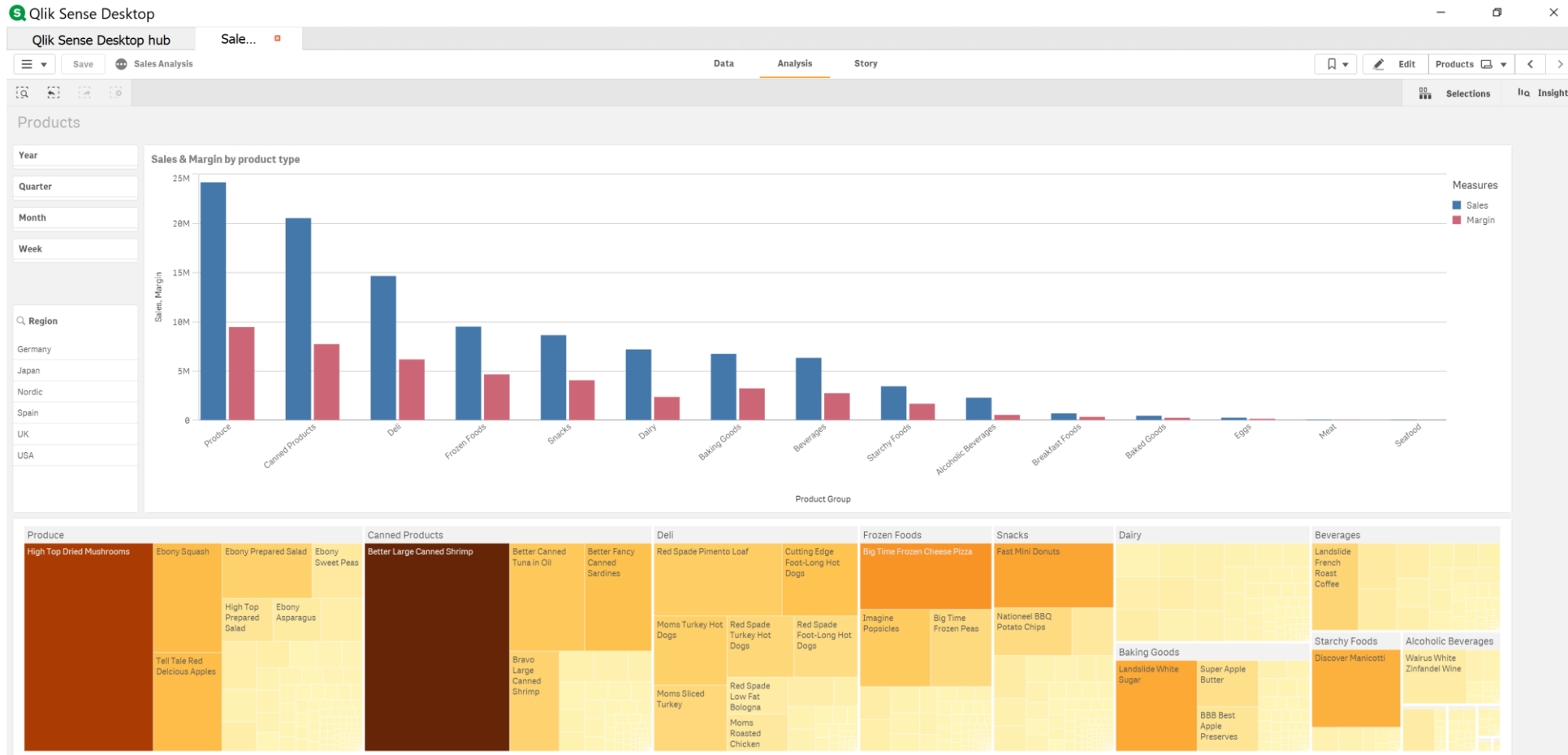
Dashboard – Page 1



Dashboard – Page 2



Dashboard – Page 3



Build your own dashboard on Stock Prices

Data available here:

<https://github.com/mscfinance-big-data-viz/session-01>

<https://simfin.com/data/bulk>

See you on

Jan 23, 2020