universität wien

Rhetoric of visuals

The art of communicating data

Laura Koesten & Verena Prantl

January 11, 2024

Schedule

Lecture on 9th of January:

TextVis

Lecture TODAY:

Rhetoric of visuals

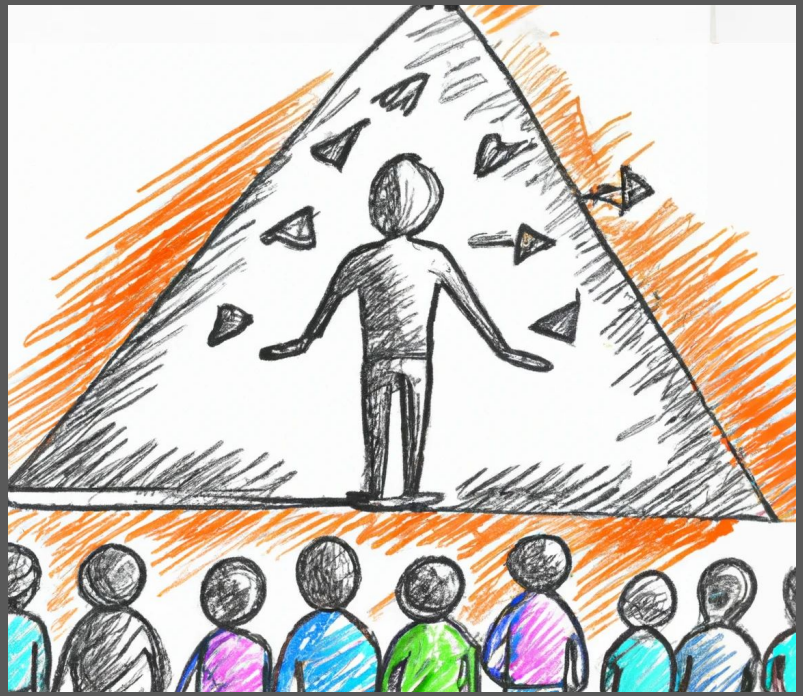
Lecture on 13th of January:

Vis recommender systems

Week	Date	Tuesday (13:15 - 14:45)	Thursday (13:15 - 14:45)
1	Oct 03/05	Introduction (TM) pdf [Munzner Ch. 1] Rosling at TED 2006; Krulwich at RadioLab	D3 Tutorial (YJ) zip browser
2	Oct 10/12	Design Principles (MK) pdf [Tufte, The Visual Display of Quantitative Information]	Visual Encoding Principles (MK) pdf [Munzner Ch. 5] Learning perceptual kernels for vis design Livingstone: What Art can tell us about the brain (Vis 2008 keynote)
	Oct 15	Due: A1 (23:55)	
3	Oct 17/19	Data Types, Semantics (AC) pdf Dataset + Dataset Description [Munzner Ch. 2+3] Task Typology	Q&A + D3 Tutorial (YJ) zip browser
4	Oct 24/26	Vis Process + D3 Q&A (AC) pdf [d3 paper]	National Holiday
5	Oct 31/Nov 02	sick / no lecture	All Saints Day
	Nov 05	Due: A2 (23:55)	
6	Nov 07/09	Arrange Tables + Spatial Data (SR) pdf [Munzner Ch. 7+8]	Arrange Tables + Spatial Data (SR) pdf [Munzner Ch. 7+8]
7	Nov 14/16	Arrange Networks / Trees (CK) pdf [Munzner Ch. 9+10]	Q&A and D3 Tutorial (AC, YJ)
8	Nov 21/23	Arrange Networks / Trees (CK) pdf [Munzner Ch. 9+10] Example: GraphDiaries by Bach et al.	Tasks (TM) pdf [Munzner Ch. 2+3] Task Typology
9	Nov 28 / Nov 30	Midterm (TM, CK)	Facet into Multiple Views (TM) pdf [Munzner Ch. 12] Improvise
	Nov 30	Due: A3 (23:55)	
10	Dec 05/07	Design Studies (TM) + A4 Q&A (TM) pdf [Munzner Ch. 4] Design Study Methodology	Reduce: Items and Attributes (TM) pdf [Munzner Ch. 13] DimStiller
11	Dec 12/14	Embed: Focus + Context (TM) pdf [Munzner Ch. 14]	Evaluation (RS) pdf R. - Evaluation
	Dec 17	Due: A4 (23:55)	
	Dec 19/21	Holiday	Holiday
	Dec 26/28	Holiday	Holiday
	Jan 0[illegible]/04	Holid[illegible]	Holiday
12	Jan 09/11	TextVis (TM) pdf	Ethics (LK) pdf IEEE 7000 Standard Correll paper
13	Jan [illegible]	Vis Recommender Systems (MK)	Explainability (TS) pdf
	Jan 21	Due: A5 (2[illegible]55)	
14	Jan 23/25	Final (TM, CK)	A5 presentations
	Jan 30/ Feb 1	A5 Presentations	Holiday

Outline

1. **The art of persuasion**
2. **Logos**
3. **Ethos**
4. **Pathos**
5. **Storytelling**



Main reference

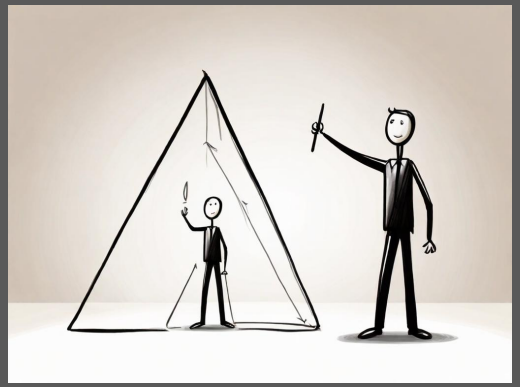
- Charles Kostelnick. 2008. **The visual rhetoric of data displays: The conundrum of clarity.** IEEE Transactions on Professional Communication 51, 1 (2008), 116–130.

Introduction activity

Use your smartphone or a web browser.

https://www.menti.com/alhvrquvcb8o

The art of persuasion

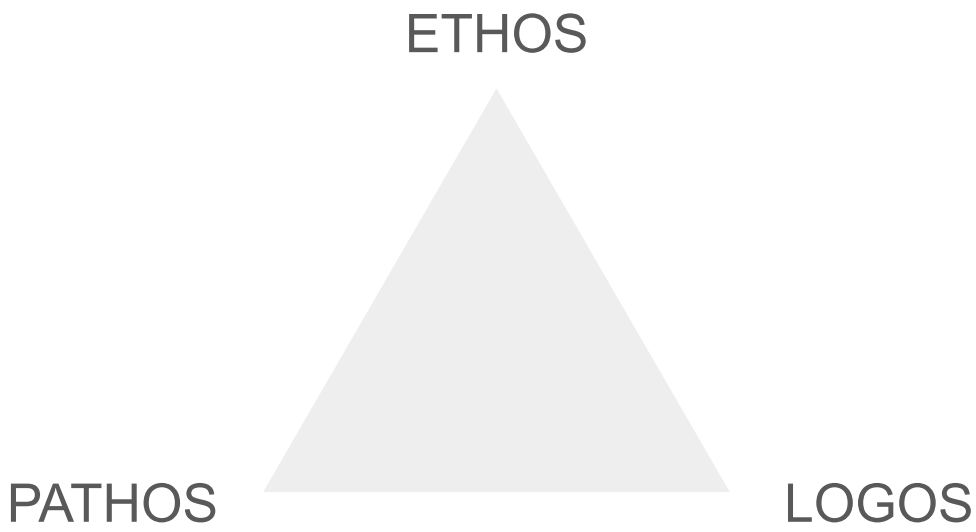


The Art of Persuasion

Aristotle has considered the art of communication (rhetoric) as a balance of:

- Logos → reason
- Ethos → morality
- Pathos → feeling

The rhetorical triangle



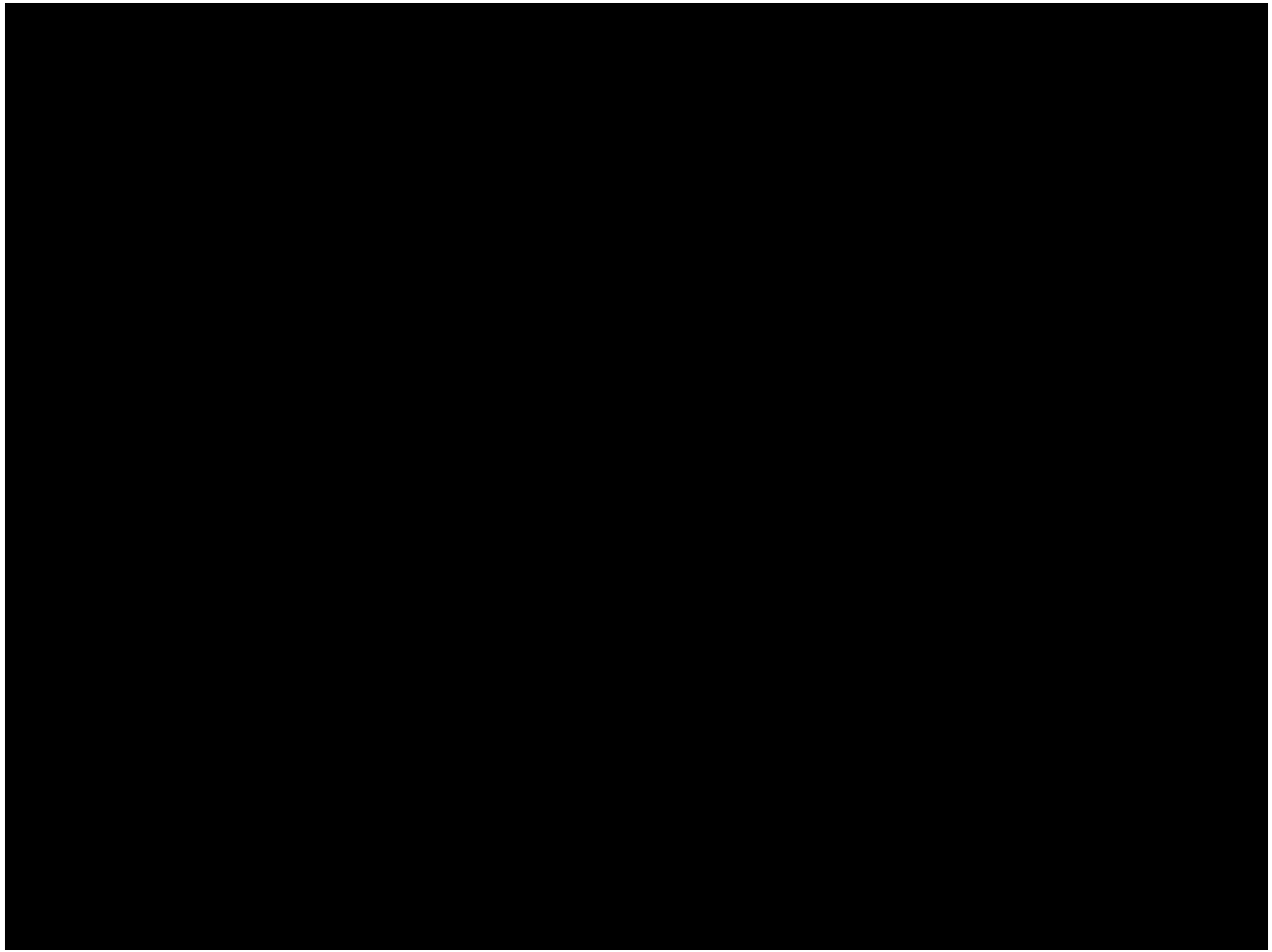
Aristoteles. 1995. Rhetorik (5th ed.). Fink Verl., Munich.

The rhetorical triangle

Logic/Reason

- sound argument
- scientific evidence

Aristoteles. 1995. Rhetorik (5th ed.). Fink Verl., Munich.



The rhetorical triangle

ETHOS

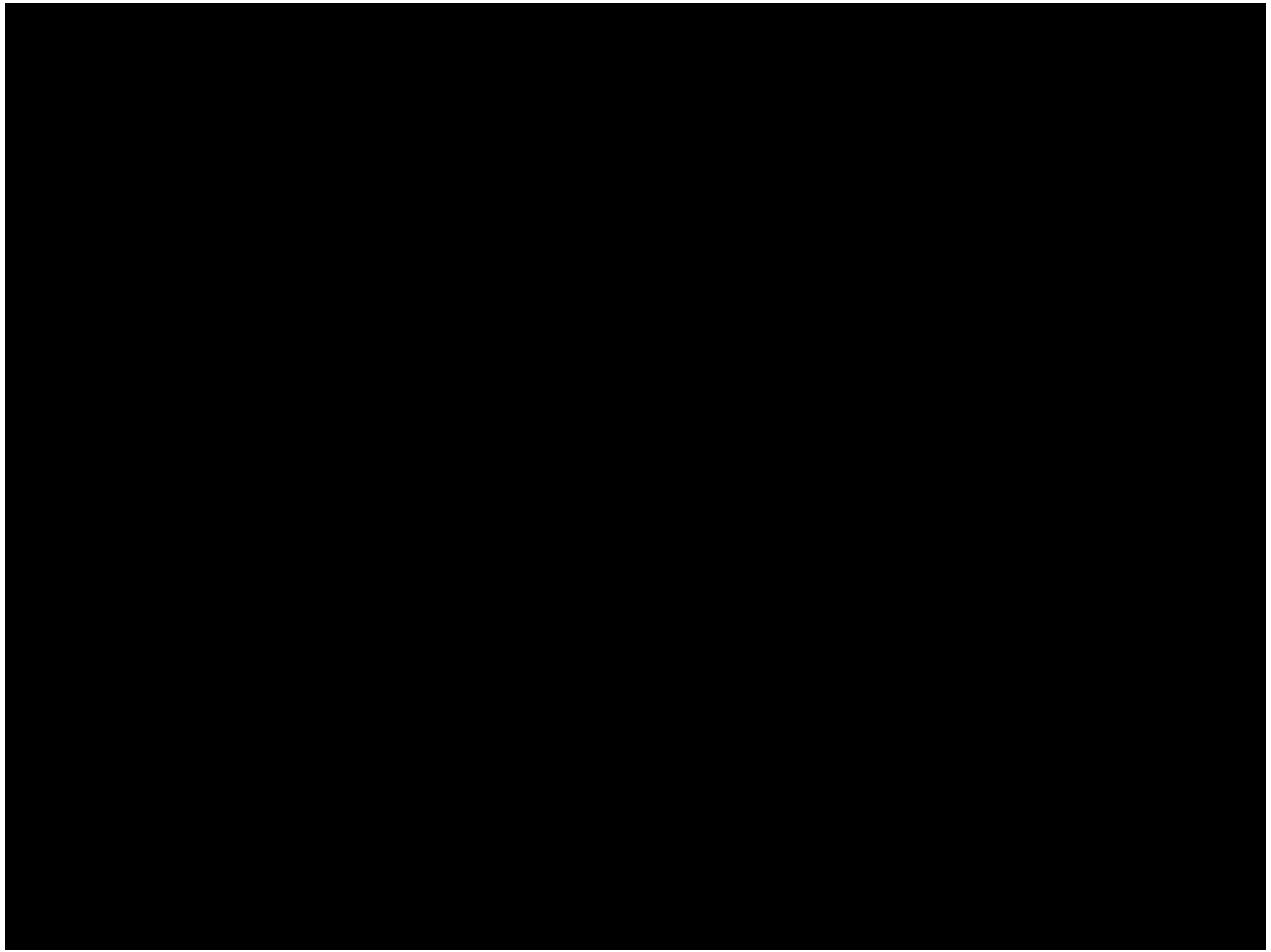
Ethics/Credibility
- trustworthiness
- authority

PATHOS

LOGOS

Logic/Reason
- sound argument
- scientific evidence

Aristoteles. 1995. Rhetorik (5th ed.). Fink Verl., Munich.



The rhetorical triangle

ETHOS

Ethics/Credibility
- trustworthiness
- authority

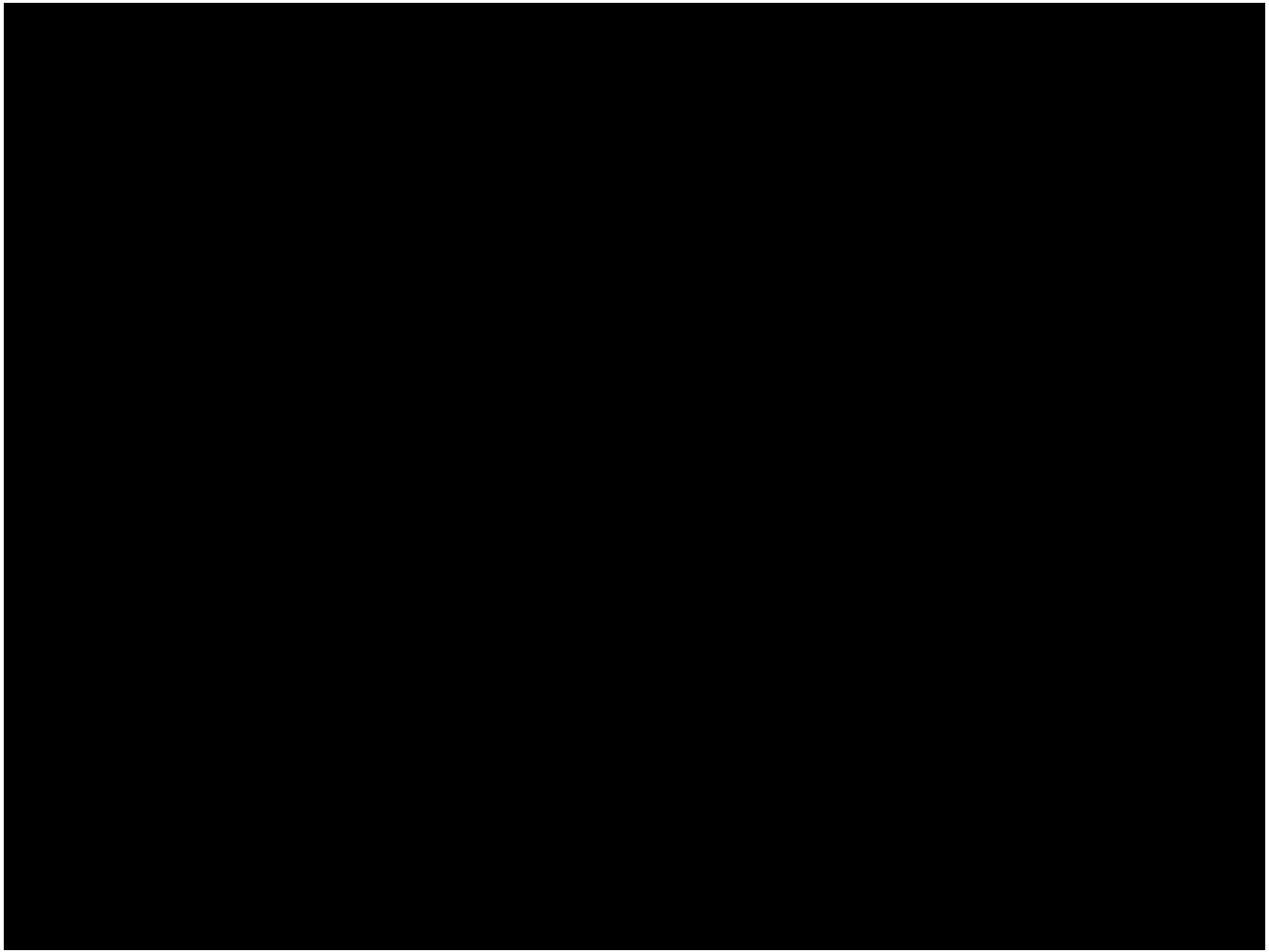
PATHOS

Feelings of the audience
- emotional appeal
- personal connection

LOGOS

Logic/Reason
- sound argument
- scientific evidence

Aristoteles. 1995. Rhetorik (5th ed.). Fink Verl., Munich.



The rhetorical triangle

ETHOS

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LOGOS

Logic/Reason
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- scientific evidence

Aristoteles. 1995. Rhetorik (5th ed.). Fink Verl., Munich.

Persuasive communication

Persuasion is not deception.

Persuasion is any message that is intended to shape, reinforce, or change the responses of others.

Convincing or persuading versus deception or manipulation.

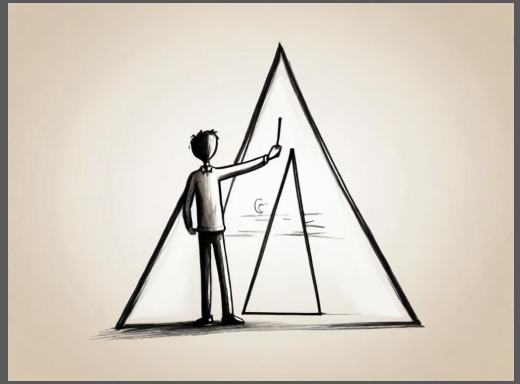
Demand for objectivity → are data visualizations really objective?

Raises the question: should datavis really aim to persuade?

Stiff, J. B., & Mongeau, P. A. 2016. Persuasive communication. Guilford Publications.

Rhetoric of visuals
The art of persuasion
Logos
Ethos
Pathos
Storytelling

Logos



Logos

- Rhetoric of science
- Appeals to logic and reason (and clarity)

-> What does this mean for data visualization?

Logos

- Rhetoric of science
- Appeals to logic and reason (and clarity)

-> What does this mean for data visualization?

- “Perceptual cognitive-based school of thought” (Brasseur, 2003)
- Principles of design optimised for perception and task

L. E. Brasseur, Visualizing Technical Information: A Cultural Critique. Amityville, NY: Baywood Publishing, 2003.

Perspective: Rhetoric of clarity

Perceptual science of data vis design

The vis is there to facilitate the readers comprehension of data

Transmission of fact and truth (rhetoric of neutrality)

Graphical excellence (Tufte)

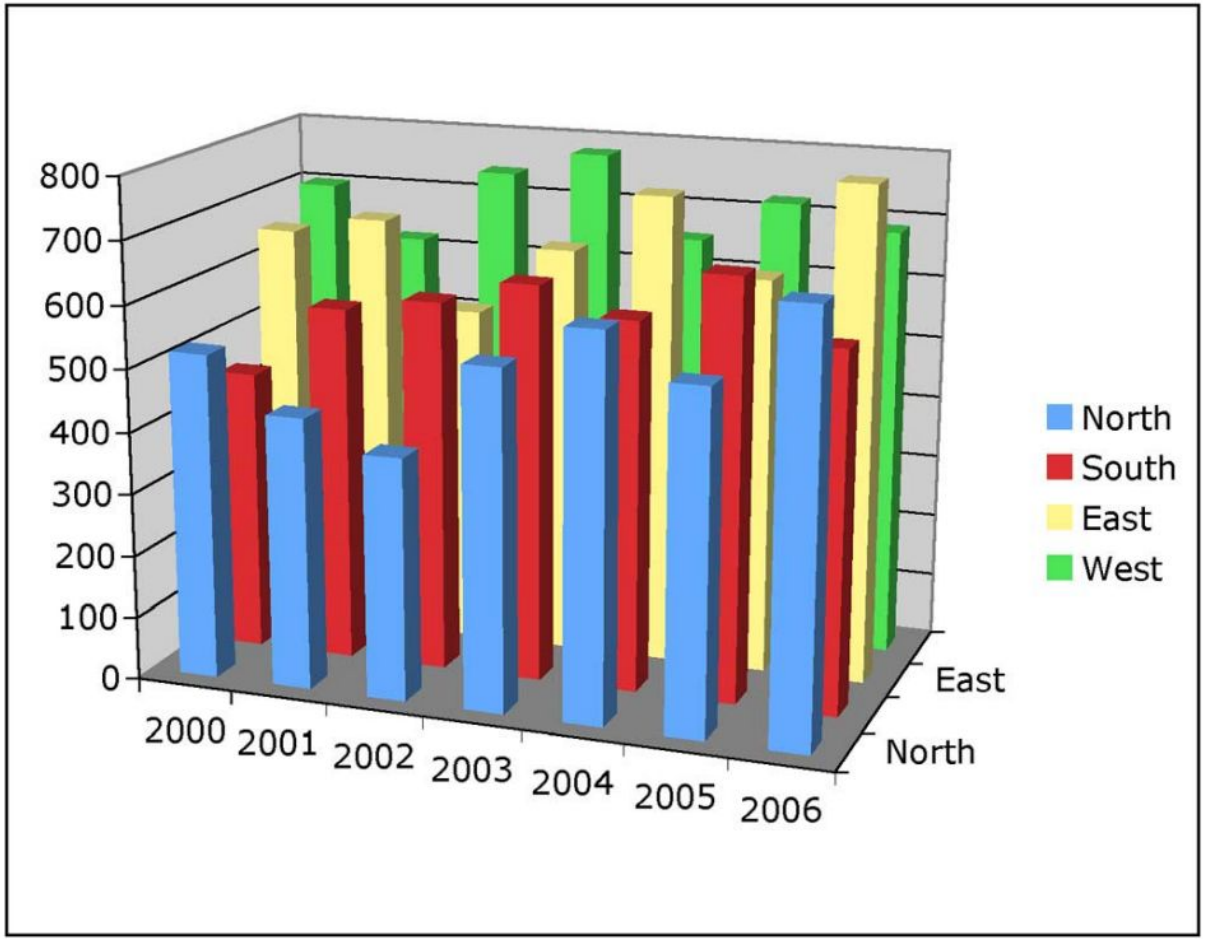
Utilitarian nature of data displays *vs. design approach (e.g. Don Norman)?*

Critique Tufte

- Memorability
- Engagement
- Support cognitive processes through repetition?

Manifesto for Putting 'Chartjunk' in the Trash 2021!

Akbaba, D., Wilburn, J., Nance, M.T. and Meyer, M., 2021. Manifesto for Putting 'Chartjunk' in the Trash 2021!. arXiv preprint arXiv:2109.10132.



Charles Kostelnick. 2008. The visual rhetoric of data displays: The conundrum of clarity. IEEE Transactions on Professional Communication 51, 1 (2008), 116–130.

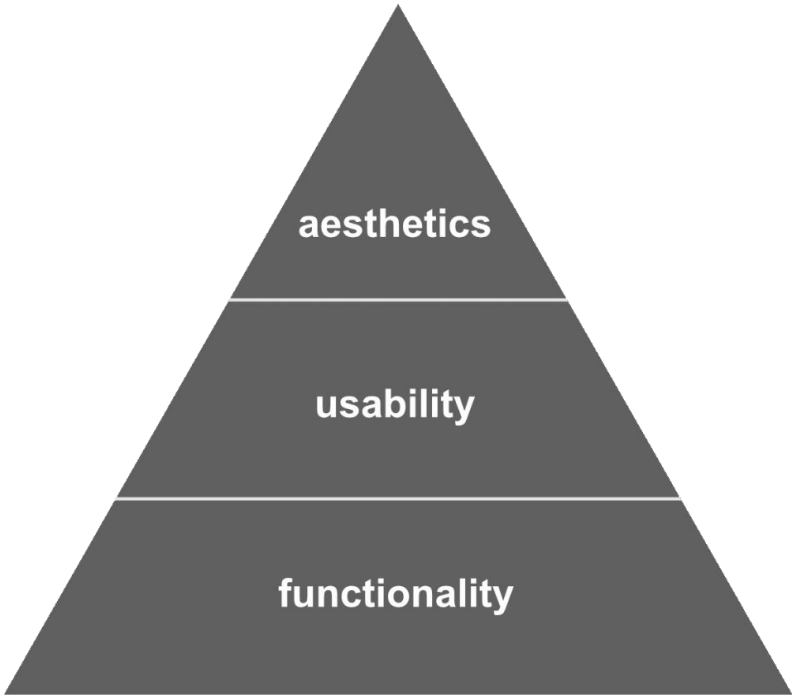
Aesthetics vs. Functionality

- Beautiful things are also more functional (Norman), **but**:

  it can negatively impact the integrity of the data

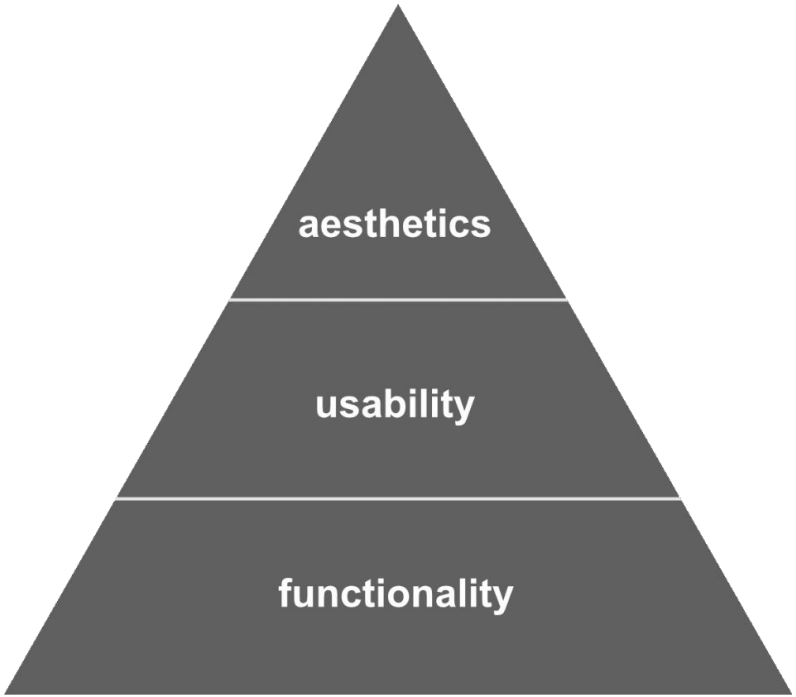
- Function comes first, aesthetics second

Aesthetics vs. Functionality



UX hierarchy of needs

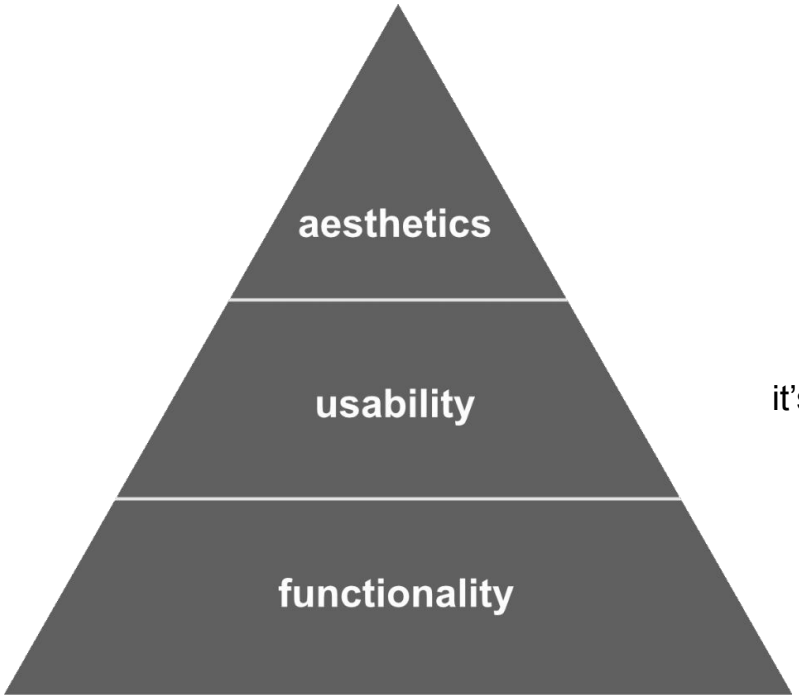
Aesthetics vs. Functionality



UX hierarchy of needs

it works, no bugs

Aesthetics vs. Functionality

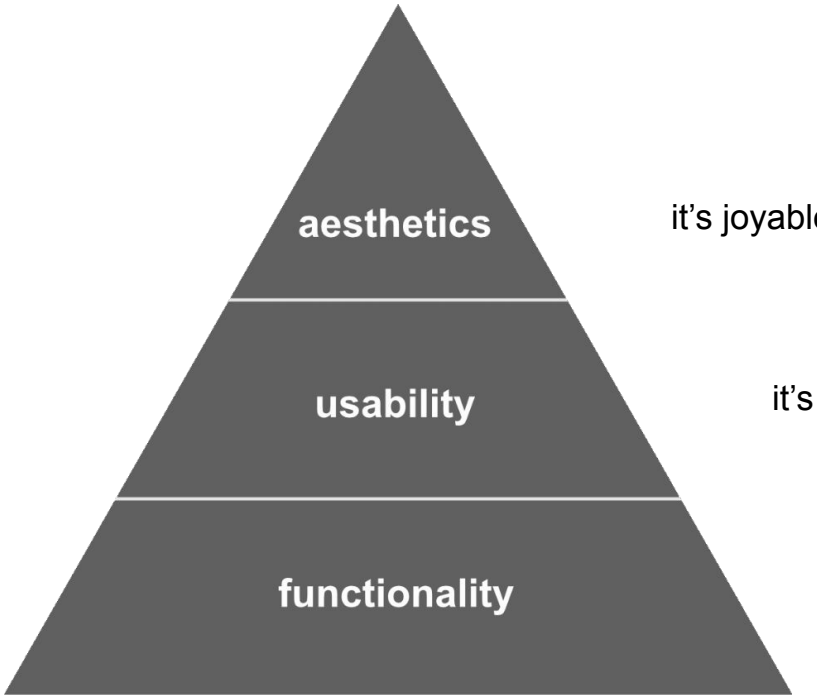


UX hierarchy of needs

it's easy to use

it works, no bugs

Aesthetics vs. Functionality



it’s joyable

it’s easy to use

it works, no bugs

UX hierarchy of needs

Aesthetics vs. Functionality

- Beautiful things are also more functional (Norman), **but**:

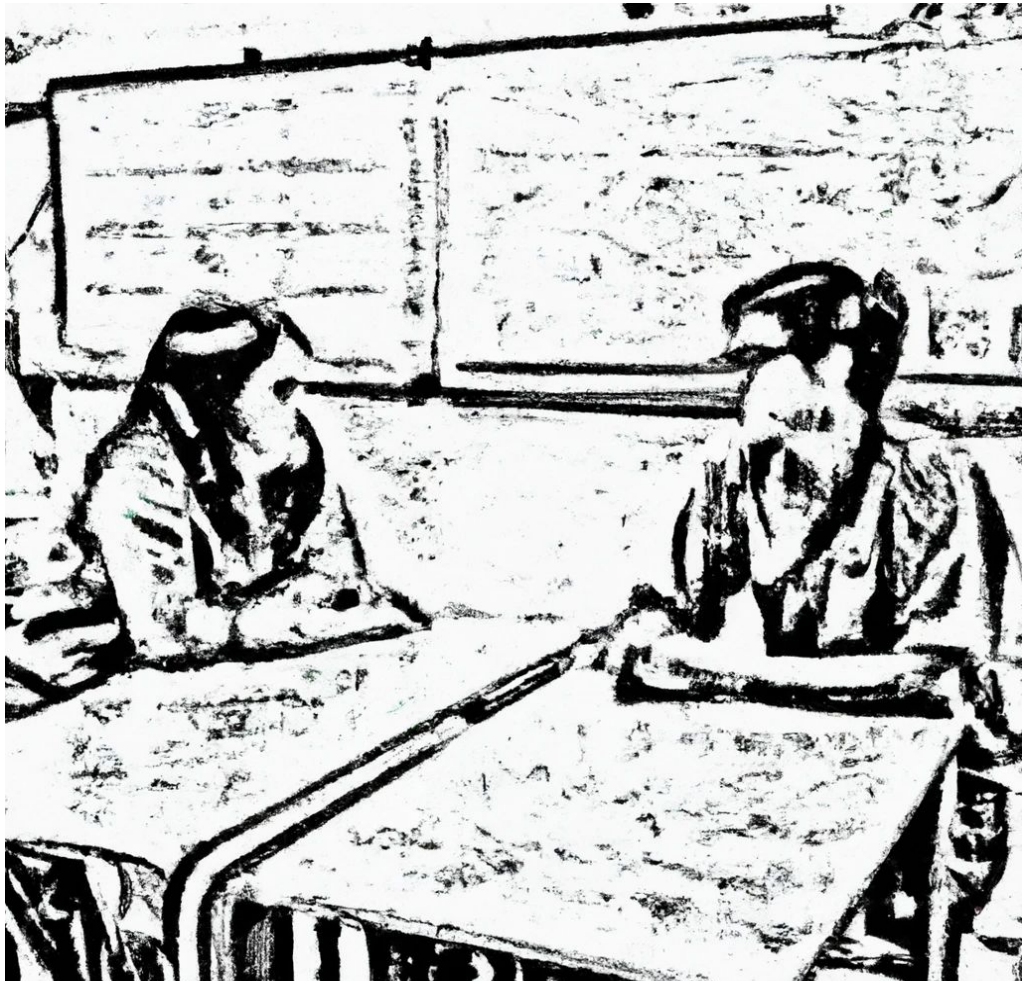
  it can negatively impact the integrity of the data

- Function comes first, aesthetic second
- Well-designed displays create a subjective response from the viewer

Charles Kostelnick. 2008. The visual rhetoric of data displays: The conundrum of clarity. IEEE Transactions on Professional Communication 51, 1 (2008), 116–130.

Alberto Cairo. 2013. The functional art: an introduction to information graphics and visualization. New Riders, Berkeley.

Takeaways ?



Takeaways: Logos

- Maximise logos
  - Sound argument
  - Good evidence
  - Reasonable connection between claim and evidence
- There is a visual rhetoric (an aesthetic) connected to this perspective -> rhetoric of neutrality
- Ethical issues need to be considered
- Communicative interactions complicate this perspective

Rhetoric of visuals
The art of persuasion
Logos
Ethos
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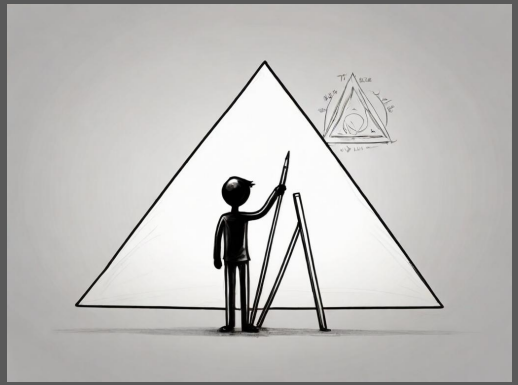
Ethos



Ethos in Data Vis

Neutrality of data

- Are data neutral?
- Ethical dimensions of data displays

Social rhetoric

- Data vis design is a process
- Readers interpret through collective learning, experience and values

Rhetoric of participation

- Readers actively manipulate displays to explore
- Personal interest and interpretative preference in the foreground

Charles Kostelnick. 2008. The visual rhetoric of data displays: The conundrum of clarity. IEEE Transactions on Professional Communication 51, 1 (2008), 116–130.

“The world does not spontaneously quantify, curate, or data-mine itself. Rather, the process of observing the world and quantifying it is a political act, and deserves ethical consideration”

Michael Correll. 2019. Ethical Dimensions of Visualization Research. In CHI Conference on Human Factors in Computing Systems. ACM, New York, 1–19.

Neutrality of data

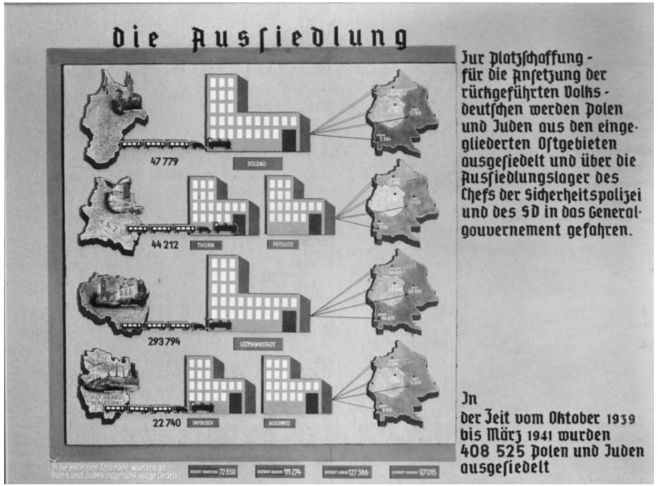
- Data are never neutral

"Visualization creates an inherent separation between the people impacted by the data and the people consuming the data"

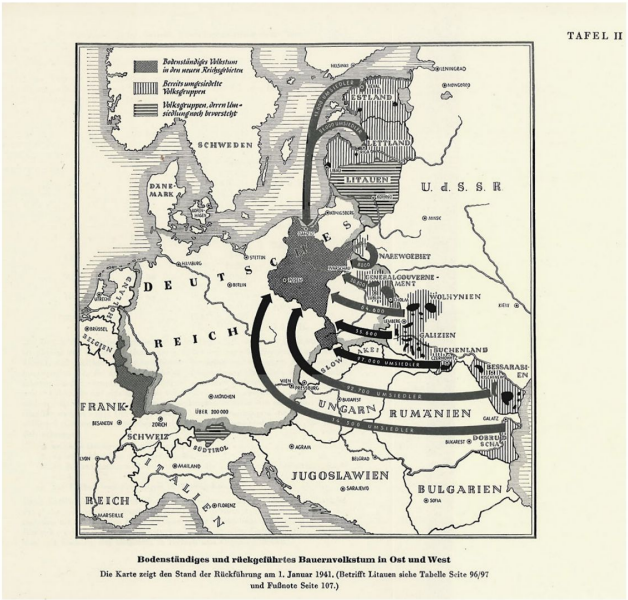
- Question of "power" and "responsibility"
- "Middleman" between data and stakeholder
- Emotional distance — "banality of evil"

Michael Correll. 2019. Ethical Dimensions of Visualization Research. In CHI Conference on Human Factors in Computing Systems. ACM, New York, 1–19.

The banality of evil



Source-destination map



Flow map

Correll, M., 2019, May. Ethical dimensions of visualization research. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (pp. 1-13).

“All visualizations are rhetorical, and have the potential to persuade. Minor choices in how these charts are designed and presented can alter the message that people take away”

Michael Correll. 2019. Ethical Dimensions of Visualization Research. In CHI Conference on Human Factors in Computing Systems. ACM, New York, 1–19.

How to avoid unethical visualizations

- Make the invisible visible
  - visualize hidden labor
  - visualize hidden uncertainty
  - visualize hidden impacts
- Collect data with empathy
  - encourage “small data”
  - anthropomorphize data
  - obfuscate data to protect privacy
- Challenge structures of power
  - support data “due process”
  - act as data advocates
  - pressure or slow unethical analytical behavior

Michael Correll. 2019. Ethical Dimensions of Visualization Research. In CHI Conference on Human Factors in Computing Systems. ACM, New York, 1–19.

Social rhetoric

- Readers interpret displays through their collective learning, experience, and values
  - Interpretation of data design is a highly social act
- Data displays as socially constructed conventions
  - Achieving clarity is a collective effort
- We need to tailor communication to specific situations:
  - Audience
  - Purpose
  - Context

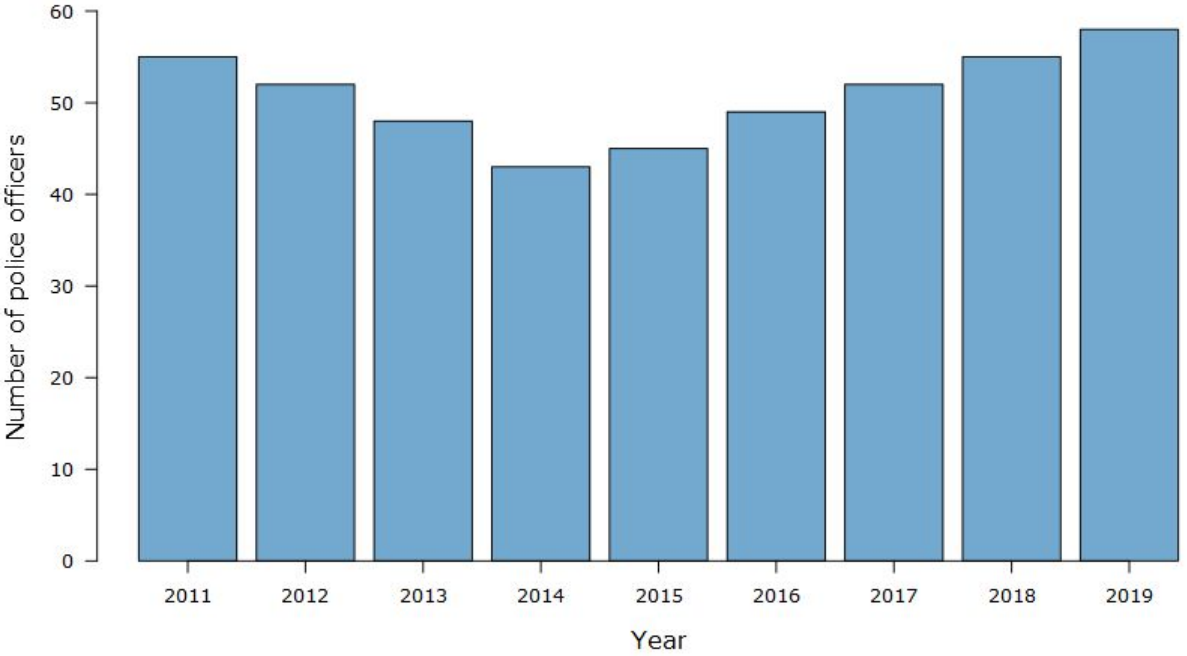
Charles Kostelnick. 2008. The visual rhetoric of data displays: The conundrum of clarity. IEEE Transactions on Professional Communication 51, 1 (2008), 116–130.

“Readers are not naïve noble savages who gaze innocently; rather, they are members of ***discourse communities*** *- large and small, public and specialized - that foster their interpretive skills”*

Charles Kostelnick. 2008. The visual rhetoric of data displays: The conundrum of clarity. IEEE Transactions on Professional Communication 51, 1 (2008), 116–130.

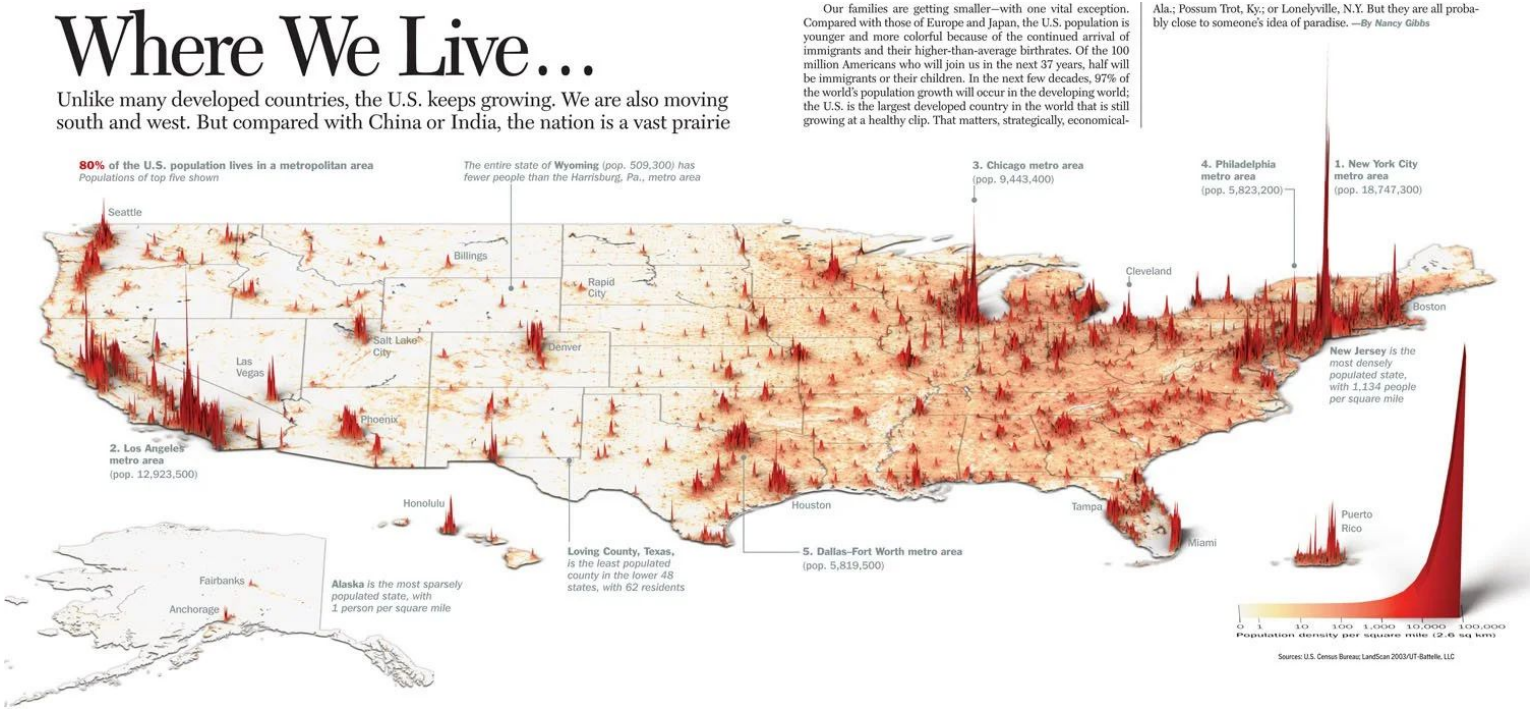
We learn how to read charts

Chart 5.2.1
Number of police officers in Crimeville, 2011 to 2019



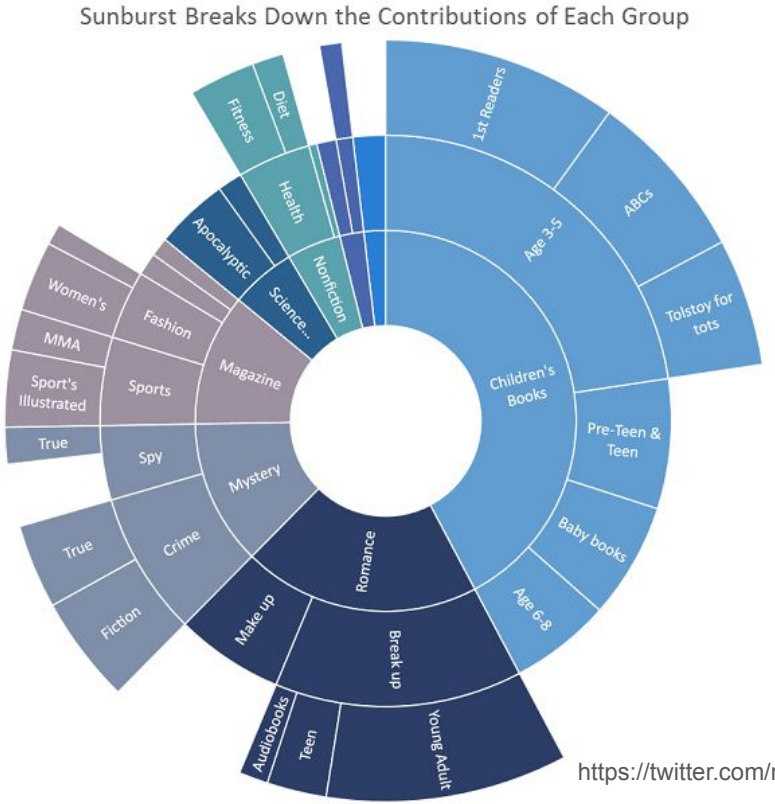
https://www150.statcan.gc.ca/n1/edu/power-pouvoir/ch9/bargraph-diagrammeabarres/5214818-eng.htm

We learn how to read charts



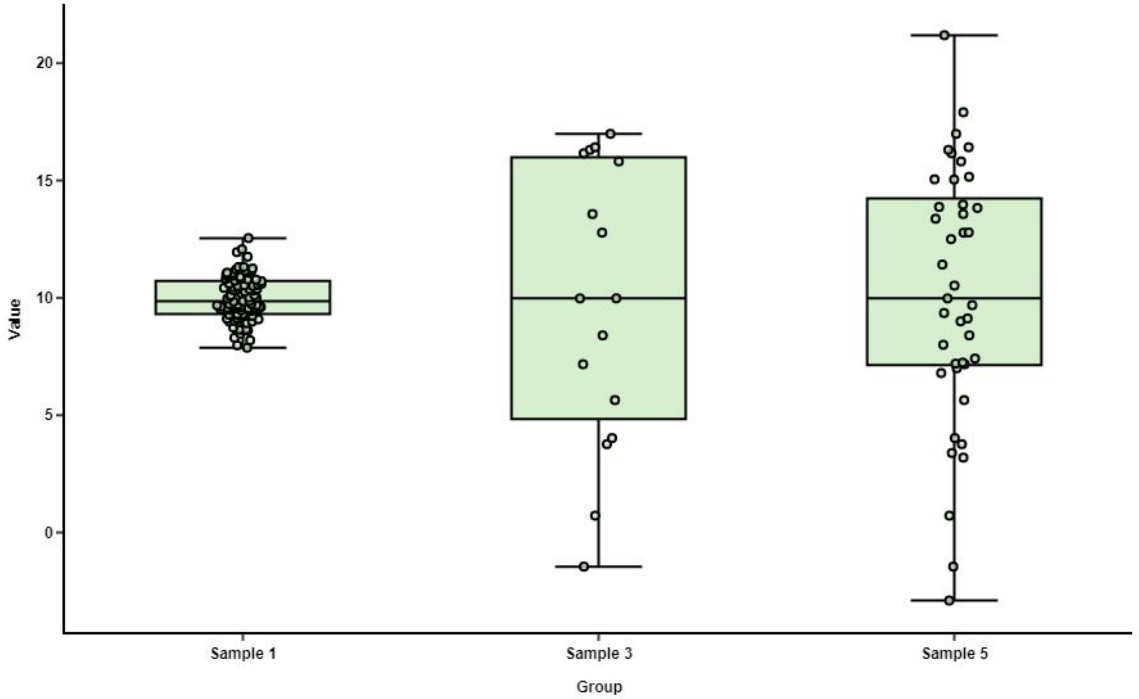
https://www.reddit.com/r/dataisbeautiful/comments/z7ylr/map_of_population_density_xpost_from_rmapporn_on/

We learn how to read charts



https://twitter.com/msexcel/status/627161301039599616/photo/1

We learn how to read charts



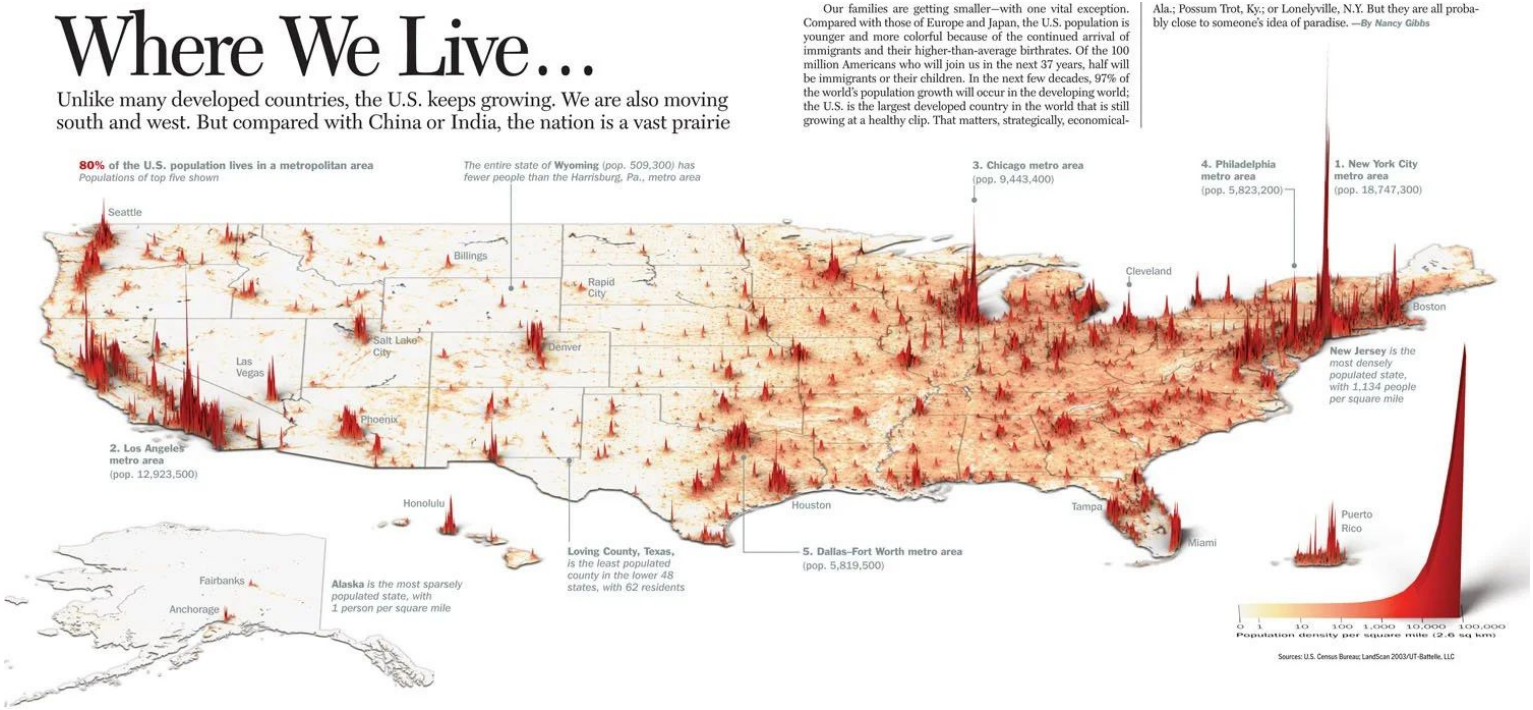
https://blog.bioturing.com/2018/05/22/how-to-compare-box-plots/

Interactivity & Participation

- Shift from *speech* to print to screen
- Shift from a passive to an active, participatory role of the user
  - user participates in adapting the display
- Micro- and macro view

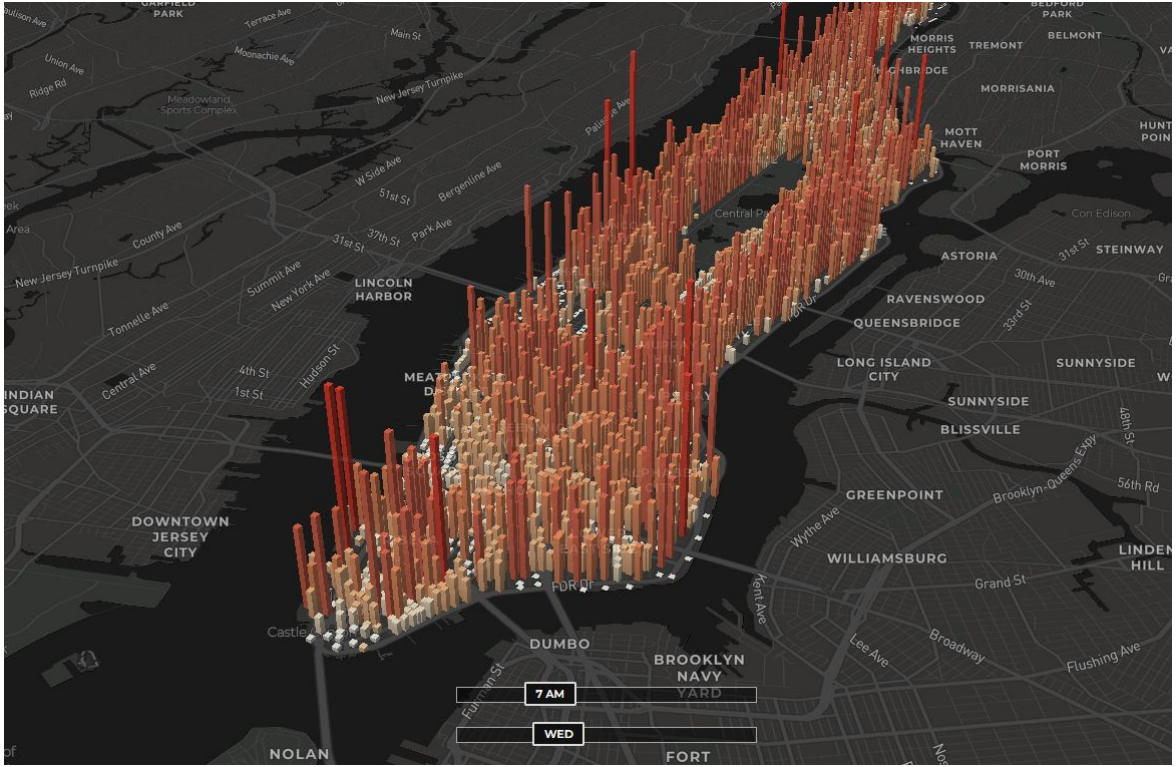
Charles Kostelnick. 2008. The visual rhetoric of data displays: The conundrum of clarity. IEEE Transactions on Professional Communication 51, 1 (2008), 116–130.
Edward R Tufte. 1990. Envisioning Information. Graphic Press, Cheshire, Connecticut.
Firat, E.E., Joshi, A. and Laramee, R.S., 2022. Interactive visualization literacy: The state-of-the-art. Information Visualization, 21(3), pp.285-310.

Static



https://www.reddit.com/r/dataisbeautiful/comments/z7ylr/map_of_population_density_xpost_from_rmapporn_on/

Interactive

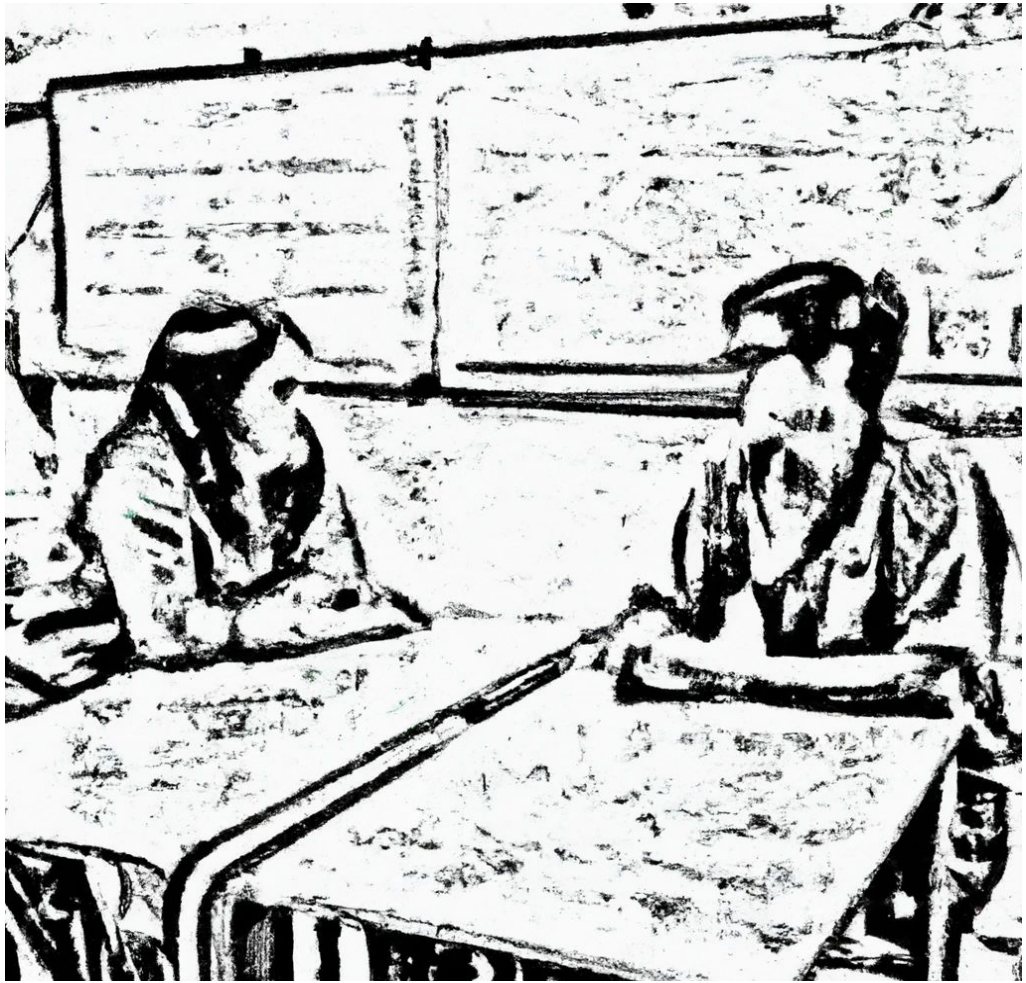


http://manpopex.us/

“We control the curation, presentation, rhetorical content of the visualizations we create”

Michael Correll. 2019. Ethical Dimensions of Visualization Research. In CHI Conference on Human Factors in Computing Systems. ACM, New York, 1–19.

Takeaways ?



Takeaways (ethos)

- Data visualizations are political: they influence representation, delegation, interpretation, as well as marginalization
- Data displays need to be functional but also well-designed in order to elicit a subjective response
- Communication via data displays is a social act
- Different target audiences have different interpretive frameworks that profoundly influence what they find clear and credible in data displays

Rhetoric of visuals
The art of persuasion
Logos
Ethos
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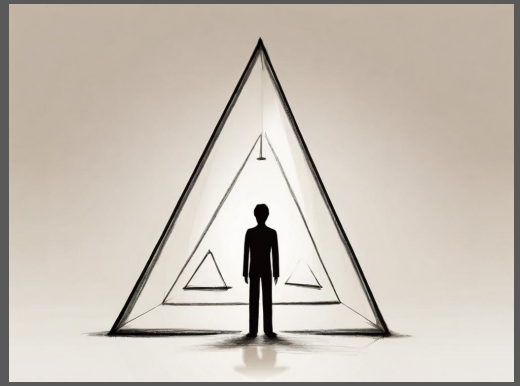
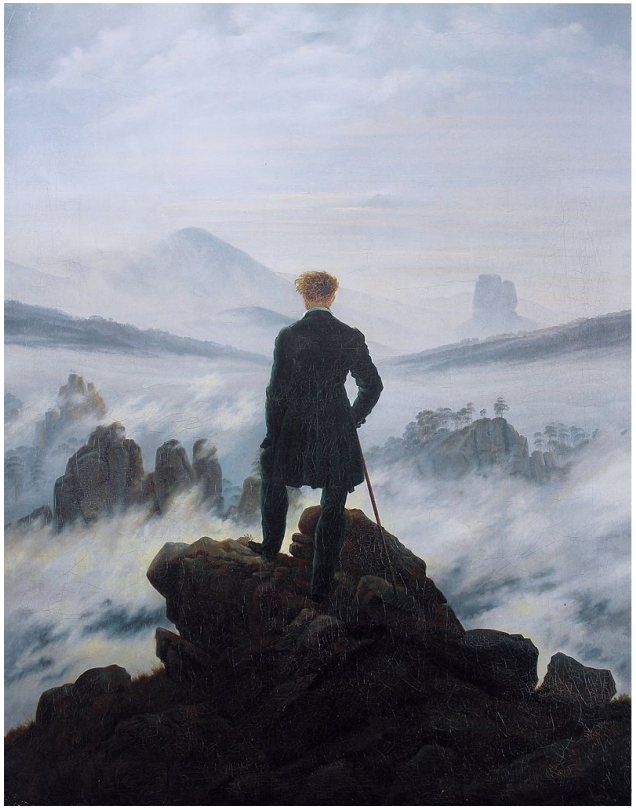
Pathos



What is Pathos?



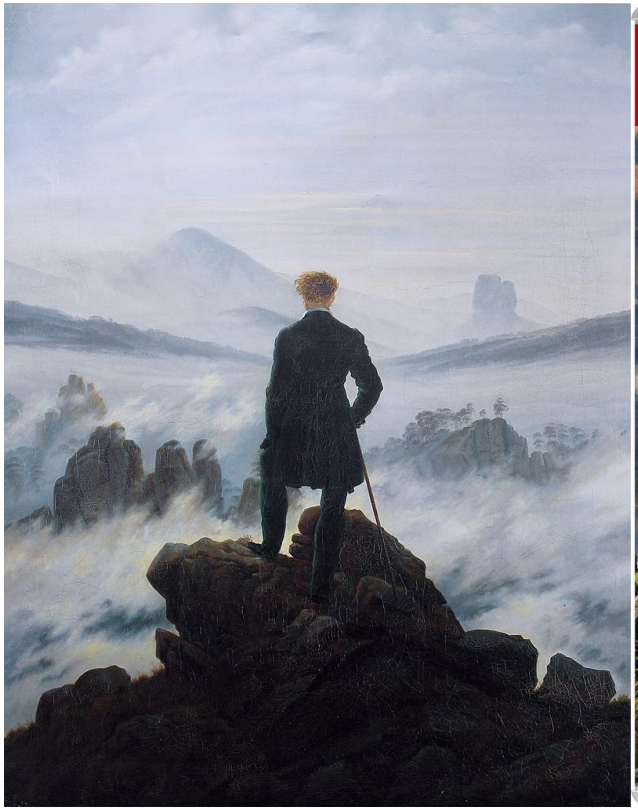
What is Pathos and why is it a good thing?

- Aesthetic-rhetorical concept
- No universal definition of the term pathos
- Appeal to the audiences emotions → those that affect a person's soul
- Pathos originally was used to (in theaters):
  - persuade the audience
  - enhance their catharsis
- Emotions tie to experiences → part of the sensemaking process

Aristoteles. 1995. Rhetorik (5th ed.). Fink Verl., Munich

Yun Wang, Adrien Segal, Roberta Klatzky, Daniel F. Keefe, Petra Isenberg, Jörn Hurtienne, Eva Hornecker, Tim Dwyer, Stephen Barrass, and Theresa Marie Rhyne. 2019. An Emotional Response to the Value of Visualization. IEEE Computer Graphics and Applications 39, 5 (2019), 8–17.

What is Pathos and why is it a good thing?



https://www.reddit.com/r/nintendo/comments/5obw0l/wanderer_above_the_sea_of_fog breath_of_the_wild/

“if the numbers are boring, then you've got the wrong number's. [...] who would trust a chart that looks like a videogame?"

Edward R Tufte. 1990. Envisioning Information. Graphic Press, Cheshire, Connecticut.

“The world cannot be understood without numbers. And it cannot be understood with numbers alone”

Hans Rosling. 2019. Factfulness. Ten reasons we’re wrong about the world - and why things are better than you think. Sceptre, London.

Techniques to create Pathos in Data Vis

- Proximity techniques
  - Time
  - Place
  - People
- Color & Design
- (Personal) Interest

Proximity Techniques

- **Time**
  - Assumption: Temporal proximity creates a higher emotional resonance in the viewer
  - How? Prediction
  - Con: Not always possible

Sarah Campbell. 2018. The Rhetoric of Pathos in Visualization. Northeastern University Boston.
George Campbell. 2008. The Philosophy of Rhetoric. Southern Illinois University Press.

Proximity Techniques

- **Place**
  - Assumption: Data with a local proximity to the viewer cause that individual to feel more strongly about them
  - How? Let people choose/appeal to imagination
  - Con: Subsets of data need to be generated → can create completely different datasets (not comparable anymore)

Sarah Campbell. 2018. The Rhetoric of Pathos in Visualization. Northeastern University Boston.
George Campbell. 2008. The Philosophy of Rhetoric. Southern Illinois University Press.

Proximity of time / place: AI generating future scenarios

Alexandra Luccioni, Victor Schmidt, Vahe Vardanyan, and Yoshua Bengio. 2021. Using Artificial Intelligence to Visualize the Impacts of Climate Change. IEEE Computer Graphics and Applications 41, 1 (2021), 8–14.

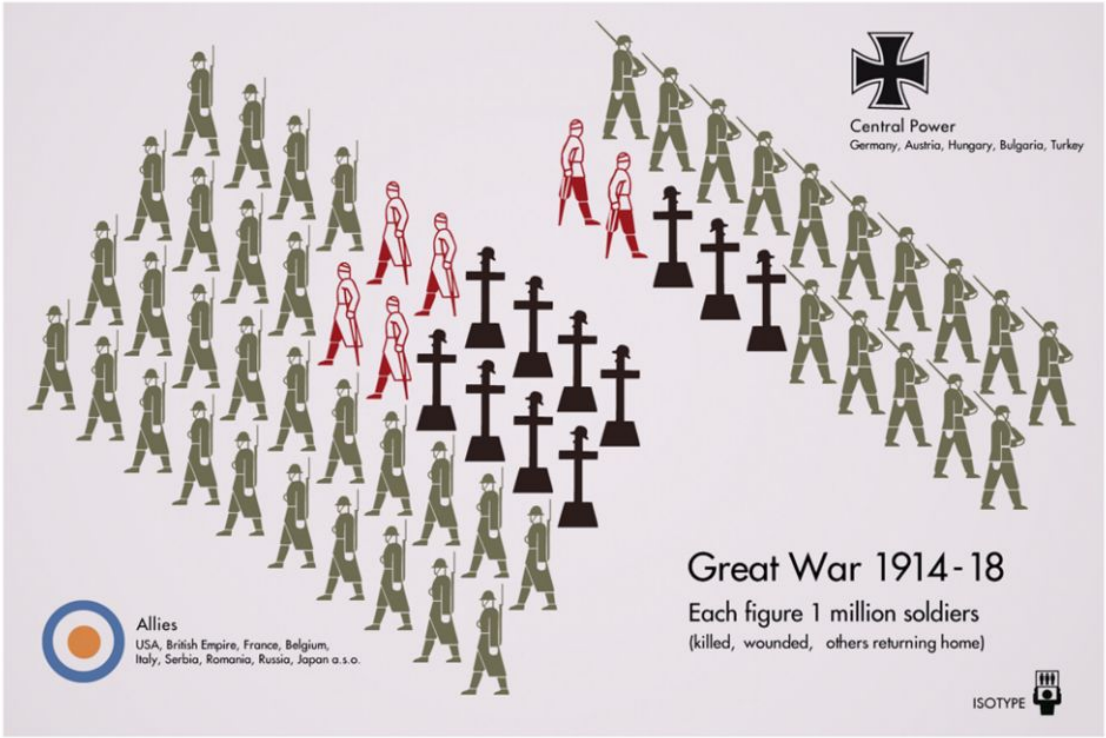
Proximity Techniques

- **People → humanizing data**
  - Assumption: When the data concerns people connected to the target-audience, people care more
  - How? Show people behind the data, anthropographics
  - Con: similarity bias/ individual differences (e.g. skin color)

Xingyu Lan, Yanqiu Wu, Yang Shi, Qing Chen, and Nan Cao. 2022. Negative Emotions, Positive Outcomes? Exploring the Communication of Negativity in Serious Data Stories. In CHI Conference on Human Factors in Computing Systems. 1–14.

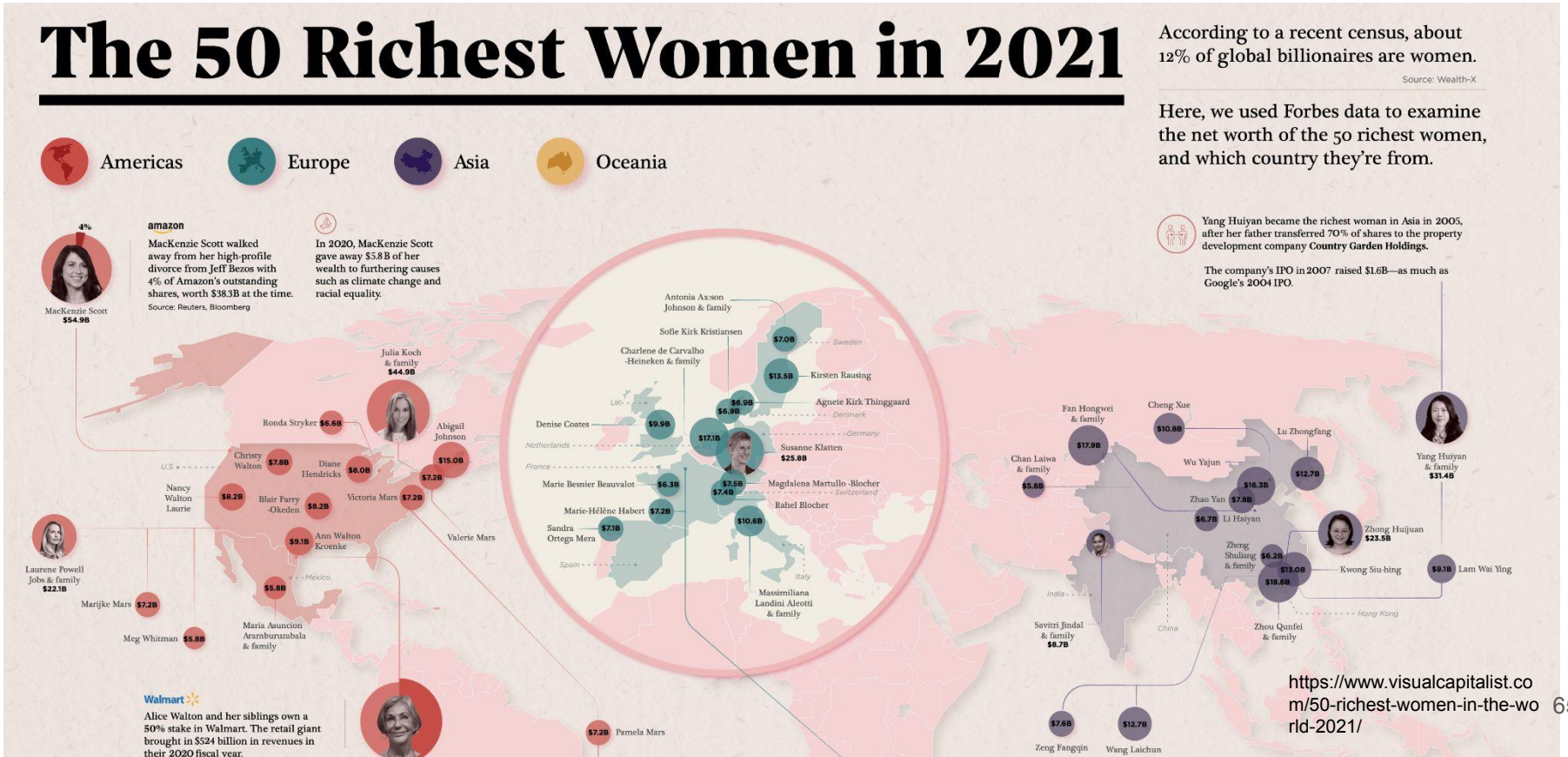
Jeremy Boy, Anshul Vikram Pandey, John Emerson, Margaret Satterthwaite, Oded Nov, and Enrico Bertini. 2017. Showing People Behind Data: Does Anthropomorphizing Visualizations Elicit More Empathy for Human Rights Data?. In Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (CHI '17). Association for Computing Machinery, New York, NY, USA, 5462–5474.

Anthropographics



Luiz Morais, Yvonne Jansen, Nazareno Andrade, Pierre Dragicevic. Showing Data about People: A Design Space of Anthropographics. IEEE Transactions on Visualization and Computer Graphics, 2022, 28 (3), pp.1661-1679

Proximity to people (similarity)



https://www.visualcapitalist.com/50-richest-women-in-the-world-2021/

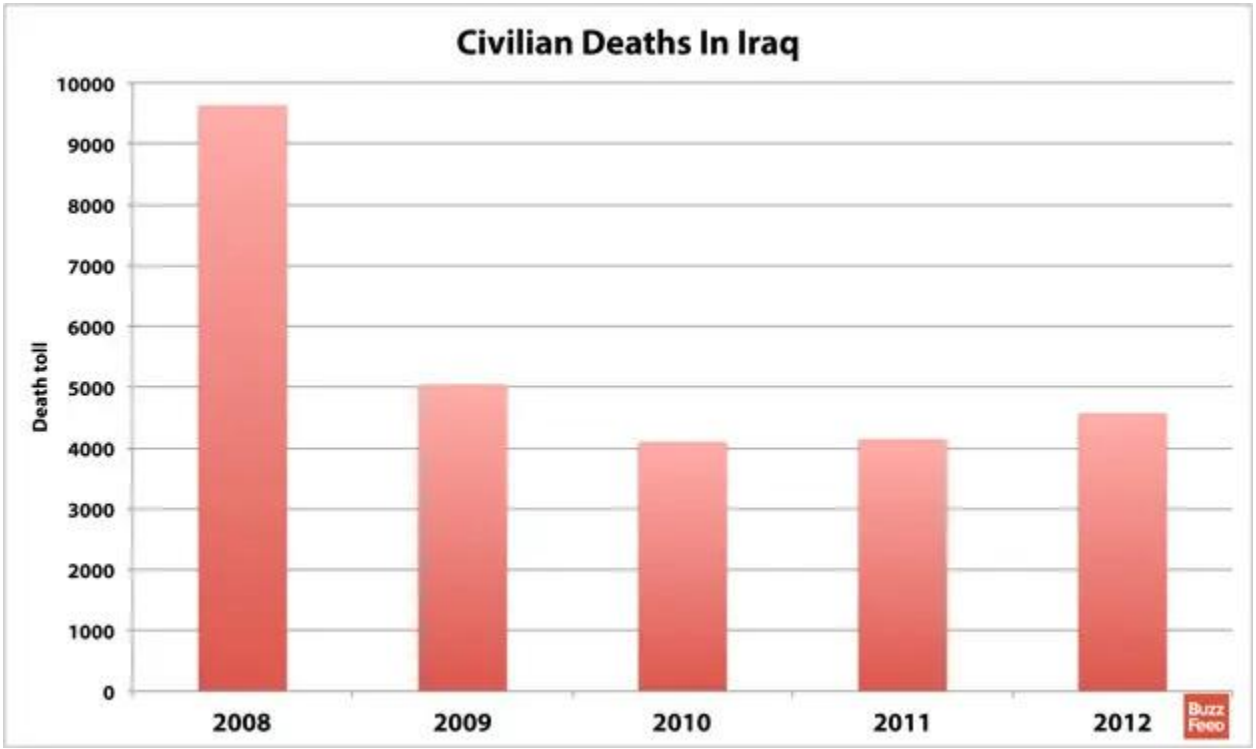
Color & Design

- Assumption: A deliberate choice of design can address the emotional side of the viewer
- How? Make use of colors / Emotional Design (2004) by Donald A. Norman
- Con: Trust / credibility / Tufte

Francesca Samsel, Lyn Bartram, and Annie Bares. 2018. Art, Affect and Color: Creating Engaging Expressive Scientific Visualization. In 2018 IEEE VIS Arts Program (VISAP). 1–9.

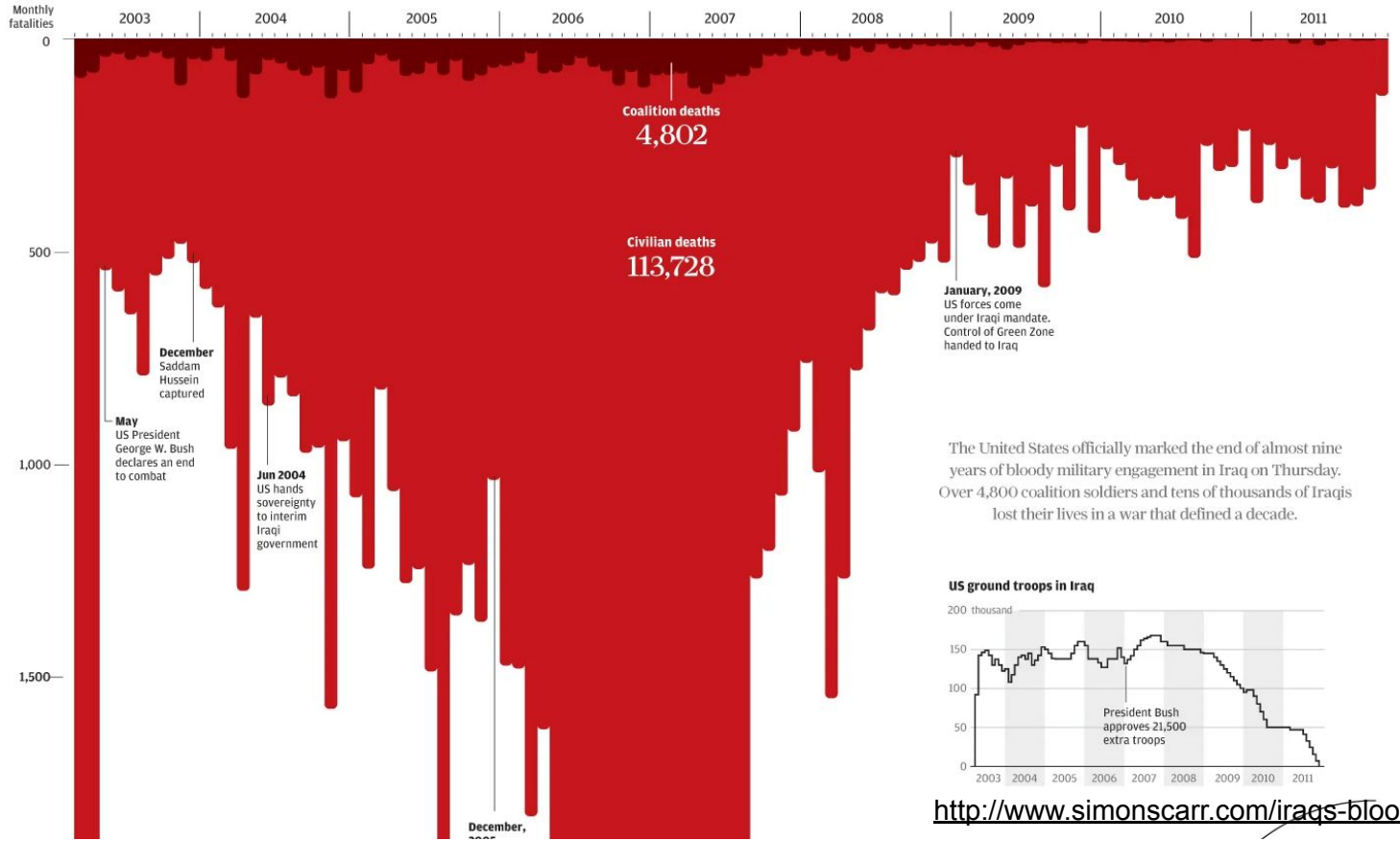
Lisa Charlotte Muth. 2016. A Data Point Walks Into a Bar. https://lisacharlottemuth.com/2016/12/27/datapoint-in-bar/

Color & Design:



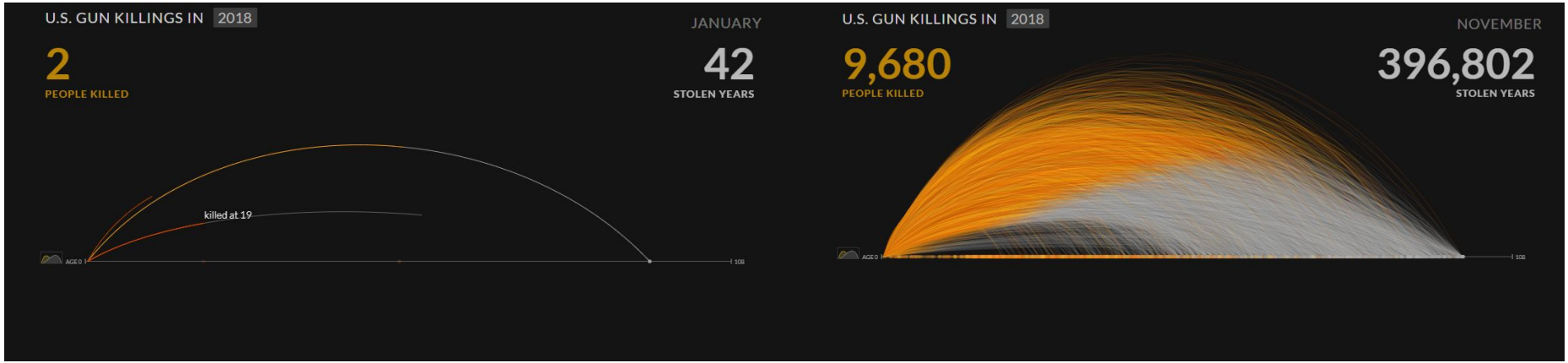
Anna North. 2013. For Iraq, The War Isn't Over. https://www.buzzfeednews.com/article/annanorth/for-iraq-the-war-isnt-over

Color & Design: “Iraq’s bloody toll” by Simon Scarr



http://www.simonscarr.com/iraqs-bloody-toll

Color & Design: Example



https://guns.periscopic.com/

Interest

- Assumption: The greater the interest people feel toward something, the higher the engagement with the visualization
- How? Subject matter
- Con: Very individual

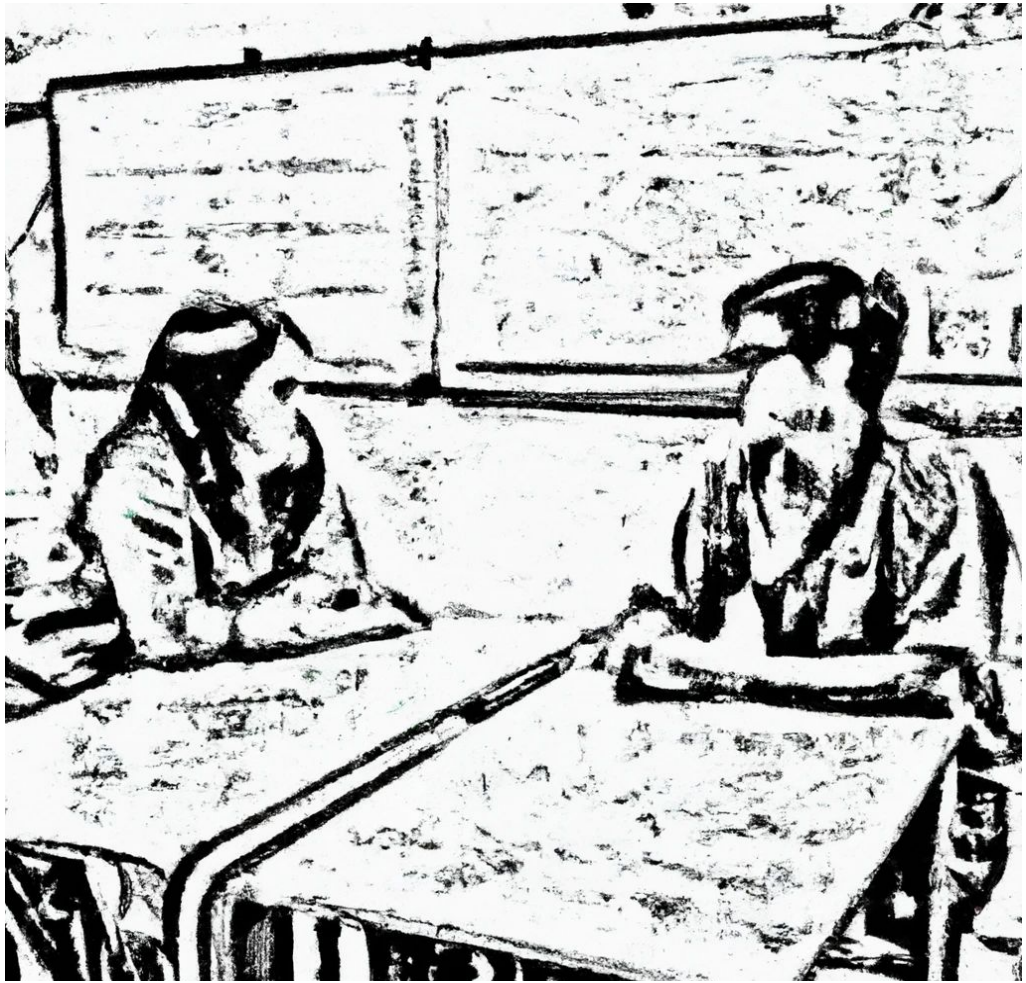
Helen Kennedy and Rosemary Lucy Hill. 2018. The Feeling of Numbers: Emotions in Everyday Engagements with Data and Their Visualisation. Sociology 52, 4 (2018), 830–848.

Sarah Campbell and Dietmar Offenhuber. 2019. Feeling numbers. The emotional impact of proximity techniques in visualization. Information design journal 25 (2019), 71–86.

*“In fact, **emotion could be thought of as a byproduct of** a **learning** outcome. [...] If an advocacy group is trying to get their audience fired up and emotionally charged, it’s because they want them to take an action”*

Elsie Lee-Robbins and Eytan Adar. 2022. Affective Learning Objectives for Communicative Visualizations. IEEE Transactions on Visualization and Computer Graphics (2022), 1–11. https://doi.org/10.1109/TVCG.2022.3209500

Takeaways ?



Takeaways (pathos)

- Pathos is the appeal to the audience's emotion
- The use of proximity techniques can create pathos
- Show the people behind the data (Humanize your data)
- Make use of color and design
- Let people choose → appeal to their interests

Rhetoric of visuals
The art of persuasion
Logos
Ethos
Pathos
Storytelling

Storytelling with data

*“Datastories are **intentional communicative artefacts that present data** in an interesting, evocative and informative way”*

Feigenbaum, A. and Alamalhodaei, A., 2020. The Data Storytelling Workbook. Routledge.

Science is a form of storytelling

- When data and stories are used together they resonate with audiences on both an **intellectual and emotional level**
- Potential to focus on the **human** elements.
- A dataset likely contains **multiple possible** stories.
- A great story needs to **surprise** (then it sticks).
- The discovery process has the potential to create great narratives.

S. A. Matei and L. Hunter, 2021. Data storytelling is not storytelling with data: A framework for storytelling in science communication and data journalism. The Information Society, 37(5):312–3225.

“It is naïve to expect that simply by rendering multiple data streams visually, a teacher or learner will be able to make sense of them”

Roberto Martinez-Maldonado, V Echeverria, Gloria Fernandez Nieto, and Simon Buckingham Shum. 2020. From Data to Insights: A Layered Storytelling Approach for Multimodal Learning Analytics. In CHI Conference on Human Factors in Computing Systems. CHI ’20, Honolulu, 1–15.

Principles of Data Storytelling

- Data Storytelling is goal oriented
- The data story should rely on a fitting chart type
- The data story should be stripped down first
- The data story should guide attention

Narrative Design Patterns

Martinez-Maldonado, R., Echeverria, V., Fernandez Nieto, G. and Buckingham Shum, S., 2020. From data to insights: A layered storytelling approach for multimodal learning analytics. In Proceedings of the 2020 chi conference on human factors in computing systems

Bach, B., Stefaner, M., Boy, J., Drucker, S., Bartram, L., Wood, J., Ciuccarelli, P., Engelhardt, Y., Koeppen, U. and Tversky, B., 2018. Narrative design patterns for data-driven storytelling. In Data-driven storytelling, AK Peters/CRC Press.

Narrative Design Patterns (summarized)

Argumentation: reasoning systematically to support messages and arguments.

Flow: helping structure the sequence of messages and arguments.

Framing: the way facts and events in a story are perceived and understood through narration.

Emotion: enhancing readers' ability to understand and share the feelings and experiences important to the story.

Engagement: the feeling of being part of the story, of being connected to it and being in control over the interaction with the story's content.

Bach, B., Stefaner, M., Boy, J., Drucker, S., Bartram, L., Wood, J., Ciuccarelli, P., Engelhardt, Y., Koeppen, U. and Tversky, B., 2018. Narrative design patterns for data-driven storytelling. In Data-driven storytelling, AK Peters/CRC Press.

Example: Sea depth

Example: The collapse of insects

https://www.reuters.com/graphics/GLOBAL-ENVIRONMENT/INSECT-APOCALYPSE/egpbykdxjvq/

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