Data visualisations for clinical and patients use

The Kleefstra Sydrome Scientific Conference 2023

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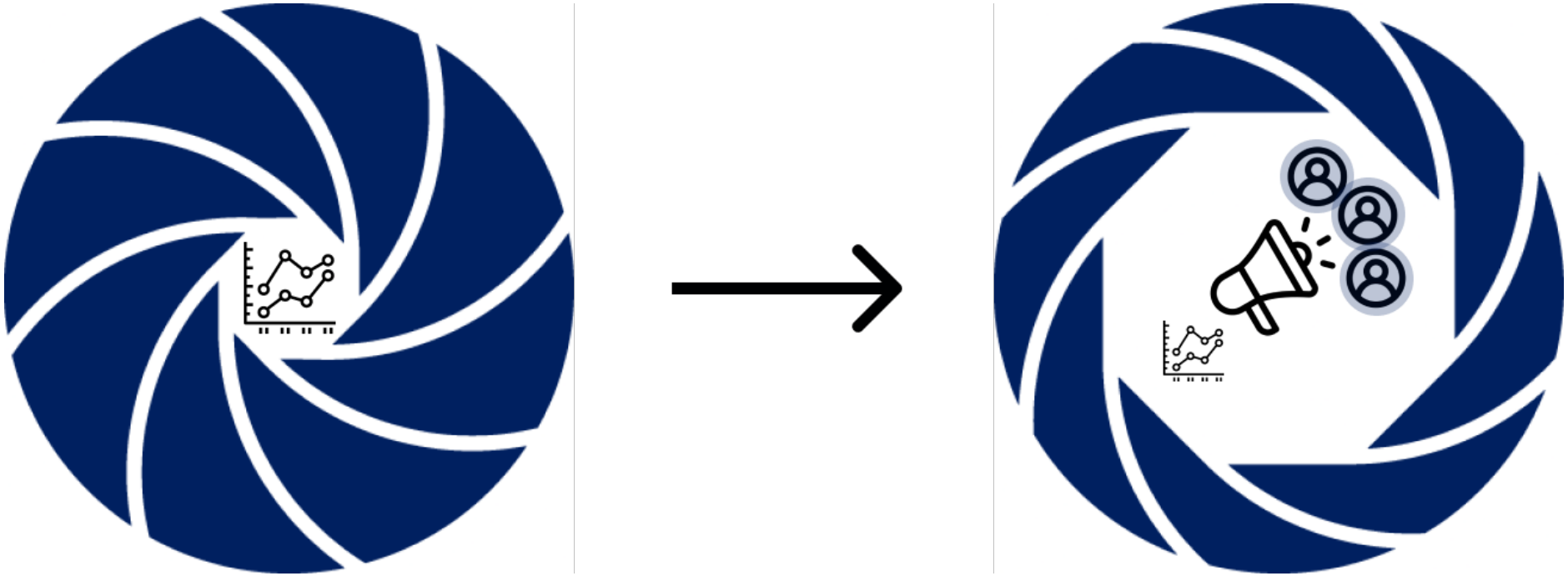
June 1st, 2023

Jožef Stefan Institute

UPPSALA UNIVERSITET

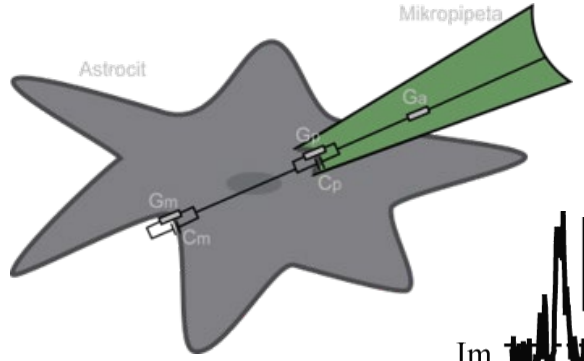
Department for Artificial Intelligence

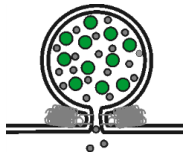
Shifting the focus

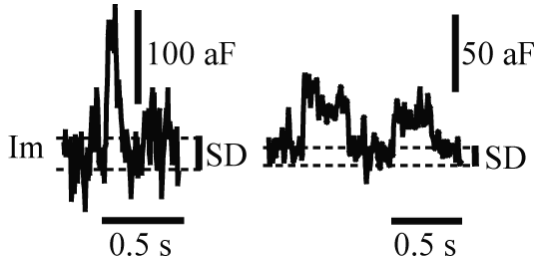


Icons by pch.vector, skyclick, uniconlabs

Alenka Guček





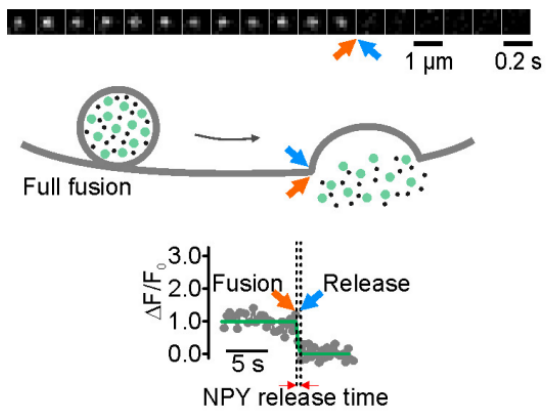


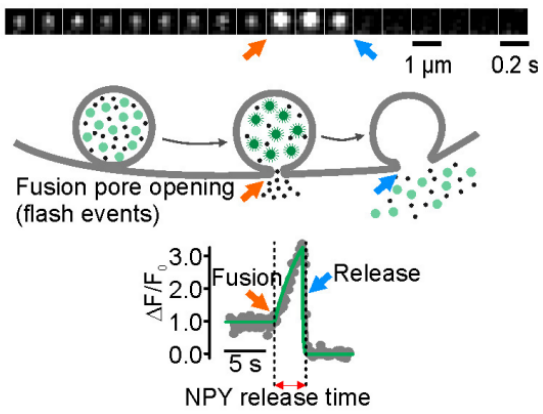
Biochemistry,
UL, Slovenia

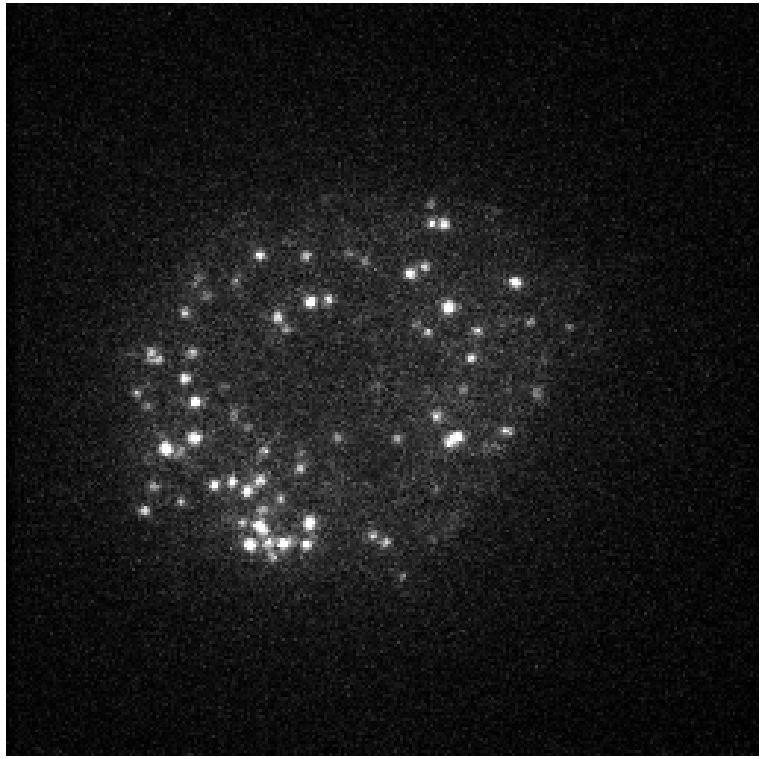
PhD in neuroscience & cell biology,
UL, Slovenia

Postdoc in diabetes & mol cell biology,
Uppsala University, Sweden

Data visualization & researcher,
AI lab, JSI, Slovenia







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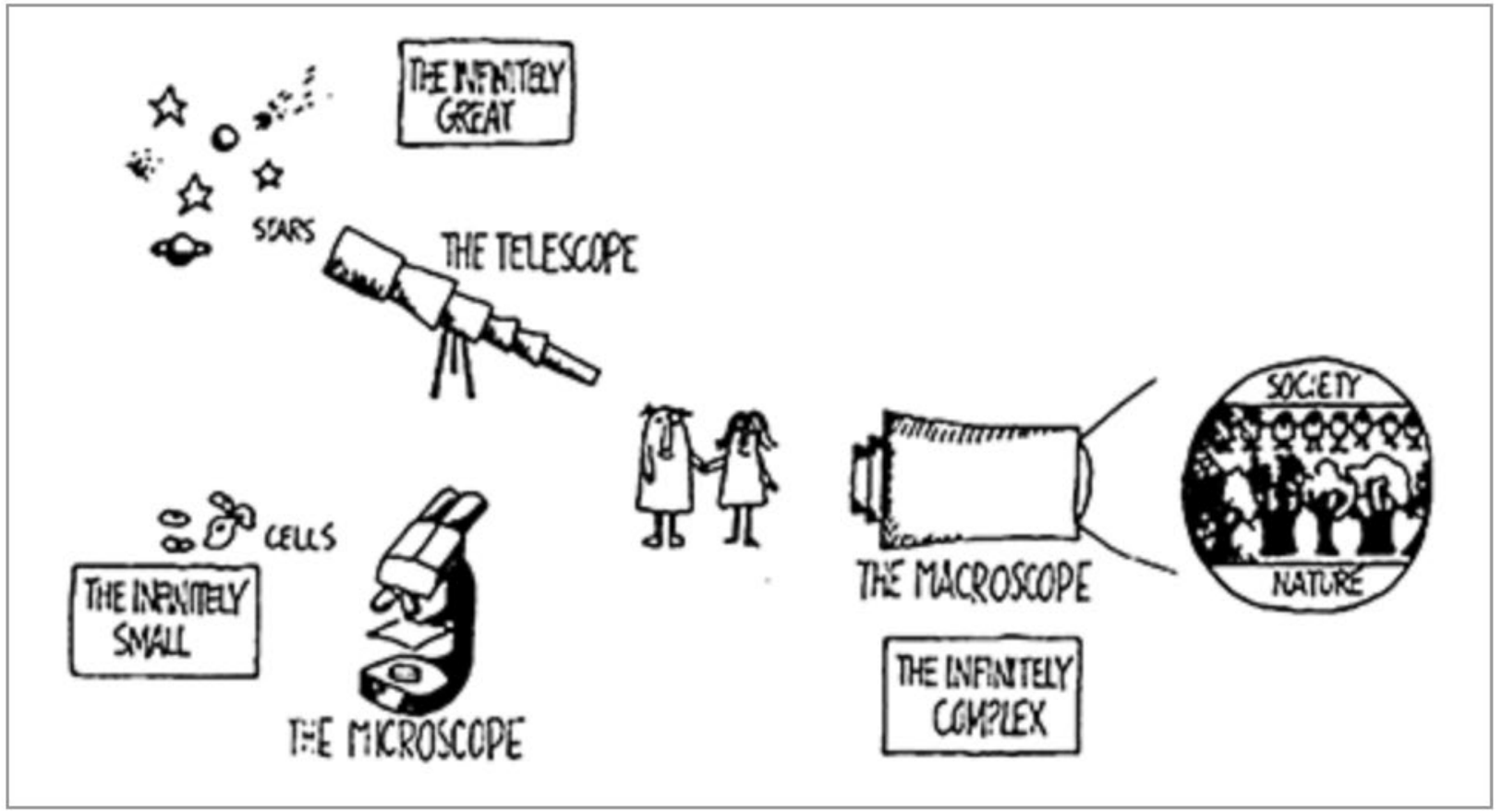
data visualization today: to provide us with **new kinds of "glasses"** to see the world.

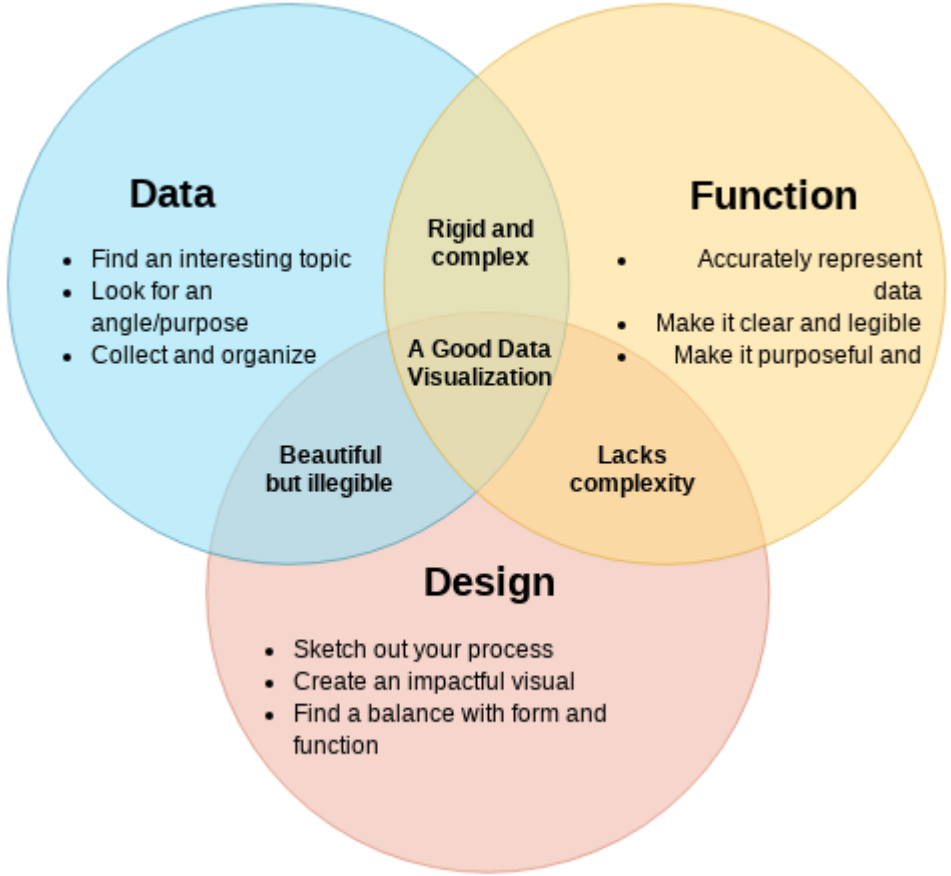


Joel de Rosnay described a fascinating, futuristic device in 1979: the **macroscope**. Just

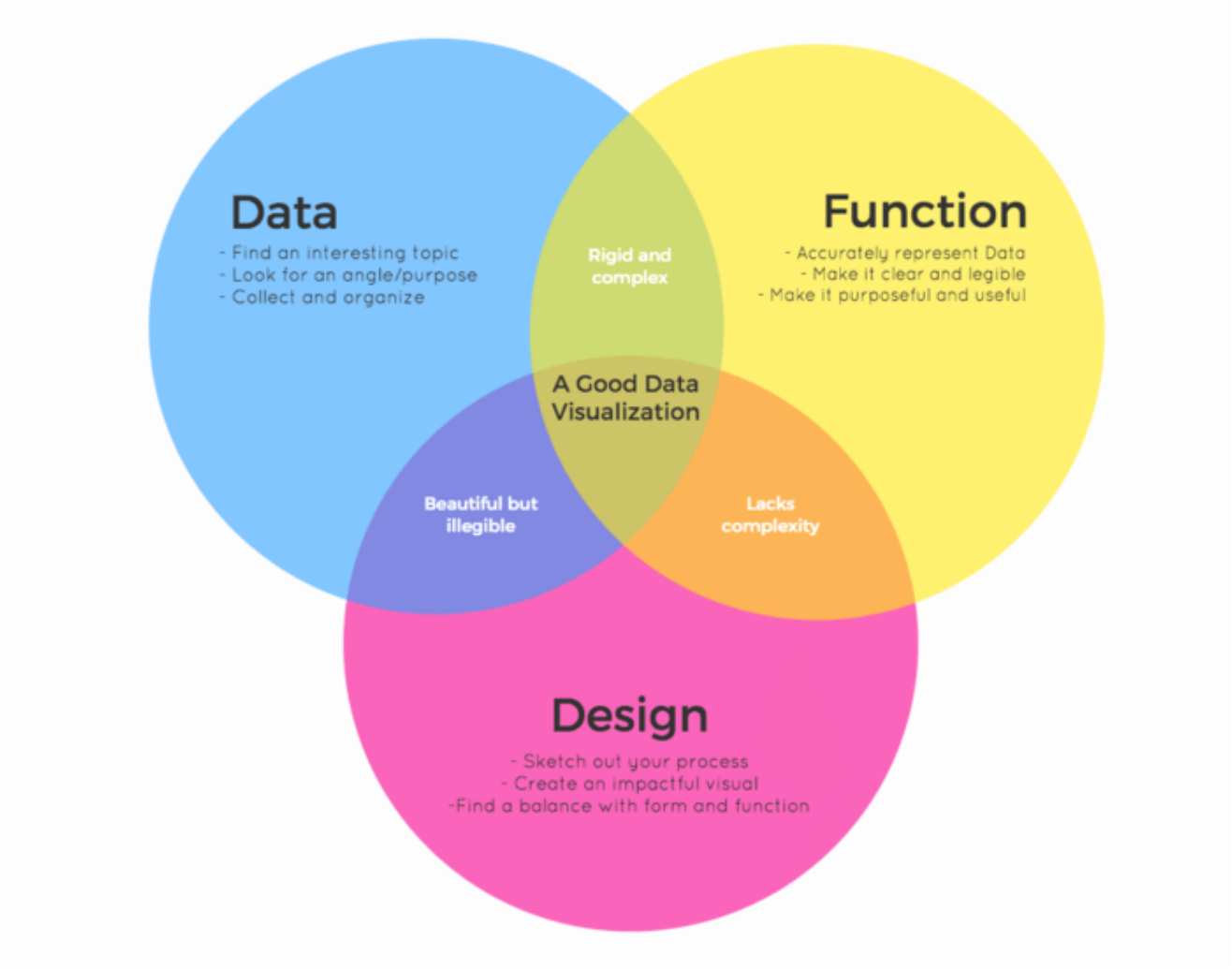
Moritz Stefaner blog http://well-formed-data.net/archives/1027/worlds-not-stories

Data visualization

The science of visual representation of data

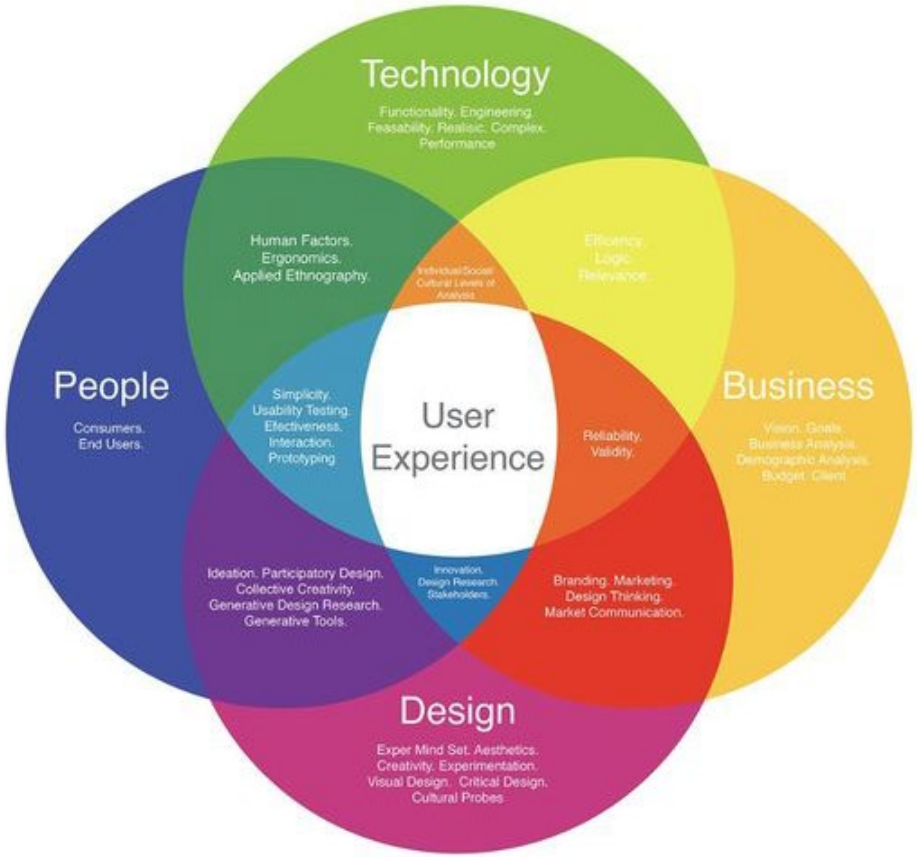


Data visualization



https://venngage.com/blog/how-to-choose-the-best-charts-for-your-infographic/

Human centered design

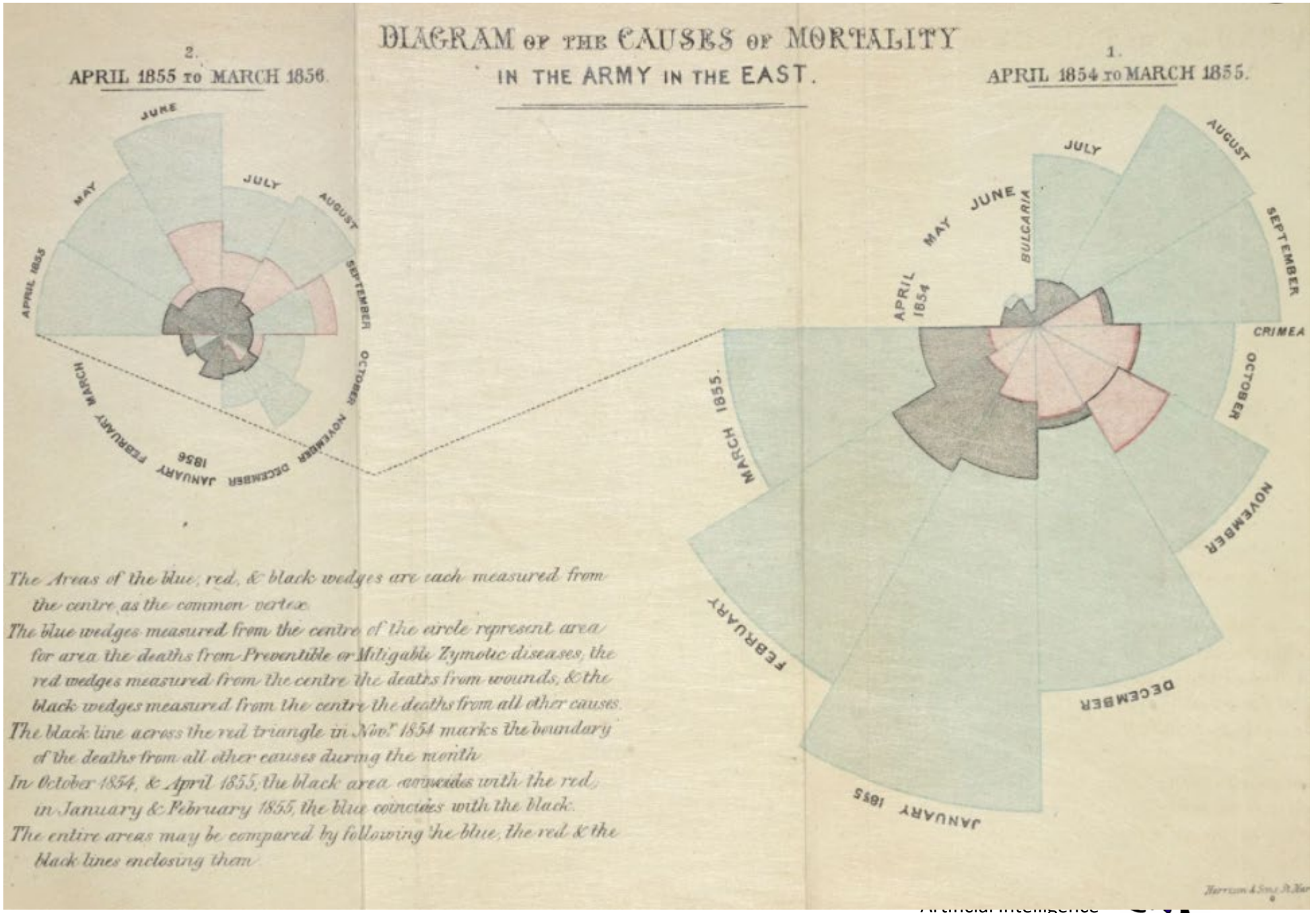


Asking the “right” questions

- What is the ultimate goal? => **info that needs to go through; action; decision to be made**
- Who do we want to communicate it to? => **AUDIENCE**
- How do we want to communicate the message? => **chart type**

You are the content expert and are responsible for all the design decisions!

Florence Nightingale



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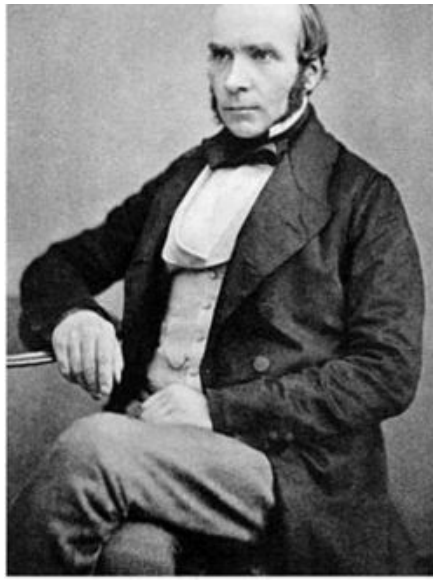
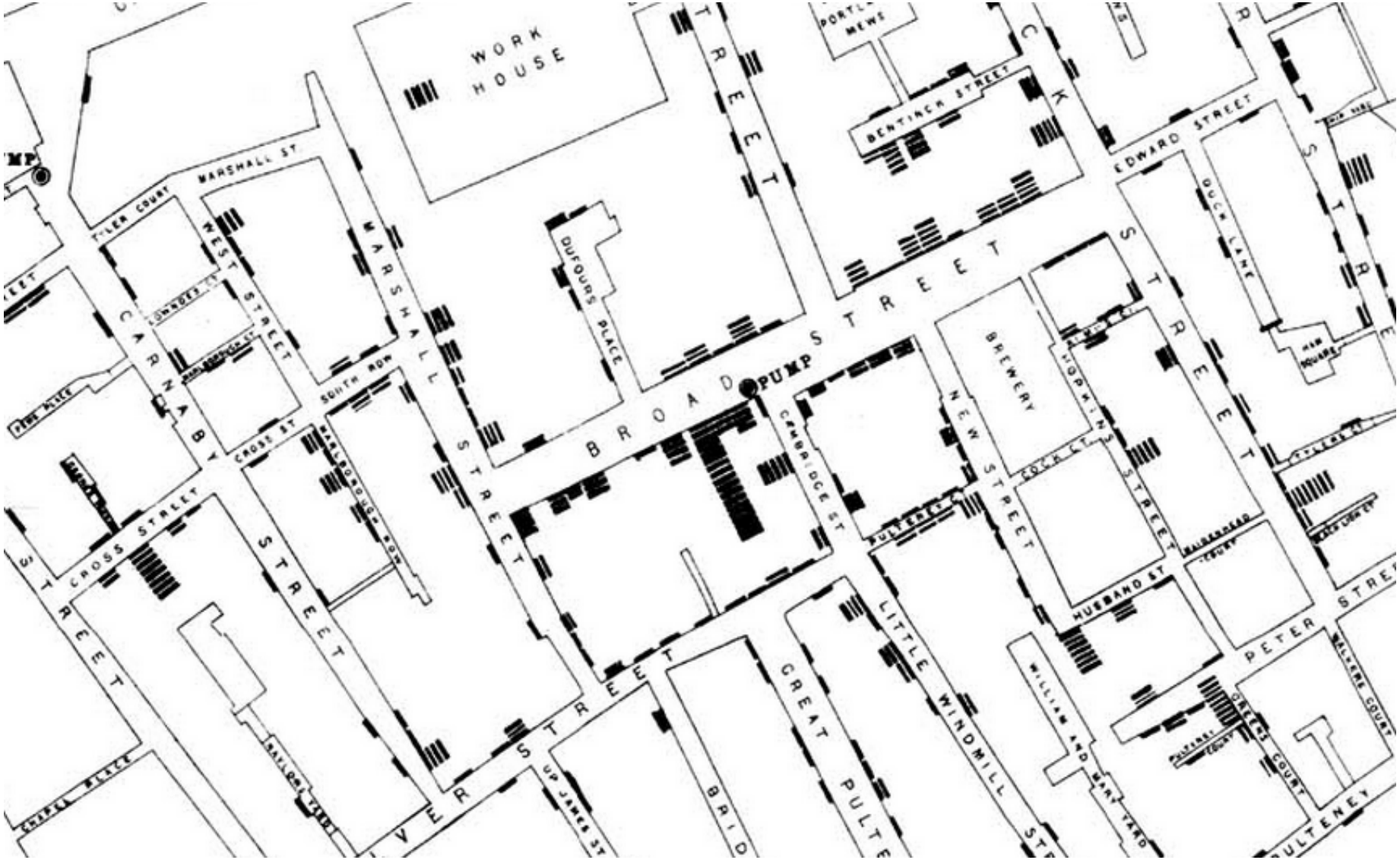
Artificial Intelligence

John Snow





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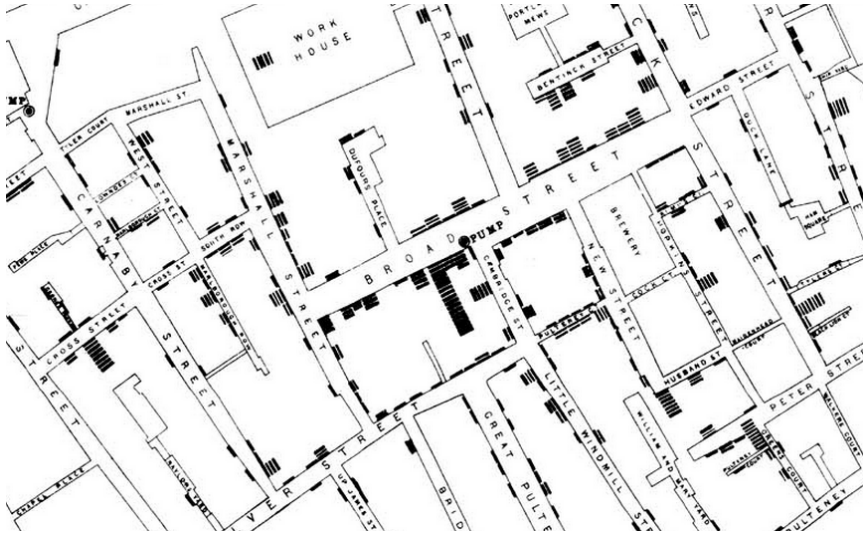
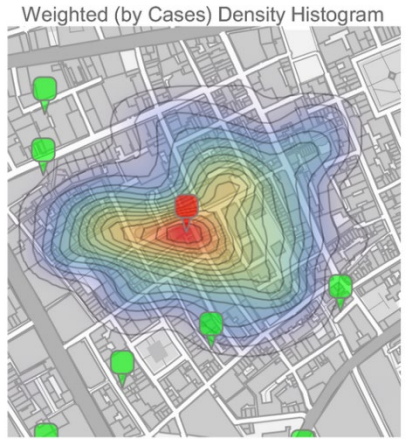
Artificial Intelligence

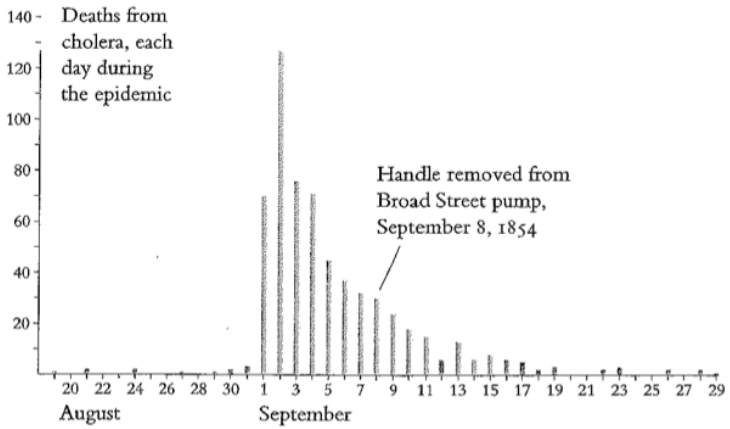
Choosing the “right” visualization to present data

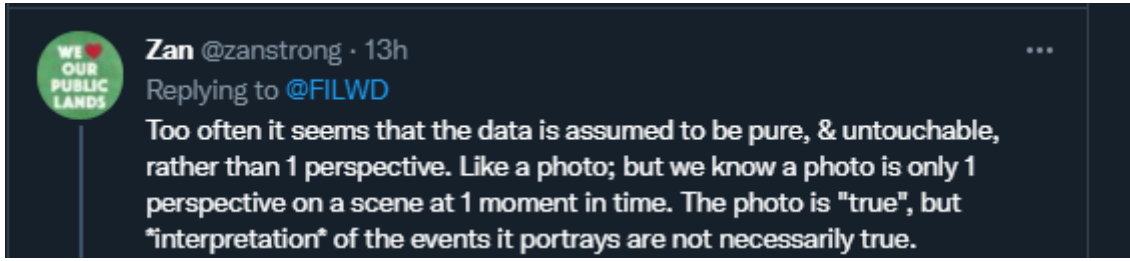


https://blog.wolfram.com/2021/08/03/john-snow-the-birth-of-epidemiology-data-analysis-visualization/



Edward Tufte *Visual and Statistical Thinking*





Fast forward

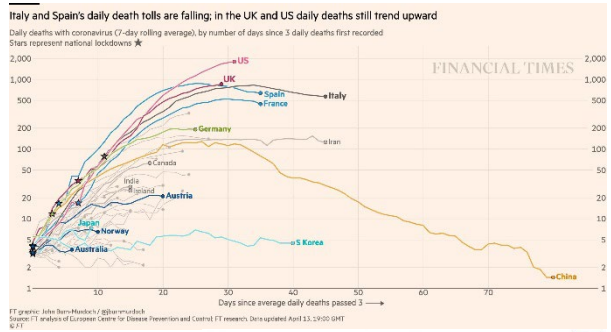
- Context of reserach papers: pdfs with static figures
- Databases on patient reported outcomes

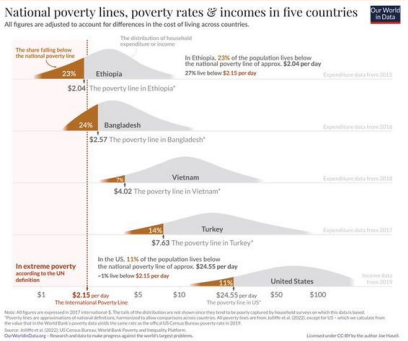
RARE DISEASES OBSERVATORY

Our World in Data

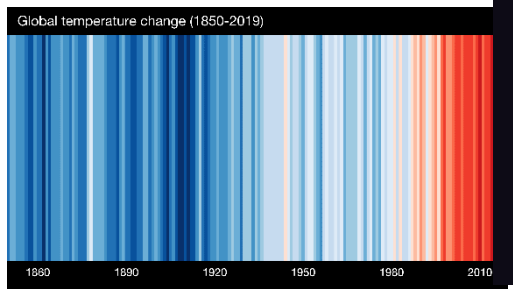
Exploratory
Discovery
Priority: finding new insights

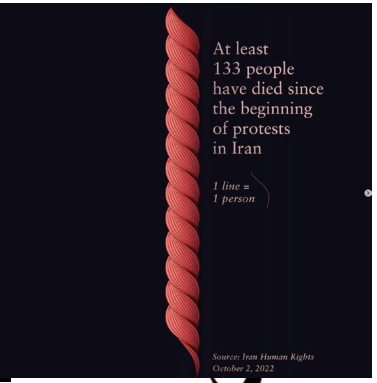
Explanatory
Communication
Priority: efficiency + effectiveness





Affective
Emotion
Priority: creativity + novetly





Ed Hawkings, Federica Fragapane

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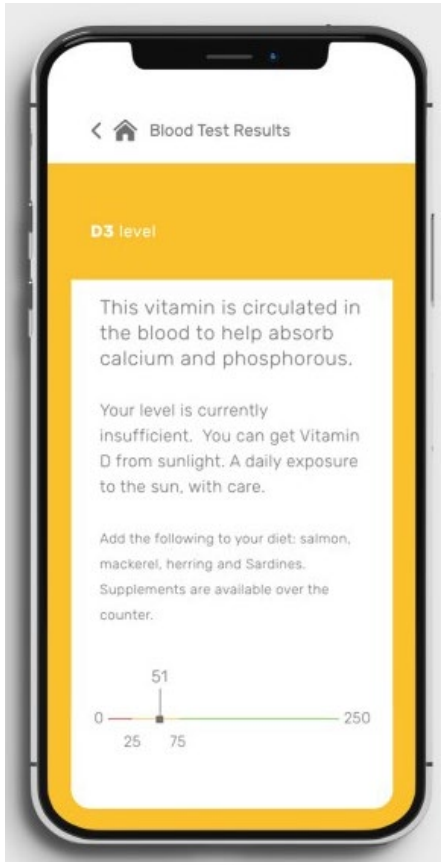
Modified from Cédric Scherer & Alberto Cairo

Patient-oriented approach

FULL REPORT

BIOCHEMISTRY			Reference Range	HAEMATOLOGY			Reference Range
SODIUM	142	mmol/L	(139 - 153)	RBC	6.3	x10^12/L	(4.9 - 8.2)
POTASSIUM	4.9	mmol/L	(3.9 - 5.9)	HAEMOGLOBIN	148	g/L	(100 - 206)
CHLORIDE	109	mmol/L	(101 - 118)	HAEMATOCRIT	0.40	L/L	(0.35 - 0.58)
BICARBONATE	17	mmol/L	(12 - 26)	RETICULOCYTE %	1.0	%	(0.0 - 1.5)
NA:K RATIO	29.0		(26.0 - 35.0)	RETICULOCYTE ABS	63	x10^9/L	(10 - 110)
ANION GAP	20.9	mmol/L	(14.0 - 32.0)	MCV	**63** L	fL	(64 - 76)
GLUCOSE, SERUM	**3.2** L	mmol/L	(3.3 - 6.8)	MCH	23	pg	(21 - 26)
UREA	9.1	mmol/L	(2.5 - 10.0)	MCHC	**370** H	g/L	(310 - 360)
CREATININE	0.08	mmol/L	(0.05 - 0.15)	PLATELET COUNT	460	x10^9/L	(200 - 500)
SDMA	14	ug/dL	(0 - 14)	WBC	12.5	x10^9/L	(4.5 - 17.0)
CALCIUM	2.6	mmol/L	(1.9 - 2.9)	NEUTROPHILS%	67	%	
PHOSPHATE	1.4	mmol/L	(0.8 - 2.1)	NEUTROPHILS	8.4	x10^9/L	(3.5 - 12.0)
CA:P RATIO	1.9		(1.2 - 3.0)	LYMPHOCYTES%	25	%	
PROTEIN, TOTAL	68	g/L	(52 - 80)	LYMPHOCYTES	3.1	x10^9/L	(0.9 - 3.5)
ALBUMIN	35	g/L	(23 - 40)	MONOCYTES%	5	%	
GLOBULIN	33	g/L	(25 - 45)	MONOCYTES	0.6	x10^9/L	(0.0 - 1.1)
A:G RATIO	1.1		(0.6 - 1.4)	EOSINOPHILS%	3	%	
BILIRUBIN, TOTAL	0	umol/L	(0 - 7)	EOSINOPHILS	0.4	x10^9/L	(0.0 - 1.4)
ALP	112	IU/L	(1 - 150)	BASOPHILS%	0	%	
ALP STEROID ISOENZYME	31	IU/L		BASOPHILS	0.0	x10^9/L	(0.0 - 0.1)
AST	48	IU/L	(18 - 80)	BLOOD SMEAR EXAMINATION	Automated CBC.		
ALT	**93** H	IU/L	(16 - 90)				
CK	214	IU/L	(73 - 510)				
CHOLESTEROL	6.4	mmol/L	(3.5 - 9.0)				
AMYLASE	751	IU/L	(333 - 1500)				
LIPASE	494	IU/L	(77 - 750)				
GAMMA GT	6	IU/L	(0 - 9)				
SAMPLE APPEARANCE	Mild haemolysis Moderate lipaemia						



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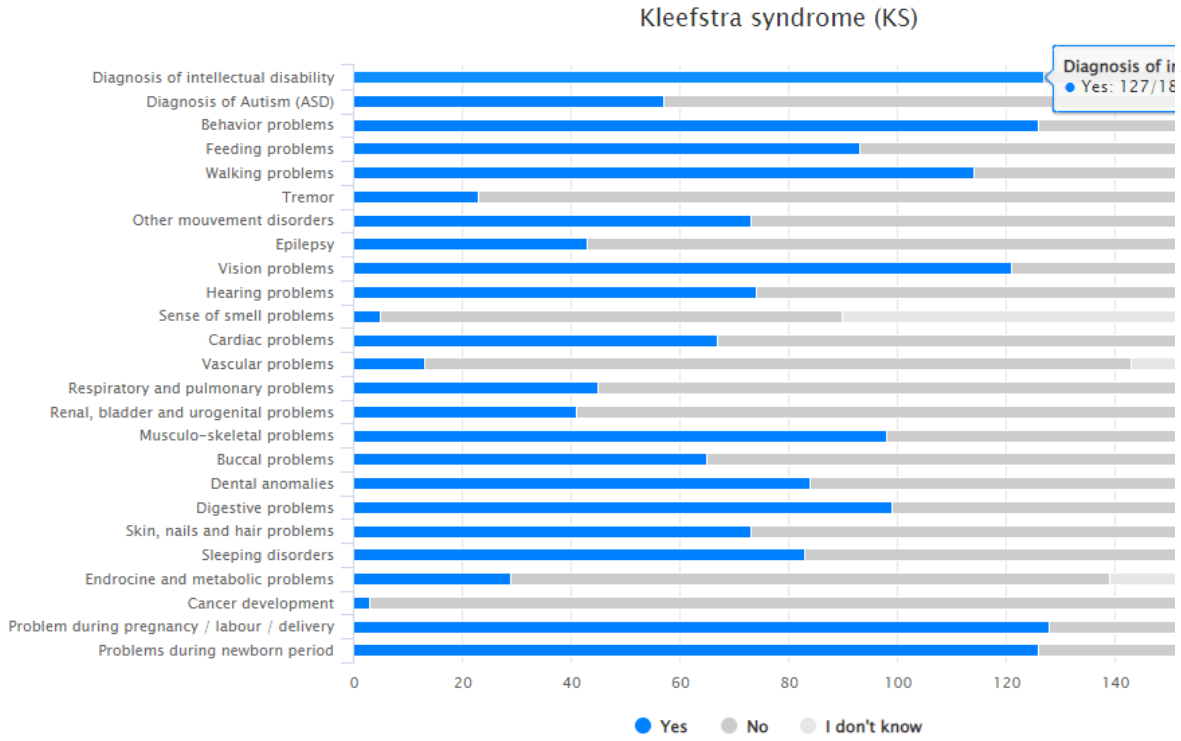
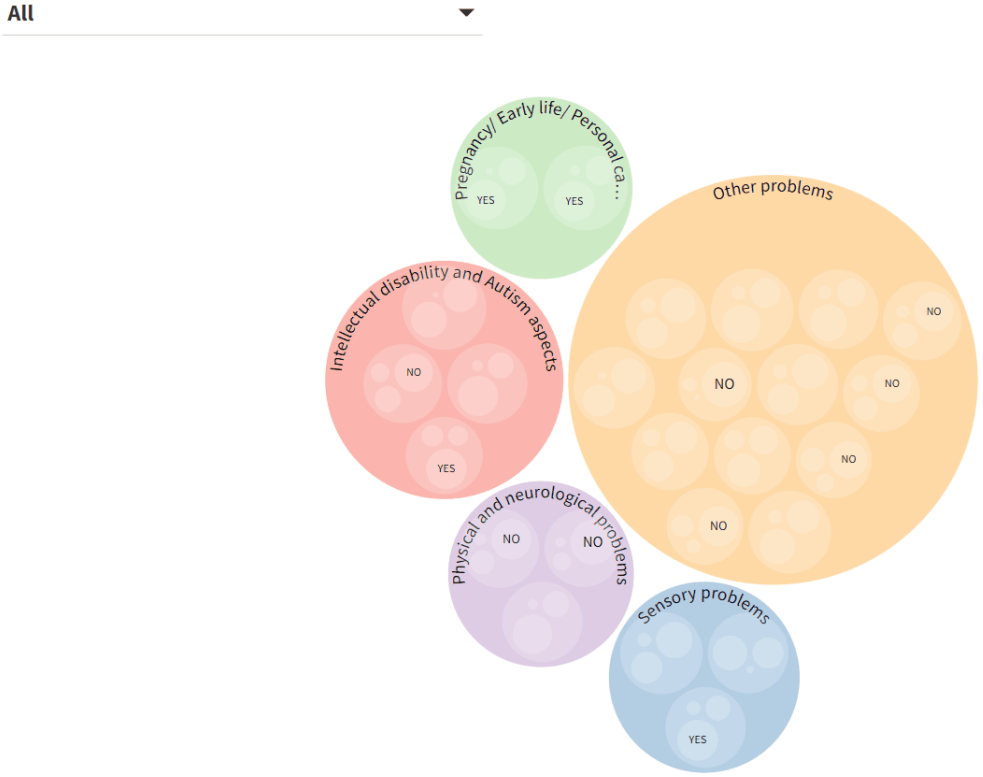
Or Misgav, Nightingale, 2022. https://nightingaledvs.com/can-we-understand-blood-test-results-without-numbers-ask-participant-23/

GenIDA exploration



Kleefstra sydrome patient reported outcomes

Source: GENIDA database



https://genida.unistra.fr/

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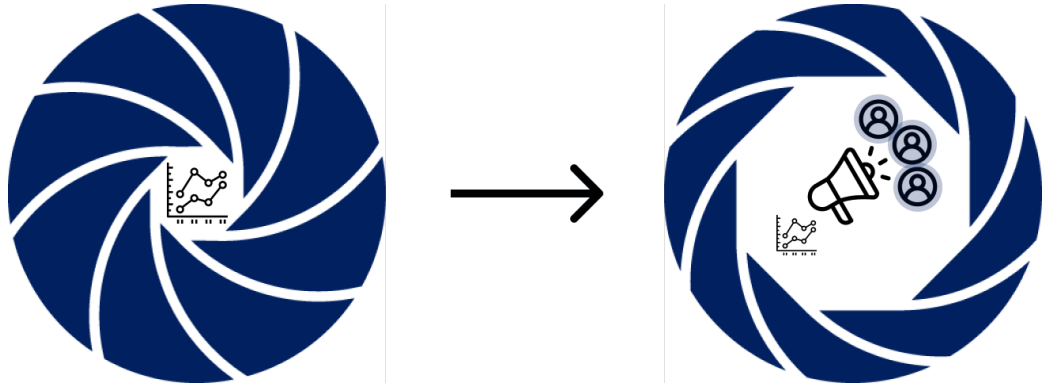
GENIDA

https://public.flourish.studio/visualisation/12906970/

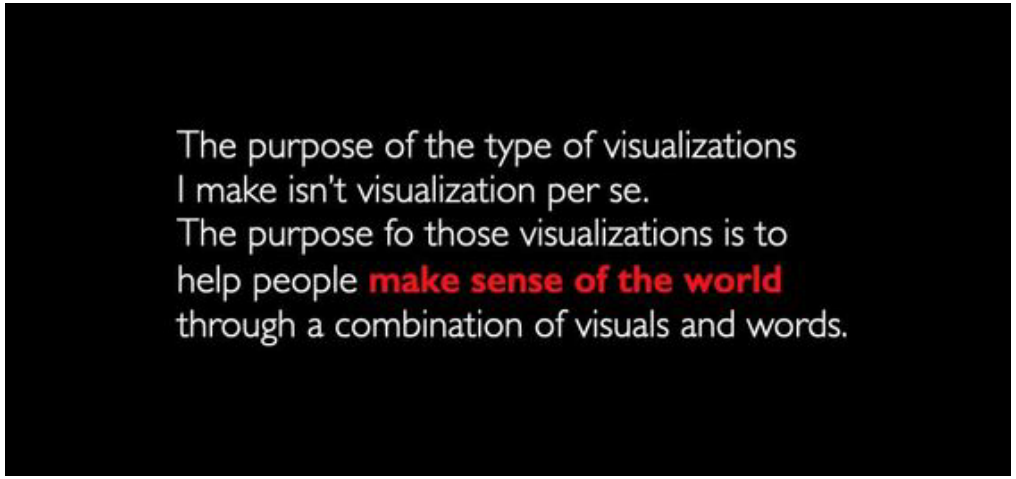
- ▶ Pregnancy/ Early life/ Personal care
- ▶ Intellectual disability and Autism aspects
- ▶ Physical and neurological problems
- ▶ Sensory problems
- ▶ Other problems

Take away



Shifting the focus from data => audience

- What is the ultimate goal of visualization?
- Who is the audience? What do they care about?



Alberto Cairo

Thank you!

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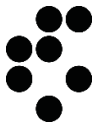


from Data to Viz

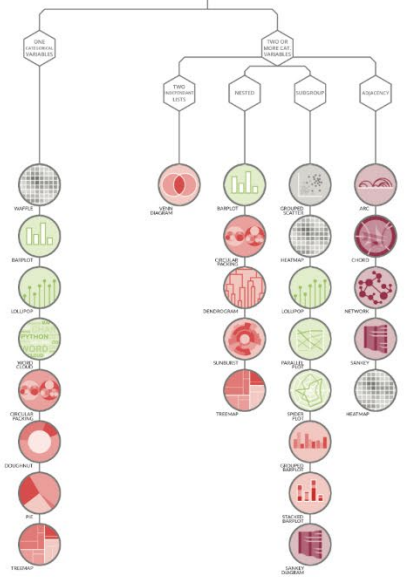
'From Data to Viz' is a classification of chart types based on input data format. It will help you find the perfect chart in three simple steps :

1. Identify what type of data you have.
2. Go to the corresponding decision tree and follow it down to a set of possible charts.
3. Choose the chart from the set that will suit your data and your needs best.

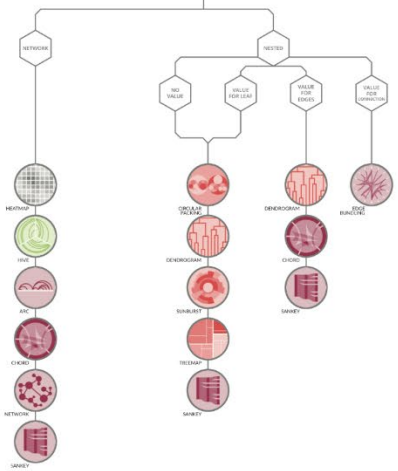
Dataviz is a world with endless possibilities and this project does not claim to be exhaustive. However it should provide you with a good starting point. For an interactive version and much more, visit:

data-to-viz.com

CATEGORIC

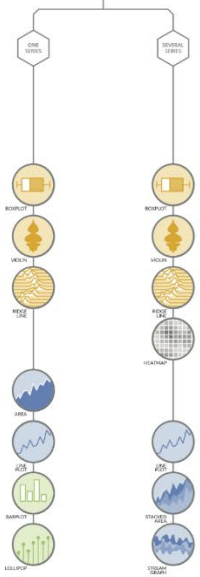


RELATIONAL



MAP

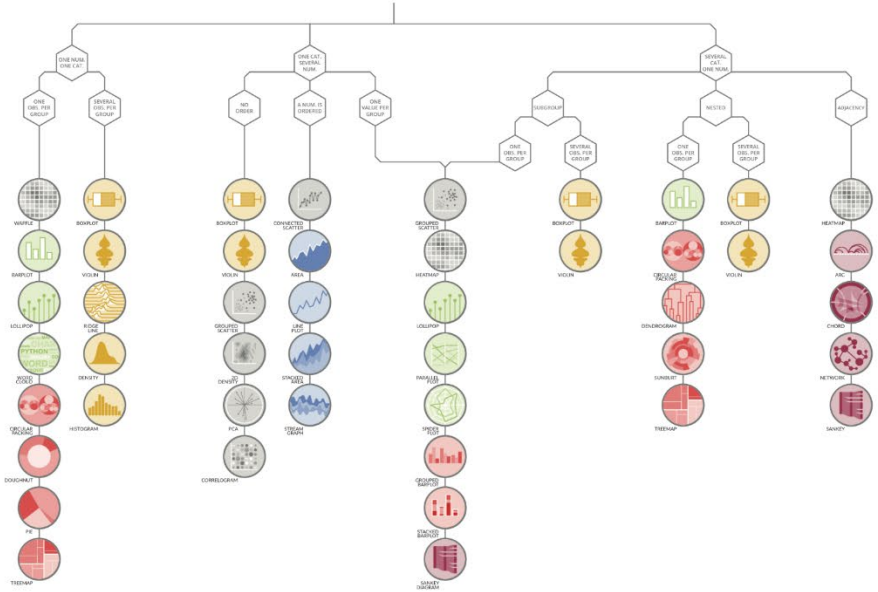
TIME SERIES



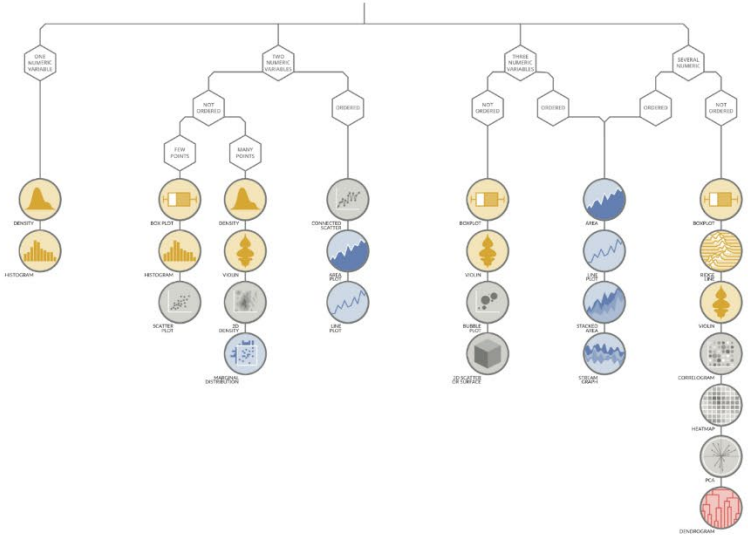
WHAT DO YOU WANT TO SHOW ?

- Distribution
- Correlation
- Ranking
- Part of a whole
- Evolution
- Maps
- Flow

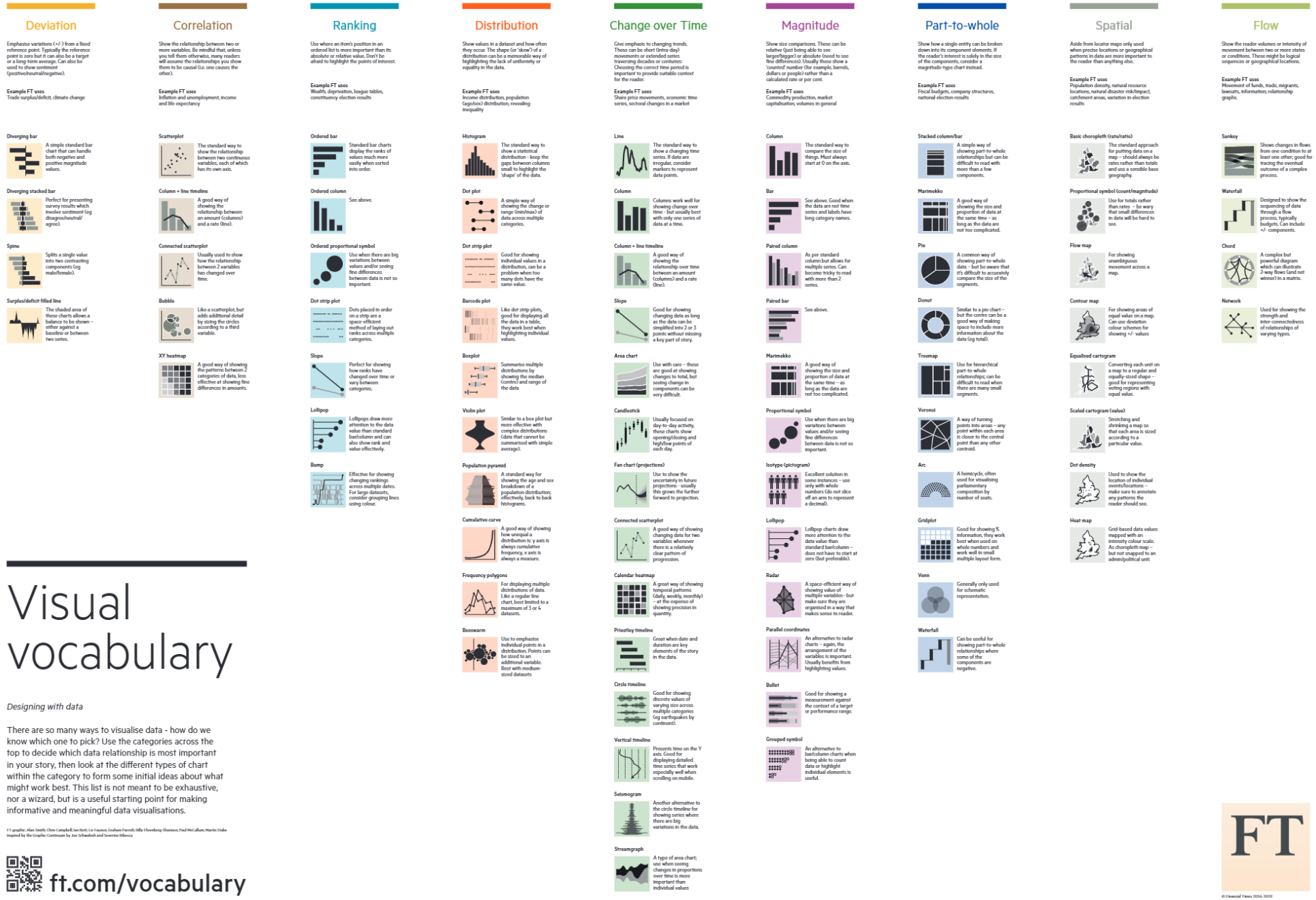
CATEGORIC AND NUMERIC



NUMERIC



- https://github.com/Financial-Times/chart-doctor/blob/main/visual-vocabulary/Visual-vocabulary.pdf




Search by Function
View by List
Arc Diagram
Area Graph
Bar Chart
Box & Whisker Plot
Brainstorm
Bubble Chart
Bubble Map
Bullet Graph
Calendar
Candlestick Chart
Chord Diagram
Choropleth Map
Circle Packing
Connection Map
Density Plot
Donut Chart
Dot Map
Dot Matrix Chart
Error Bars
Flow Chart
Flow Map
Gantt Chart
Heatmap
Histogram
Illustration Diagram
Kagi Chart
Line Graph
Marimekko Chart
Multi-set Bar Chart
Network Diagram