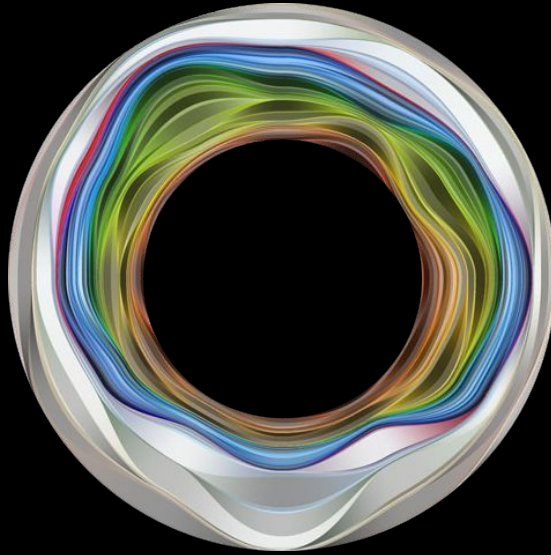


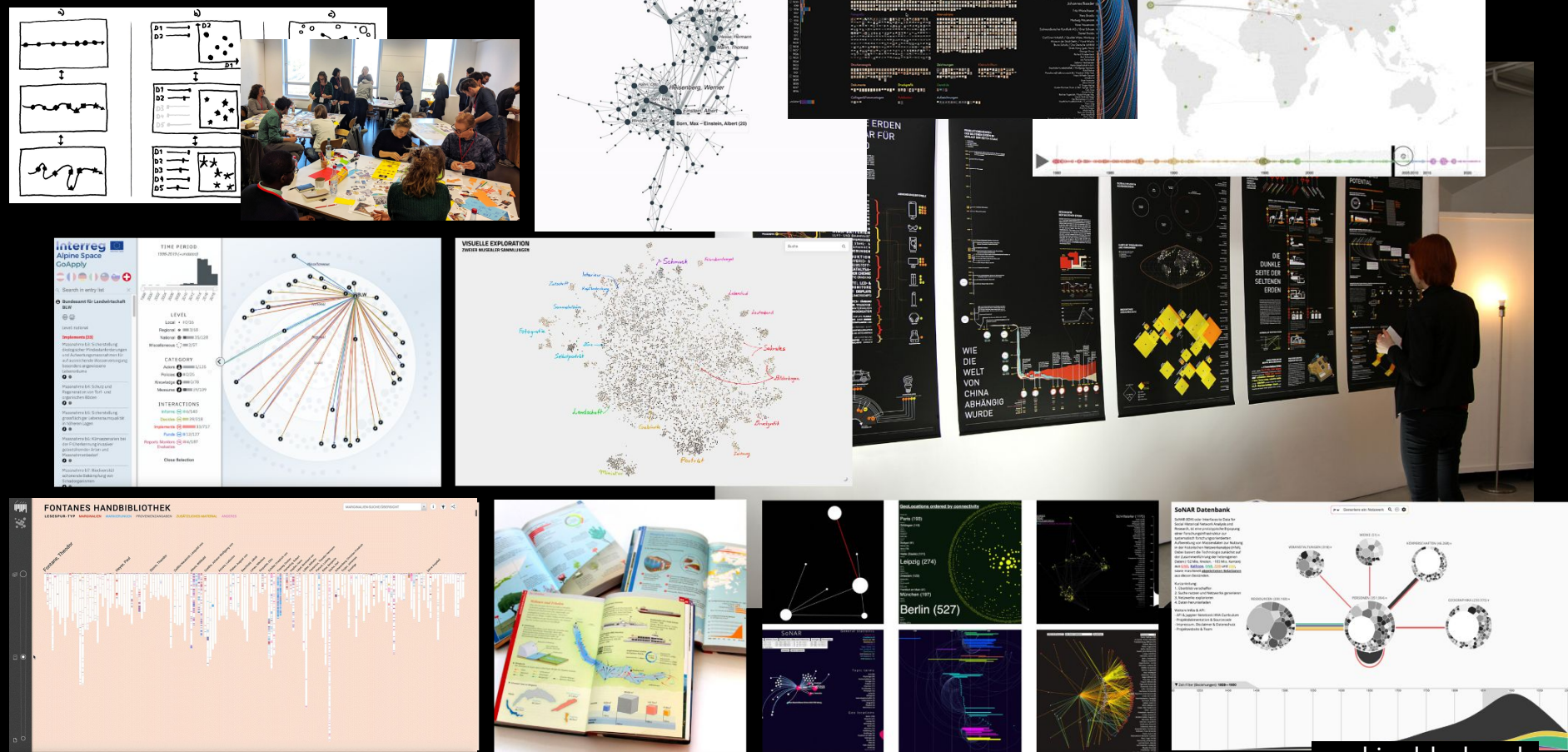
Einführung in die Datenvisualisierung

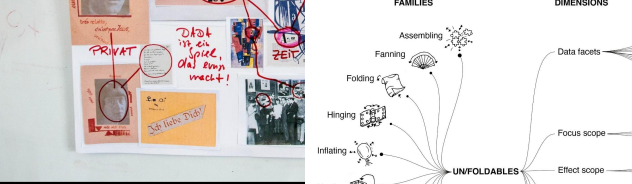
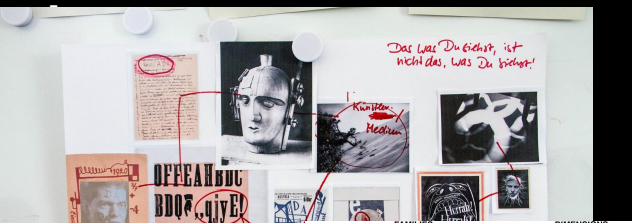


Mark-Jan Bludau
markjanbludau.de / mail@markjanbludau.de

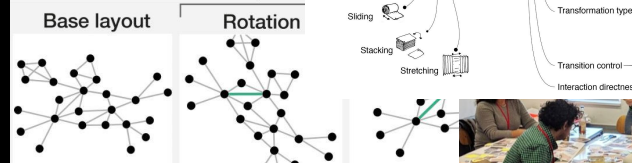
Image credit: Flickr Flow by Martin
Wattenberg & Fernanda Viégas

Über mich

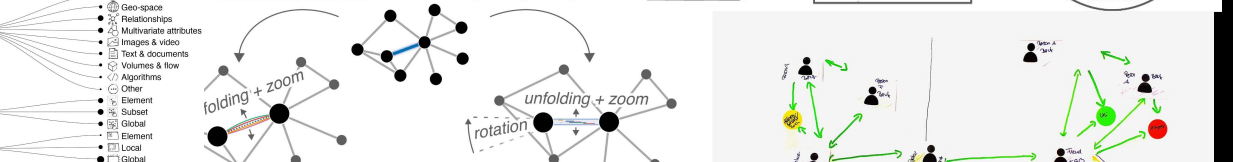
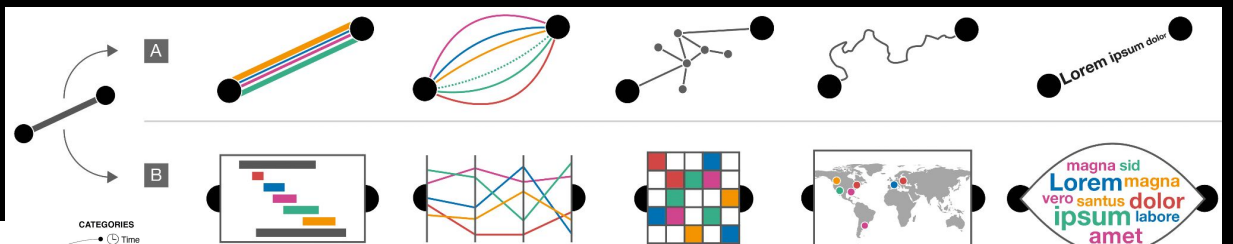
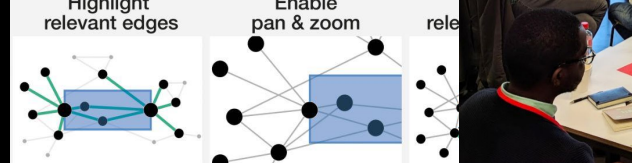




Creating focus and space



Navigation to other edges



- Bludau, M. J., Dörk, M., Bruckner, S., & Tominski, C. (2025). Fluidly Revealing Information: A Survey of Un/foldable Data Visualizations. In *Computer Graphics Forum*
- Bludau, M. J., Dörk, M., & Tominski, C. (2023). Unfolding Edges: Adding Context to Edges in Multivariate Graph Visualization. In *Computer Graphics Forum* (Vol. 42, No. 3)
- Brüggemann, V., Bludau, M. J., & Dörk, M. (2020). The fold: Rethinking interactivity in data visualization. *DHQ*, 14(3).
- Braunschweiger, D., Pütz, M., Heidmann, F., & Bludau, M. J. (2018). Mapping governance of adaptation to climate change in Switzerland. *Regional Studies, Regional Science*, 5(1), 398-401.
- ...

UCLAB (Urban Complexity Lab)



<https://uclab.fh-potsdam.de>





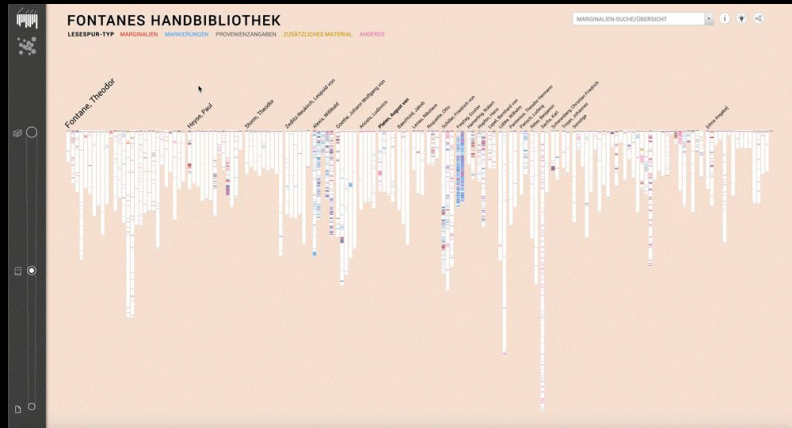
<https://uclab.fh-potsdam.de/closeupcloud>

Pauline Junginger, Dennis Ostendorf, Anastasia Voloshina, Barbara Vissirini, Timo Hausmann, Christopher Pietsch, Sarah Kreiseler



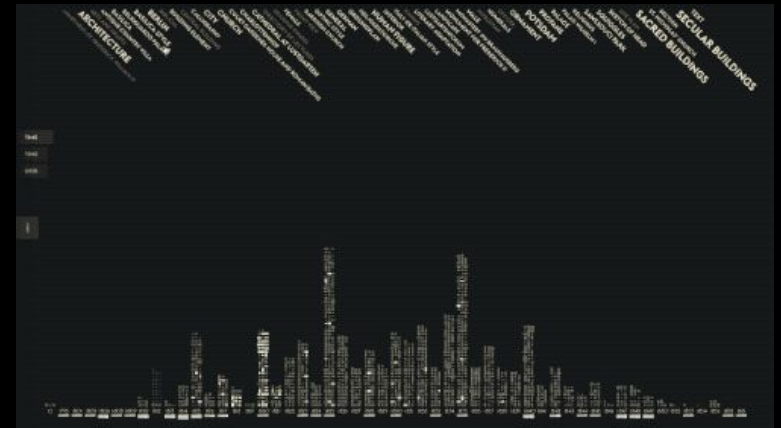
<https://uclab.fh-potsdam.de/coins>

Flavio Gortana, Daniela Guhlmann, Franziska von Tenspolde



<https://uclab.fh-potsdam.de/ff>

Mark-Jan Bludau, Viktoria Brüggemann, Marian Dörk



<https://uclab.fh-potsdam.de/fw4>

Christopher Pietsch, Katrin Glinka, Marian Dörk

Information Visualization?

Definition für »Information Visualization«

*explore patterns and
relationships in data*

*utilize human
visual perception*

*»The use of computer-supported, **interactive, visual**
representations of **abstract** data to **amplify cognition**.«*

no inherent spatial dimension

make connections and decisions

Warm-up

Warm-up

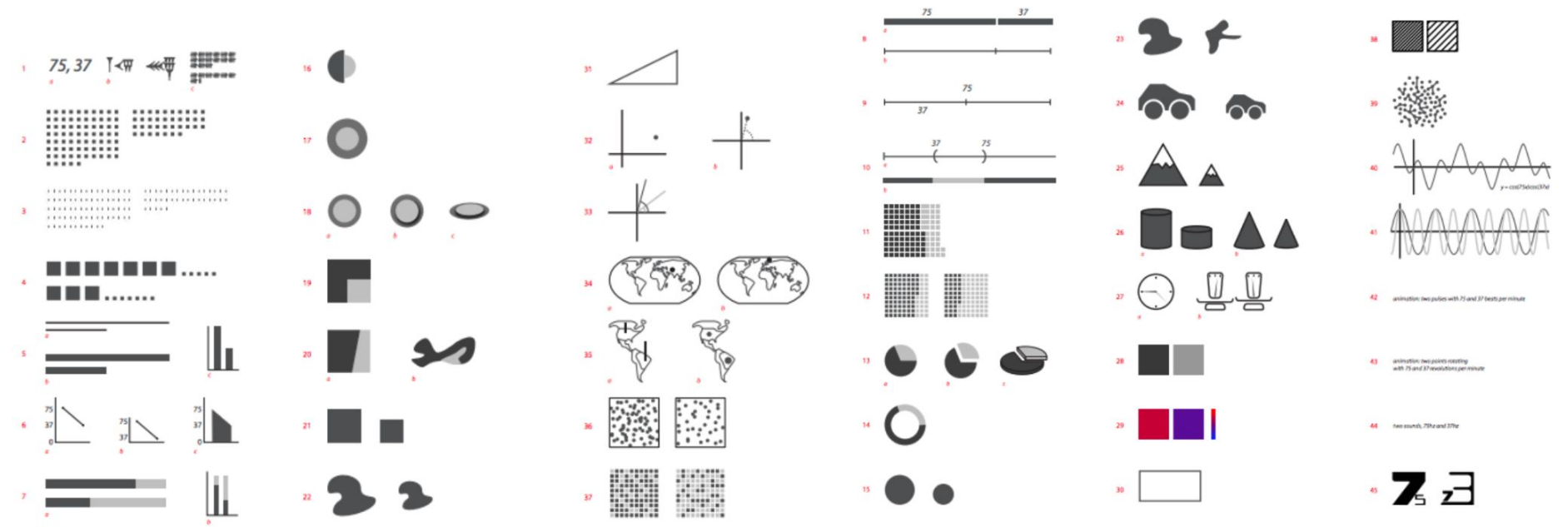
Aufgabe:

Finden Sie in 7 Minuten möglichst viele Wege, den folgenden Datensatz zu visualisieren.

Warm-up

75
37

»45 ways to communicate 2 quantities«



Warm-up: Was wäre wenn...?

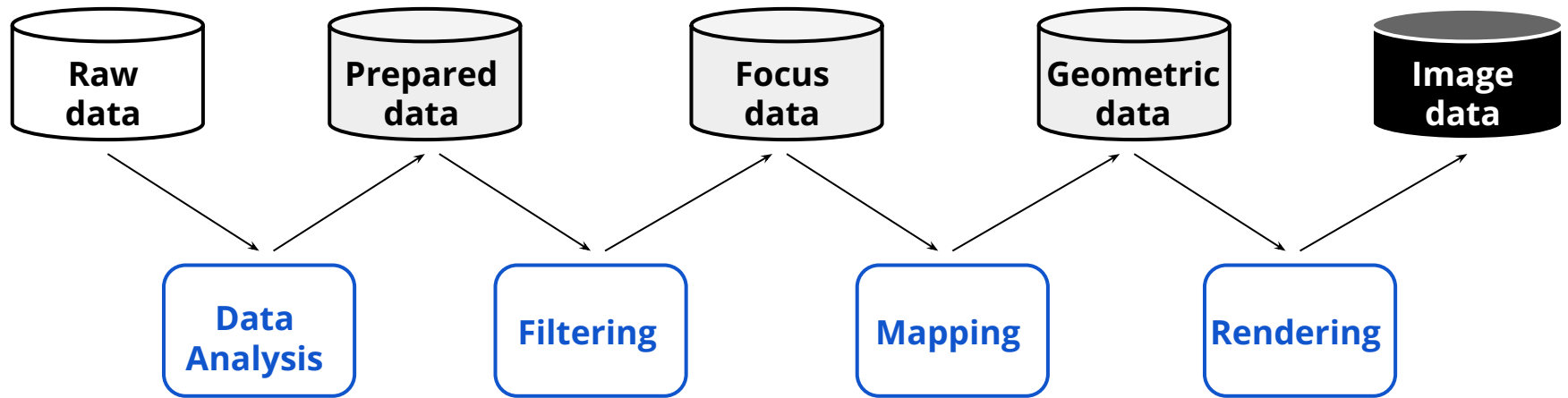
**75?
ca. 37**

Übungsreflektion

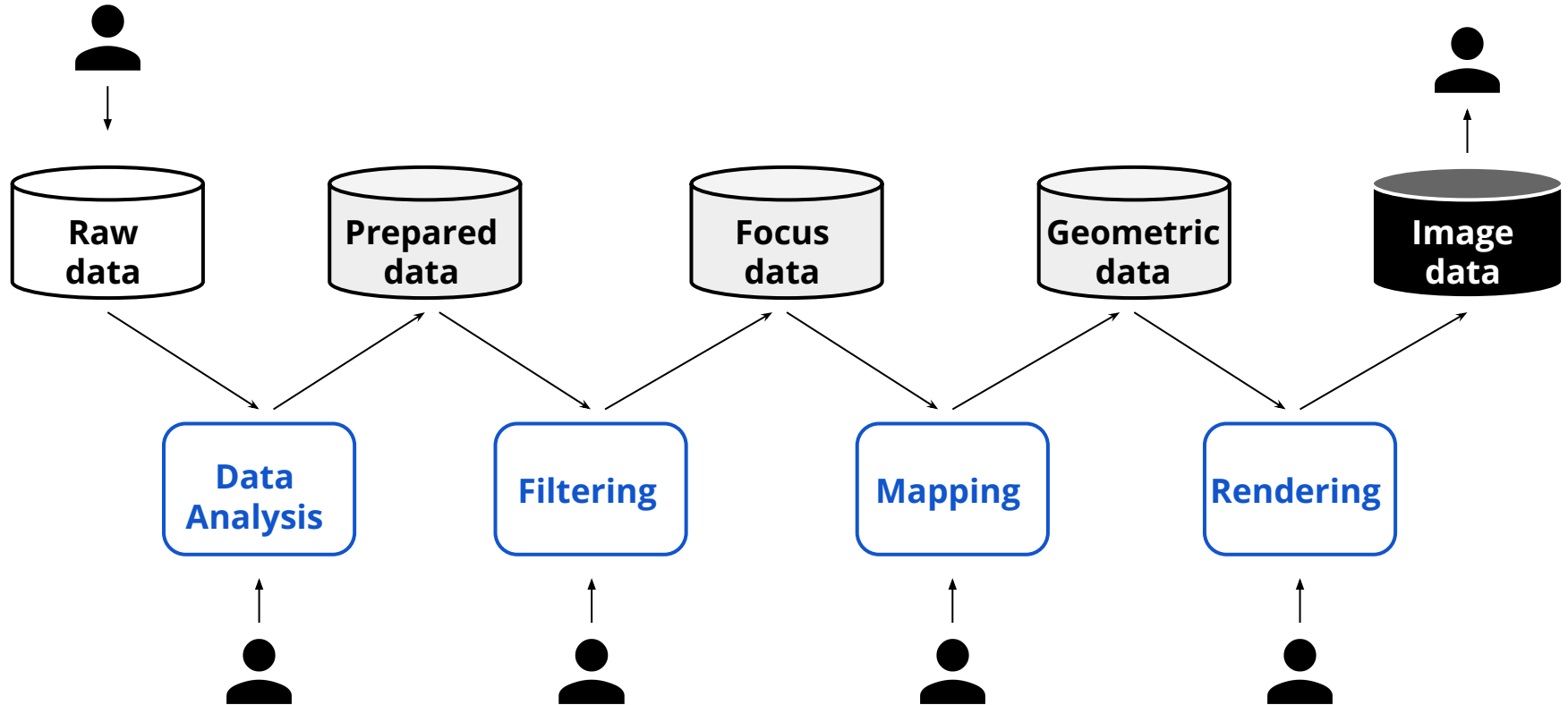
- Es gibt viele Möglichkeiten, selbst sehr kleine Datensätze zu visualisieren.
- Es gibt keine »beste« Art, einen Datensatz zu visualisieren
- Semantik und Kontext sind wichtig
- Die Größe des Datensatzes spielt eine Rolle
- Das Publikum, das die Daten liest und interpretiert, ist zu berücksichtigen
- Es ist wichtig, verschiedene Gestaltungsalternativen zu kennen (und zu erkunden) und darauf aufbauend Entscheidungen zu treffen

Grundlagen der Datenvisualisierung

Visualisierungspipeline



Visualisierungspipeline



Adaptiert von dos Santos, S. and Brodlie, K. Gaining understanding of multivariate and multidimensional data through visualization. Computers & Graphics, 28(3):311–325. 2004.

Datenattribute

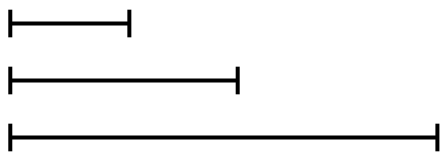
Categorical/Nominal



Ordinal



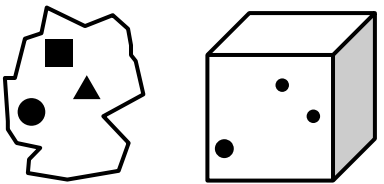
Quantitative



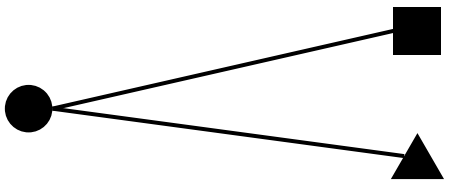
Temporal/Sequential



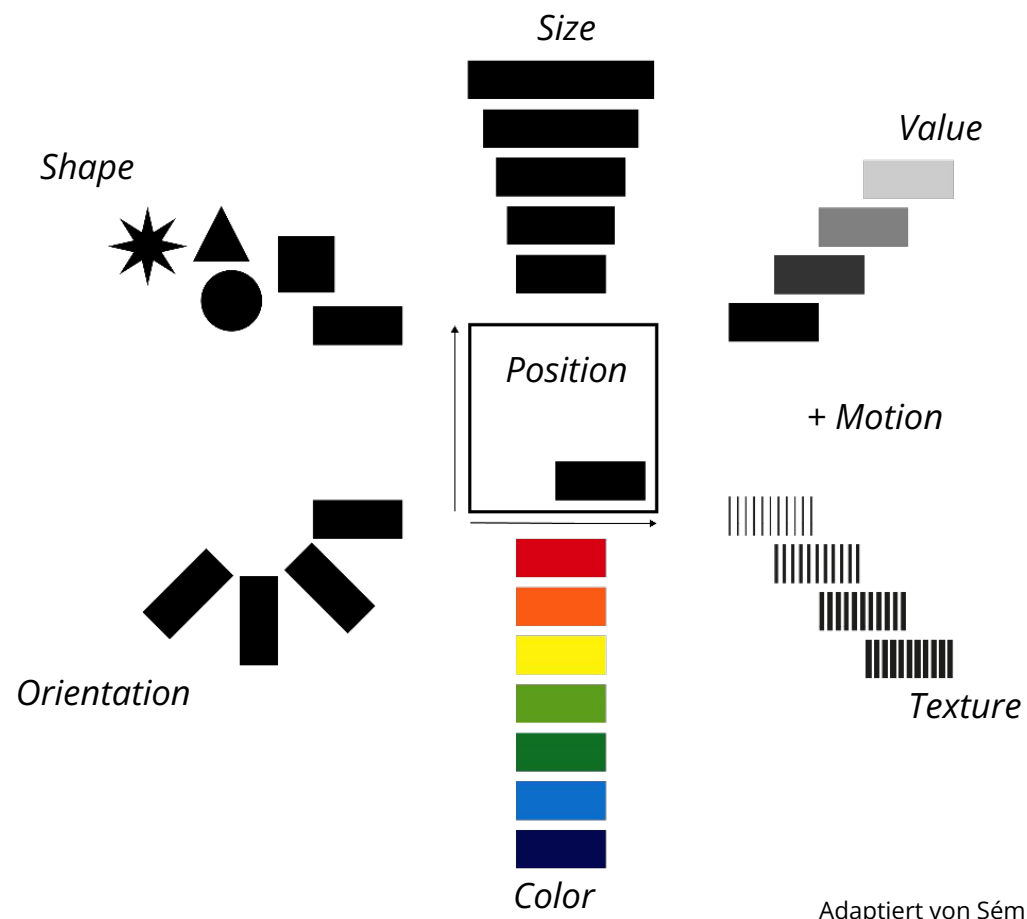
(Geo)Spatial



Relational/Hierarchical

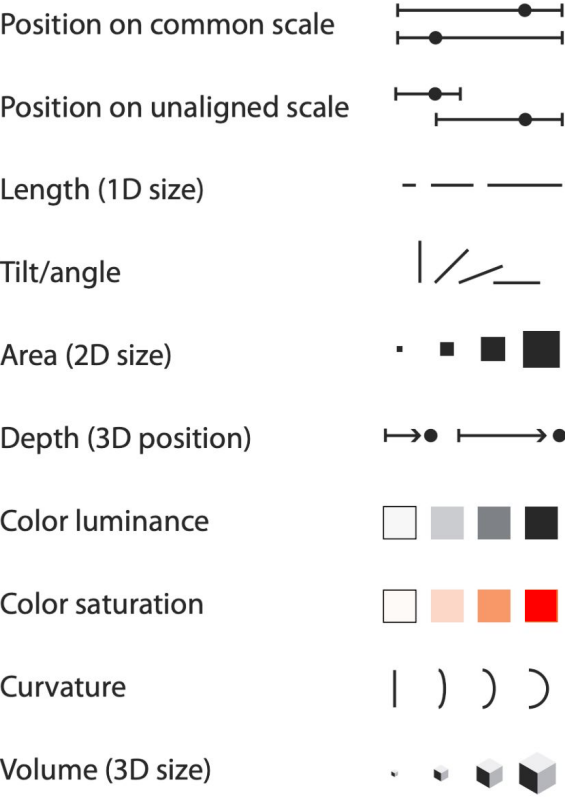


Visuelle Variablen

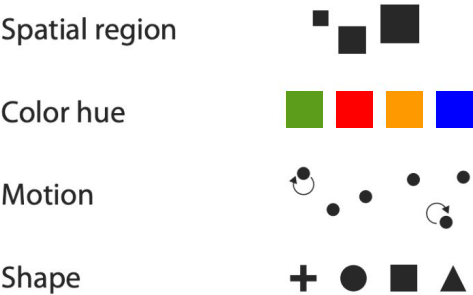


Effektivitäts-Ranking

Quantitative/Ordnungs- Attribute

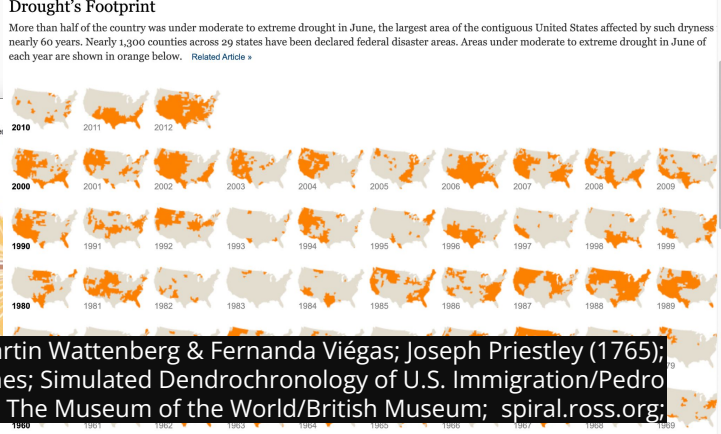
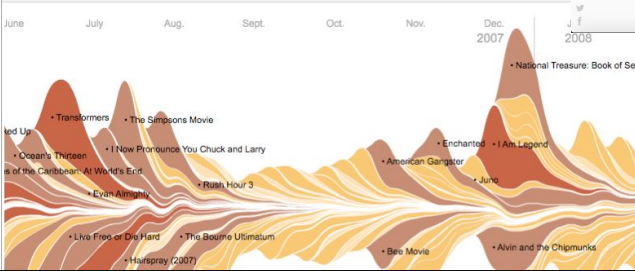
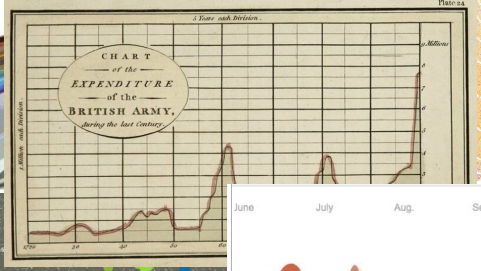
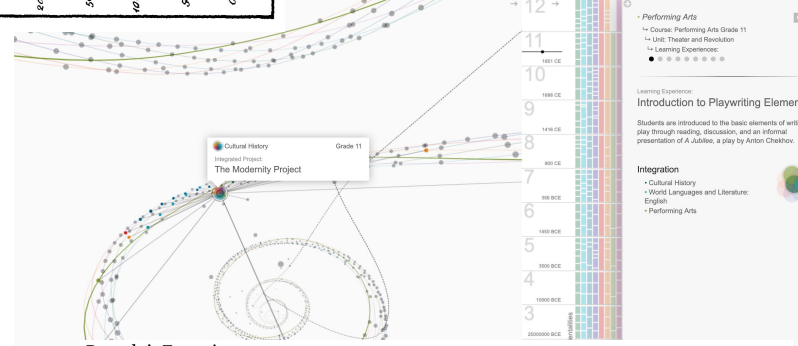
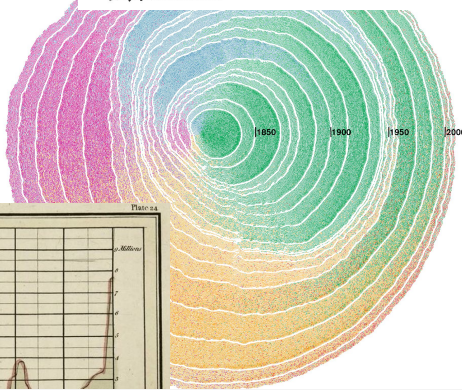
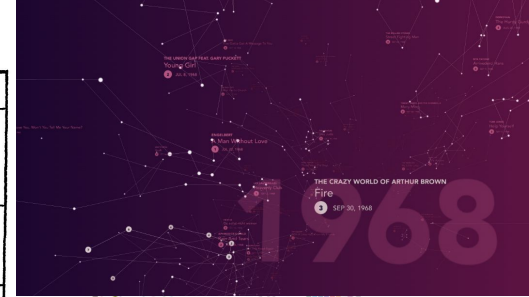
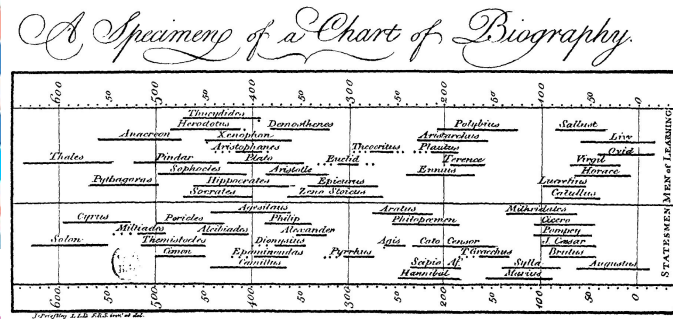
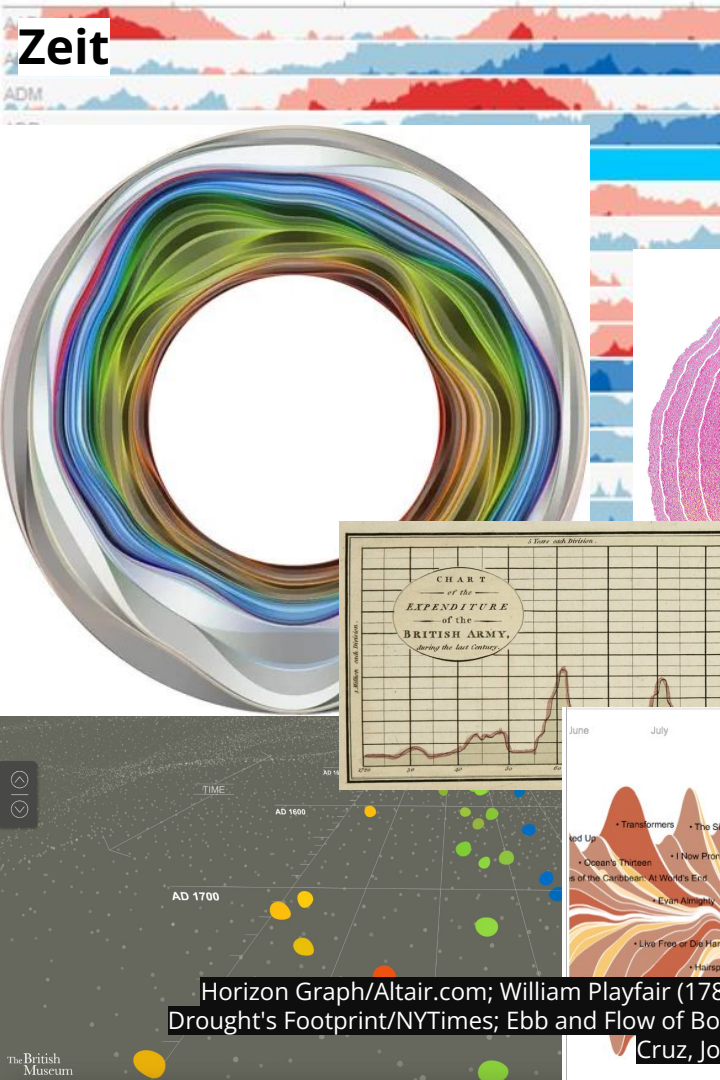


Kategorische Attribute

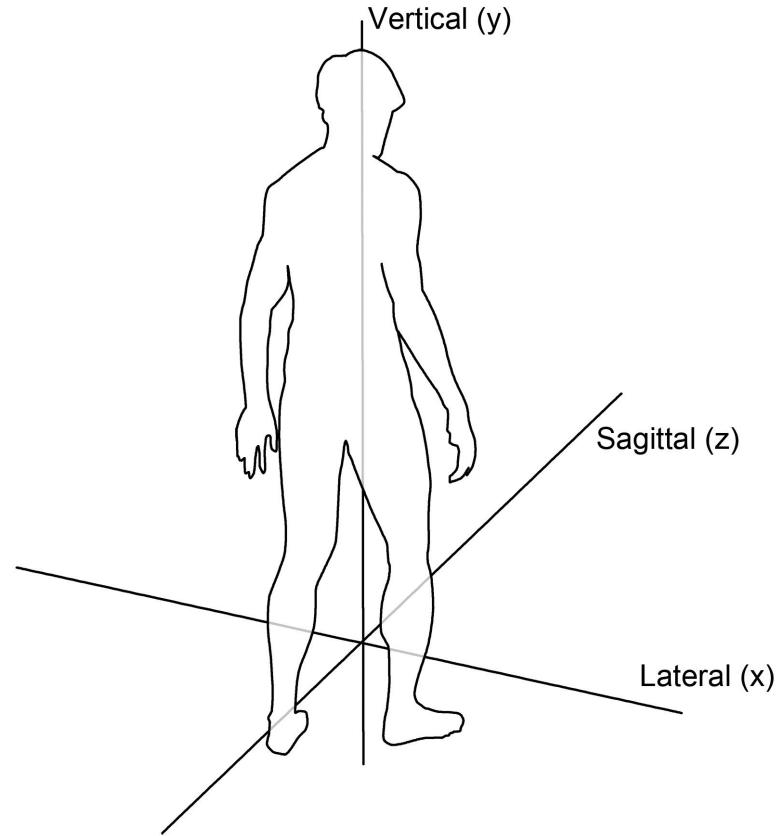


▲ Most
Effectiveness
Least ▼

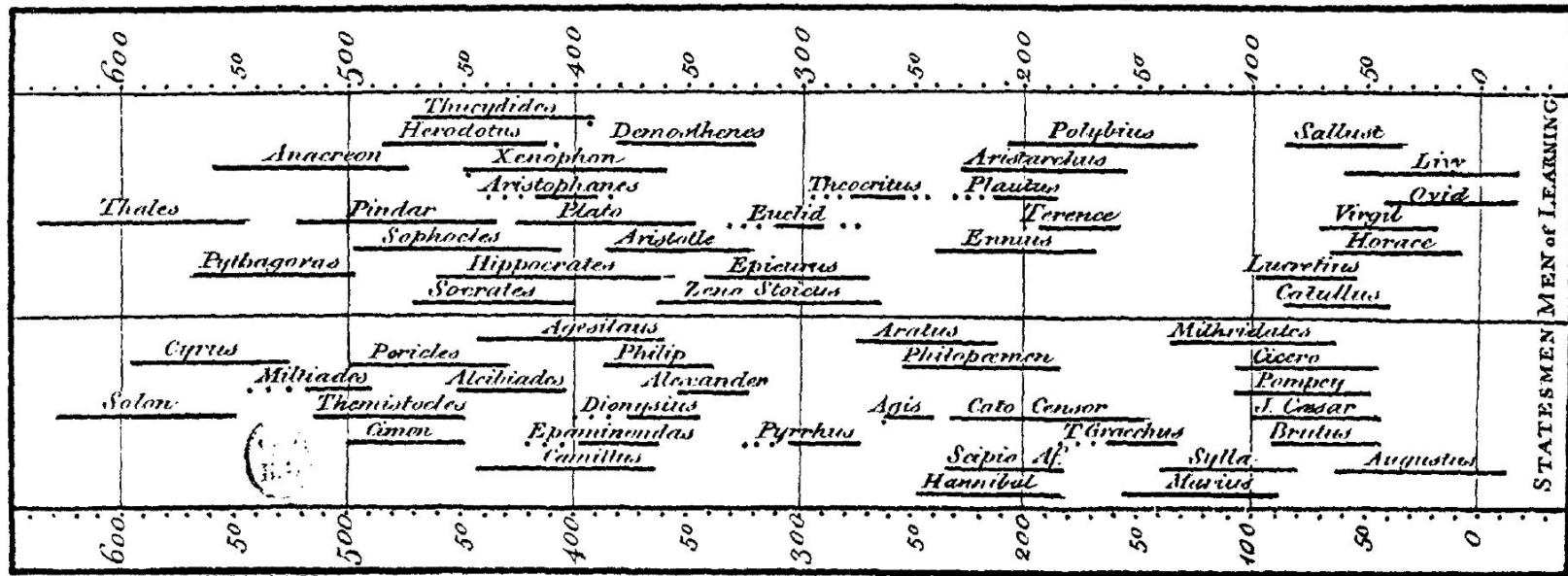
Tour durch den Visualisierungs-Zoo



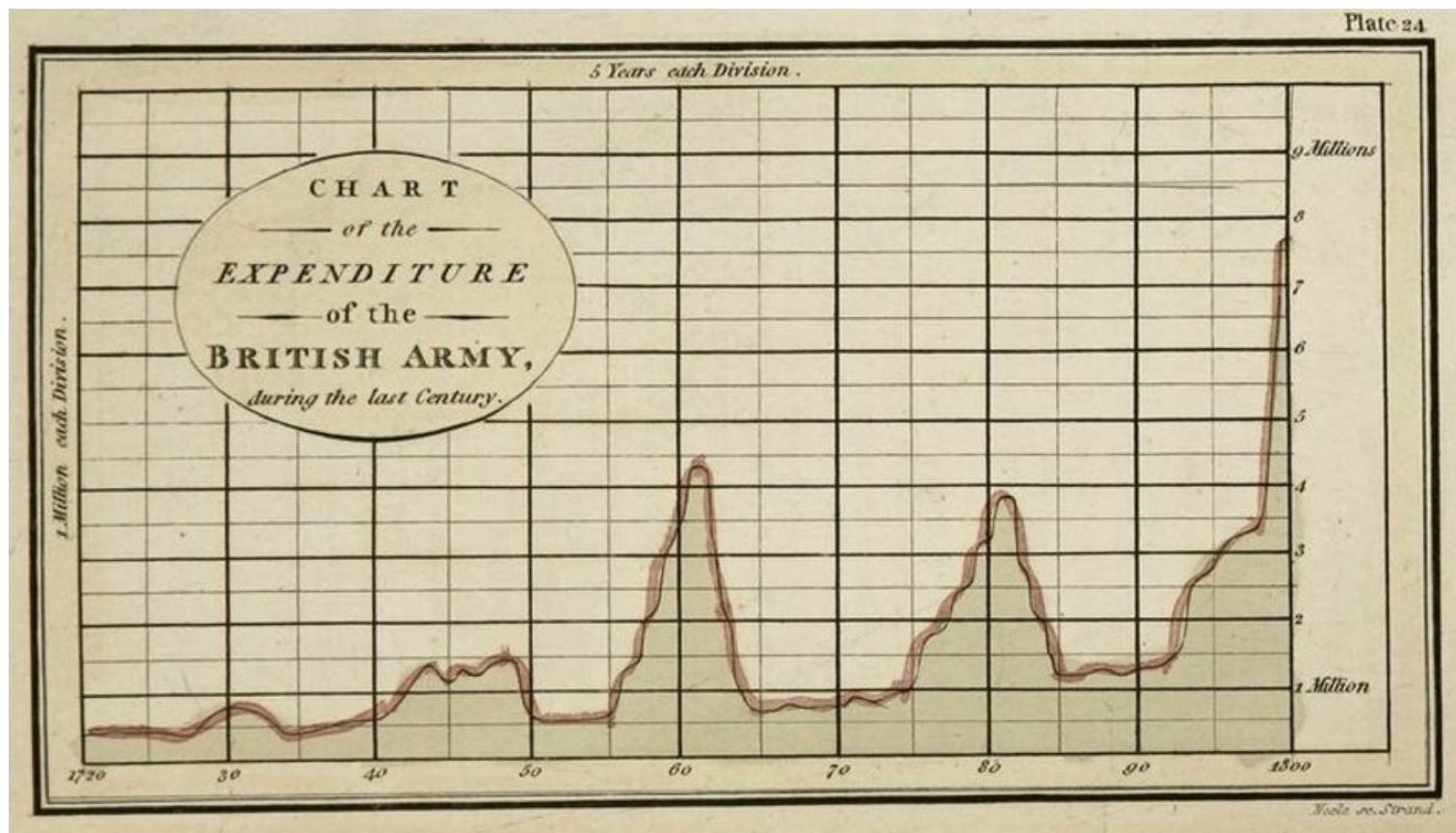
Horizon Graph/Altair.com; William Playfair (1786); 50-jahre-hitparade.ch; Flickr Flow by Martin Wattenberg & Fernanda Viégas; Joseph Priestley (1765); Drought's Footprint/NYTimes; Ebb and Flow of Box Office Receipts Over Past 20 Years/NYTimes; Simulated Dendrochronology of U.S. Immigration/Pedro Cruz, John Wihbey, Avni Ghael, and Felipe Shibuya; The Museum of the World/British Museum; spiral.ross.org;

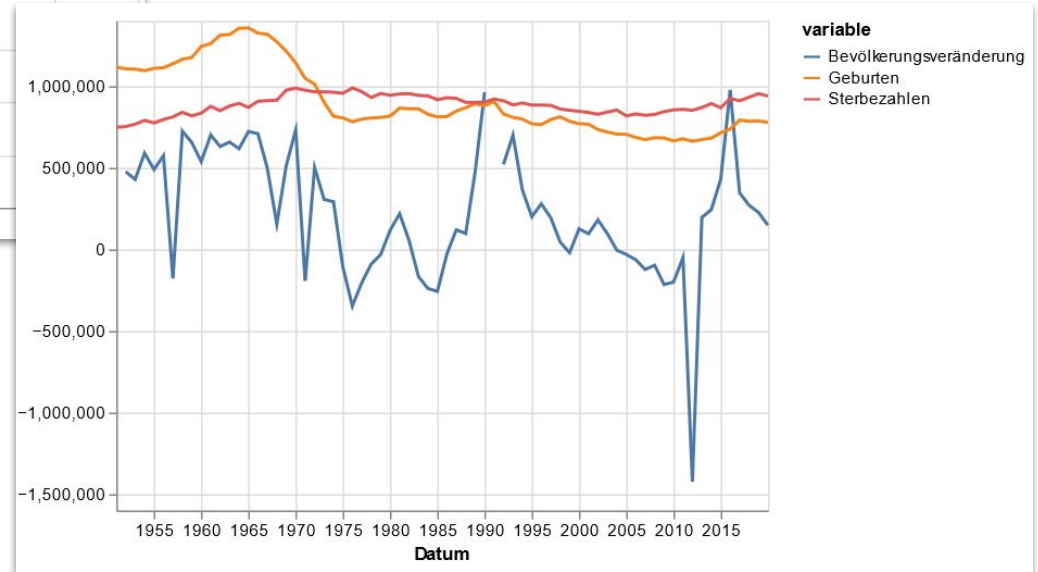


A Specimen of a Chart of Biography.



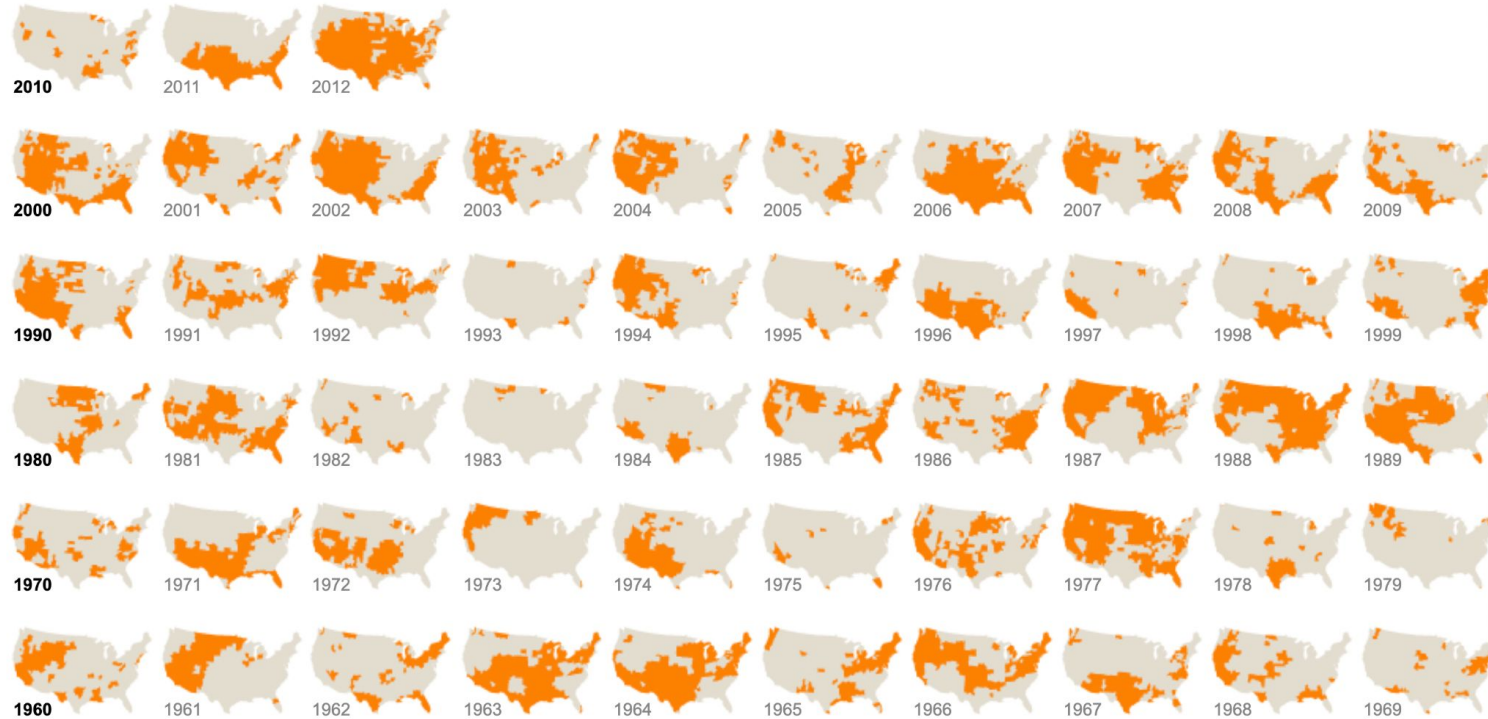
J. Priestley L.L.D. F.R.S. inv. et del.

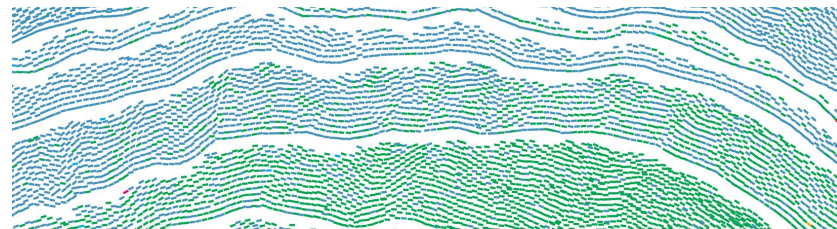
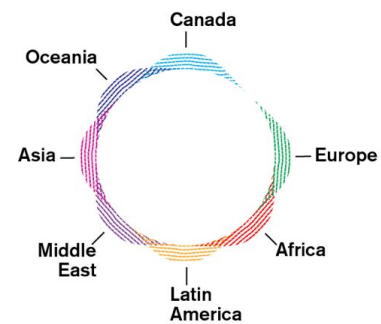
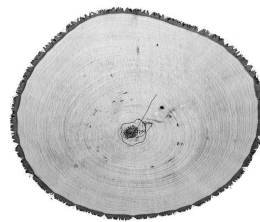




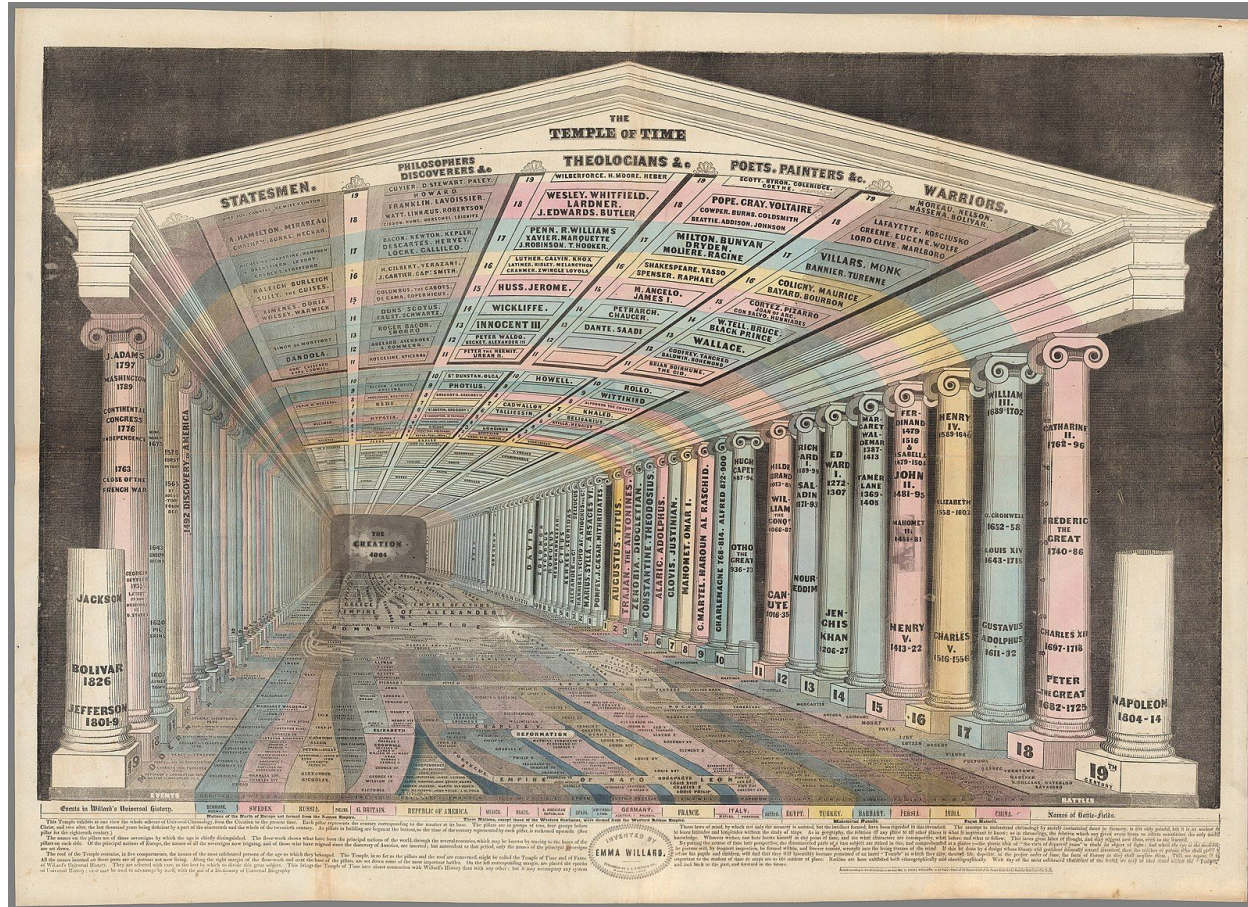
Drought's Footprint

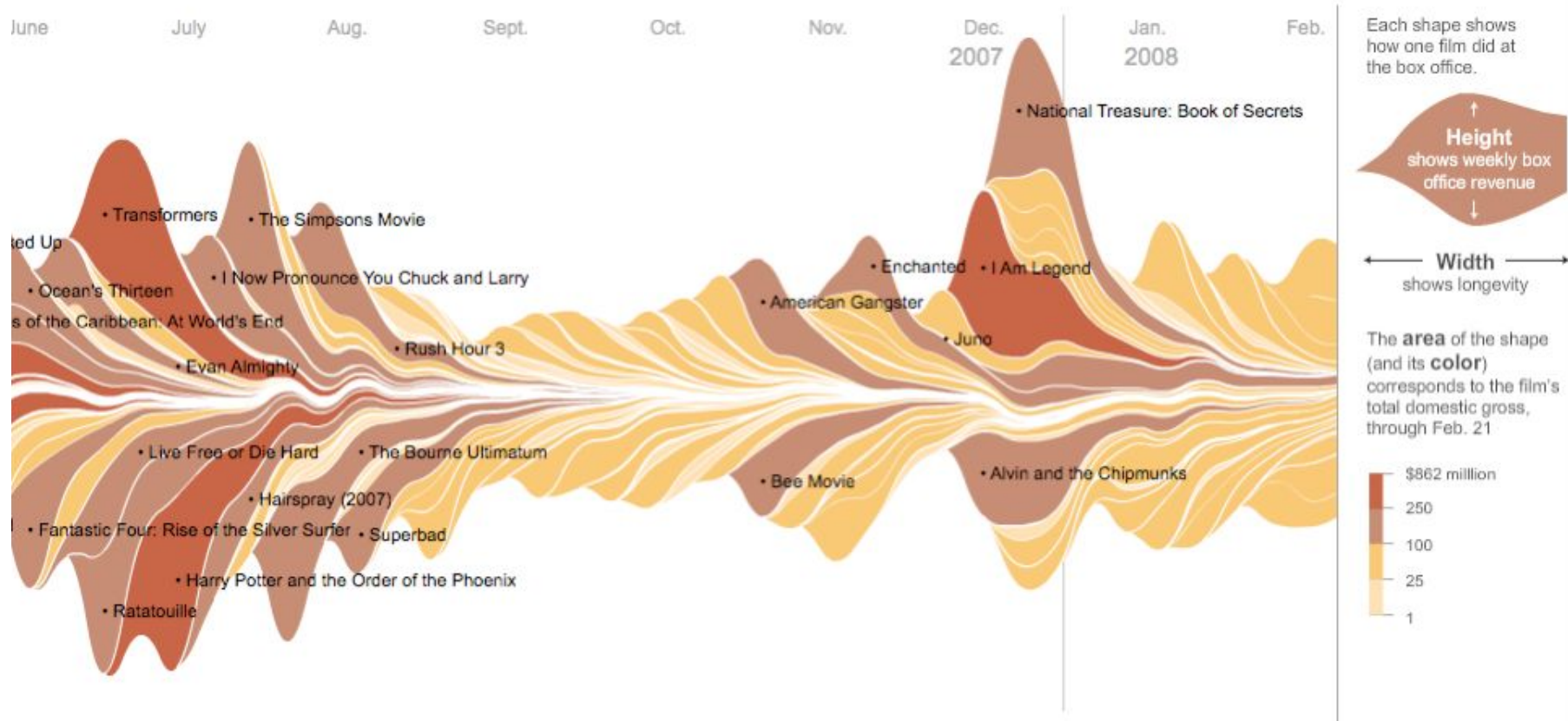
More than half of the country was under moderate to extreme drought in June, the largest area of the contiguous United States affected by such dryness nearly 60 years. Nearly 1,300 counties across 29 states have been declared federal disaster areas. Areas under moderate to extreme drought in June of each year are shown in orange below. [Related Article »](#)





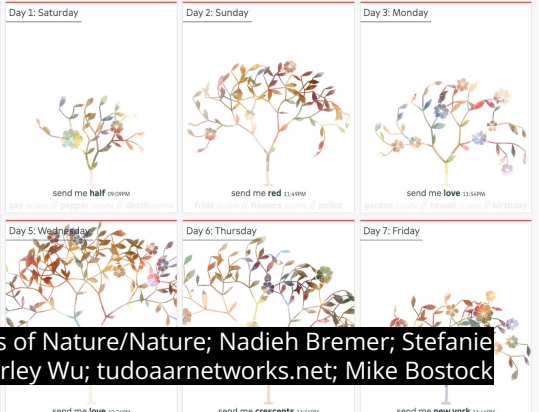
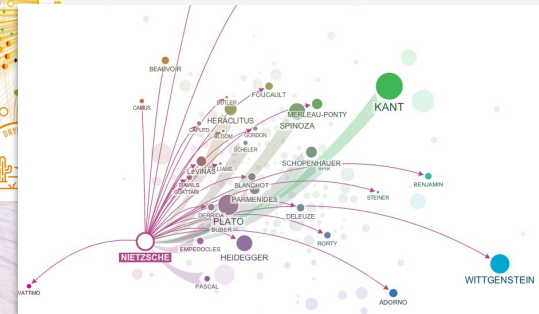
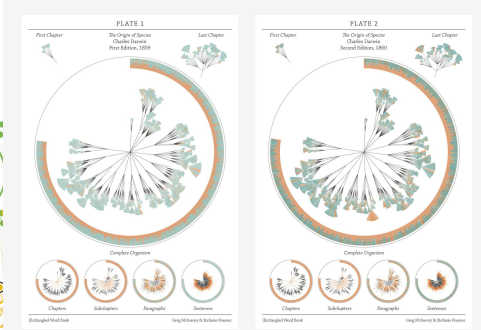
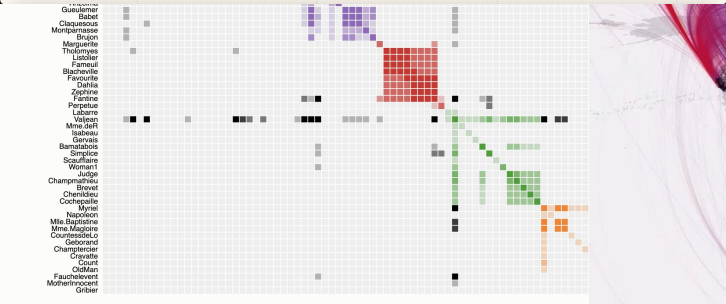
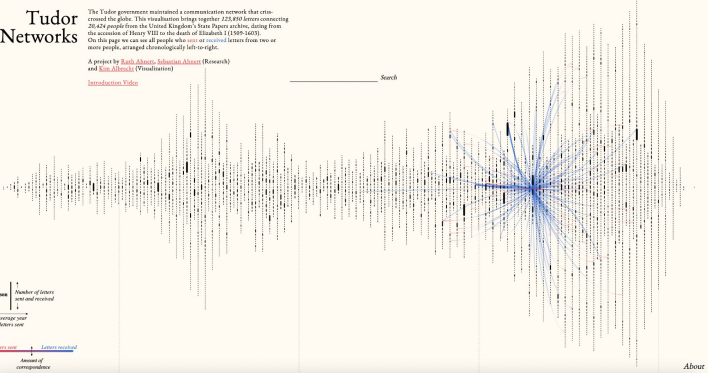
Simulated Dendrochronology of U.S. Immigration:
<https://web.northeastern.edu/naturalizing-immigration-dataviz/>





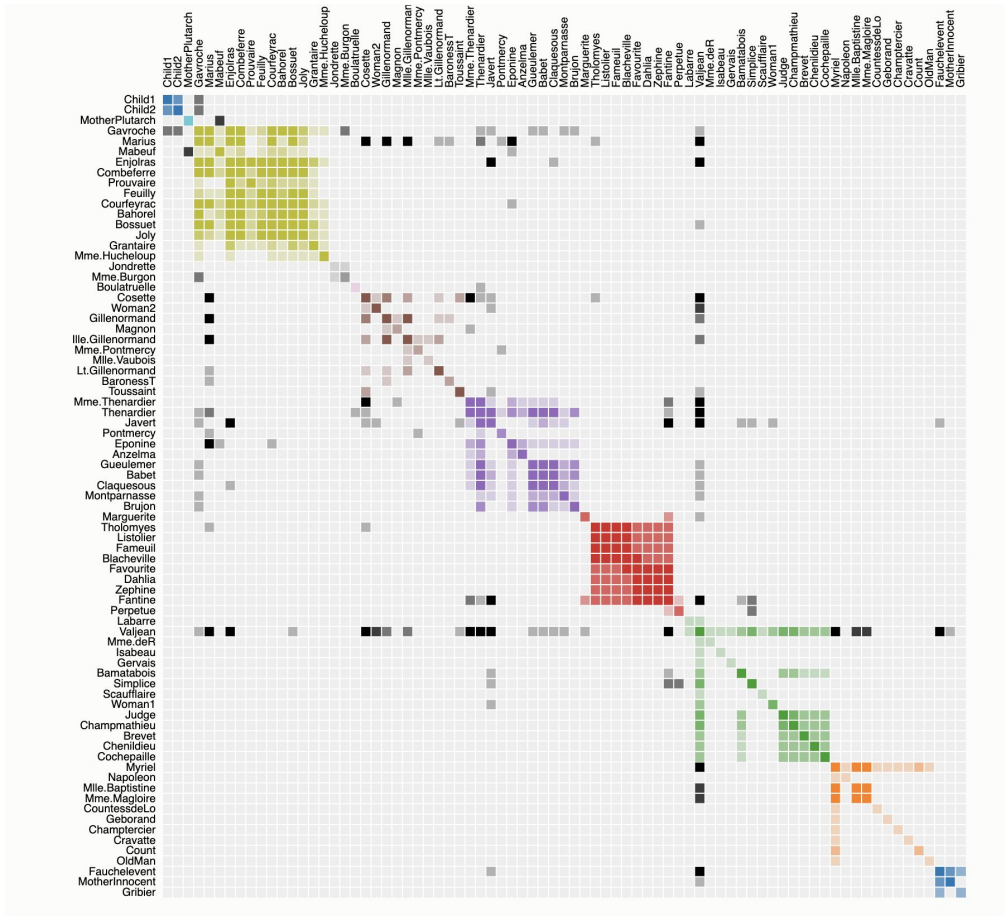
Ebb and Flow of Box Office Receipts Over Past 20 Years
by The New York Times (2008)

Netzwerke & Hierarchien



Charting culture/Nature Video; 150 years of Nature/Nature; Nadieh Bremer; Stefanie Posavec; Marian Dörk; Shirley Wu; tudaarnetworks.net; Mike Bostock





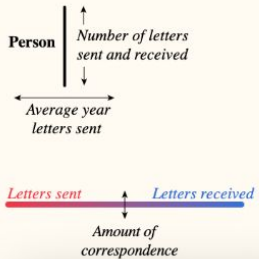
Tudor Networks

The Tudor government maintained a communication network that criss-crossed the globe. This visualisation brings together *123,850 letters* connecting *20,424 people* from the United Kingdom's State Papers archive, dating from the accession of Henry VIII to the death of Elizabeth I (1509-1603). On this page we can see all people who *sent* or *received* letters from two or more people, arranged chronologically left-to-right.

A project by [Ruth Ahnert](#), [Sebastian Ahnert](#) (Research)
and [Kim Albrecht](#) (Visualization)

[Introduction Video](#)

Search

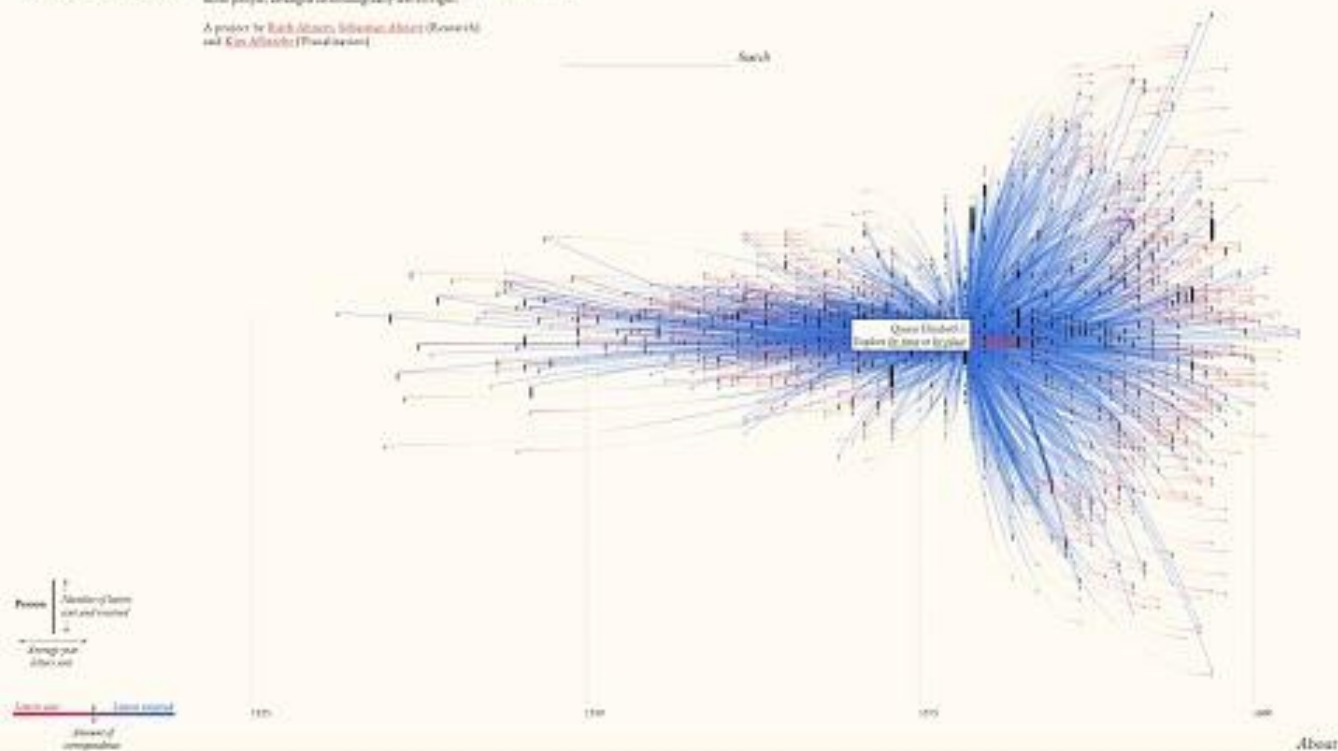


tudornetworks.net/

Tudor Networks

The Tudor government maintained a communication network that crisscrossed the globe. This visualization brings together 22,000 letters connecting 20,624 people from the United Kingdom's State Papers archives, dating from the accession of Henry VIII to the death of Elizabeth I (1509-1603). On this page we can see all people who sent or received letters from one or more people, arranged geographically left to right.

A project by [Erich Adams](#), [Siddhant Akhtar](#) (Rice) & [Kim Albin](#) (Purdue)



Karten und Geodaten

Line data from these cities has been compiled to build the first picture of America's homeless relocation programs. Over the period for which our data is most complete, we are able to track 20,000 homeless people have been sent to and from within the



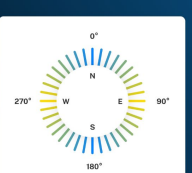
SHIFTED MAPS

Travel Duration: 3 days
Avg. Duration: 30 minutes

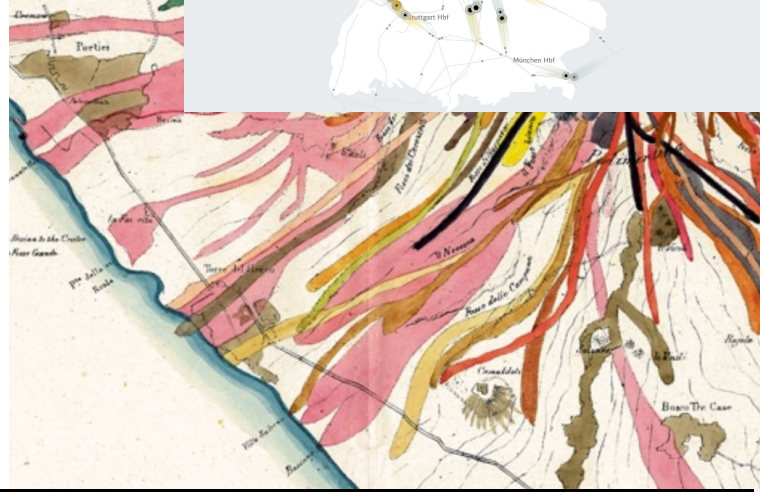
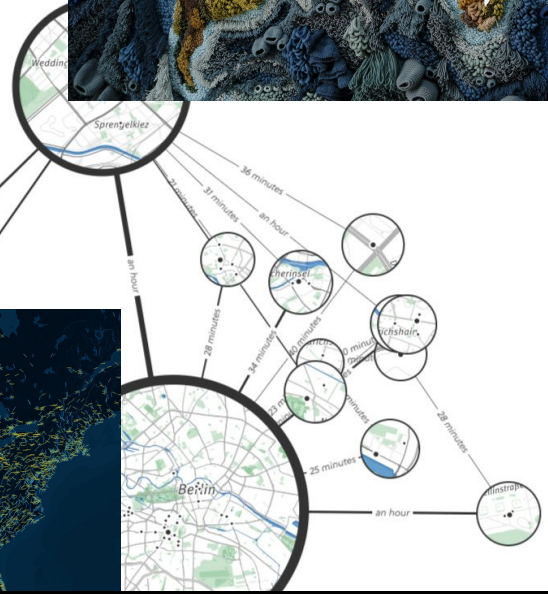


TRAILS OF WIND

The architecture of airport runways
DATE: May 14th 2019
BY: Figures
TAG: stratoswind



The lines on the map display the orientation of all airport runways in color gradients from north-south axis (blue) to east-west axis (yellow).



<https://shifted-maps.com/> ; <https://trailsofwind.figures.cc/> ; Botanical Tapestry by Vanessa Barragão ; <https://truth-and-beauty.net/projects/peakspotting> ; <https://www.theguardian.com/us-news/ng-interactive/2017/dec/20/bussed-out-america-moves-homeless-people-country-study> ; Map of Vesuvius showing the direction of the streams of Lava in the Eruptions from 1631 AD. to 1831 AD. / John Auldjo

The True Size Of ...

eg... Ghana

Quick Comparisons

JP vs US

US vs IN

Australia

7,692,024 km² 27.3M

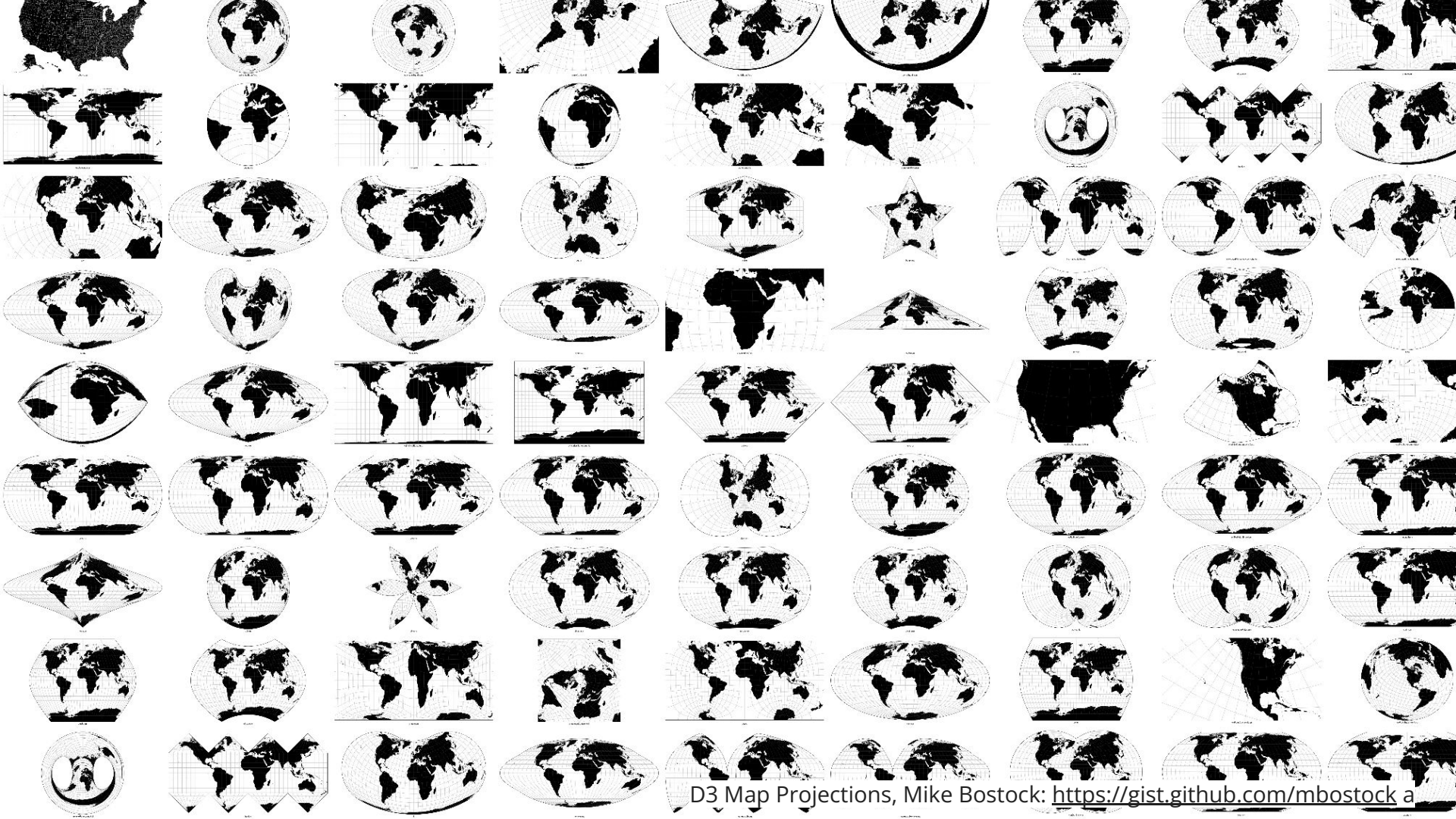
[About](#) | [How it works](#) | [Privacy Policy](#)

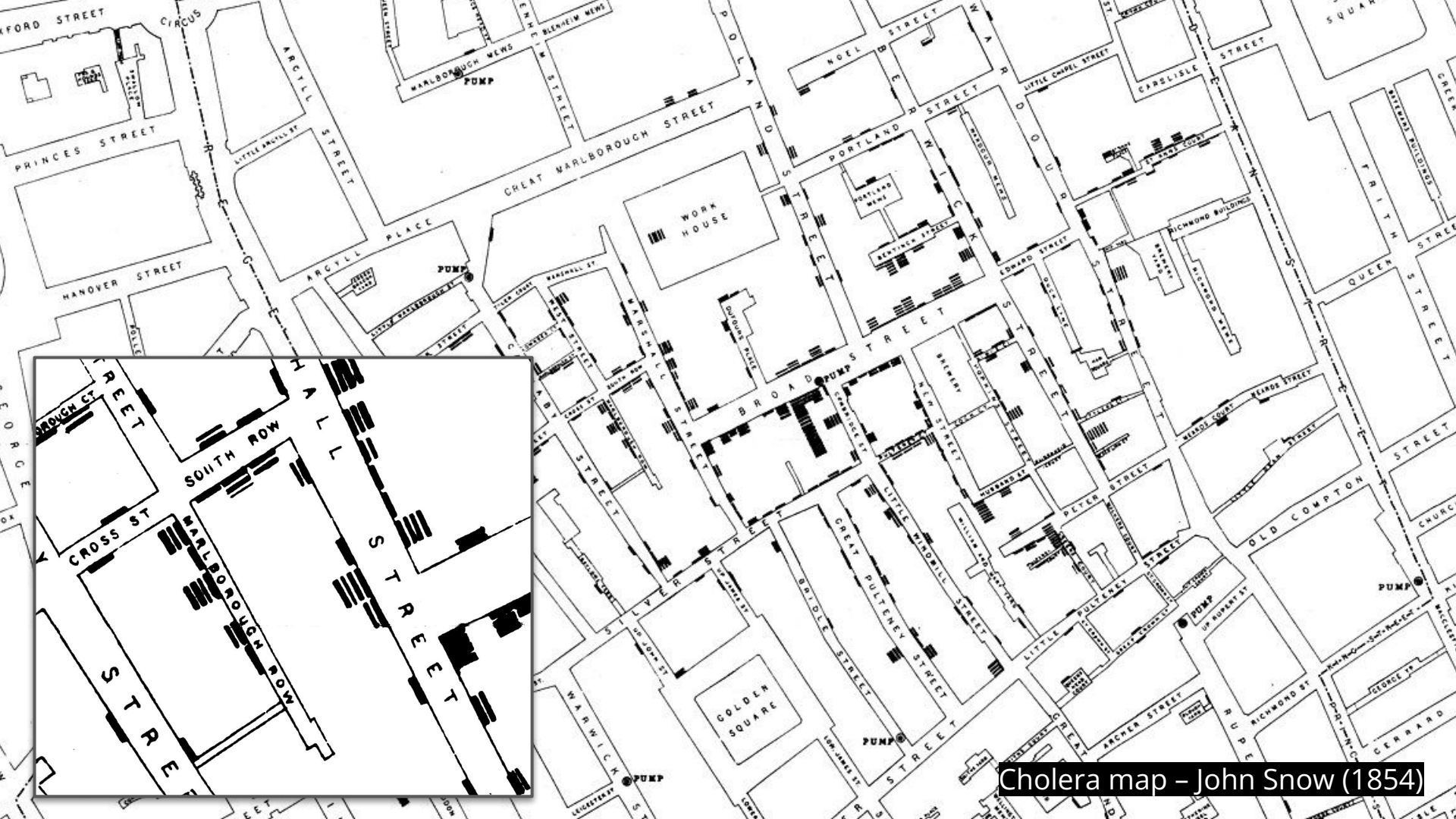
© 2026 The True Size. All rights reserved. [Cookie Policy](#)

Australia

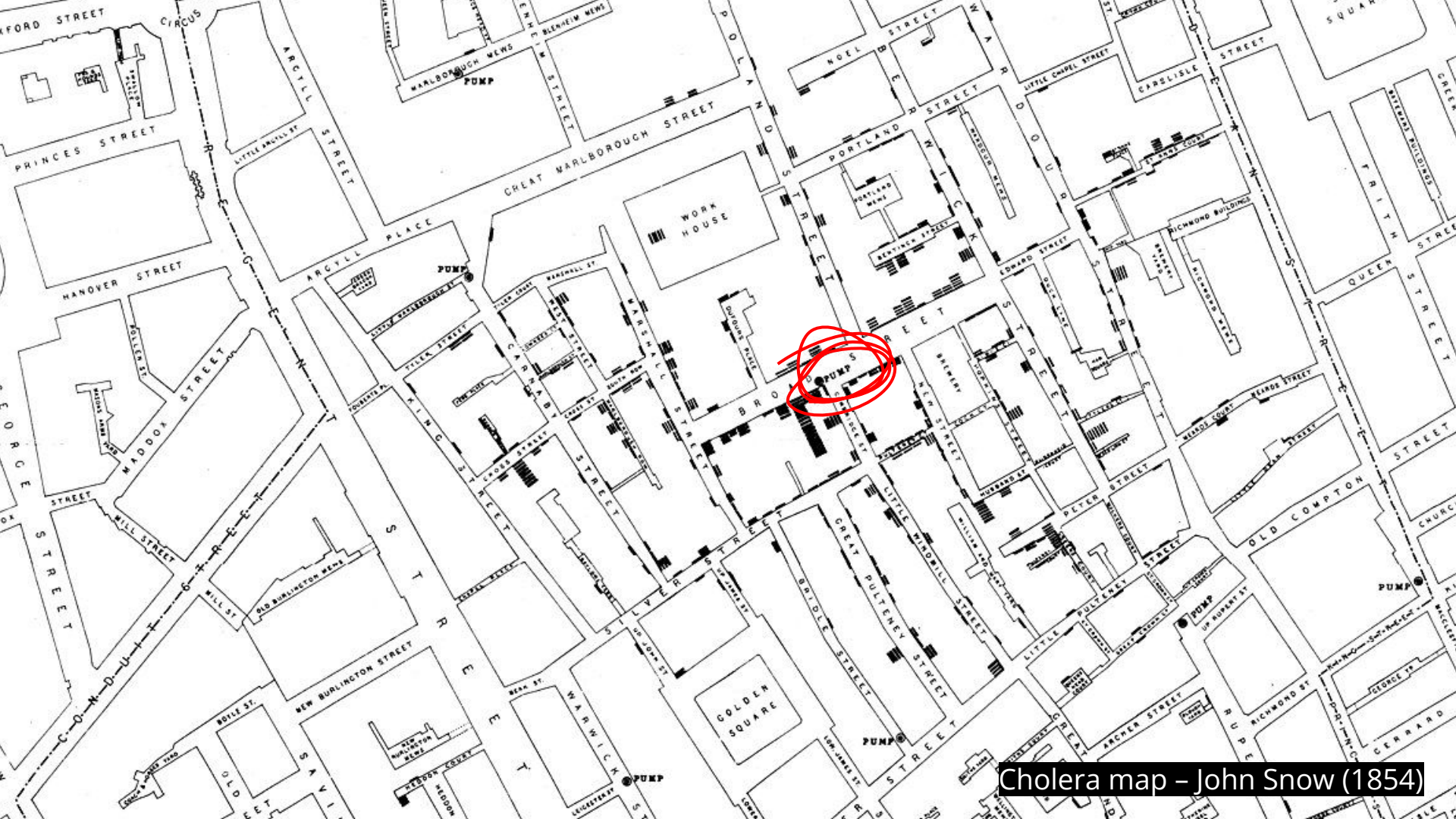
Total size: 7,692,024 km²

Population: 27.3M

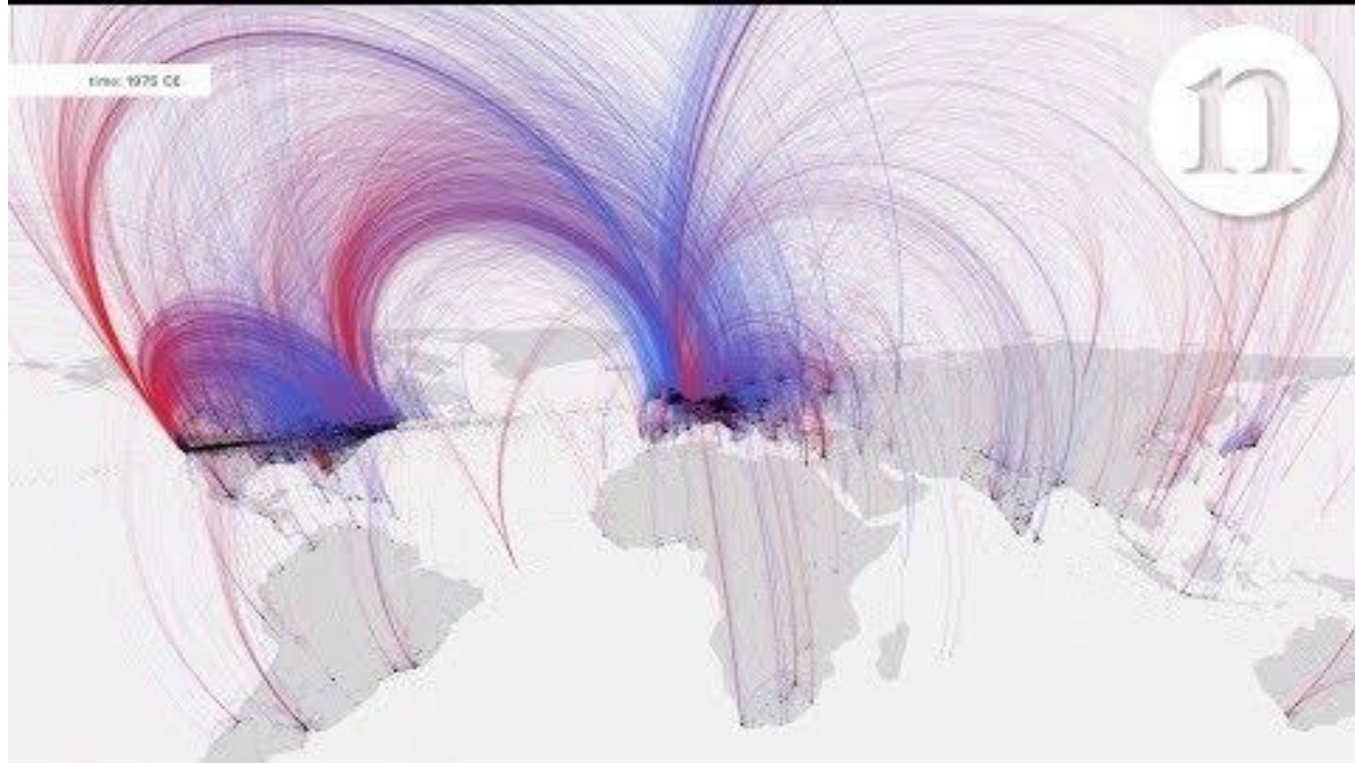




Cholera map - John Snow (1854)



Cholera map - John Snow (1854)



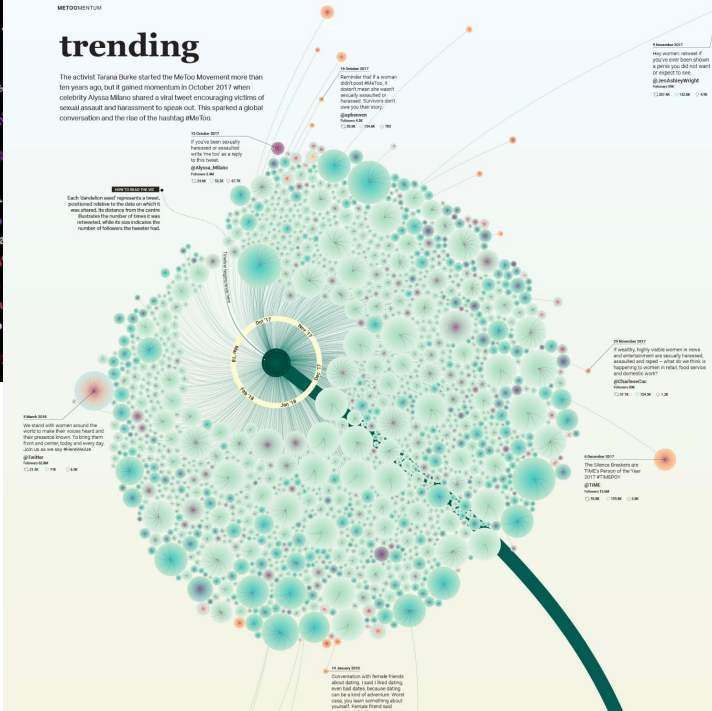
<https://www.youtube.com/watch?v=4glhRkCcD4U>

Text

#MeToo Anti-Network

Analysis

Diagrams

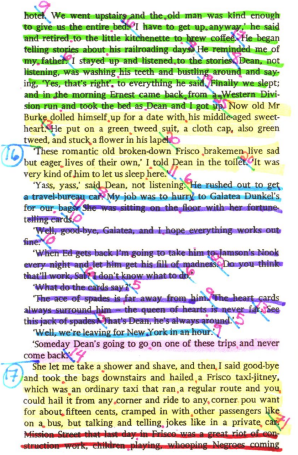


<http://metoomentum.com/> ; <https://metoo.kimalbrecht.com/> ; <https://uclab.fh-potsdam.de/NCM/index.de.html>
[wikipedia.org/wiki/Datei:V_wordcloud_skill.png](https://www.wikipedia.org/wiki/Datei:V_wordcloud_skill.png) ; <https://dhq.digitalhumanities.org/vol/13/3/000414/000414.html>

berlin Alexanderplatz

Am Alexanderplatz reißen sie den Damm auf für die Untergrundbahn. Man geht auf Brettern. Die Elektrischen fahren über den Platz die Alexanderstraße herauf durch die Münzstraße zum Rosenthaler Tor. Rechts und links sind Straßen. In den Straßen steht Haus bei Haus. Die sind vom Keller bis zum Boden mit Menschen voll. Unten sind die Läden.





Writing Without Words (Stefanie Posavec)

Multivariate Daten

2015

Now You See Me 2

The Legend of Tarzan

Independence Day: Resurgence

Central Intelligence

Terminator Genisys

Straight Outta Compton

Ant-Man

Mission: Impossible - Rogue Nation

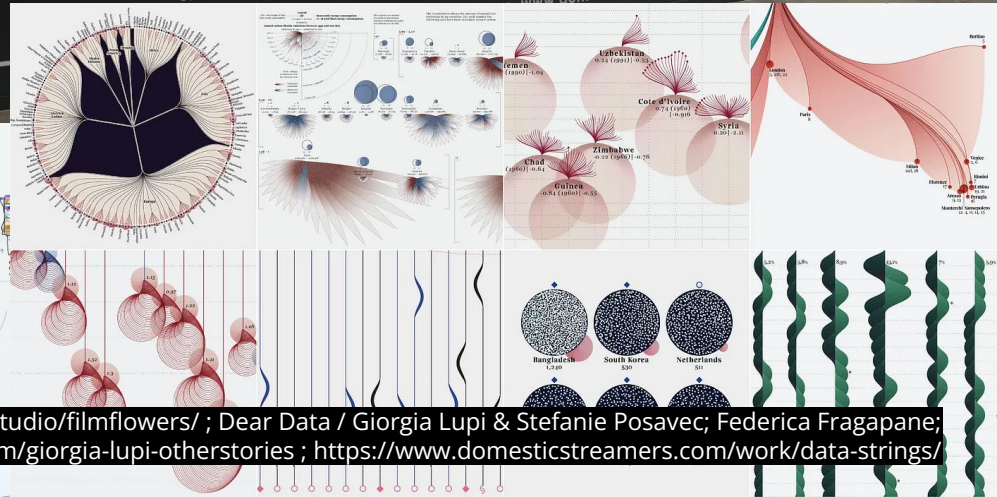
2014

Teenage Mutant Ninja Turtles

22 Jump Street

2013

<https://shirleywu.studio/filmflowers/> ; Dear Data / Giorgia Lupi & Stefanie Posavec; Federica Fragapane; <https://giorgialupi.com/giorgia-lupi-otherstories> ; <https://www.domesticstreamers.com/work/data-strings/>



2016



Now You See Me 2



The Legend of Tarzan



Independence Day:
Resurgence



Central Intelligence



Finding Dory

2015



Terminator Genisys



Straight Outta
Compton



Ant-Man



Mission: Impossible -
Rogue Nation



Minions

2014



Teenage Mutant Ninja
Turtles



22 Jump Street



Dawn of the Planet of
the Apes



Transformers: Age of
Extinction



Guardians of the
Galaxy

2013



World War Z



Monsters University



Gravity



Man of Steel



Despicable Me 2

2012



Ice Age: Continental
Drift



Ted



Brave



The Amazing Spider-
Man

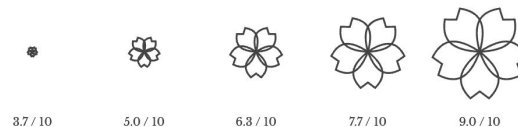
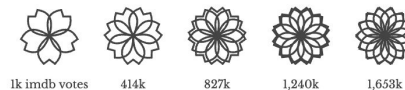
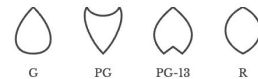


The Dark Knight Rises

film flowers

top summer blockbusters
reimagined as flowers

([shirley wu](#))



Film Flowers – Shirley Wu
<https://shirleywu.studio/filmflowers/>

Ähnlichkeitsbasierte Darstellungen



What visual similarities can a computer vision algorithm find to connect a set of images with a drawing?



Daniel Chester French, 1922
The Reno
Amnon Carter Museum of American Art

Frederic Remington, 1896
The Reno
Amnon Carter Museum of American Art

Albert-Ernest Carrier-Belleuse, 1870-1871
The Reno
Städtische Kunsthalle Karlsruhe

Unknown
The Metropolitan Museum of Art

Unknown, ca. 1560
Herald Crest for the Burgonet of Sforza Palevino (1819-1885)
The Metropolitan Museum of Art

Unknown (Pase Via Via)
The J. Paul Getty Museum

Frank Furness, ca. 1940
The J. Paul Getty Museum

Elsie Wein, 1938
The National Gallery of Art, Washington DC

1941
The National Gallery of Art, Washington DC

1941
The National Gallery of Art, Washington DC

<https://truth-and-beauty.net/projects/multiplicity>
https://artsexperiments.withgoogle.com/xddegrees/8gHu5Z5RF4BsNg/BgHD_Fxb-V_K3A
<https://christian-parsons.com/mapamundi-wdvp/>
<https://uclab.fh-potsdam.de/ff> <https://visualisierung.smb.museum/> ;

FONTANES HANDBIBLIOTHEK
LESESPUR-TYP MARKIERUNGEN MARKIERUNGEN PROVENIENZKARTE ZUSÄTZLICHES MATERIAL ANDERES

Pictorial Book of Ballads

Das Ding an sich

Wanderungen durch die Welt Zweanzig bis Dreißig

Dicken's Leben 2 "Frohes und Eintracht aus me..."

Enzyklopädisches Französi...

Gedichte von Theodor Font...

Erinnerungen an Theodor F...

Mittheilungen über die Geschic...

Soil und Haben 2

Soil und Haben 1

Gedichte.

Suche

Q

Schmuck

Feierabendengel

Laternen

Laternen

Saturnus

Bildbogen

Selbstporträt

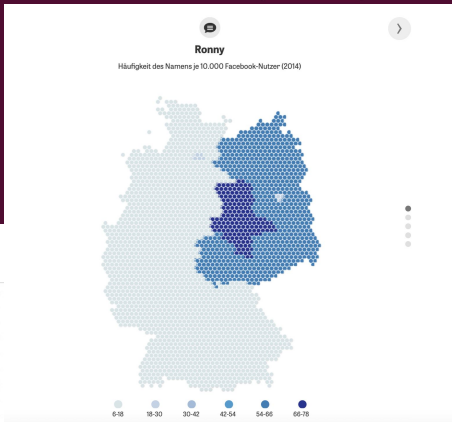
Narrative und Storytelling



East-West Exodus

The Millions Who Left

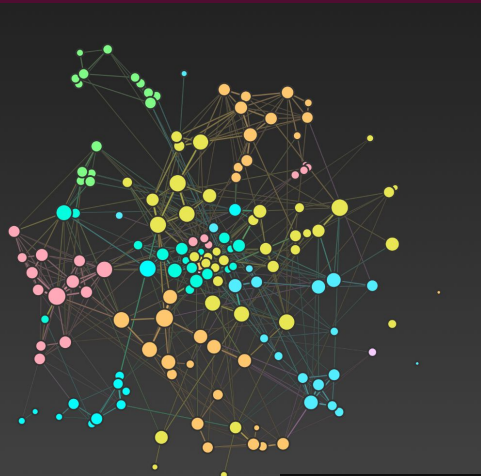
Since Germany's reunification, millions of people have left the East, triggering a demographic crisis. Data now shows exactly what happened – and why there's cause for hope.



You can also explore the 150-researcher network yourself. Select a name to find that researcher's connectedness scores and top collaborators.

Enter exploration mode

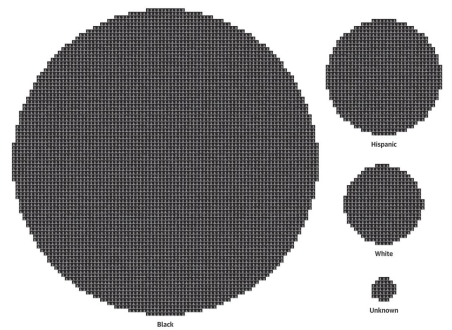
...or scroll down for more information.



R2 D3

A VISUAL INTRODUCTION TO MACHINE LEARNING – PART II

Model Tuning and the Bias-Variance Tradeoff



Homan Square arrestees are disproportionately black.

82% of known detentions – or 5,906 arrests over nearly 11 years – were of black people.

Another 12% of the people detained at Homan Square were identified as Hispanic by the CPD. Just 6% were identified as white.

The city of Chicago is 33% black, 29% Hispanic and 32% white, according to the 2010 census.

China 3,900,000 Deaths Flood | 1-1935

<https://www.zeit.de/politik/deutschland/2019-05/east-west-exodus-migration-east-germany-demography> ;

<https://connections.spectrumnews.org> ; <http://www.r2d3.us/visual-intro-to-machine-learning-part-2> ;

<https://www.zeit.de/feature/mauerfall-das-geteilte-land> ;

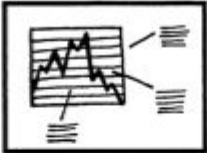
<https://www.theguardian.com/us-news/ng-interactive/2015/oct/19/homan-square-chicago-police-detainees> ; <https://alhadaqa.com/pompeii/>

Narrative visualization: Telling stories with data

Seven Genres



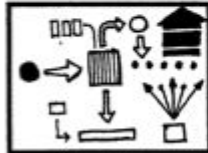
Magazine Style



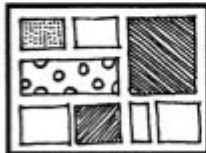
Annotated Chart



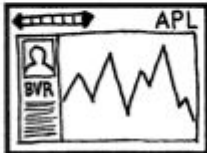
Partitioned Poster



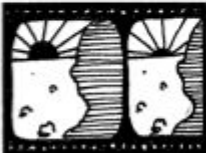
Flow Chart



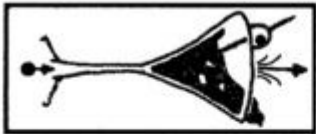
Comic Strip



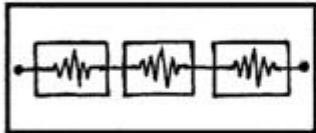
Slide Show



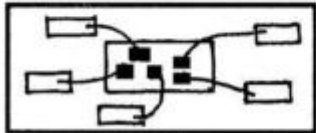
Film/Video/Animation



Martini glass structure



Interactive slideshow



Drill down story

I WANT A BETTER CATASTROPHE

A flowchart for navigating our climate predicament

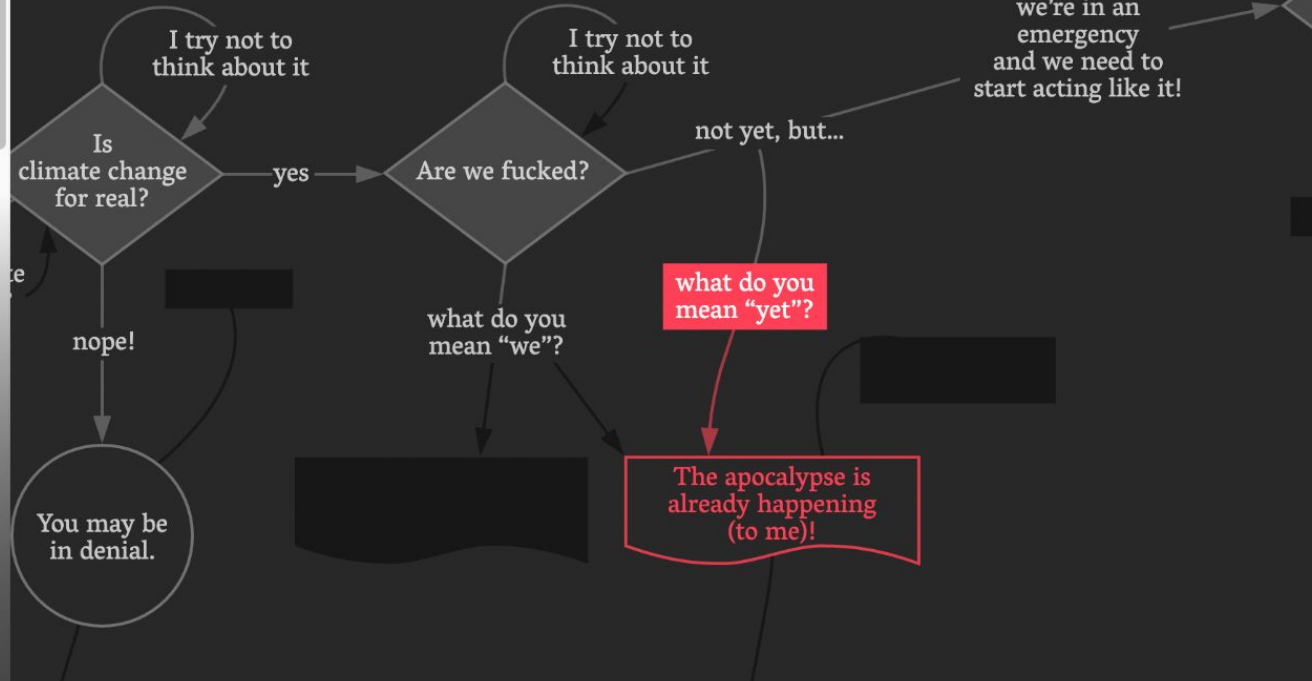
Global warming is projected to rocket past the 1.5°C limit, throwing lifelong activist Andrew Boyd into a crisis of hope, and off on a quest to learn how to live with the “impossible news” of climate breakdown. With gallows humor and a broken heart, Andrew steers us through our climate angst as he walks his own. This flowchart is an invitation to join him on his narrative path and explore our predicament on your own.

Want to re-explore from the beginning?

Reset progress and start over

BACKGROUND

Use the buttons below to start (or reuse) Andrew's explanations. You can also explore the chart with a different set of items and move through the flowchart in a different way. The original version of the flowchart is available at <https://flowchart.bettercatastrophe.com/>



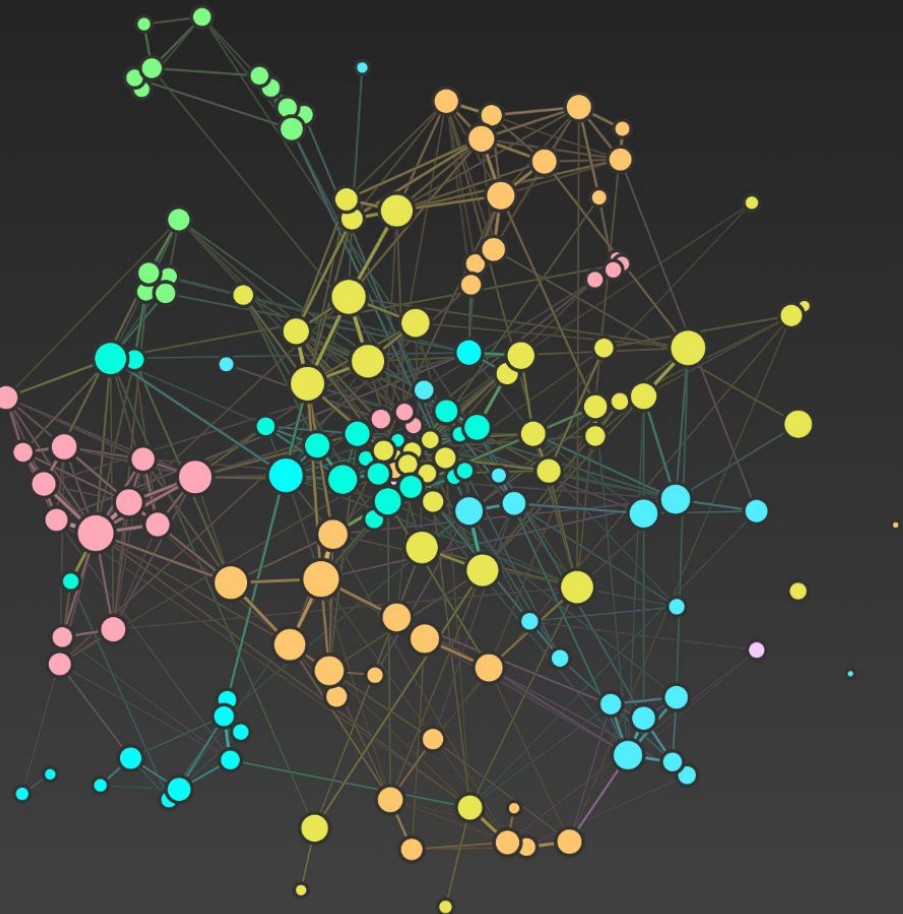
I Want a Better Catastrophe – Jona Pomerance, Marian Dörk, Andrew Boyd

<https://flowchart.bettercatastrophe.com/>



Is climate change for real?





EXPLORE

You can also explore the 150-researcher network yourself. Select a name to find that researcher's connectedness scores and top collaborators.

Enter exploration mode

...or scroll down for more information.

<https://connections.spectrumnews.org>

Das Familienbildnis der Hohenlohe

Die Beschreibung und Interpretation des Ölgemäldes bietet mehrere Zugänge an: Auf den ersten Blick zeigt es drei elegante junge Damen und zwei Herren in einer Landschaft. Jeder der abgebildeten Figuren ist ein Attribut zugeordnet, z. B. ein Vogel oder ein Spiegel. Diese Attribute verweisen auf die fünf menschlichen Sinne - Schmecken, Riechen, Sehen, Hören und Tasten - eines der vielfältigsten und reizvollsten Themen der europäischen Malerei. Zugleich ist das Werk auch ein Familienporträt von fünf Geschwistern einer Familie aus dem Nordosten Baden-Württembergs, dem ehemaligen Fürstentum des Hauses Hohenlohe. Darüber hinaus stellt es die Mode aus der Zeit des 30-jährigen Krieges in Deutschland dar.

Sabine de Günther
11. September 2023



Bildnis der fünf Kinder Graf Philipp Ernsts zu Hohenlohe-Langenburg als Allegorie der fünf Sinne: Eva, Christina, Anna Magdalena, Maria Juliana, Heinrich Friedrich, Joachim Albrecht



G_372_452-vordere Seite_Detail



title: An example of a possible essay.

date: "2023-12-03"

color: "blue"

author: Giacomo Nanni

isPublic: true

lang: en

description: "Lorem ipsum dolor sit amet, consectetur adipiscing. Sed vel augue viverra, suscipit nisi sagittis, molestie neque."

cover: "https://uclab.fh-potsdam.de/refa-catalog/files/large/c70c26ab79548a46066efc31bf517afc08127c66.jpg"

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Künstlerische Datenvisualisierung

Artistic Data Visualization: Beyond Visual Analytics

Fernanda B. Viégas and Martin Wattenberg

Visual Communication Lab, IBM Research, 1 Rogers St,
Cambridge, MA 02142, USA
{viegasf, mwatten}@us.ibm.com

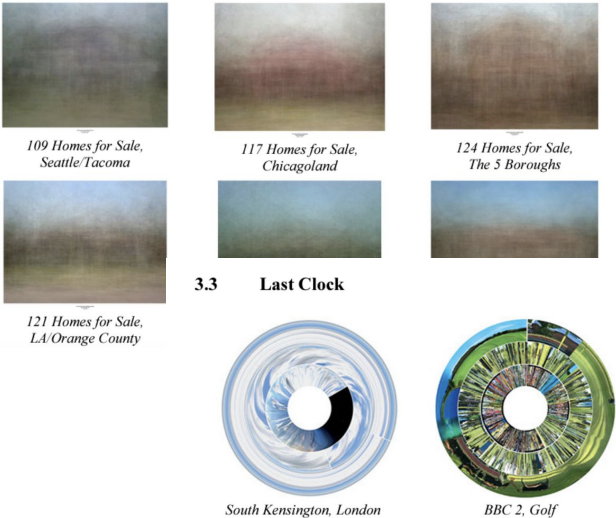


Fig. 6. Last Clock, by Jussi Ängeslevä & Ross Cooper.

Abstract. Information visualization is traditionally viewed as a tool for data exploration and hypothesis formation. Because of its roots in scientific reasoning, visualization has traditionally been viewed as an analytical tool for sensemaking. In recent years, however, both the mainstreaming of computer graphics and the democratization of data sources on the Internet have had important repercussions in the field of information visualization. With the ability to create visual representations of data on home computers, artists and designers have taken matters into their own hands and expanded the conceptual horizon of infovis as artistic practice. This paper presents a brief survey of projects in the field of artistic information visualization and a preliminary examination of how artists appropriate and repurpose “scientific” techniques to create pieces that actively guide analytical reasoning and encourage a contextualized reading of their subject matter.

Keywords: Visualization

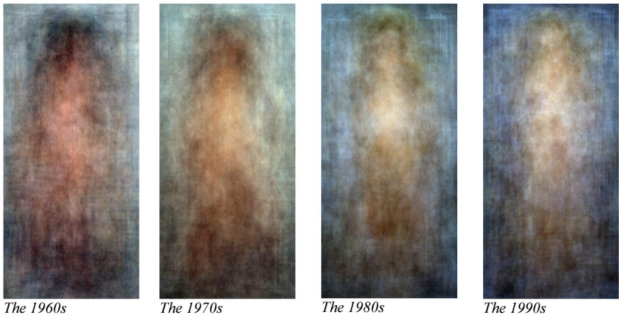
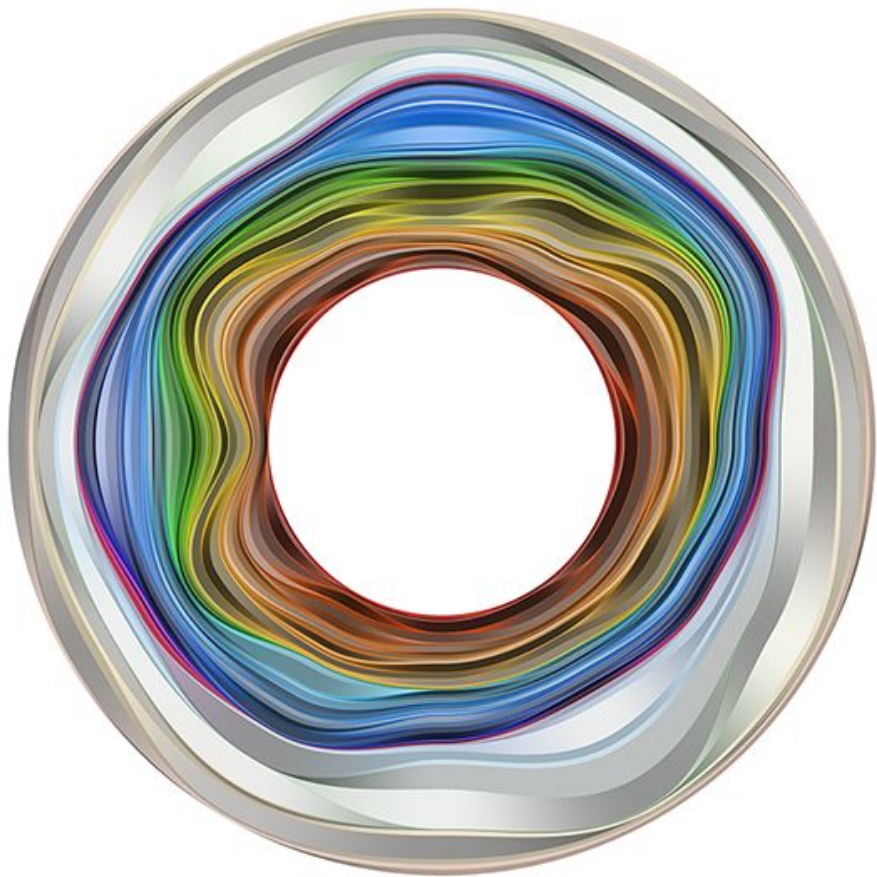


Fig. 3. Every Playboy Centerfold, The Decades (normalized), by Jason Salavon

Viégas, F. B., & Wattenberg, M. (2007). Artistic data visualization: Beyond visual analytics. In Online Communities and Social Computing: Second International Conference, OCSC 2007, Held as Part of HCI International 2007, Beijing, China, July 22-27, 2007. Proceedings 2 (pp. 182-191). Springer Berlin Heidelberg.



Flickr Flow: Fernanda Viégas

Interaktivität

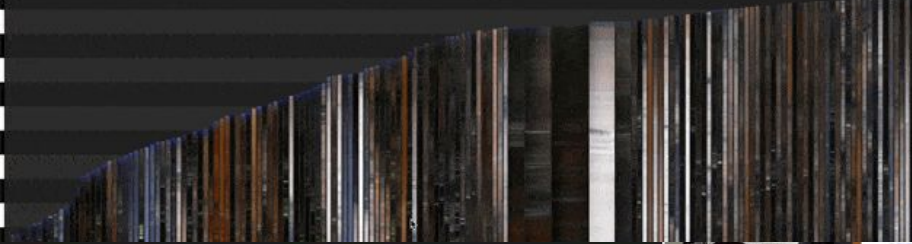
17 NOV 2015

Information:

KIOGRAMS

YELLOWKNIFE

AURORAMAX

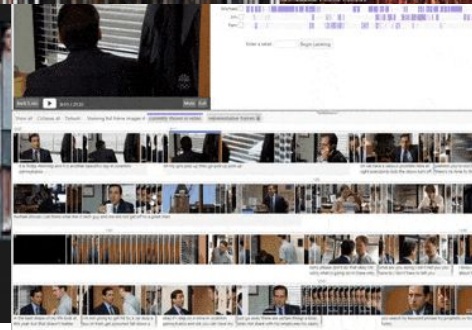


Standard-colored, average-amounted dresses wrapped into a dress and suit

A large amount of varied dress with pronounced seams

A dark black jacket draped with multi-colored corded strings

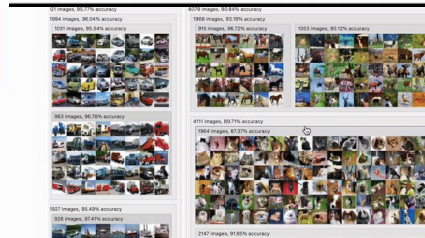
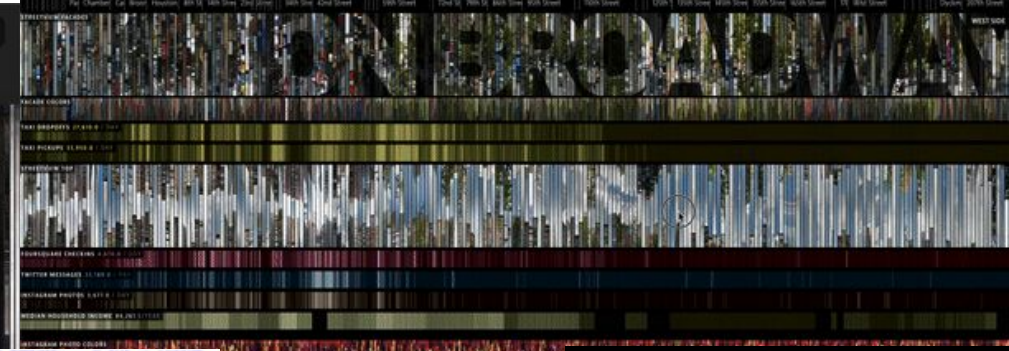
Content



romance

der

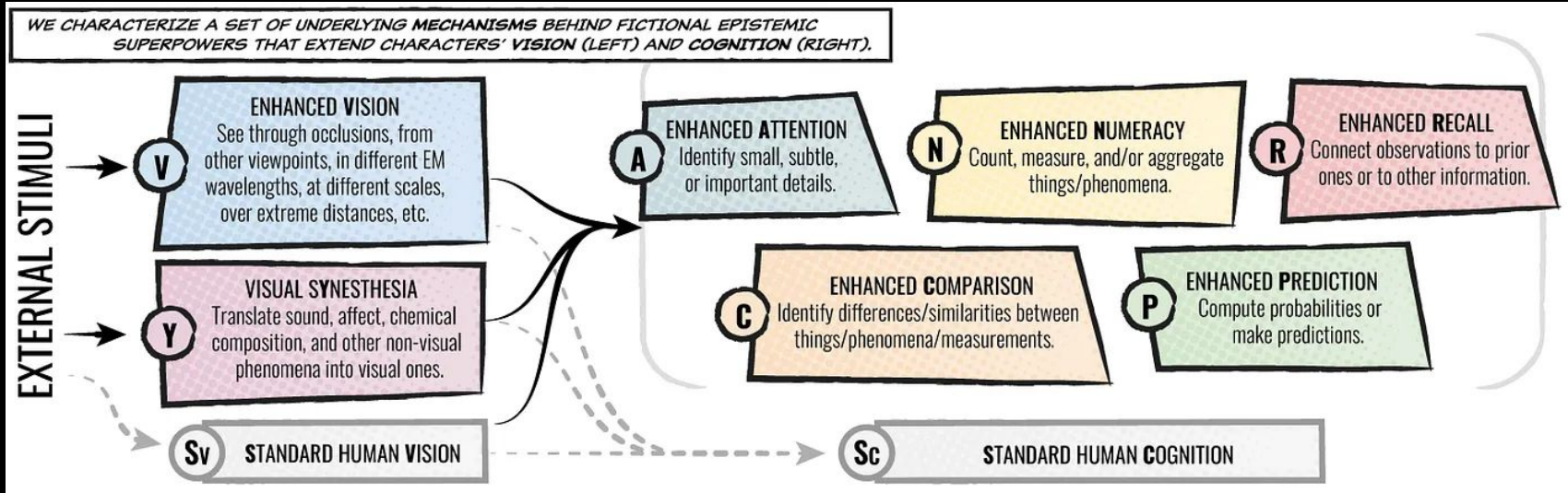
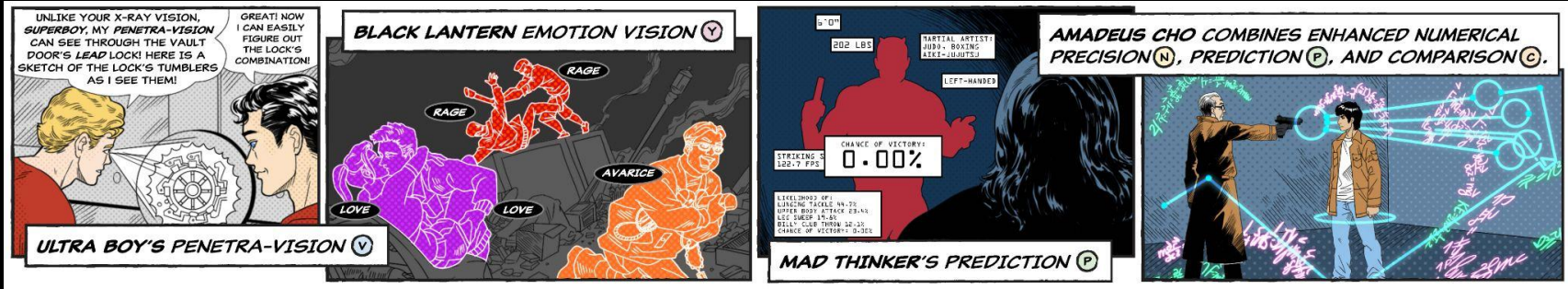
Die Beschreibung und Interpretation des Ölgemäldes bietet mehrere Zugänge an: Auf den ersten Blick zeigt es drei elegante junge Damen und zwei Herren in einer Landschaft. Jeder der abgebildeten Figuren ist ein Attribut zugeordnet, z. B. ein Vogel oder ein Spiegel. Diese Attribute verweisen auf die fünf menschlichen Sinne - Schmecken, Riechen, Sehen, Hören und Tasten - eines der vielfältigsten und reizvollsten Themen der europäischen Malerei. Zugleich ist das Werk auch ein Familienporträt von fünf Geschwistern einer Familie aus dem Nordosten Baden-Württembergs, dem ehemaligen Fürstentum des Hauses Hohenzollern. Darüber hinaus stellt es die



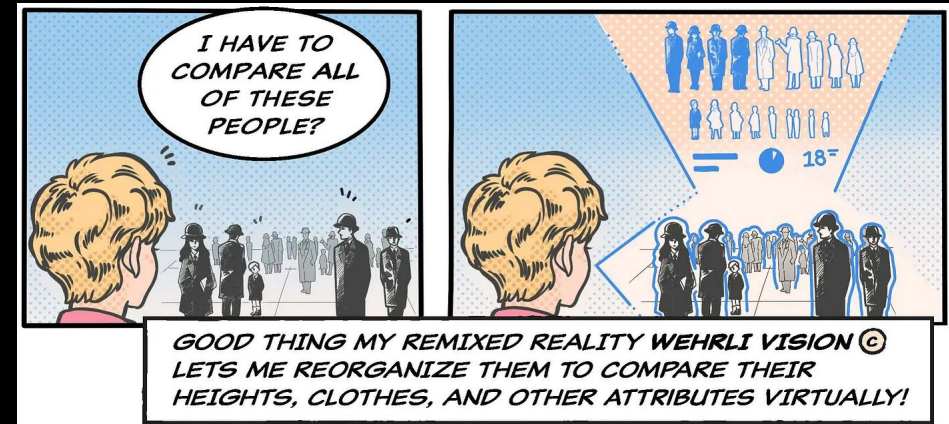
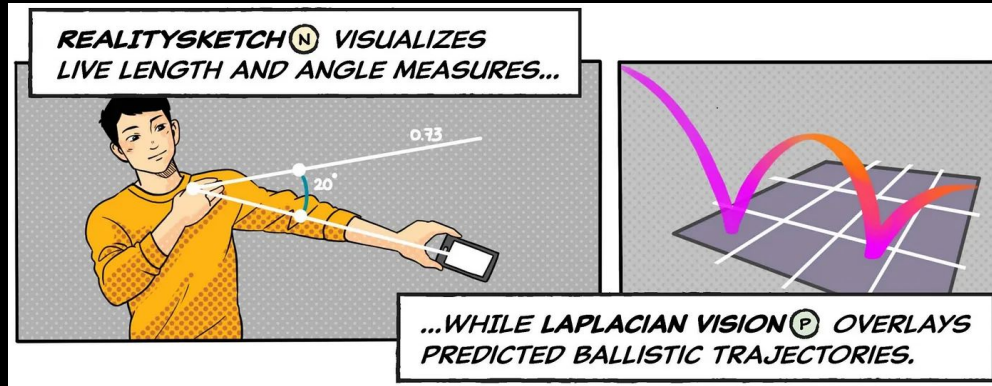
Barnes, C., Goldman, D. B., Shechtman, E., & Finkelstein, A. (2010). Video tapestries with continuous temporal zoom. In ACM SIGGRAPH 2010 papers <https://www.on-broadway.nyc/>; <https://mariandoerk.de/fluidviews/>; <https://refareader.fh-potsdam.de/>; <https://div-lab.github.io/dendromap/>; <https://www.nytimes.com/newsgraphics/2013/09/13/fashion-week-editors-picks>; <https://imld.de/research/research-projects/auroravis/>; Ruangrotsakun, A., Oh, D., Nguyen, T. V., Lee, K., Ser, M., Hiew, A., ... & Kahng, M. (2023). Viva: Visual exploration and analysis of videos with interactive annotation. In Companion Proceedings of the 28th International Conference on Intelligent User Interfaces (pp. 162-165).

(Kritische) Datenpraktiken

Visualisierung als Superkraft



Visualisierung als Superkraft



Visualisierung genutzt von Superschurken



Willett, W., Aseniero, B. A., Carpendale, S., Dragicevic, P., Jansen, Y., Oehlberg, L., & Isenberg, P. (2021). Perception! immersion! empowerment! superpowers as inspiration for visualization. *IEEE transactions on visualization and computer graphics*, 28(1), 22-32.

Können Daten objektiv sein?

»Visualizations are interpretative translations, but they pass themselves off as images of data.«

»Data are capta, taken not given, constructed as an interpretation of the phenomenal world, not inherent in it.«

- Johanna Drucker

The Persuasive Power of Data Visualization

Anshul Vikram Pandey, Anjali Manivannan,
Oded Nov, Margaret Satterthwaite, and Enrico Bertini, *Member, IEEE*

Abstract—Data visualization has been used extensively to inform users. However, little research has been done to examine the effects of data visualization in influencing users or in making a message more persuasive. In this study, we present experimental research to fill this gap and present an evidence-based analysis of persuasive visualization. We built on persuasion research from psychology and user interfaces literature in order to explore the persuasive effects of visualization. In this experimental study we define the circumstances under which data visualization can make a message more persuasive, propose hypotheses, and perform quantitative and qualitative analyses on studies conducted to test these hypotheses. We compare visual treatments with data presented through barcharts and linecharts on the one hand, treatments with data presented through tables on the other, and then evaluate their persuasiveness. The findings represent a first step in exploring the effectiveness of persuasive visualization.

Index Terms—Persuasive visualization, elaboration likelihood model, evaluation



Daten sind persönlich

ABSTRACT

Many of the guidelines that inform how designers create data visualizations originate in studies that unintentionally exclude populations that are most likely to be among the “data poor”. In this paper, we explore which factors may drive attention and trust in rural populations with diverse economic and educational backgrounds - a segment that is largely underrepresented in the data visualization literature. In 42 semi-structured interviews in rural Pennsylvania (USA), we find that a complex set of factors intermix to inform attitudes and perceptions about data visualization - including educational background, political affiliation, and personal experience. The data and materials for this research can be found at <https://osf.io/uxwts/>

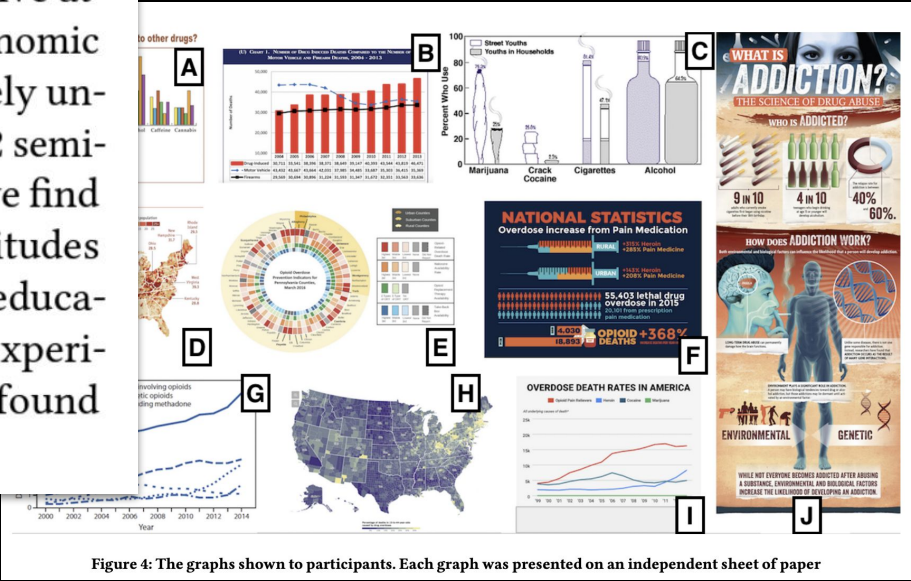
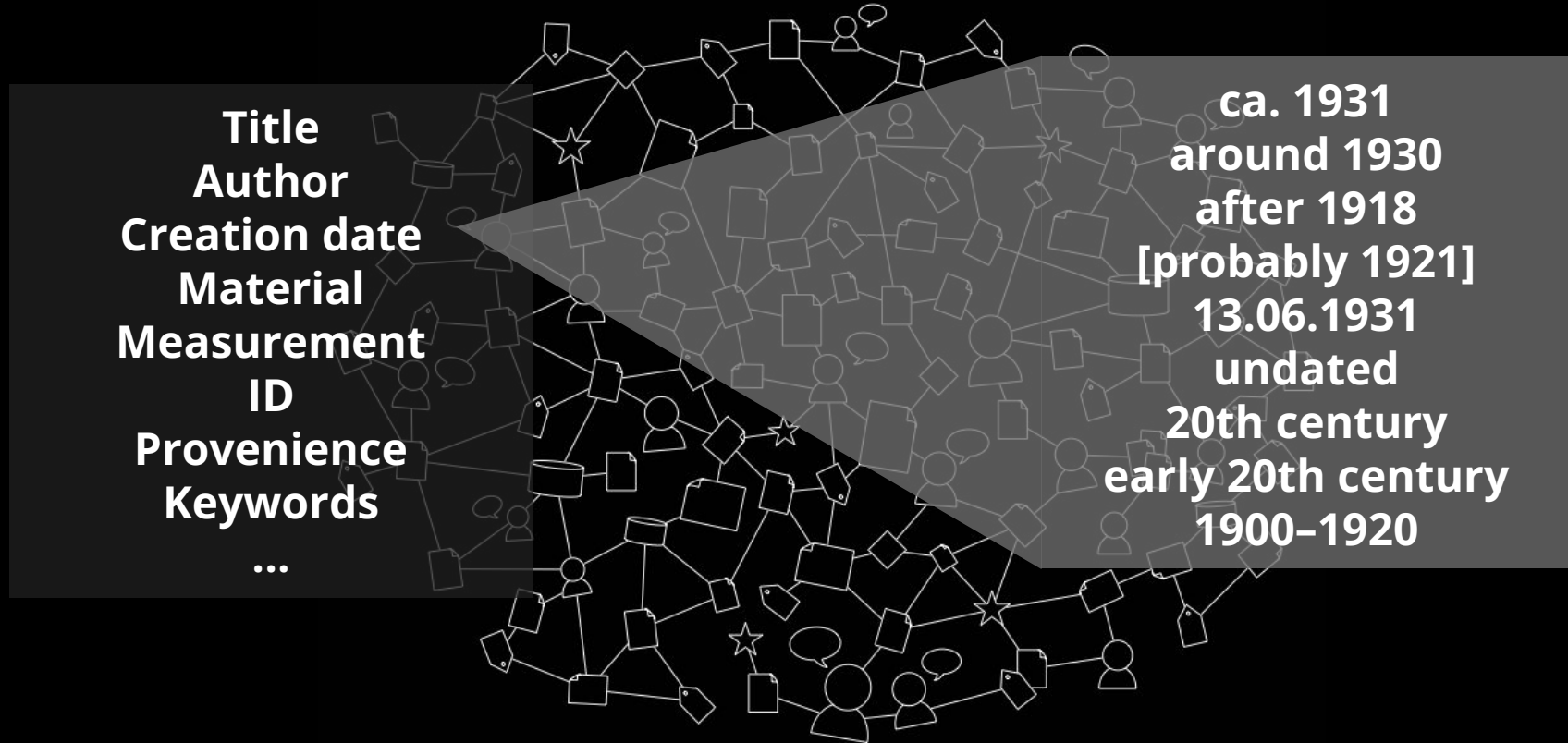


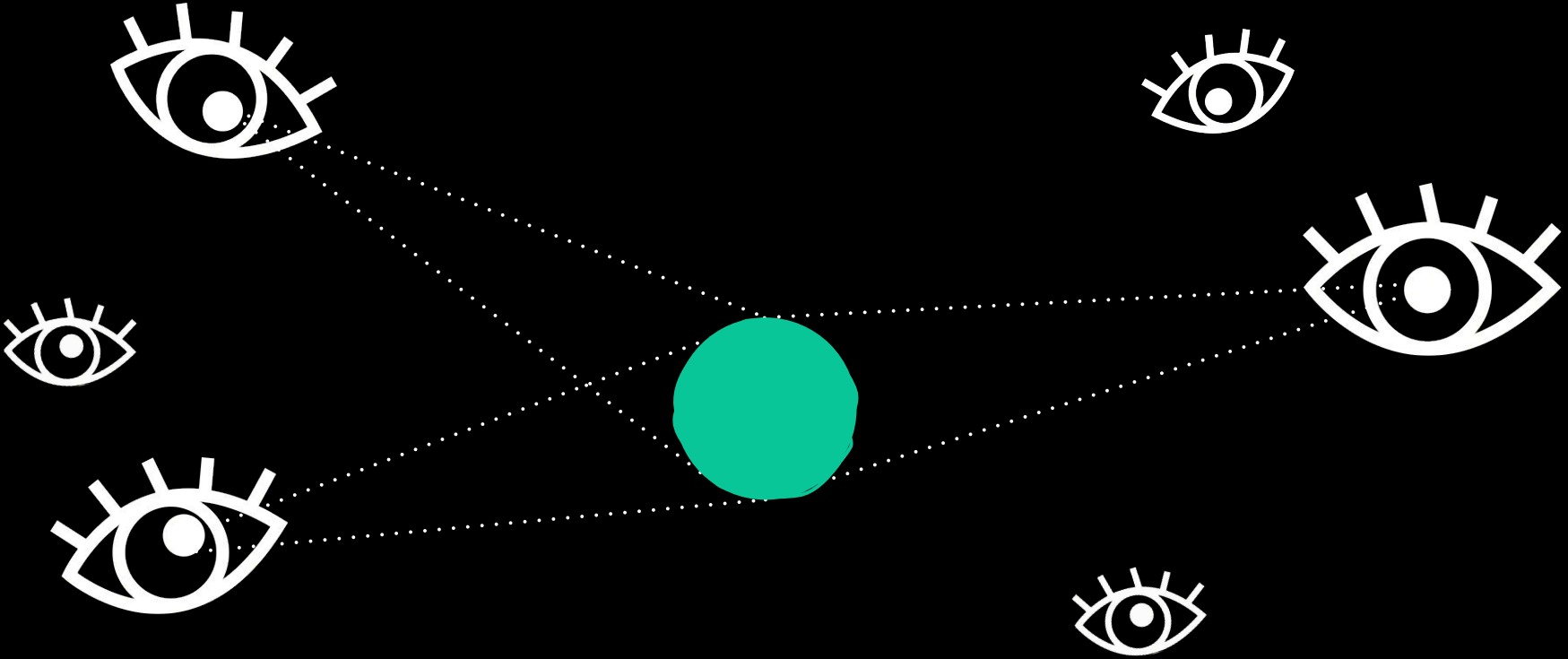
Figure 4: The graphs shown to participants. Each graph was presented on an independent sheet of paper

Peck, E. M., Ayuso, S. E., & El-Etr, O. (2019, May). Data is personal: Attitudes and perceptions of data visualization in rural pennsylvania. In Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems (pp. 1-12).

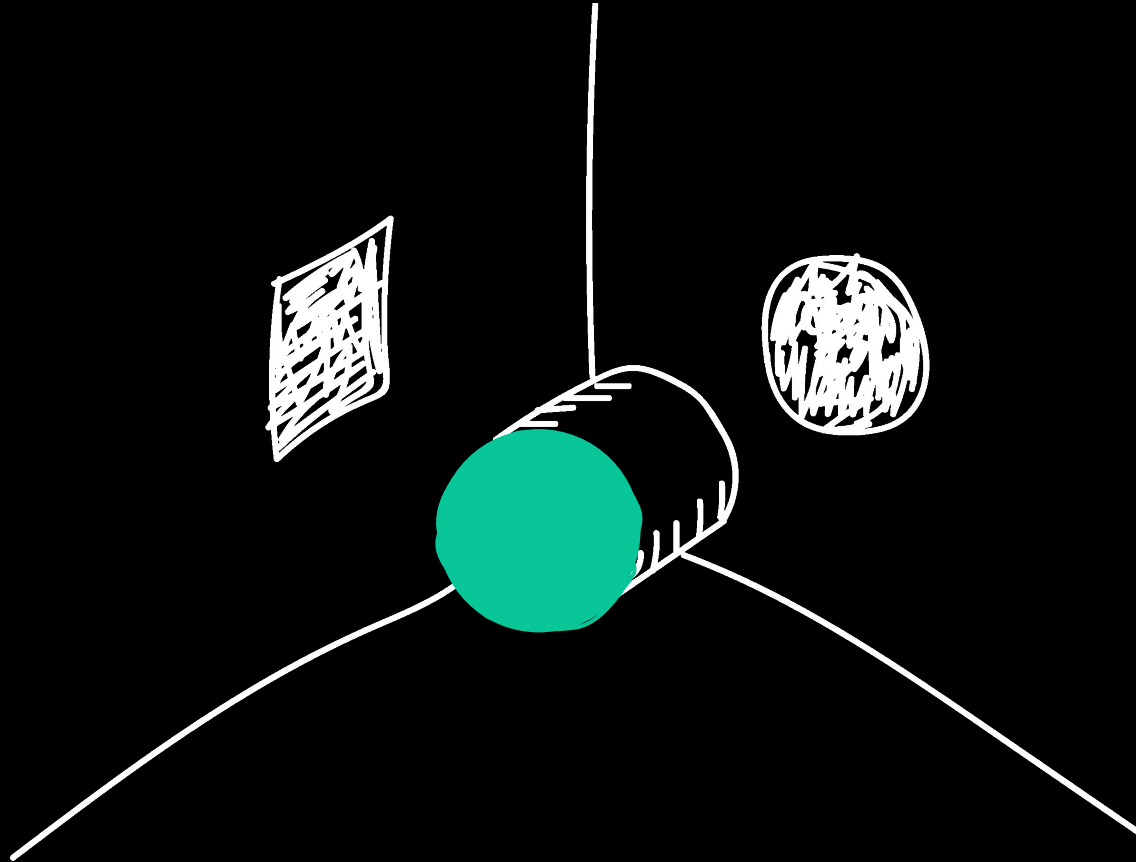
Unpräzise, unvollständige, unstrukturierte und fehlerhafte Daten



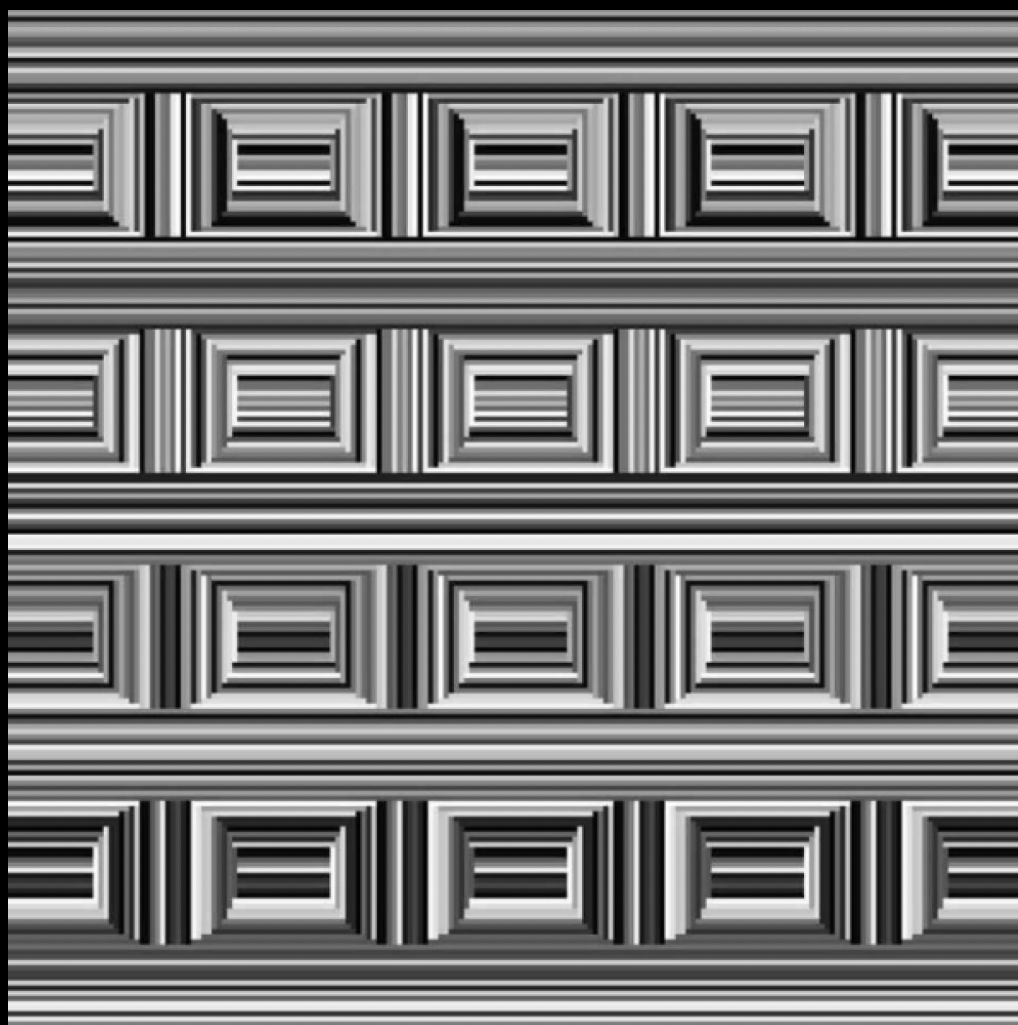
Perspektive und Situiertheit



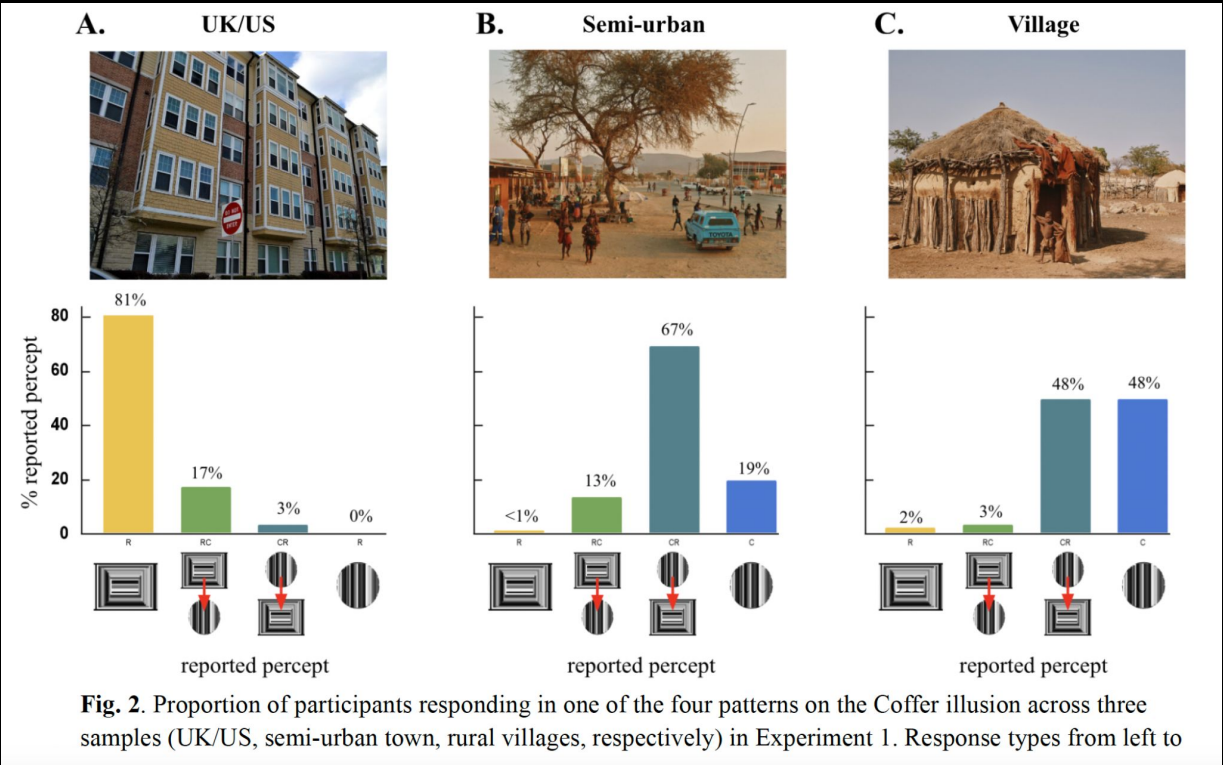
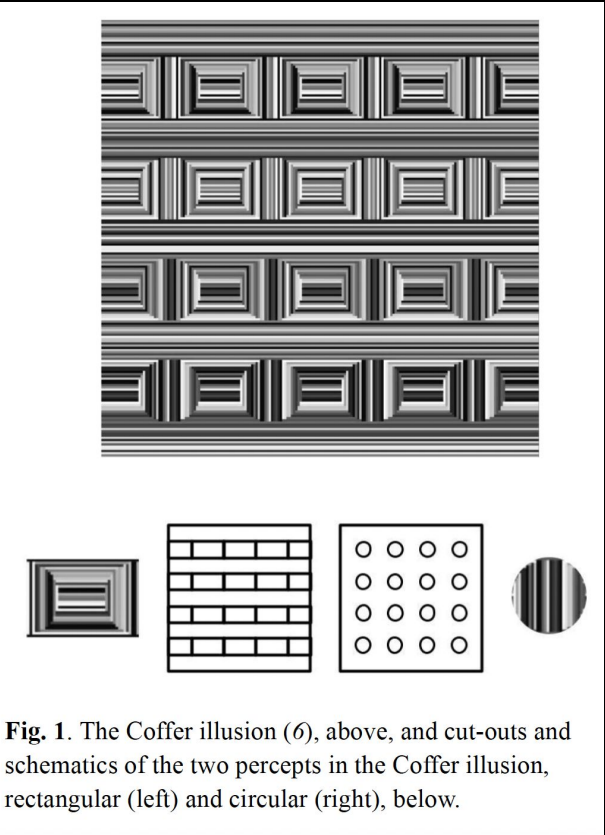
Perspektive und Situiertheit



Was sieht man?



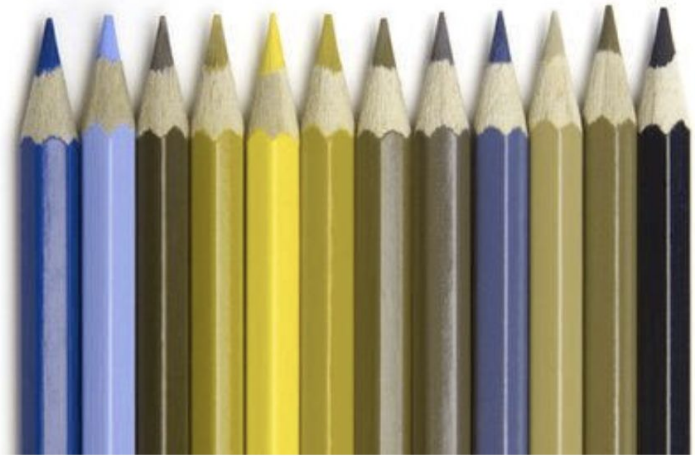
Kulturelle Unterschiede der visuellen Wahrnehmung



Kroupin, I., Davis, H. E., Lopes, A. J. P., Konkle, T., & Muthukrishna, M. (2025, February 13). Visual illusions reveal wide range of cross-cultural differences in visual perception. https://doi.org/10.31234/osf.io/gxzcq_v2

Zugänglichkeit und Barrierefreiheit

»Color blindness (color vision deficiency, or CVD) affects approximately **1 in 12 men (8%)** and **1 in 200 women (0.5%)**.«

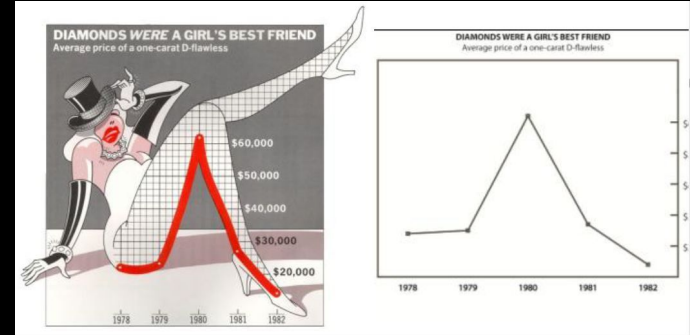
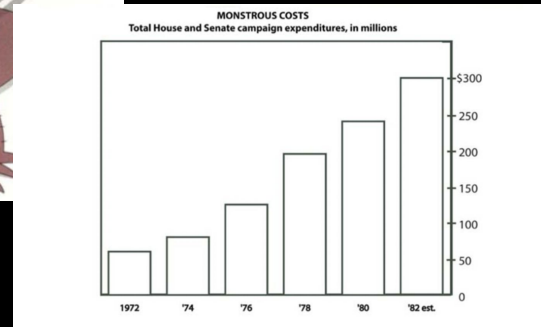


Zugänglichkeit und Barrierefreiheit

»According to recent research in 2017, around 36 million people were estimated to be blind (**~0.4% of the global population**), while approximately 217 million people had moderate to severe visual impairment (**~3%**). The numbers are growing with the growth and aging of the world's population. The increasing barriers to access visualizations can widen the information gap for the blind and visually impaired.«



Visuelle Verzerrungen und »Chartjunk«



Bateman, S., Mandryk, R. L., Gutwin, C., Genest, A., McDine, D., & Brooks, C. (2010, April). Useful junk? The effects of visual embellishment on comprehension and memorability of charts. In Proceedings of the SIGCHI conference on human factors in computing systems (pp. 2573-2582).

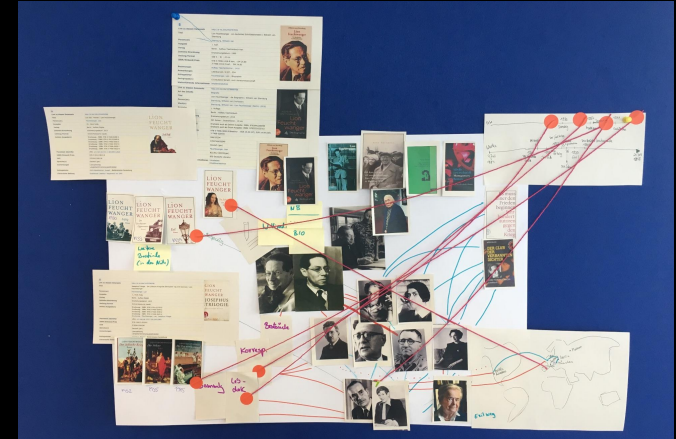
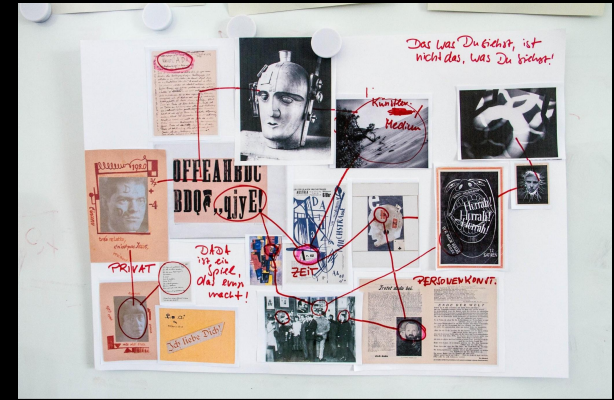
Lücken zwischen den Zahlen



»What are we making inherently unknowable by making the world more measurable, familiar, and predictable?« – Romi Morrison

Morrison, Romi Ron "Gaps Between the Digits: On the Fleshy Unknowns of The HUMAN", Information Visualization, Information Design Journal (25:1). Fall 2019

Co-design



Dörk, M., Müller, B., Stange, J.-E., Herseni, J., and Dittrich, K. (2020). Co-designing visualizations for information seeking and knowledge management. *Open Information Science*, 4:217–235. <https://dx.doi.org/10.1515/opis-2020-0102>

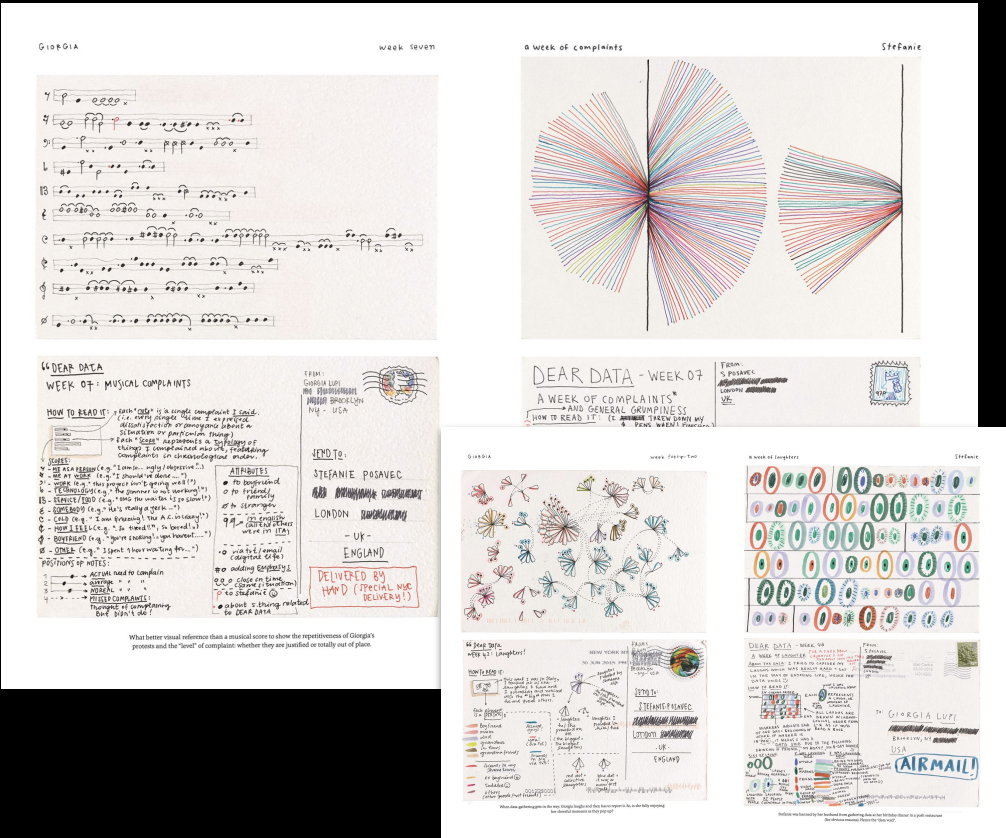
Datenfeminismus



DATA
HUMANISM

~~SMALL~~ big data
data ~~bandwidth~~ **QUALITY**
~~imperfect~~ infallible data
~~SUBJECTIVE~~ impartial data
~~INSPIRING~~ descriptive data
~~SERENDIPITOUS~~ predictive data
data ~~conventions~~ **POSSIBILITIES**
data to ~~simplify~~ complexity / **DEPICT**
data ~~processing~~ **DRAWING**
data driven **design**
~~SPEND~~ save time with data
data is ~~numbers~~ **PEOPLE**
data will make us more efficient **HUMAN.**

Dear Data



Dear Data (Giorgia Lupi & Stefanie Posavec)
<http://www.dear-data.com/theproject>

Data humanism, Giorgia Lupi :
<https://vimeo.com/241617101>

Daten, Ressourcen & Tools

CSV (Comma-Separated Values)

	A	B	C	D	E
1	source	target	Beziehung	Beziehungs-Propert	Richtung (ungerichtet, unidirekti
2	Goltz, Friedrich Leopold	Physiologe	Beruf		ungerichtet
3	Goltz, Friedrich Leopold	Anatomisches Institut Universität	Affiliation	wiss. Assistent	ungerichtet
4	Goltz, Friedrich Leopold	Physiologisches Institut Universität	Affiliation	Professor	ungerichtet
5	Goltz, Friedrich Leopold	Physiologisches Institut Universität	Affiliation	Professor	ungerichtet
6	Goltz, Friedrich Leopold	Naturforscherversammlung	Konferenzbesuch		ungerichtet
7	Goltz, Friedrich Leopold	Medizin	Sachbegriff		ungerichtet
8	Goltz, Friedrich Leopold	Physiologie	Sachbegriff		ungerichtet
9	Goltz, Friedrich Leopold	Zentralnervensystem	Sachbegriff		ungerichtet
10	Goltz, Friedrich Leopold	Lokalisation seelischer Funktioner	Sachbegriff		ungerichtet
11	Goltz, Friedrich Leopold	Schrader, M.E.	beruflich	"Schüler"	bidirektional
12	Goltz, Friedrich Leopold	Ewald, Ernst Julius Richard	beruflich	"Schüler"	bidirektional
13	Goltz, Friedrich Leopold	Gaule, Justus	beruflich	"Schüler"	bidirektional
14	Goltz, Friedrich Leopold	Bethe, Albrecht	beruflich	"Schüler"	bidirektional
15	Goltz, Friedrich Leopold	Mehring, Joseph von	beruflich	"Schüler"	bidirektional
16	Goltz, Friedrich Leopold	Loeb, Jacques	beruflich	"Schüler"	bidirektional
17	Goltz, Friedrich Leopold	Freusberg, Adolf			
18	Goltz, Friedrich Leopold	Bickel, Adolf			
19	Goltz, Friedrich Leopold	Bethe, Albrecht			
20	Anatomisches Institut Universit	Königsberg			
21	Physiologisches Institut Univers	Halle			
22	Physiologisches Institut Univers	Straßburg			
23	Naturforscherversammlung	Hannover			
24	Wittich, Wilhelm Heinrich von	Physiologe			
25	Wittich, Wilhelm Heinrich von	Albertus-Universität zu Königs			
26	Wittich, Wilhelm Heinrich von	Naturforscherversammlung			

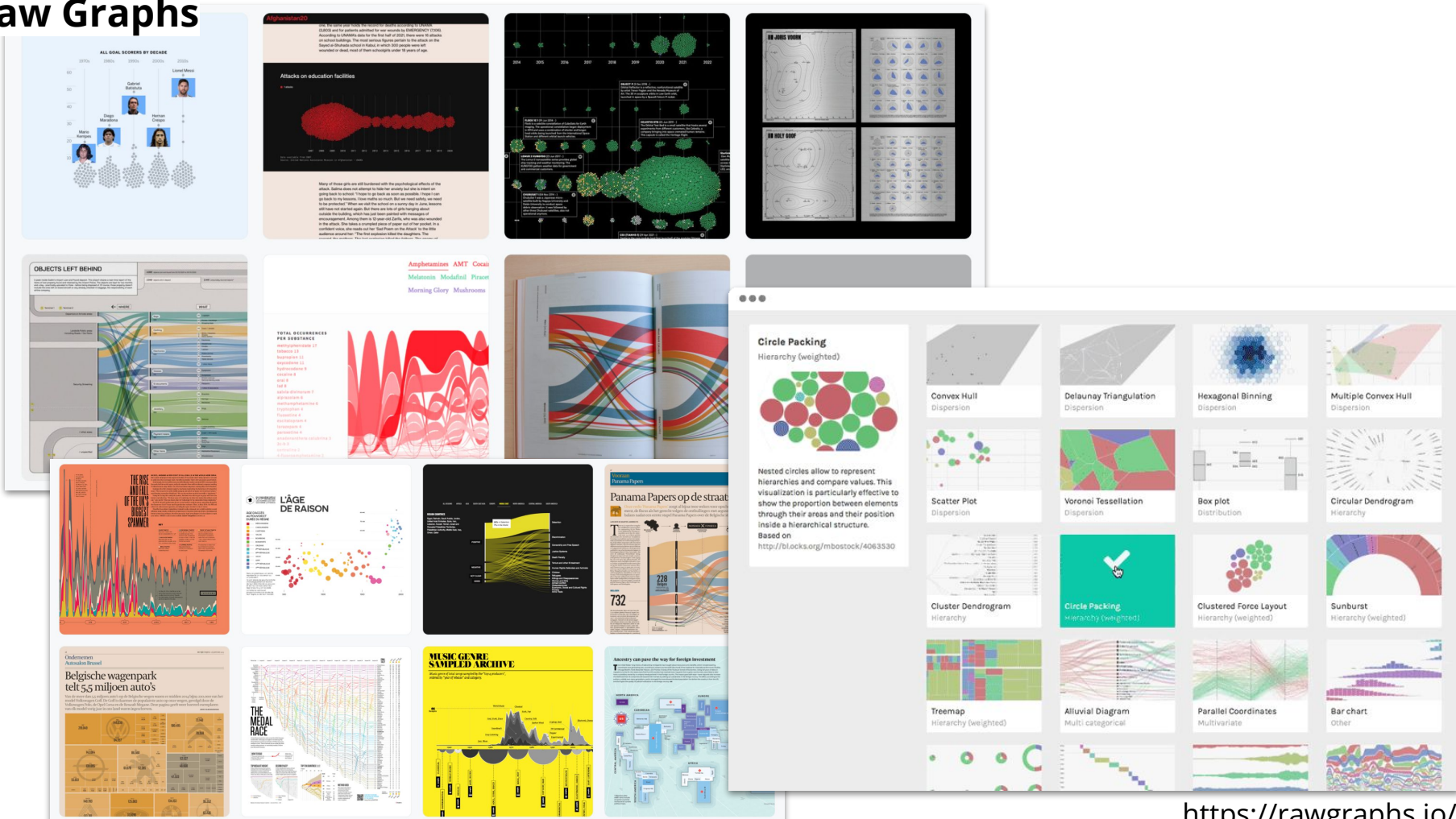
```
id,name,label,p.PerGender,p.PerDateApprox,p.PerDateStrict,p.EntityVari
(DE-588)115568808,"Fritsch, Gustav",[PerName],1,1838-1927,"","Fritsch,
(DE-588)116917423,"Hitzig, Eduard",[PerName],1,1838-1907,06.02.1838-20.
(DE-588)117185930,"Munk, Hermann",[PerName],1,1839-1912,03.02.1839-01.1
(DE-588)118800000,"Fick, Adolf",[PerName],1,1829-1901,03.09.1829-21.08.
(DE-588)118896202,"Zuntz, Nathan",[PerName],1,1847-1920,07.10.1847-22.0
(DE-588)119133628,"Loeb, Jacques",[PerName],1,1859-1924,07.04.1859-11.0
```

JSON (JavaScript Object Notation)

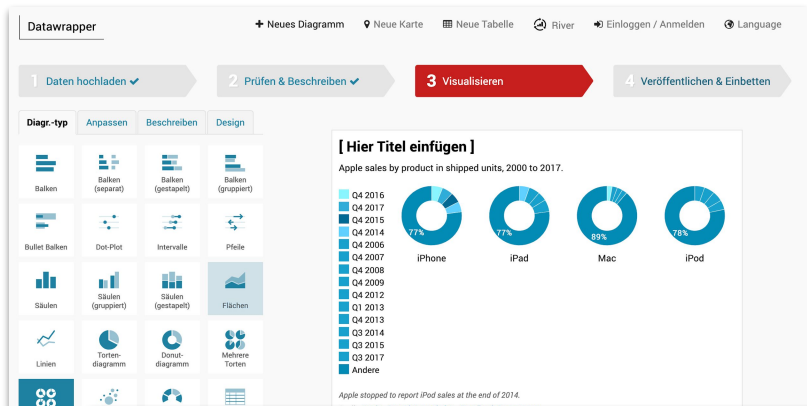
```
{
  "data": [
    {
      "name": "Alice",
      "age": 28,
      "gender": "Female",
      "salary": 65000,
      "department": "Marketing"
    },
    {
      "name": "Bob",
      "age": 35,
      "gender": "Male",
      "salary": 80000,
      "department": "Finance"
    },
    {
      "name": "Charlie",
      "age": 42,
      "gender": "Male",
      "salary": 95000,
      "department": "Engineering"
    }
  ]
}
```

```
{
  "nodes": [
    {"id": "Myriel", "group": 1},
    {"id": "Napoleon", "group": 1},
    {"id": "Mlle.Baptistine", "group": 1},
    {"id": "Mme.Magloire", "group": 1},
    {"id": "CountessdeLo", "group": 1},
    {"id": "Geborand", "group": 1},
    {"id": "Champtercier", "group": 1},
    {"id": "Cravatte", "group": 1}
  ],
  "links": [
    {"source": "Napoleon", "target": "Myriel", "value": 1},
    {"source": "Mlle.Baptistine", "target": "Myriel", "value": 8},
    {"source": "Mme.Magloire", "target": "Myriel", "value": 10},
    {"source": "Mme.Magloire", "target": "Mlle.Baptistine", "value": 6},
    {"source": "CountessdeLo", "target": "Myriel", "value": 1},
    {"source": "Geborand", "target": "Myriel", "value": 1},
    {"source": "Champtercier", "target": "Myriel", "value": 1},
    {"source": "Cravatte", "target": "Myriel", "value": 1},
    {"source": "Count", "target": "Myriel", "value": 2},
    {"source": "OldMan", "target": "Myriel", "value": 1},
    {"source": "Valjean", "target": "Labarre", "value": 1}
  ]
}
```

Raw Graphs

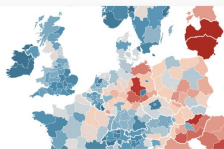


DataWrapper



What kind of map do you want to create?

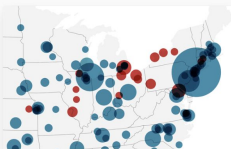
Choose the map type that fits your data:



Choropleth map

Color regions to show data like unemployment rates or election results on a map. Upload your own map or use any of our more than 3000 maps. The resulting map is responsive & interactive.

[Learn more about choropleth maps](#)



Symbol map

Create symbols sized and colored according to your data. Works great for specific locations (like cities). Upload your own map or use any of our more than 3000 maps. The resulting map is responsive & interactive.

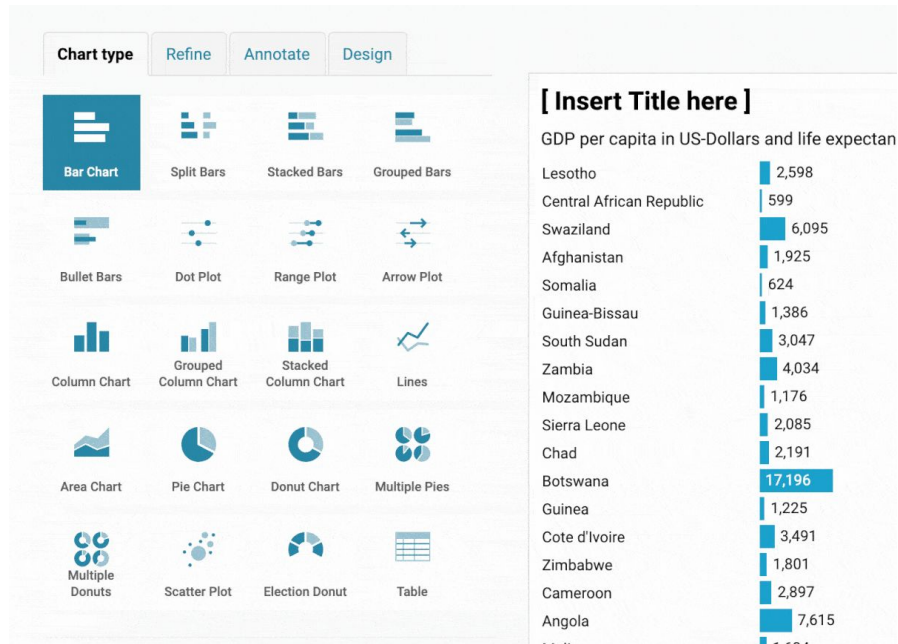
[Learn more about symbol maps](#)



Locator map

Add markers to a map to show where something is located or happened, e.g. events within a city. Perfect for showing readers the places you mention in an article. The resulting map is responsive and static.

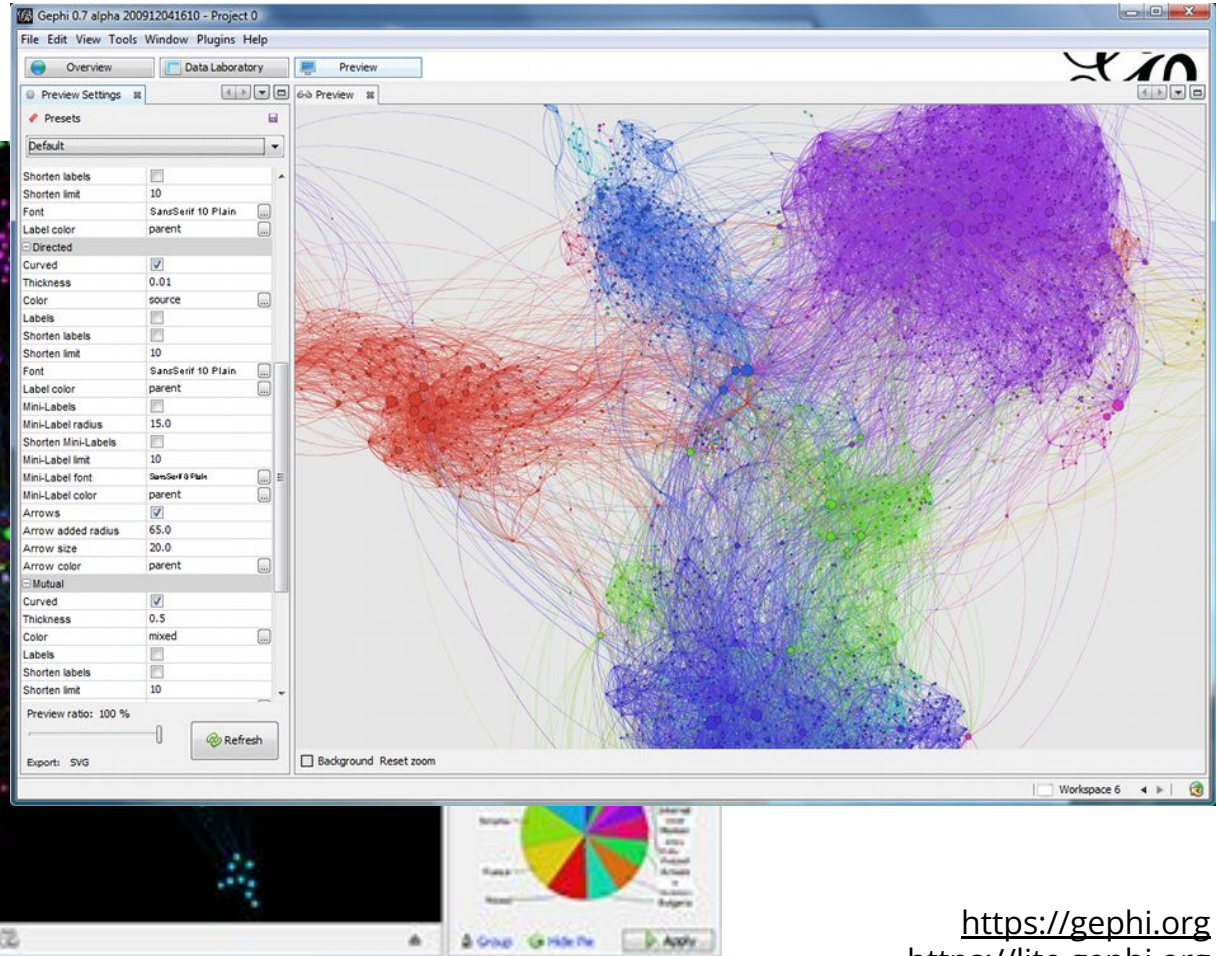
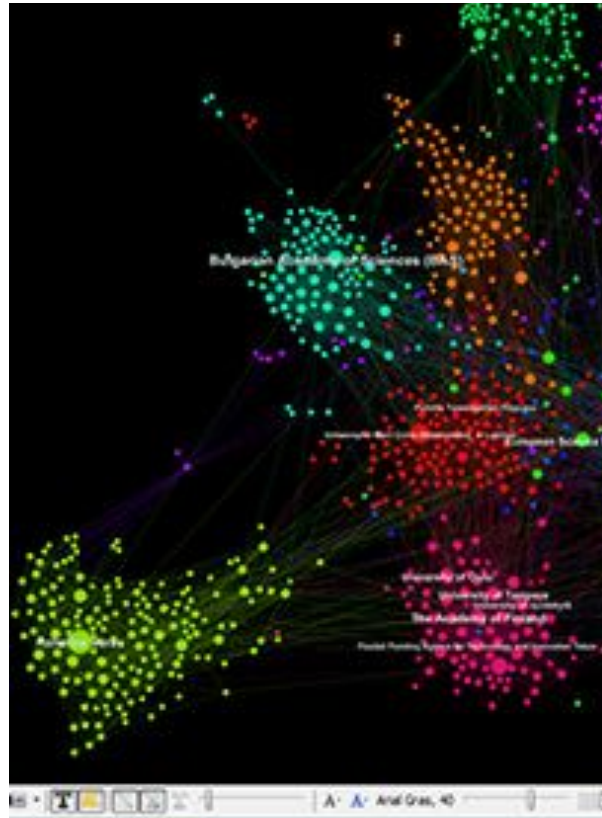
[Learn more about locator maps](#)



<https://app.datawrapper.de/>
<https://app.datawrapper.de/select/map>

[illegible]

Gephi



<https://gephi.org>
<https://lite.gephi.org>

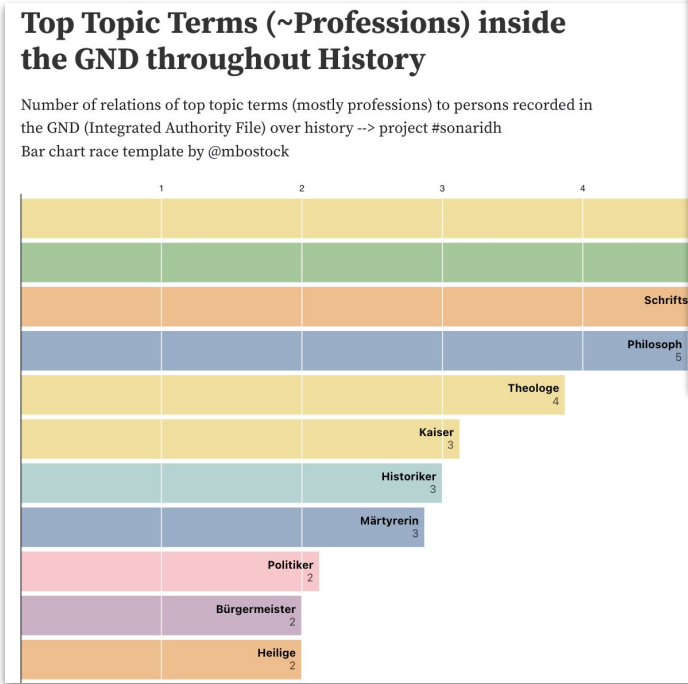


```
data = ▶Object {2015: Array(6), 2016: Array(6), 2017: Array(6)}

// help the parser out by putting {} in ()
data = ({
  2015: [2,1,4,3,5,7],
  2016: [5,3,3,2,4,6],
  2017: [ 3,2,4,4,5,3],
})
```

Fruit Counts By Year

Fruit	2015	2016	2017
Apples	2	5	3
Pears	1	3	2
Nectarines	4	3	4
Plums	3	2	4
Grapes	5	4	5
Strawberries	7	6	3



D

V

P

ALL

FAMILY

INPUT

FUNCTION

SHAPE

Q

I

by **ferdio**

hire us!

1 dataset. 100 visualizations.

Discover data viz applied to real data in our latest project!

Alluvial Diagram

Sankey Diagram

Donut Chart

Line Graph

Radial Bar Chart

Polar Area Chart

Pictorial Percentage Chart

Bar Chart (Vertical)

Exploded

Sunburst Diagram

Flow Map

Treemap

Sorted S

The Data Visualisation Project

About · Blog · Shop

Español

Français

Pyc

Search by Function

Arc Diagram

Area Graph

Bar Chart

Bubble Map

Bullet Graph

Calendar

Circle Packing

Connection Map

Density Plot

www.Datavizcatalogue.com

Vis Tools

VISBROWSER

ADD A TOOL

ABOUT

Search

AVAILABILITY	PROGRAMMING SKILLS	PLATFORM	FEATURES	TYPE OF DATA	VISUALIZATION
36 Free 30 Open source 20 \$ Paid	25 None 12 Javascript 7 Python 2 Java 11 Other 1 Matlab 4 R 0 R	18 Apple 21 Windows 12 Linux 24 Web 8 Library 1 Other	24 Web-publishing 27 File exports 12 Other 11 Wizard 9 PDF Export 0 Wizard	34 Numeric 27 Geographic 30 Temporal 14 Text 18 Other 6 Network	12 Networks 27 Maps 33 Basic charts 18 Advanced charts 17 Other 16 Storytelling

COLORBREW 2.0

color advice for cartography

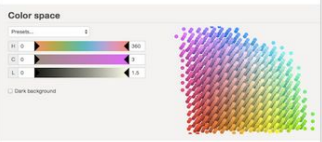


COLORBREW

<https://colorbrewer2.org/>
 Intended for use as a diagnostic tool for evaluating the robustness of individual colour schemes.



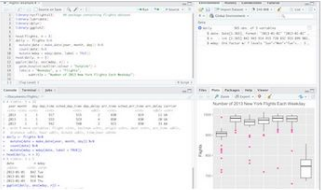
i want hue



I WANT HUE

<https://medialab.github.io/iwanthue/>
 Colors for data scientists. Generate and refine palettes of optimally distinct colors.





RSTUDIO

<https://rstudio.com/>
 RStudio is an integrated development environment for R, a programming language for statistical computing and...





CHARTBLOCKS

<https://www.chartblocks.com/en/>
 Build a chart in minutes in the easy to use chart designer, choosing from dozens of chart types and then...

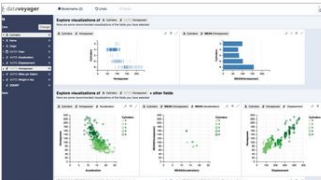




GEPHI

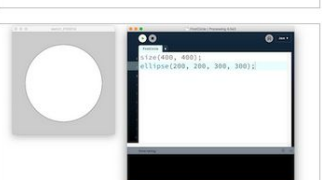
<https://gephi.org/>
 Gephi is an open-source network analysis and visualization software package written in Java on the NetBean...













<https://vistools.net>

Colors

Number of data classes: 7

how to use updates downloads credits

Nature of your data:
sequential diverging qualitative

Pick a color scheme:
Multi-hue: Single hue:

Only show:
colorblind safe
print friendly
photocopy safe

Context:
roads
cities
borders

Background:
solid color
terrain

7-class BuGr

HEX

#e0f8fb

#ccece6

#99d8c9

#66c2a4

#41ae76

VIZ PALETTE

By: Elijah Meeks & Susie Lu

PICK

Use Chrome.js

Use ColorGist

Use Colorbrewer

EDIT

7 Colors

GET

COLORBREWER 2.0

color advice for cartography

COLORS IN ACTION

Color Population: No Color Deficiency - 98% Deuteranomaly - 2.7% Protanomaly - 0.88% Protanopia - 0.59% Deuteranopia - 0.56% Grayscale

COLOR REPORT

Area like colors difficult to tell apart in

#f08080 pink

#f08080 light orange

Monochrome name change for categorical palette

Shows on small points

i want hue

Colors for data scientists. Generate and refine palettes of optimally distinct colors.

Color space

All colors

H 0 360

C 35.0 100

L 0 100

Improve for the colorblind (slow)

Dark background

Palette

5 colors

hard (Force vector)

Reroll palette

Sort by diff hue chroma lightness random

Google Arts & Culture

Experiments

Art Palette

FROM AN IMAGE

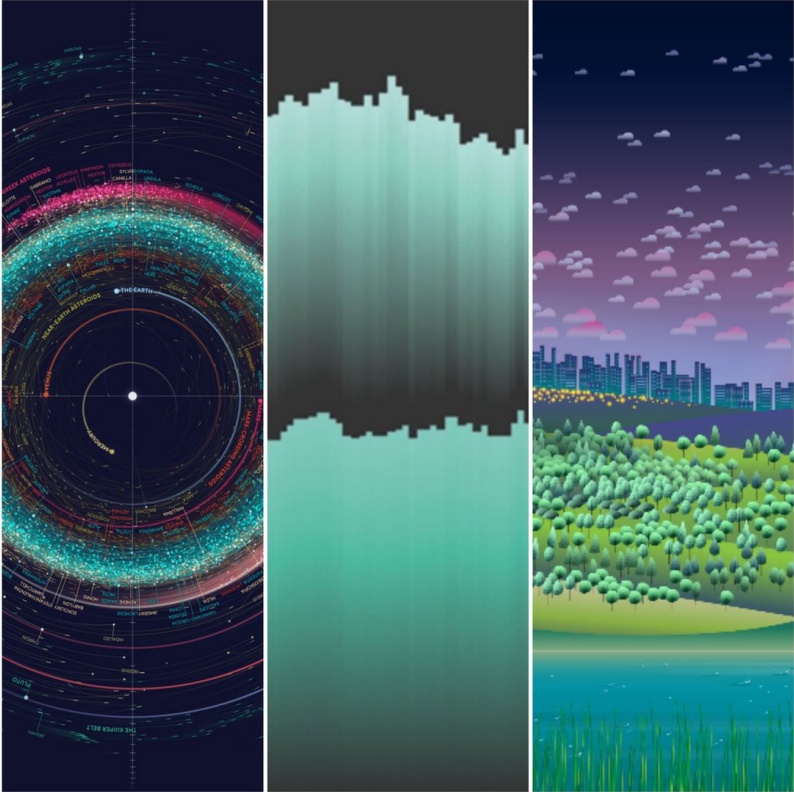
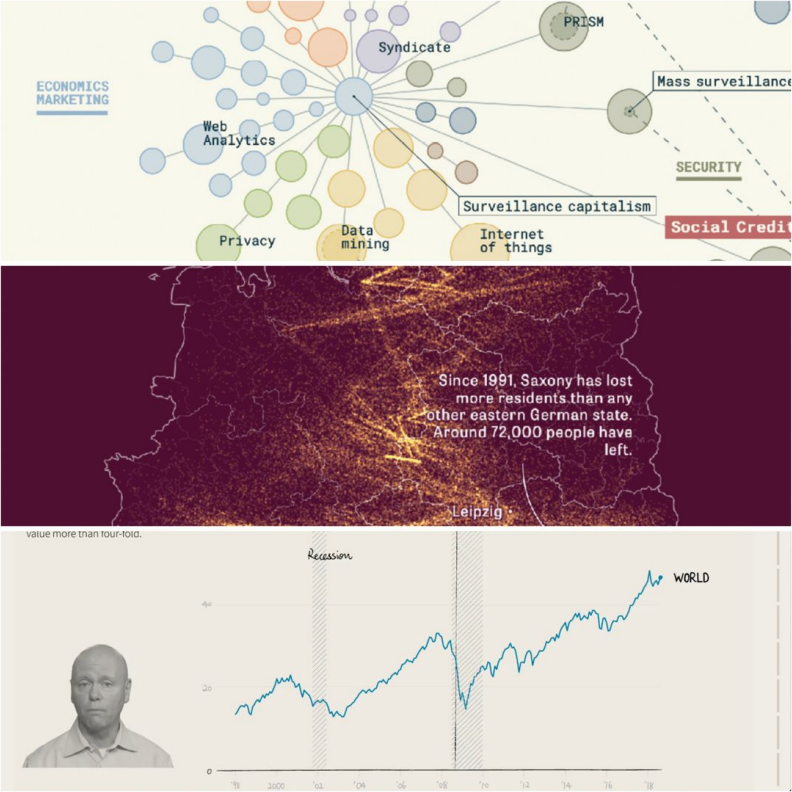
SURPRISE ME

<https://colorbrewer2.org>
<https://projects.susielu.com/viz-palette>
<https://medialab.github.io/iwanthue/>
<https://artsexperiments.withgoogle.com/artpalette>

VIS Pubs (with publications from IEEE Vis, ACM CHI & Eurovis)

VIS PUBLICATIONS		ABOUT		
	Search (Title, Author, Abstract) film		  	 21 papers  EXPORT
Understanding Narrative Linearity for Telling Expressive Time-Oriented Stories				CHI, 2021 [6]
Xingyu Lan, Xinyue Xu, Nan Cao				
Origraph: Interactive Network Wrangling				VAST, 2019 [7]
Alex Bigelow, Carolina Nobre, Miriah D. Meyer, Alexander Lex				
VIAN: A Visual Annotation Tool for Film Analysis				EuroVis, 2019 [8]
Gaudenz Halter, Rafael Ballester-Ripoll, Barbara Flückiger, Renato Pajarola				
Visualizing Nonlinear Narratives with Story Curves				InfoVis, 2017 [9]
Nam Wook Kim, Benjamin Bach, Hyejin Im, Sasha Schriber, Markus H. Gross, Hanspeter Pfister				
Has Instagram Fundamentally Altered the 'Family Snapshot'?				CHI, 2017 [10]
Effie Le Moignan, Shaun W. Lawson, Duncan A. Rowland, Jamie Mahoney, Pam Briggs				
EventAction: Visual analytics for temporal event sequence recommendation				VAST, 2016 [11]
Fan Du, Catherine Plaisant, Neil Spring, Ben Shneiderman				
Visualization of personal history for video navigation				CHI, 2014 [12]
Abir Al Hajri, Gregor Miller, Matthew Fong, Sidney S. Fels				
Small Multiples, Large Singles: A New Approach for Visual Data Exploration				EuroVis, 2013 [13]
Stef van den Elzen, Jarke J. van Wijk				
ManyNets: an interface for multiple network analysis and visualization				CHI, 2010 [14]
Manuel Freire, Catherine Plaisant, Ben Shneiderman, Jennifer Golbeck				
Visualization in the Einstein Year 2005: a case study on explanatory and illustrative visualization of relativity and astrophysics				VIS, 2005 [15]
Daniel Weiskopf, Marc Borchers, Thomas Ertl, Martin Falk, Oliver Fechtig, Regine Frank, Frank Grave, Andreas King, Ute Kraus, Thomas Müller, Hans-Peter Nollert, Isabel Rica Mendez, Hanns Ruder, Corvin Zahn, Michael Zatloukal, Tobias Schafhitzel, Sonja Schär				
Exploding the frame: designing for wall-size computer displays				InfoVis, 2003 [16]
Ben Shedd				
Real-world relativity: image-based special relativistic visualization				VIS, 2000 [17]
Stef van den Elzen, Jarke J. van Wijk				

Information is Beautiful Awards



Kuratierte Ressourcen Liste

Data Visualization Resources

Authored by [Mark-Jan Bludau](#).

Data Visualization Technique Overviews:

- [The Data Viz Project](#)
- [The Data Visualisation Catalogue](#)
- [Xenographics – Weird but \(sometimes\) useful charts](#)

Tool Overviews:

- [The Chartmaker Directory by Visualising Data](#)
- [Vis Browser](#)

(Selected) Visualization Tools and Libraries:

- [Raw Graphs](#): A free and open source tool for data visualization. Almost 30 visual models to visualize quantities, hierarchies, time series and find insights in your data. Enables you to export your visualizations as svg and edit it afterwards in Illustrator or similar tools.
- [DataWrapper](#): Create interactive, responsive & beautiful data visualizations with the online tool Datawrapper – no code required. Widely used in Newsrooms and based in Berlin. Good to get fast insights into your data without coding.
- [Gephi](#): Gephi is one of the most common visualization and exploration softwares for all kinds of graph and network visualizations. It's open-source and free and doesn't require coding skills.
- [D3.js – Data driven documents](#): D3.js is a free, open-source JavaScript library for visualizing data. It's very widely used for interactive web-based visualizations and ideal for individualized approaches. It demands html, css, javascript and svg coding basics.
- [Observable](#): Data visualization notebook-based platform by the creator of D3.js.
- [Jupyter Notebooks + Python](#): Interactive coding based notebook environment for data analysis, visualization and general computation tasks.
- [R Studio](#): Development environment for statistical and data analysis and visualization.
- [Open Refine](#): OpenRefine is a powerful free, open source tool for working with messy data: cleaning it; transforming it from one format into another; and extending it with web services and external data.
- [Flourish](#): Tool for storytelling and data visualization.
- [Mapbox/Mapbox GL JS](#): Web-based maps.
- [Scrollama](#): Lightweight JavaScript library for scrollytelling by the makers of Pudding.cool.
- [Cables.gl](#): Cables is a web-based visual (node-based) programming tool that also supports sensor inputs and allows quick prototyping.
- [SVG Crowbar](#): Chrome addon to extract generated SVGs from websites to afterwards edit them in tools like Illustrator.
- [Tabula](#): Extract data tables from pdfs.
- [QGIS](#): A Free and Open Source Geographic Information System software, for creation of maps, etc.
- [Interactive FlowCharts](#): Template for audio-narrated interactive flow charts.

Research (to find research papers it's easiest to use [Google Scholar](#)):

- Franconeri, S. L., Padilla, L. M., Shah, P., Zacks, J. M., & Hullman, J. (2021). [The science of visual interest](#), 22(3), 110–161.
- Willett, W., Aseniero, B. A., Carpendale, S., Dragicevic, P., Jansen, Y., Oehlberg, L., & Isenberg, P. [for visualization](#). IEEE transactions on visualization and computer graphics, 28(1), 22–32.
- Kim, N. & Joyner, Shakila Cherise & Riegelhuth, Amalia & Kim, Y. (2021). [Accessible Visualization: Design](#) 173–188. 10.1111/cgf.14298.
- Peck, E. M., Ayuso, S. E., & El-Etr, O. (2019, May). [Data is personal: Attitudes and perceptions of data](#). Conference on Human Factors in Computing Systems (pp. 1–12).
- Meyer, M., & Dykes, J. (2019). [Criteria for rigor in visualization design study](#). IEEE transactions on visualization and computer graphics, 25(12), 3511–3520.
- Pandey, A. V., Manivannan, A., Nov, O., Satterthwaite, M., & Bertini, E. (2014). [The persuasive power of graphics](#), 20(12), 2211–2220.
- there is much, much, more. Check out [Google Scholar](#)!

Data Resources:

- [Kaggle Datasets](#)
- [Google Data Search](#)
- [Statista](#)
- [World bank open data](#)
- [OpenStreetMap](#)
- Government websites (EU, Germany, states, cities...)

Community:

- [Datavis.berlin](#): Data Visualization Meetup and Overview of people doing DataVis in Berlin.
- [Mastodon vis.social](#): Mastodon visualization instance.
- [Information Is Beautiful Awards](#): International Data Visualization Awards
- [Malofiej Awards](#): Infographic Awards (paused since 2021)

Surveys:

- [Time Visualization Browser](#)
- [Geospatial-Network Visualization Browser](#)
- [Data Physicalizations](#)
- [Visualizing High-Dimensional Data](#)
- [Text Visualization Browser](#)
- [Dashboard Design Patterns](#)
- [Multivariate Network Visualizations](#)
- [Networks](#)
- [Tree Visualizations](#)

Tutorials:

- [D3 Basics – D3inDepth](#)
- [D3.js Getting Started – Observable](#)

<https://markjanbludau.de/datavis-resources>

Daten:

tinyurl.com/y6szw4wa

DataWrapper:

app.datawrapper.de/create/map

RawGraphs:

rawgraphs.io

Einführung in die Datenvisualisierung

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