



Universidade de Aveiro  
Departamento de Electrónica,  
Telecomunicações e Informática



# An Introduction to Data and Information Visualization

## Learning resources

Beatriz Sousa Santos

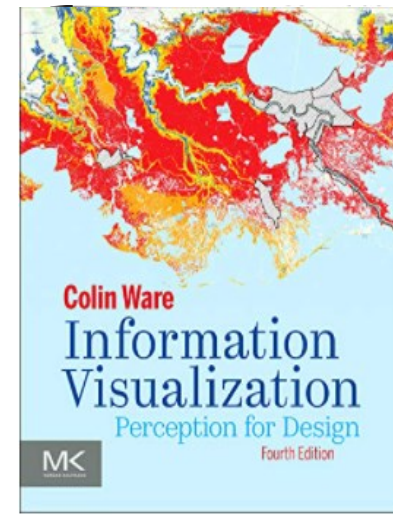
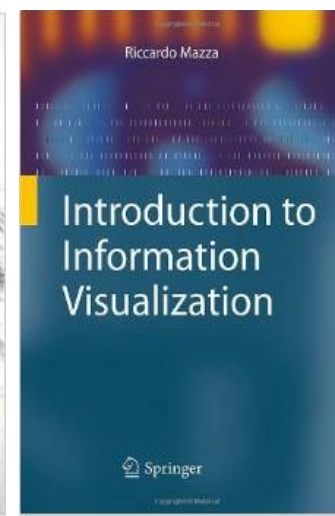
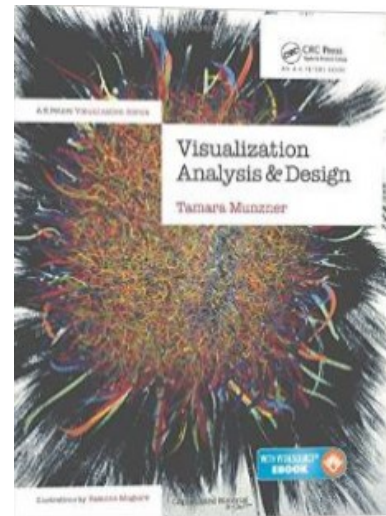
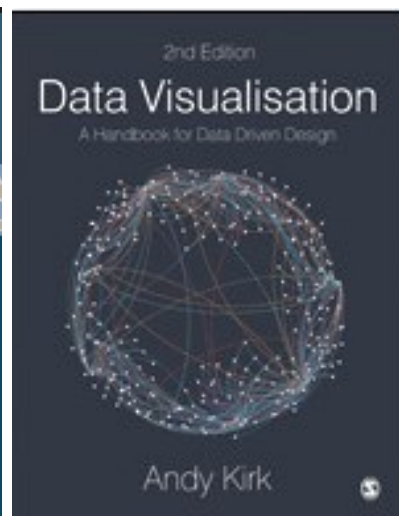
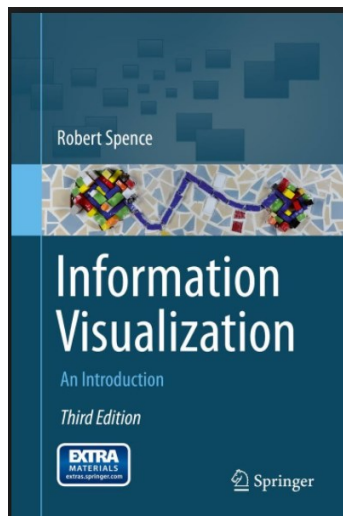
October/ 2021



Associação Portuguesa de  
Classificação e Análise de Dados

# Main Bibliography and other learning resources

- Spence, R., *Information Visualization, An Introduction*, Springer, 2014
- Munzner, T., *Visualization Analysis and Design*, A K Peters/CRC Press, 2014
- Kirk, A., *Data Visualisation A Handbook for Data Driven Design*, 2nd. Ed., Sage, 2019
- Mazza, R., *Introduction to Information Visualization*, Springer, 2009
- Ware, C., *Information Visualization, Perception to Design*, 4th ed.,Morgan Kaufmann, 2020



## Other Books

- Spence, R., *Information Visualization, Design for Interaction*, 2nd ed., Prentice Hall, 2007
- Kirk, A., *Data Visualization: A successful design process*, Pack Publishing, 2012  
[https://books.google.pt/books/about/Data\\_Visualization.html?id=I4qBVLfd3t4C&printsec=frontcover&source=kp\\_read\\_button&redir\\_esc=y#v=onepage&q&f=false](https://books.google.pt/books/about/Data_Visualization.html?id=I4qBVLfd3t4C&printsec=frontcover&source=kp_read_button&redir_esc=y#v=onepage&q&f=false)
- Bederson, B. , B. Shneiderman, *The Craft of Information Visualization: Readings and Reflections*, Morgan Kaufmann, 2003
- Card, S., J. Mackinlay, and B. Shneiderman, *Readings in Information Visualization: Using Vision to Think*, Morgan Kaufmann, 1999
- Keim, D., J. Kohlhammer, G. Ellis, & F. Mansmann, *Solving problems with Visual Analytics*, Eurographics, 2012
- Keim, D., F. Rossi, T. Seidl, M. Verleysen, & S. Wrobel, *Information Visualization, Visual Data Mining and Machine Learning* (Dagstuhl Seminar 12081). Dagstuhl Reports, 2012, 2(2), 58–83.  
<http://doi.org/10.4230/DagRep.2.2.58>

...

## “Pragmatic” Books

- Sosulski, K., *Data Visualization Made Simple: Insights into becoming visual*. Taylor & Francis, 2018.
- Healy, K, *Data Visualization, a practical introduction*. Princeton University Press, 2019.

# Information design books

- Tufte, E., *The Visual Display of Quantitative Information*, Graphics Press, 1983
- Tufte, E., *Envisioning Information*, Graphics Press, 1990
- Cairo, A., *The Functional Art*, New Riders, 2012
- Few, S., “Data Visualization for Human Perception”. In: Soegaard, M. and Dam, R. (eds.). *Encyclopedia of Human-Computer Interaction*, 2nd Ed. The Interaction Design Foundation  
[https://www.interaction-design.org/encyclopedia/data\\_visualization\\_for\\_human\\_perception.html](https://www.interaction-design.org/encyclopedia/data_visualization_for_human_perception.html)
- Stephen Few, *Information Dashboard Design: Displaying Data for At-a-Glance Monitoring*, 2<sup>nd</sup> ed., Analytics Press, 2013
- Cole Nussbaumer Knaflic, *Story Telling with Data: A Data Visualization Guide for Business Professionals*, Wiley, 2015
- Alberto Cairo, *How Charts Lie: Getting Smarter about Visual Information*, W. W. Norton & Company; 1st edition, 2020

## Some interesting papers

- Keim, D., “Information visualization and visual data mining,” *IEEE Trans. Vis. Comput. Graph.*, vol. 8, no. 1, pp. 1–8, 2002
- Keim, D., Sips, M., and Ankerst, M. “Visual data-mining techniques,” in *Visualization Handbook*, C. Johnson and C. Hansen, Eds., pp. 813–825, 2005
- Thomas, J. and Cook, K. “Visualization Viewpoints: A Visual Analytics Agenda,” *IEEE Comput. Graph. Appl.*, vol. 26, no. 1, pp. 10–13, 2006.
- Keim, D., Andrienko, G., Fekete, J., Carsten, G., Melan, G., “Visual Analytics : Definition , Process and Challenges” *Inf. Vis. - Human-Centered Issues Perspect.*, Springer, pp. 154–175, 2008.
- A. Endert, W. Ribarsky, C. Turkay, B. L. W. Wong, I. Nabney, I. D. Blanco, and F. Rossi, “The State of the Art in Integrating Machine Learning into Visual Analytics,” *Comput. Graph. Forum*, vol. 36, no. 8, pp. 458–486, 2017.
- Y. Lu, R. Garcia, B. Hansen, M. Gleicher, and R. Maciejewski, “The State-of-the-Art in Predictive Visual Analytics,” *Comput. Graph. Forum*, vol. 36, no. 3, pp. 539–562, 2017.
- A. Kirk, “A Recipe of Capabilities for Pursuing Expertise in Data Visualization: A Practitioner's Perspective”, *IEEE Comput. Graph. Appl.*, vol. 41, no. 1, pp. 58 - 62, 2021

## To probe further Scientific Journals/Conferences

IEEE Transactions on Visualization and Computer Graphics

IEEE Computer Graphics and Applications

Computer Graphics Forum

Computers & Graphics

Information Visualization



IEEE Computer Graphics and Applications – Visualization Viewpoints

IEEE Vis (<http://ieevis.org/>)

Eurovis (<https://www.eurovis.org/>)

Information Visualization (<http://www.graphicslink.co.uk/IV2021/>)

A playlist to read online:

<https://learning.oreilly.com/playlists/f68d0022-1b58-4374-9af5-280d221d4c7e>

## Interesting links

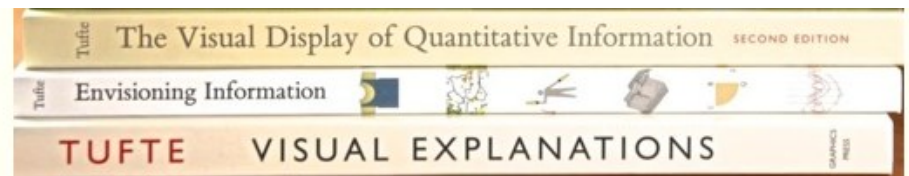
- <http://www.infovis-wiki.net/>
- <https://eagereyes.org/>
- <http://www.perceptualedge.com/>
- <http://www.thefunctionalart.com/>
- <https://www.edwardtufte.com/tufte>



@agereyes



**Visual Business Intelligence**  
for enlightening analysis and communication

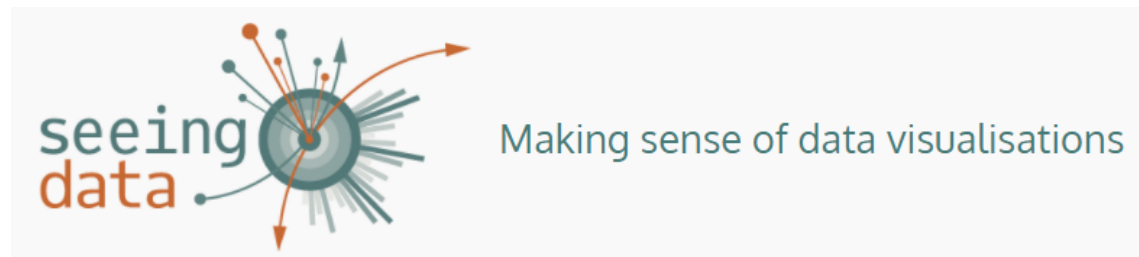


# Interesting links

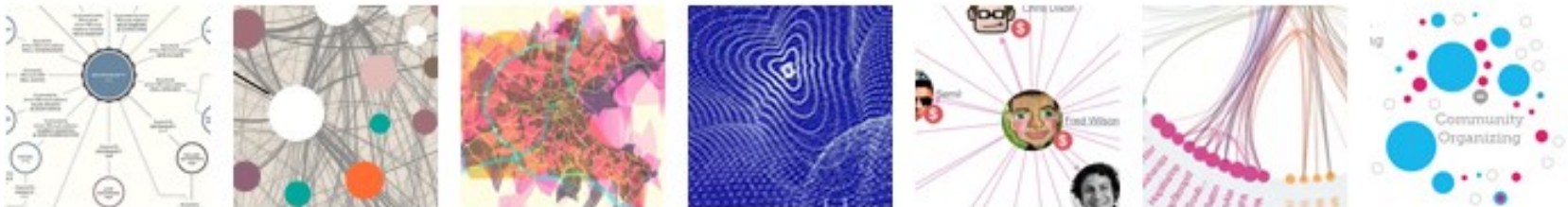
- <https://medium.com/multiple-views-visualization-research-explained>



- <http://seeingdata.org/>



- <http://www.visualcomplexity.com/vc/>





# Podcasts and Online courses

<https://datastori.es/>

# DATA STORIES [ast/](#)

A podcast on data visualization with Enrico Bertini and Moritz Stefaner

LETE SEASON 1 OF 'EXPLORE EXPLAIN' >>


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Subscriptions

Library


History

CONVERSATIONS ABOUT DATA VISUALISATION DESIGN

 Explore Explain: A Video and Podcast Series [SUBSCRIBE](#)

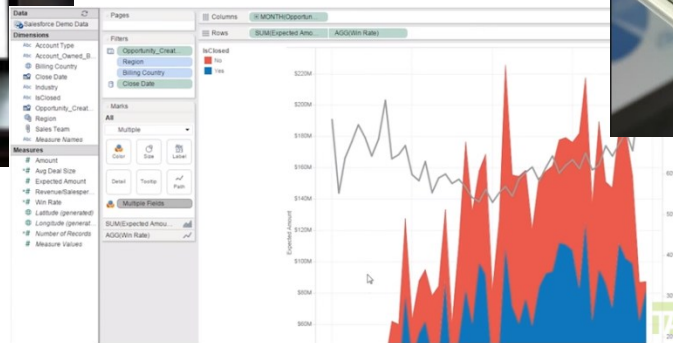
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 **S1E1 Maarten Lambrechts**  
185 views • 6 days ago  
Welcome to Episode 1 of Season 1 of Explore Explain, a video and podcast series all about data visualisation design. This is the very first episode and I am delighted to welcome Maarten Lambrechts ...



# Visualization S/W



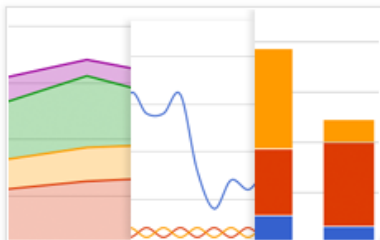
# Which Visualization Tool?

It depends ...

- Exploratory (discover pattern, multiple views)  
or Explanatory (View of the data presenting discovered highlights)?
- Type of data (Maps, Charts, Data,...)
- Developer or non-developer?
- Scientific or information Visualization (2D,3D, structure or not?)
- Interactive or Static?
- Web or local?
- Easy to use or Flexible?
- Protection of data?...

## Visualization S/W

- There are a lot of tools, of different types and with different purposes from very simple to very complex ...
- Some interesting and widely used tools:



### Google Chart Tools

A collection of simple to use, customizable and free to use interactive charts and data tools.



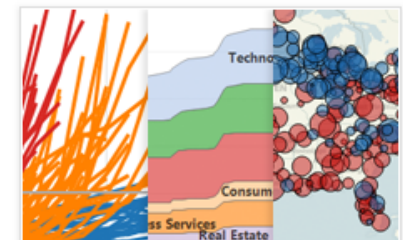
### D3.js

A small, flexible and efficient library to create and manipulate interactive documents based on data.



### R

A software environment for statistical computing and graphical techniques.



### Tableau Public

A desktop application to build and post interactive graphs, dashboards, maps and tables to the web.

see e.g.

<https://www.kdnuggets.com/2020/05/top-10-data-visualization-tools-every-data-scientist.html>

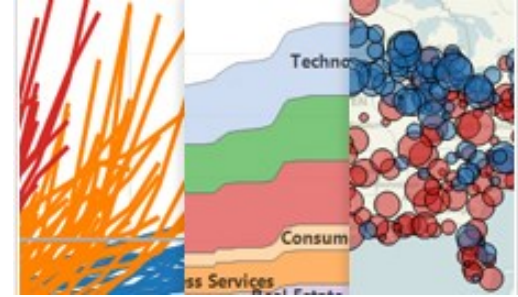
<https://www.kdnuggets.com/2019/04/7-qualities-big-data-visualization-tools.html>

<http://selection.datavisualization.ch/>



## Visualization Tools – Possible choices

- If you are in a large company: Tableau or Qlickview may be adequate (very powerful and expensive business intelligence S/W)
- If you want to produce an interactive visualization Web application to visual explore data: D3.js
- If you just want to make a few simple charts for your web page: google charts
- If you want to produce a few simple charts for a report or paper: excel, ...



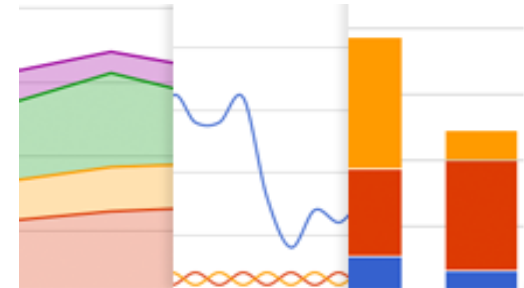
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# 2021 Gartner Magic Quadrant for Analytics and Business Intelligence Platforms



Note: the report is available upon request

# We may use the Visualization capabilities of other S/W

- Excel
- Rapidminer
- Weka
- ....
- Python graphics libraries

