UNIVERSITY OF BIRMINGHAM

Visualisation

Week 1

What is Visualisation?

What Could this Mean?

I

x_1	y_1
10	8.04
8	6.95
13	7.58
9	8.81
11	8.33
14	9.96
6	7.24
4	4.26
12	10.84
7	4.82
5	5.68

II

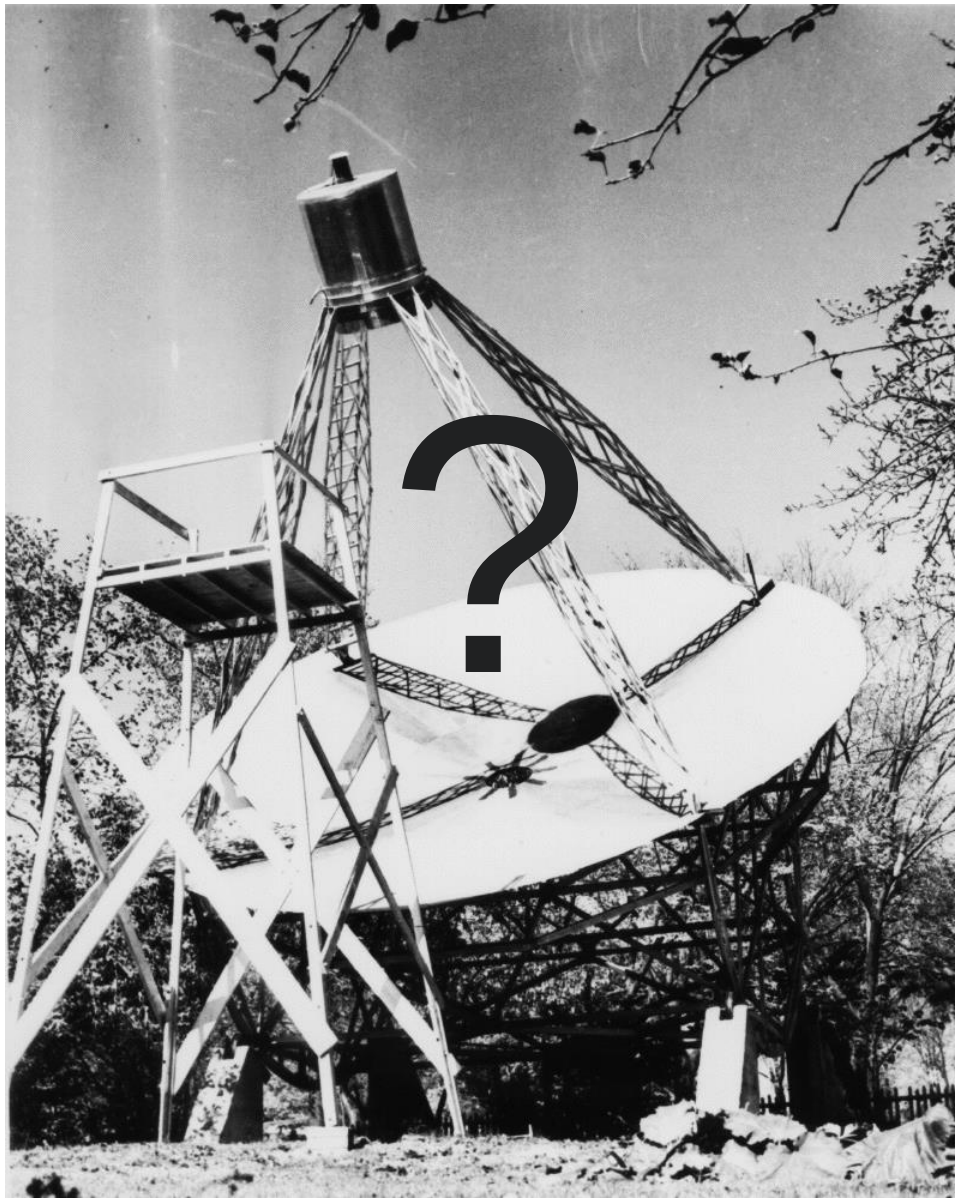
x_2	y_2
10	9.14
8	8.14
13	8.74
9	8.77
11	9.26
14	8.1
6	6.13
4	3.1
12	9.13
7	7.26
5	4.74

III

x_3	y_3
10	7.46
8	6.77
13	12.74
9	7.11
11	7.81
14	8.84
6	6.08
4	5.39
12	8.15
7	6.42
5	5.73

IV

x_4	y_4
8	6.58
8	5.76
8	7.71
8	8.84
8	8.47
8	7.04
8	5.25
19	12.5
8	5.56
8	7.91
8	6.89



I		II		III		IV	
x_1	y_1	x_2	y_2	x_3	y_3	x_4	y_4
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	8.1	14	8.84	8	7.04
6	7.24	6	6.13	6	6.08	8	5.25
4	4.26	4	3.1	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

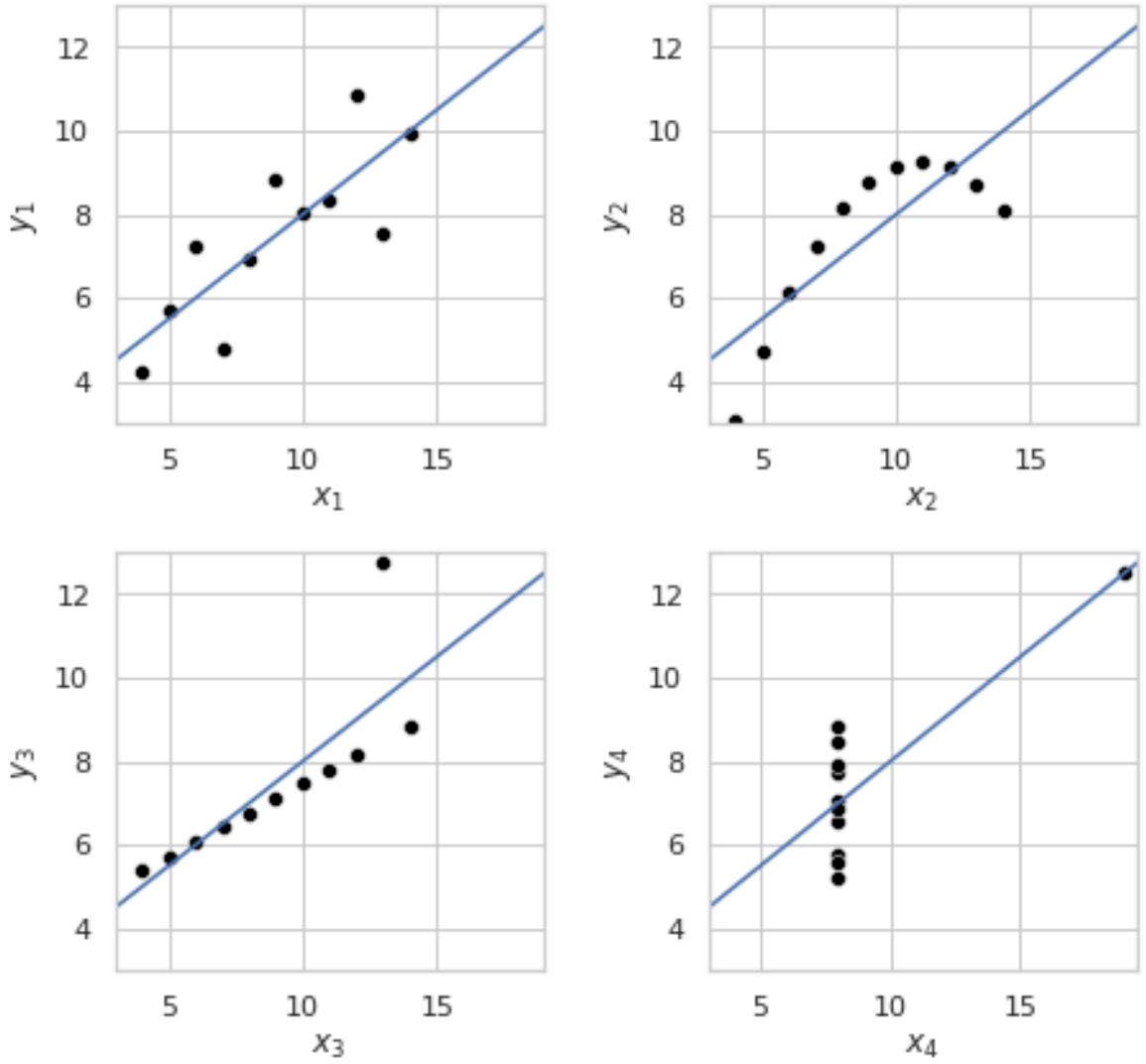
Mean:	9	7.5	9	7.5	9	7.5	9	7.5
Variance:	11	4.125	11	4.125	11	4.125	11	4.125
Correlation:	0.816		0.816		0.816		0.816	

Least squares regression $y = ax + b$

a:	0.5		0.5		0.5		0.5	
b:	0.3		0.3		0.3		0.3	

Anscombe Quartet

Frank Anscombe

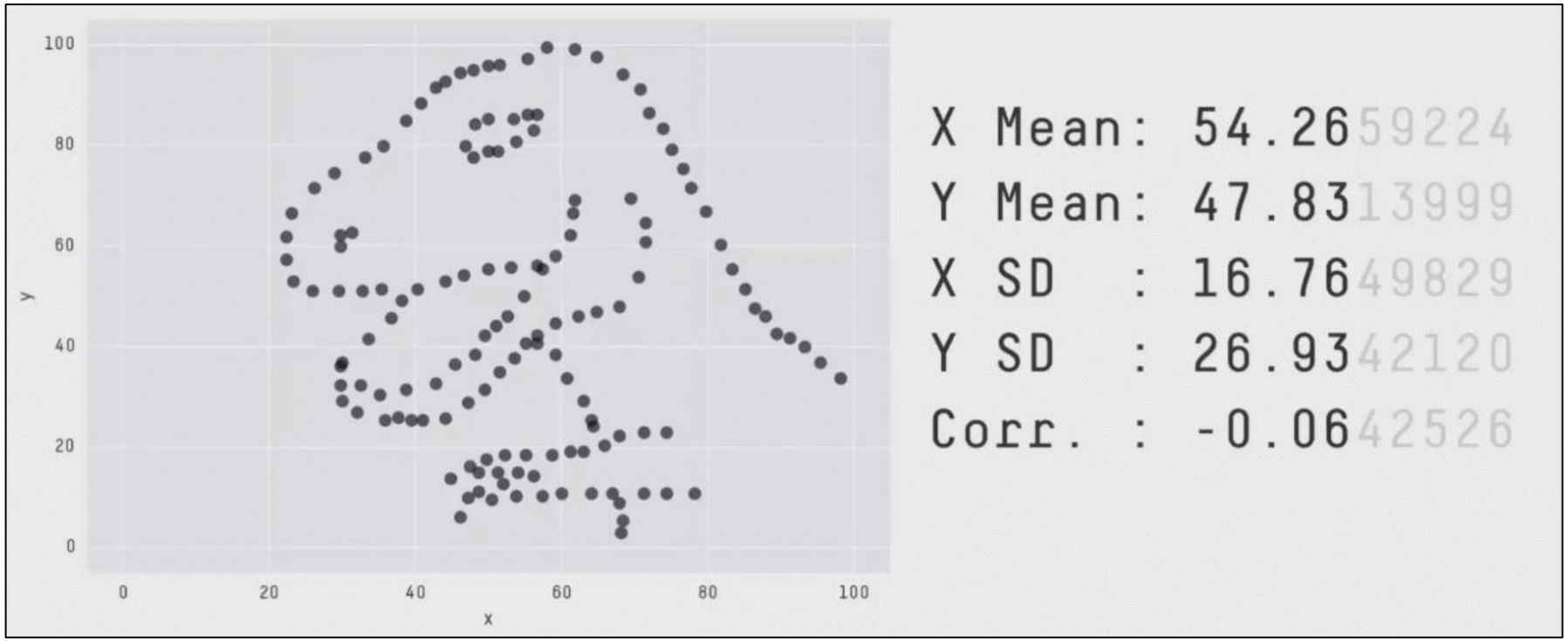


Anscombe (1973). Graphs in Statistical Analysis

Lesson:

- **Always look at your data**

Anscombosaurus



Alberto Cairo

What is going on?

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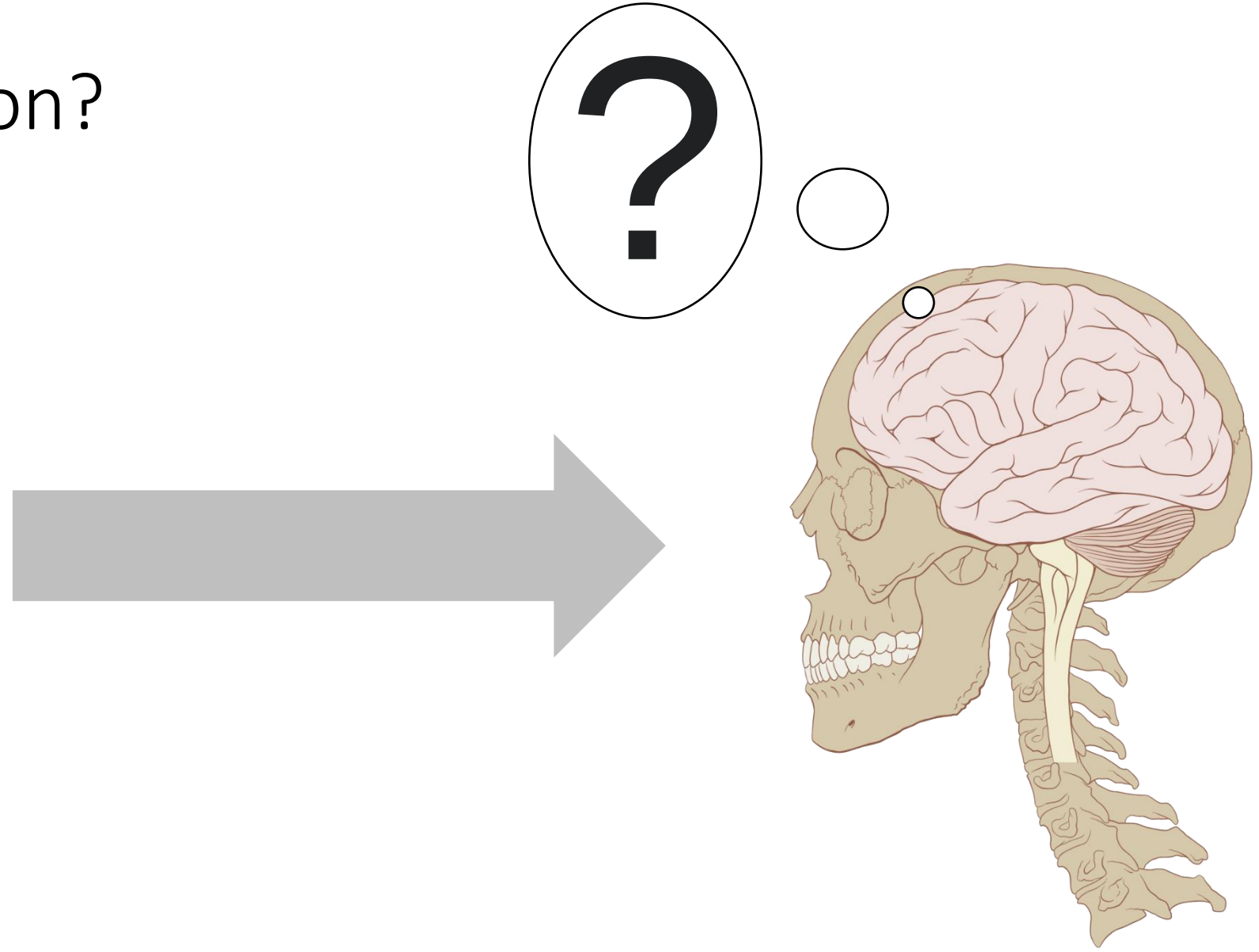

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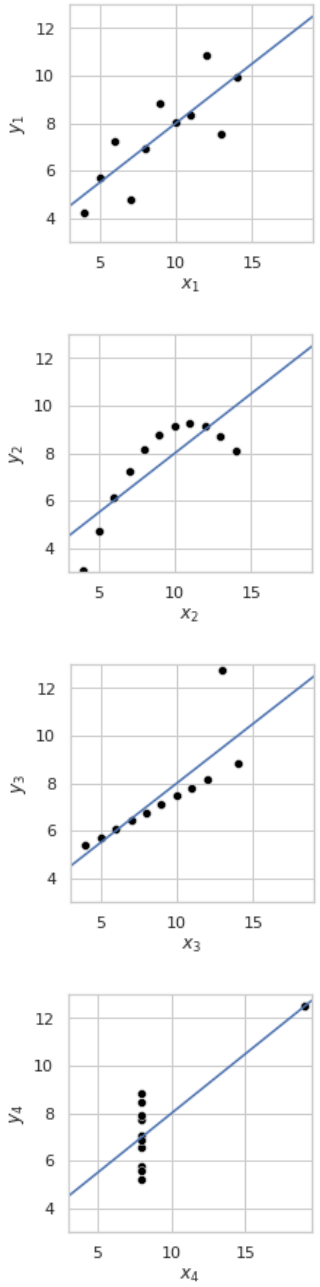
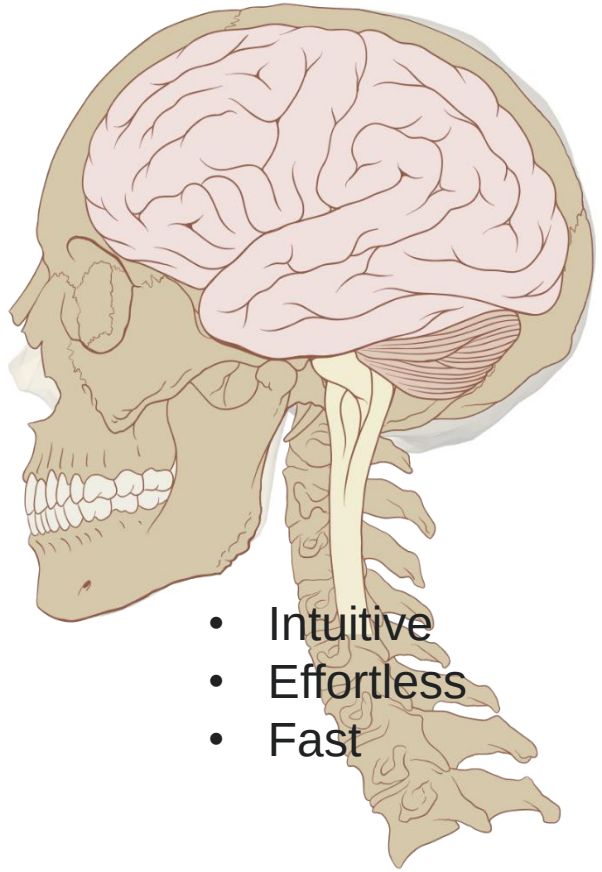
Encode



Visual cortex

An expert at pattern recognition



- Intuitive
- Effortless
- Fast

Mapping Variables to Aesthetics

Data

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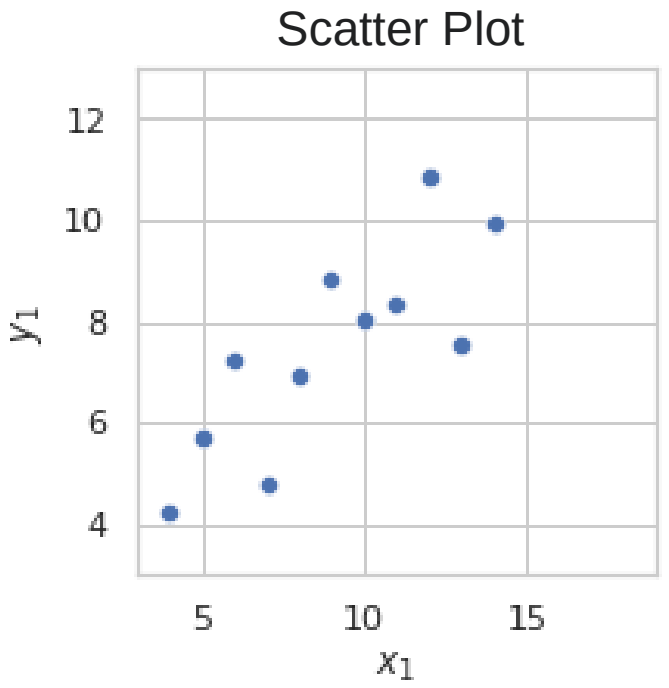
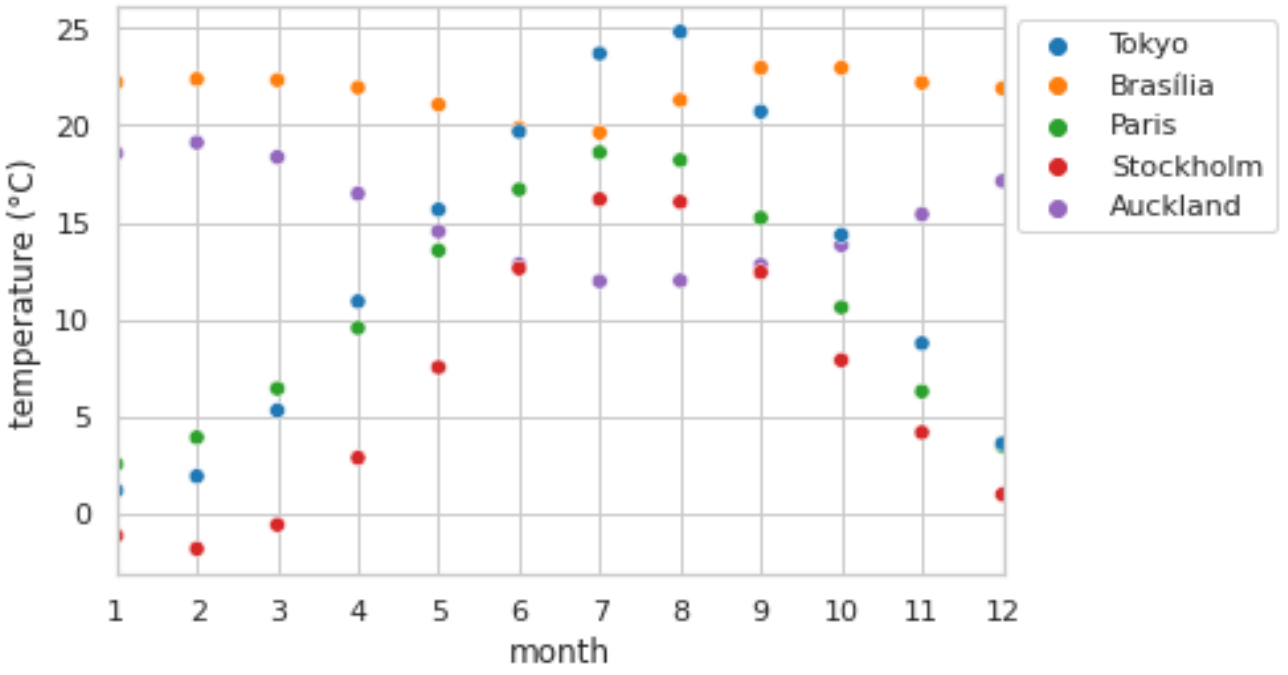
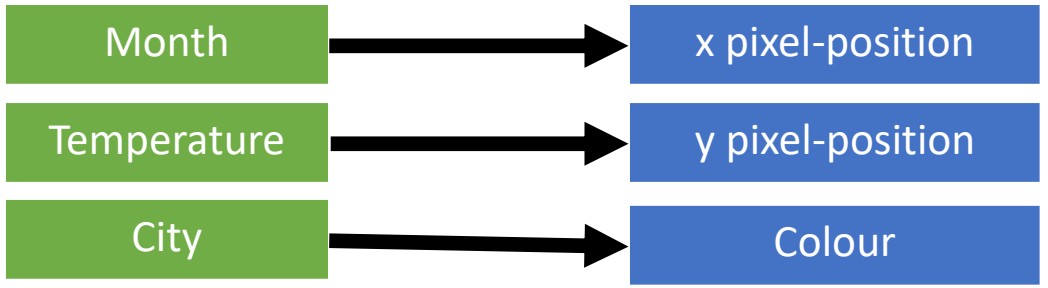


Different Ways to Map Data

	month	City	temperature (C)
0	1	Auckland	18.551830
1	1	Brasília	22.216207
2	1	Paris	2.513351
3	1	Stockholm	-1.182832
4	1	Tokyo	1.148084
5	2	Auckland	19.106219
6	2	Brasília	22.382339
7	2	Paris	3.892574
8	2	Stockholm	-1.858202
9	2	Tokyo	1.888856
10	3	Auckland	18.357038
11	3	Brasília	22.332715
12	3	Paris	6.413973
13	3	Stockholm	-0.616388
14	3	Tokyo	5.285594





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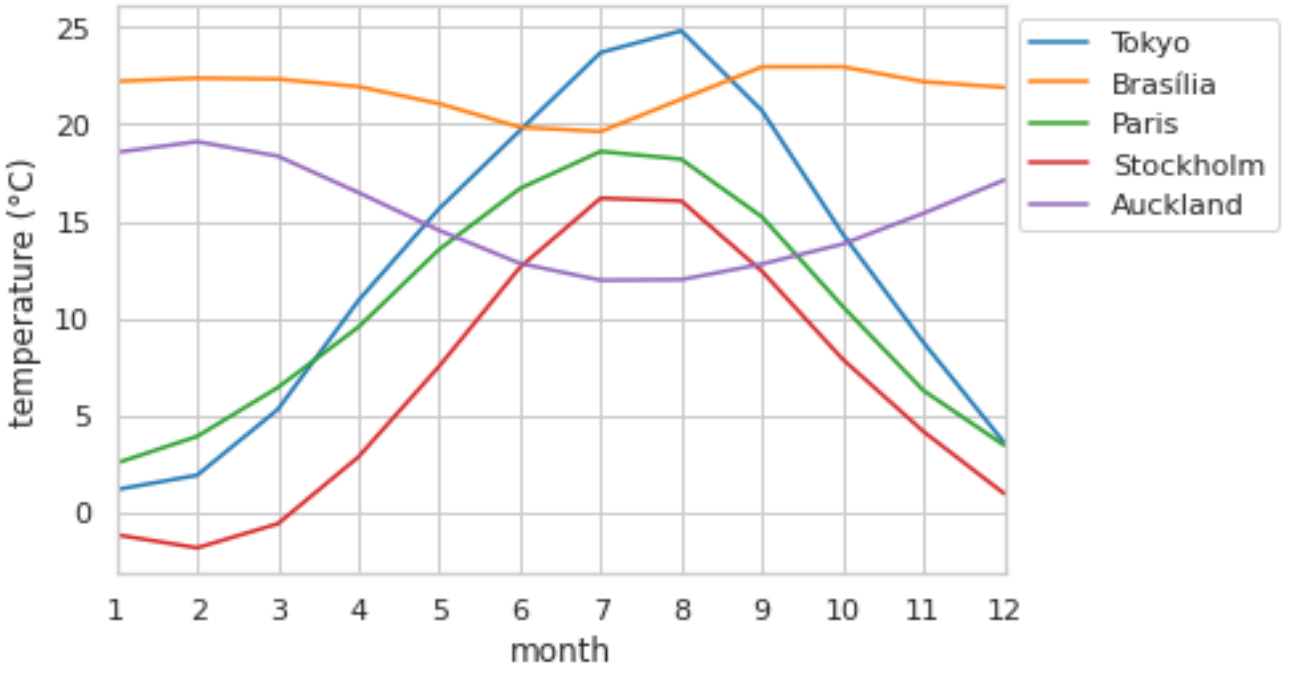

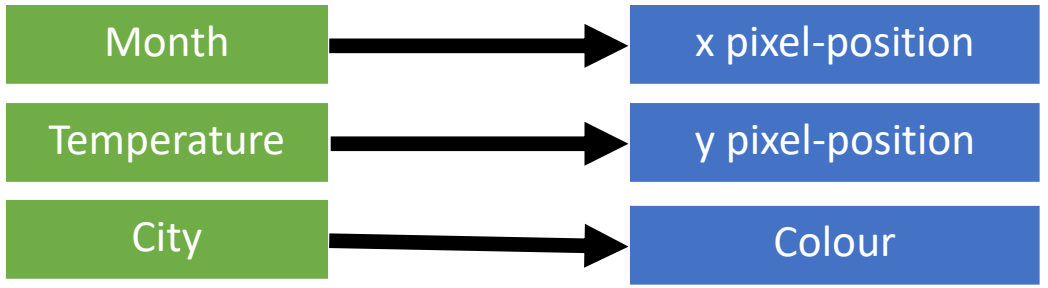

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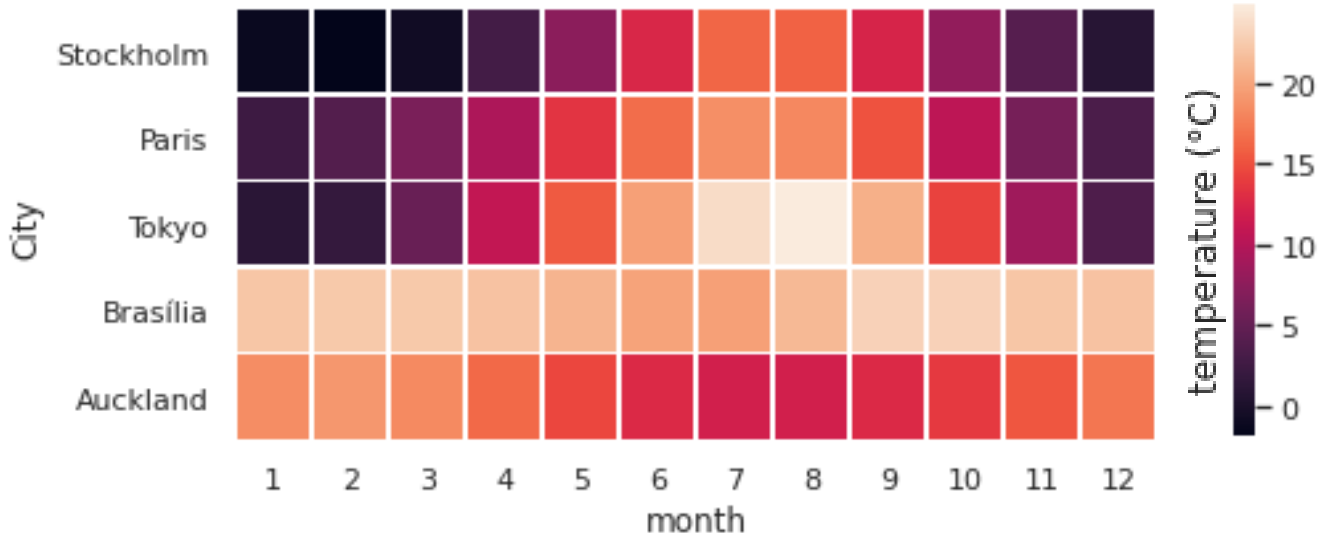

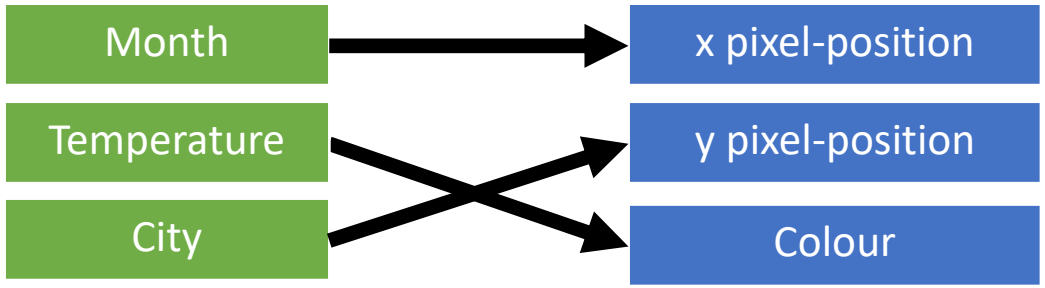

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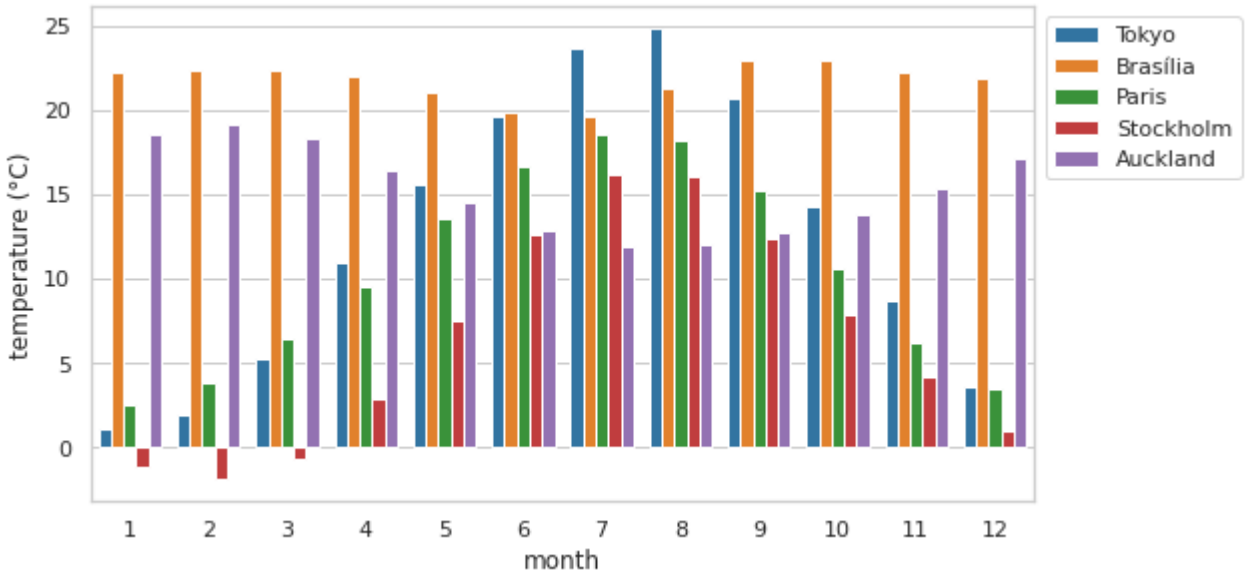

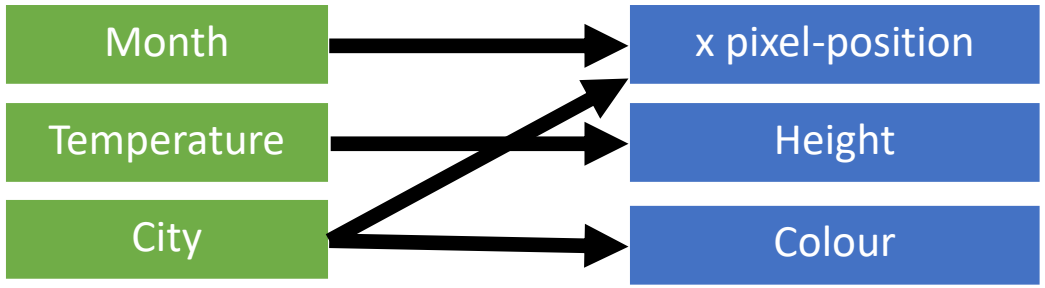

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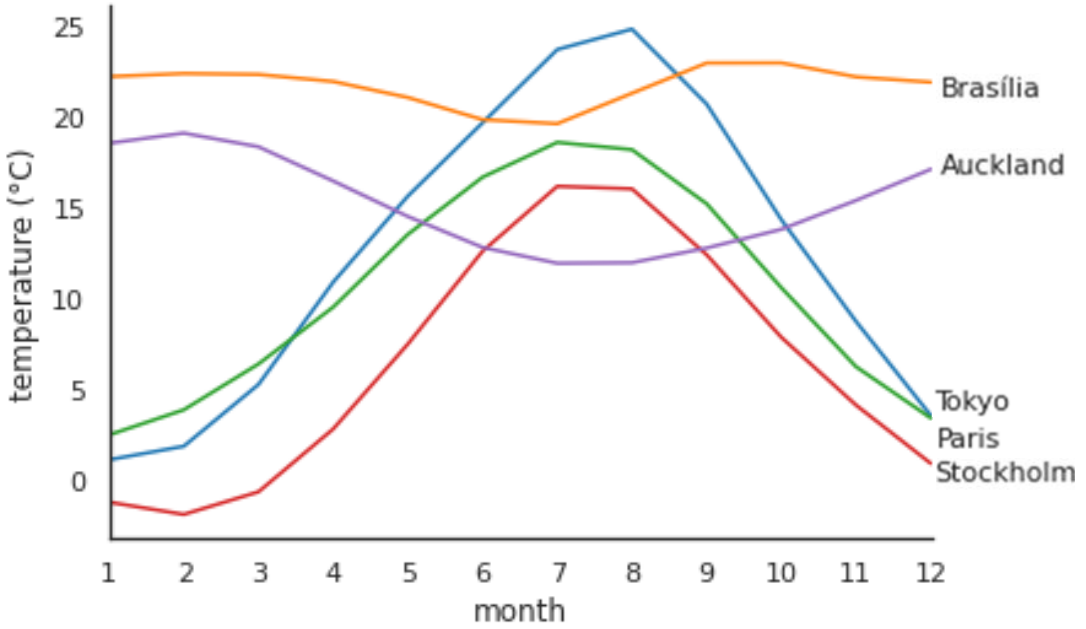
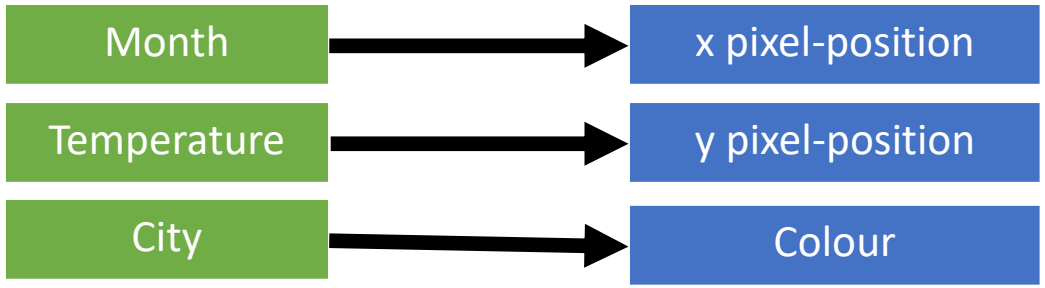
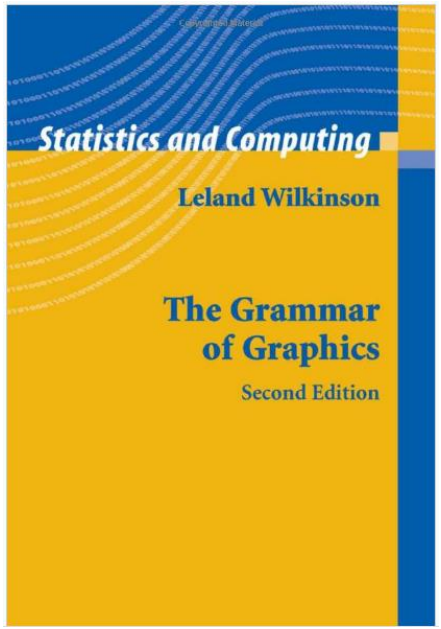
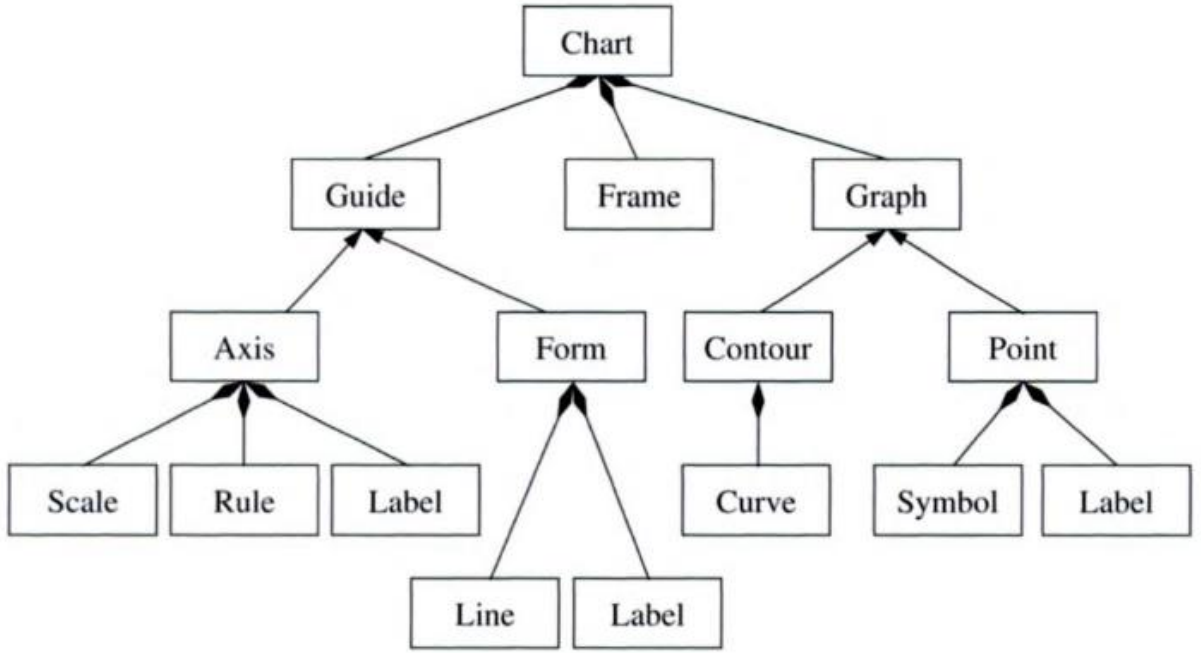




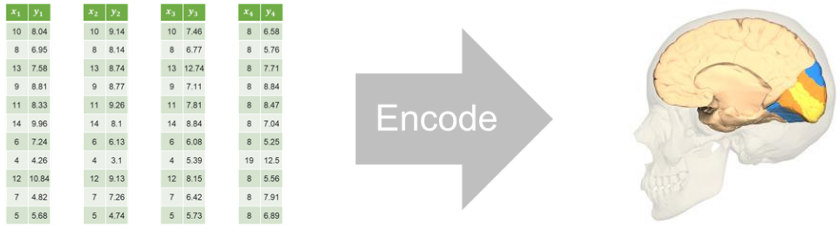
Grammar of Graphics



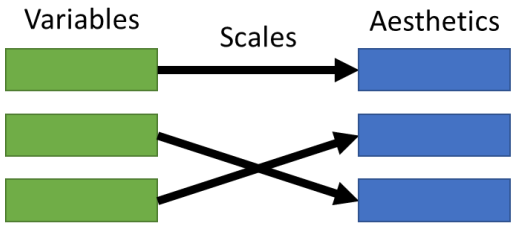


Summary - What is Data Visualisation?

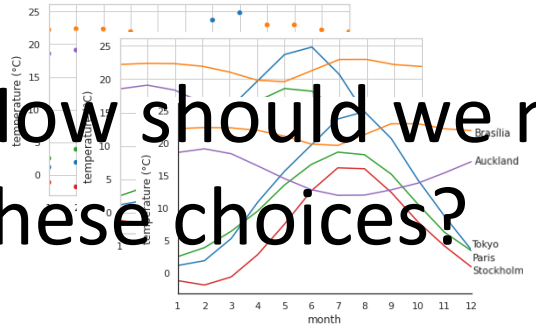
- Translate data for our visual brain.
  - Fast, intuitive processing



- Mapping variables to aesthetics.



- We can choose:
  - Which type of chart?
  - Which mapping?
  - Grid, legend, decoration?
  - …



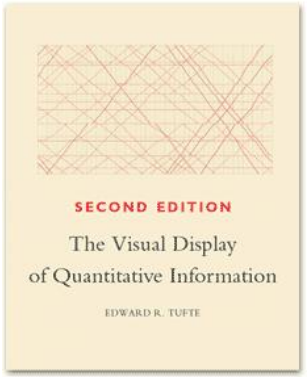
How should we make these choices?

What can Visualization Achieve?

Exploration:

- What is going on in a dataset?
- We do not know what we are looking for.
- Look at the data in different ways.
- Discover patterns.

Nathan Yau (2013)

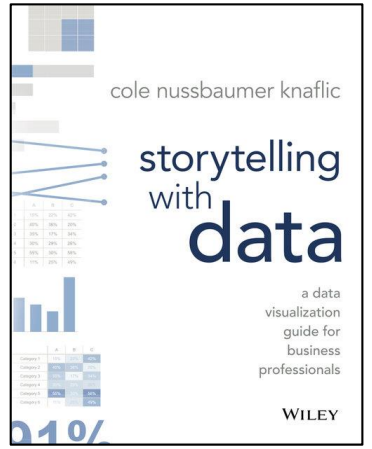


Edward Tufte (2001)

Explanation:

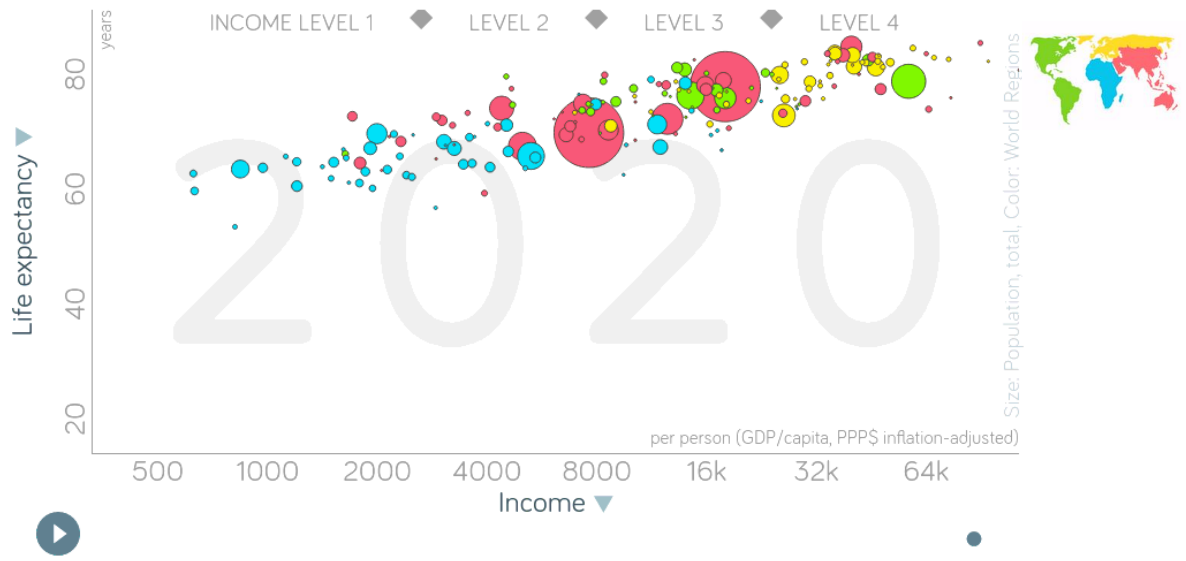
- We have a particular insight or message.
- Visualization is a communication tool.

- Highlight what is important.
- Remove irrelevant clutter.
- Show relevant context.
- Make it easily digestible.



Nussbaumer Knaflic (2015)

Hans Rosling



Income	x pixel-position
Live expect.	y pixel-position
Population	Size
Region	Colour
Time	Time