

Lesson 1: Introduction to Visual Analytics and Applications

11 January 2020

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What will you learn from this lesson?

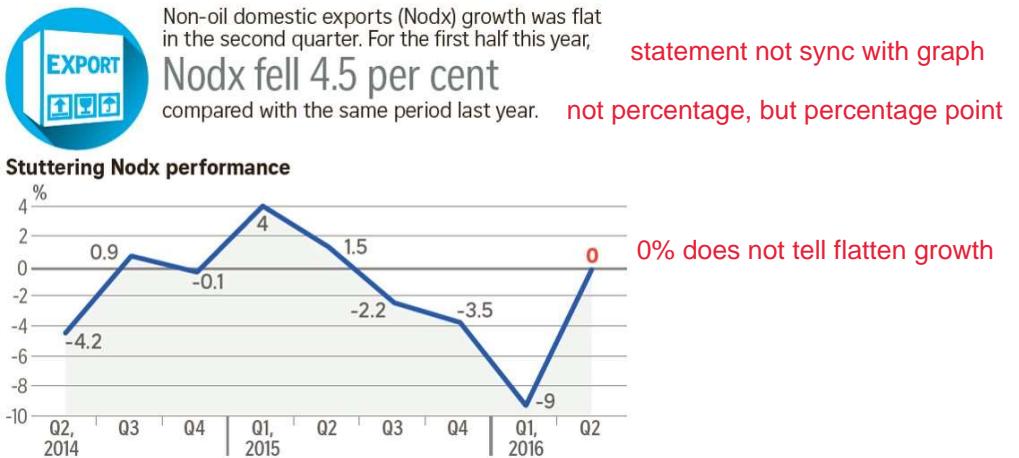
- Motivation of Visual Analytics
- What is Visual Analytics
- Learning from the history of visual analytics
- Visual analytics tools

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Motivation of Visual Analytics

The World is full of charts that lie!

world is full of first crime of data visualization



people believe that as long we put a graph/statement, people will accept it
nobody interpret the data

We need to get smarter about visual information

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1. Not just empty graph, but with a statement - what is the takeaway
2. Either you read this, or seduced by this

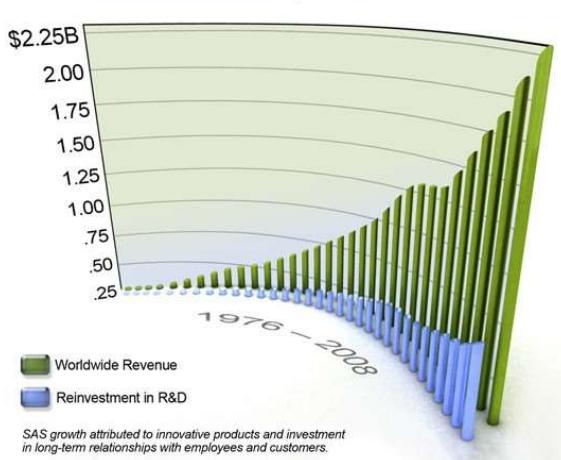
Motivation of Visual Analytics

Junk charts are good for advertising but not for understanding.

fancy graph

Graph trying to show that they commit 20%
of revenue to R&D

not functional



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Motivation of Visual Analytics

Data rich, information poor



Source: <http://omnitele-com.s3.amazonaws.com/2015/04/big-data-ocean-crop.jpeg>

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Motivation of Visual Analytics

The World is buried in data.

Just SHOW me the number

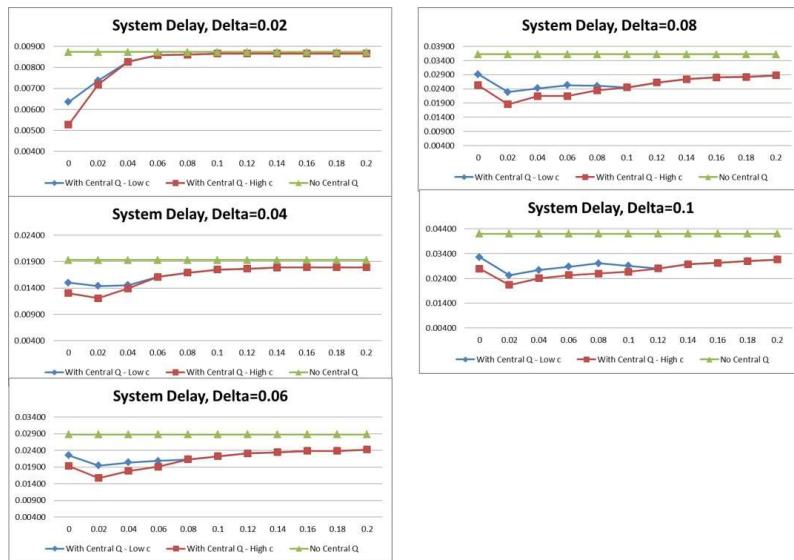
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Motivation of Visual Analytics

Spreadsheet: A great hammer but lousy screwdriver

Made in excel, makeover in the next slide

different y-axis for each graph

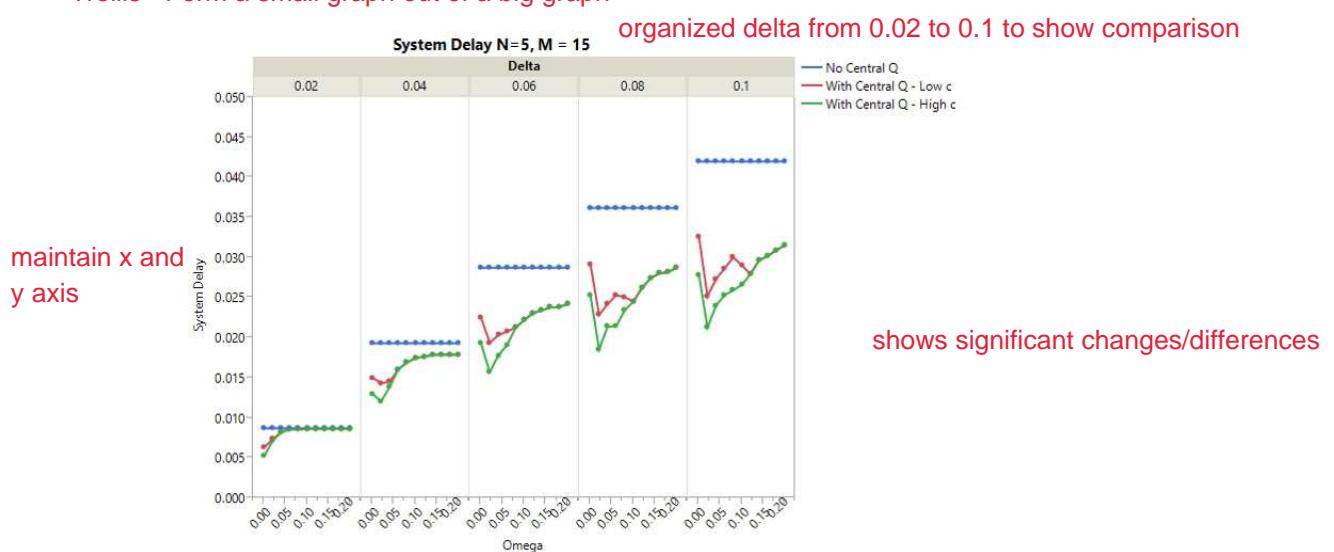


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Motivation of Visual Analytics

Visual analytics come to the rescue

Trellis - Form a small graph out of a big graph



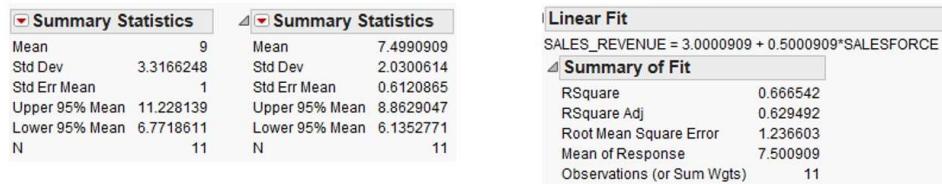
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Motivation of Visual Analytics

When statistics failed!

4 different companies, the relationship between salesforce and sales revenue

SALESFORCE A	SALES_REVENUE A	SALESFORCE B	SALES_REVENUE B	SALESFORCE C	SALES_REVENUE C	SALESFORCE D	SALES_REVENUE D
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	9.11	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



? what is this trying to say? see slide 11

over reliant on statistics

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Motivation of Visual Analytics

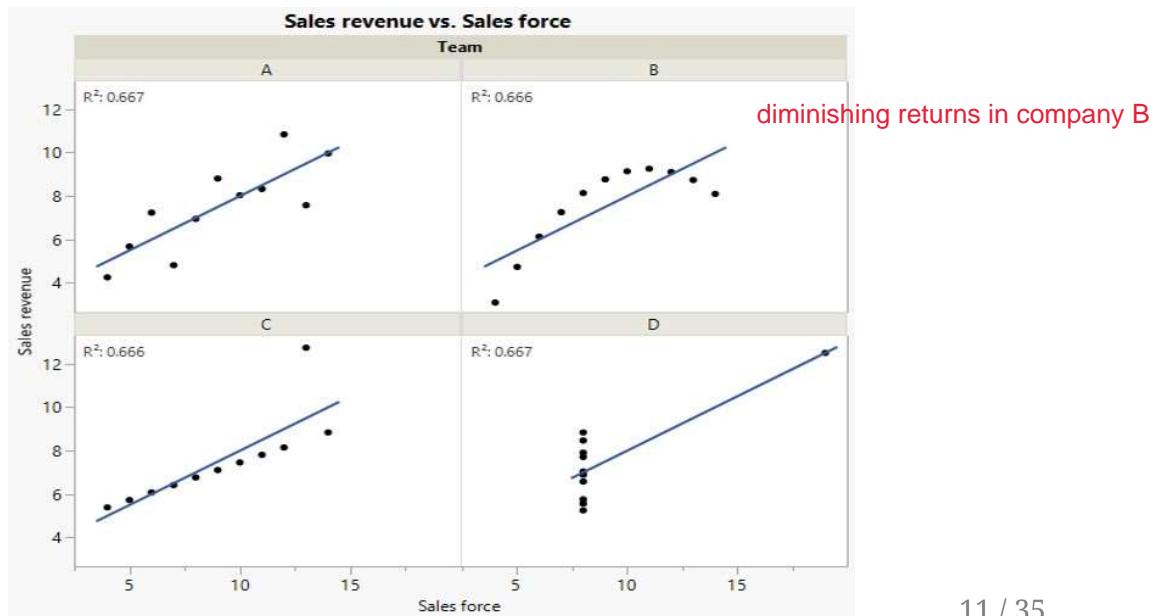
Data analysis without data visualisation is no data analysis



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Motivation of Visual Analytics

Analytical graphics reveal the truth

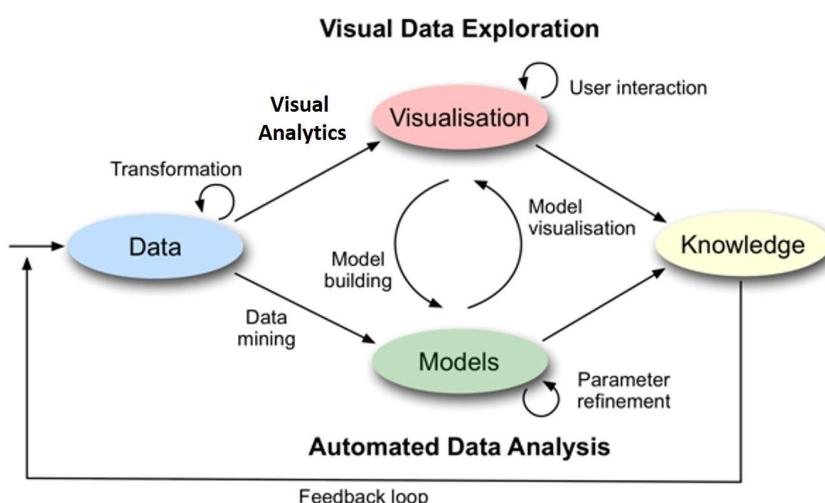


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insights clearly shown
tell 4 different stories

Motivation of Visual Analytics

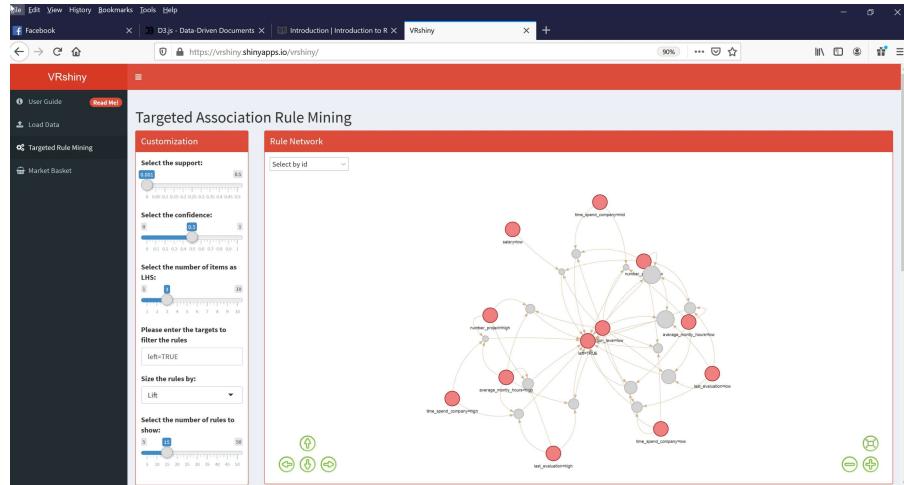
Is there a place for Visual Analytics in knowledge discovery?



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Motivation of Visual Analytics

Free and Open Source Analytics Web Apps



Visit the link at <https://vrshiny.shinyapps.io/vrshiny/>

build application that allow user to calibrate model

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Motivation of Visual Analytics

Open data need to be unlocked!



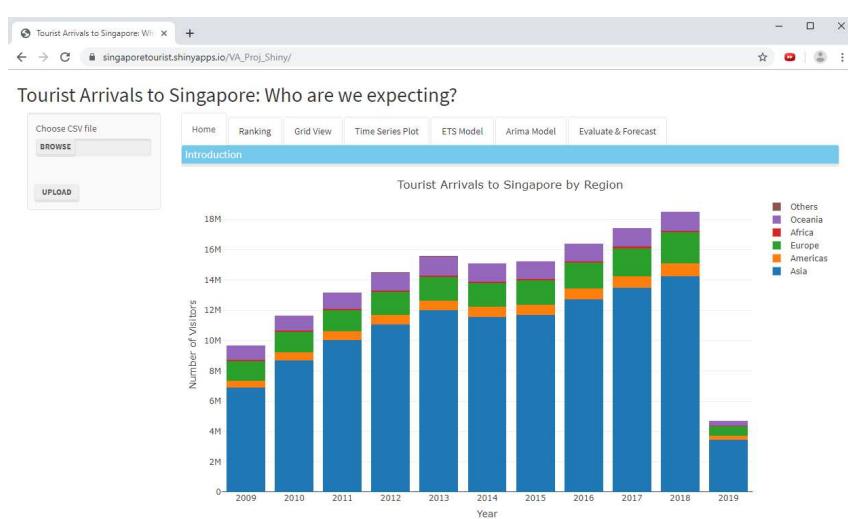
Visit the link at <https://data.gov.sg>

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Motivation of Visual Analytics

Democratising Data and Analytics with Visually-driven Web Apps

tableau public
or web app on rshiny



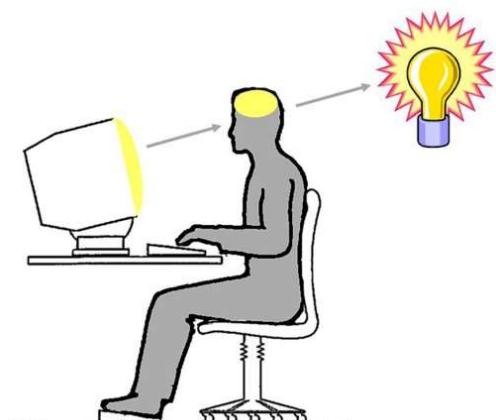
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https://singaporetourist.shinyapps.io/VA_Proj_Shiny/

What is Visual Analytics?

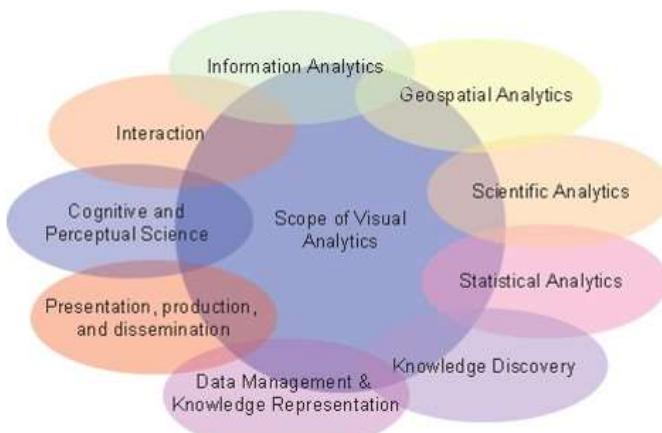
Visual Analytics is the craft of analytical reasoning supported by:

- Data Science
- Data Visualisation
- Human-Computing-Interaction (HCI)
- Interface Design
- Visual Storytelling



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Science of Visual Analytics



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Aims of Visual Analytics

To detect the expected,
To discover the unexpected

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Visual Data Sense-making

Visual Analytics' greatest strength is its use for **sense-making**.

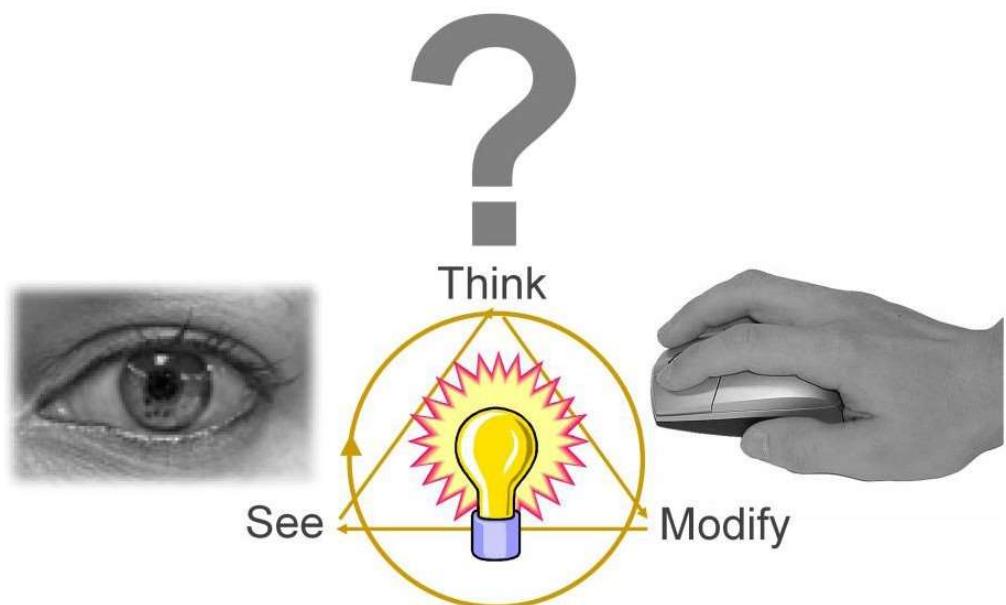
When you have
eliminated the
impossible, whatever
remains, however
improbable, must be the
truth.

Sherlock Holmes



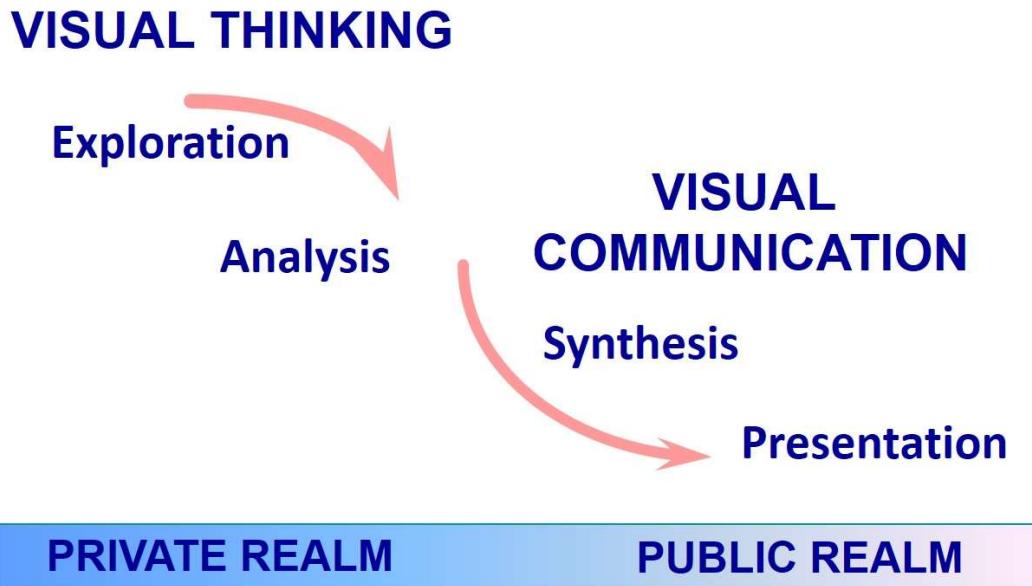
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Visual Analytics Framework



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Visual Analytics require a shift of mindset

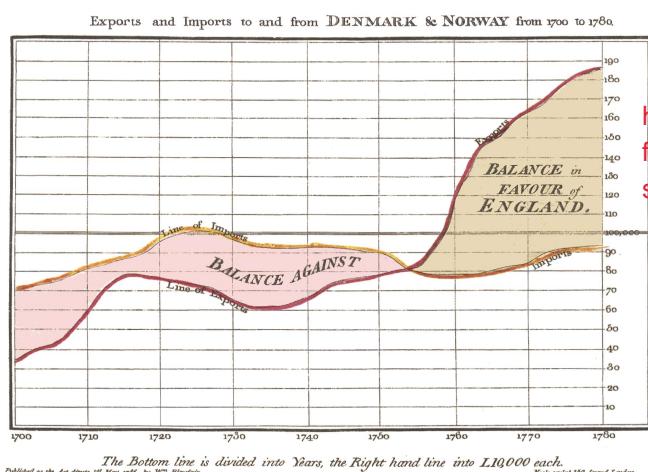


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Learning from the history of Visual Analytics

Commercial and Political Atlas by William Playfair (22 September 1759 – 11 February 1823)

we tend to overuse default



how often do we highlight balance in favour / balance against - telling the story

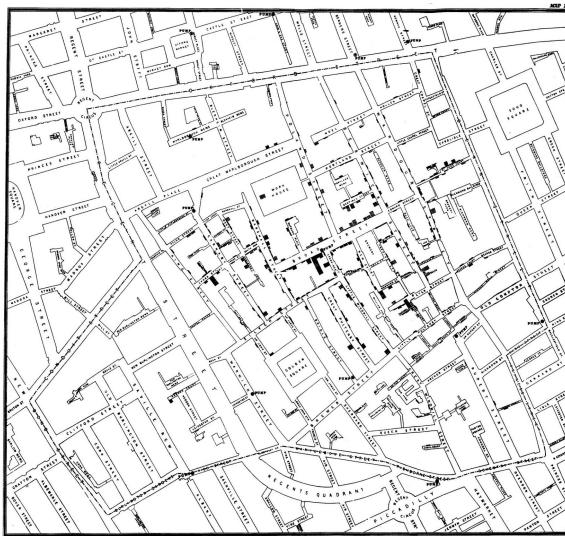
hence, don't use default alone, to customize

source: https://en.wikipedia.org/wiki/William_Playfair

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Learning from the history of Visual Analytics

Cholera and the Pump on Broad Street (John Snow, 1854).



not normal dots, stacked dots
each dot represent 1 case

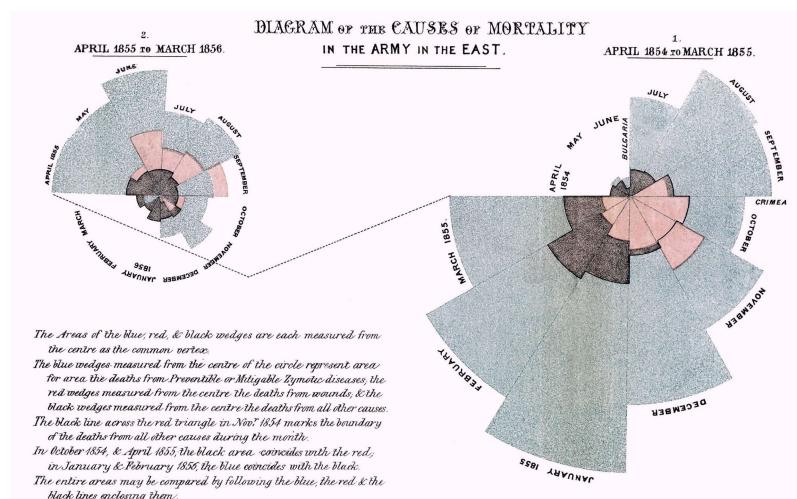
Source: https://en.wikipedia.org/wiki/John_Snow

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Learning from the history of Visual Analytics

Shining a Light on Data: Florence Nightingale (12 May 1820 – 13 August 1910)

rose diagram



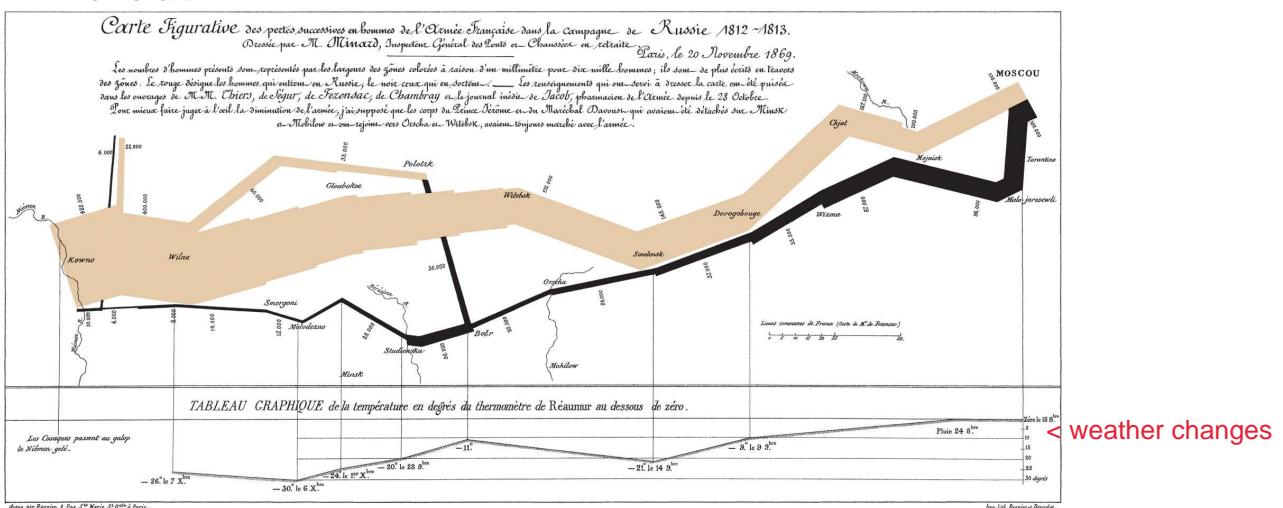
Source: https://en.wikipedia.org/wiki/Florence_Nightingale

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Learning from the history of Visual Analytics

Plot of Napoleon's ill-fated Russian campaign of 1812-1813 (Charles Joseph Minard, 1861)

flow chart



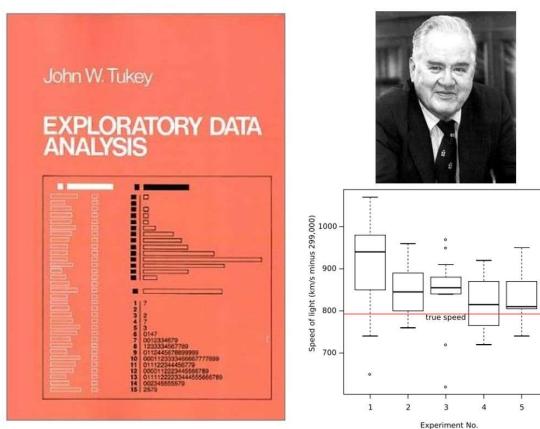
Source: https://en.wikipedia.org/wiki/Charles_Joseph_Minard

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Milestones in the history of Visual Analytics

Exploratory Data Analysis by John Tukey (June 16, 1915 – July 26, 2000)

Exploration is the key!



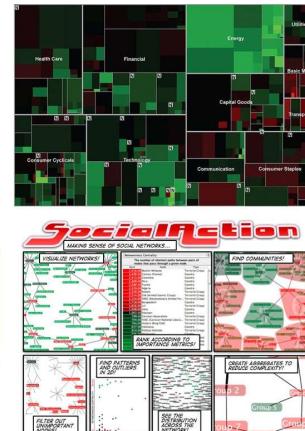
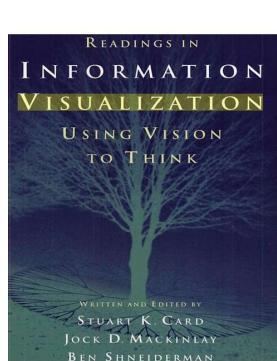
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Milestones in the history of Visual Analytics

The Craft of Information Visualization: Readings and Reflections, 2003
(Ben Shneiderman)

interact with data

Interaction is the key!



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Visual Analytics Toolkits

- Commercial-off-the-shelf
 - Visual analytics toolkit such as Tableau, JMP, PowerBI, Qlik Sense/View & TIBCO SpotFire.
 - Specialised data visualisation applications such as TreeMap from Macrofocus (<https://www.macrofocus.com/>)
- Open source
 - Specialised data visualisation applications such as Gephi (<https://gephi.org/>)
 - Data visualisation API library such as D3.js (<https://d3js.org/>)

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COS Visual Analytics Toolkit

Magic Quadrant for BI and Analytics Platforms



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COS Visual Analytics Toolkit

Data Visualisation Centric



BI Centric



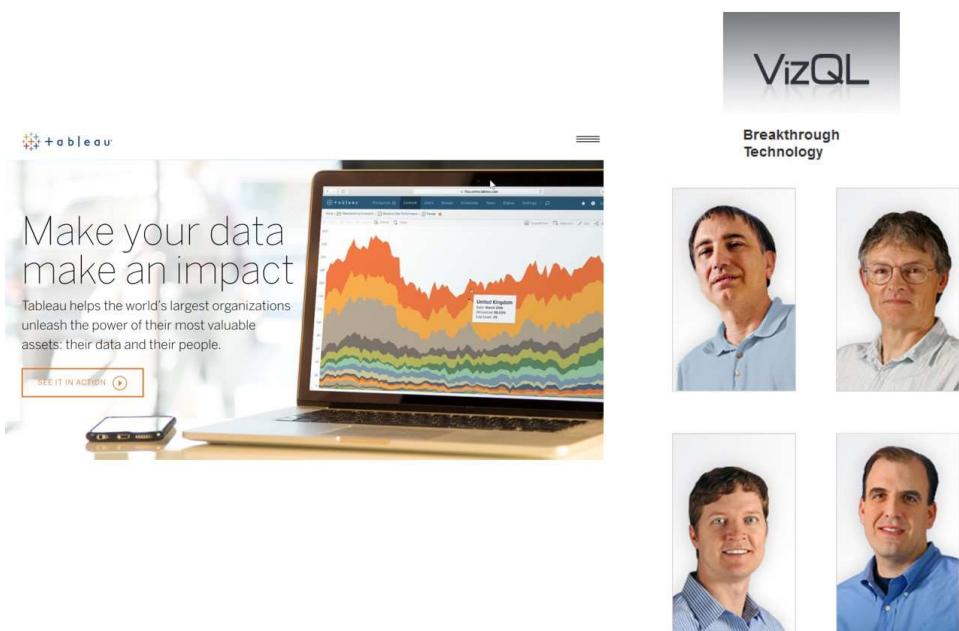
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Programmable Data Visualisation Library

- Javascript
 - D3.js (<https://d3js.org/>)
- Python
 - Matplotlib (<http://matplotlib.org>)
 - Bokeh (<http://bokeh.pydata.org/en/latest/>)
 - Plotly (<https://plot.ly/python/>)
- R, Base Graphics
 - lattice (<https://cran.r-project.org/web/packages/lattice/index.html>)
 - ggplot (<https://ggplot2.tidyverse.org>)
 - plotly R (<https://plot.ly/r/>)
 - R Shiny (<https://shiny.rstudio.com/>)

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Tableau: A visual analytics tool for everyone



The image shows the Tableau homepage on the left, featuring the slogan "Make your data make an impact" and a laptop displaying a complex, multi-layered chart. To the right is the VizQL logo with the tagline "Breakthrough Technology". Below the logo are five headshots of people.

VizQL
Breakthrough Technology

analysis > view
transform data on the fly
perform olap on the fly

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Why Tableau?

- Theory to practice
 - The Grammar of Graphics
- Science to product
 - VisQL
 - Show Me
 - Polaris

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Data Visualisation classics



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Highly recommended blogs

- Perceptual Edge (<https://www.perceptualedge.com/>)
- Junk Charts (http://junkcharts.typepad.com/junk_charts/)
- The Functional Art (<http://www.thefunctionalart.com/>)