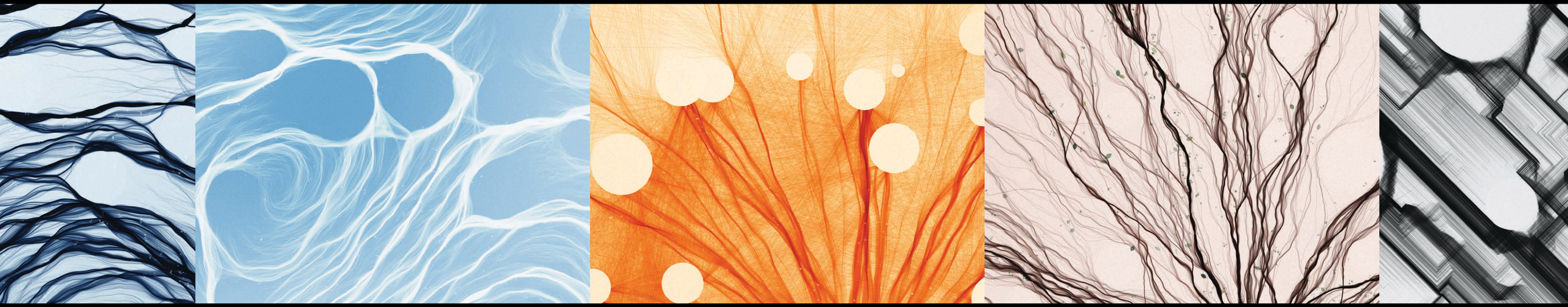
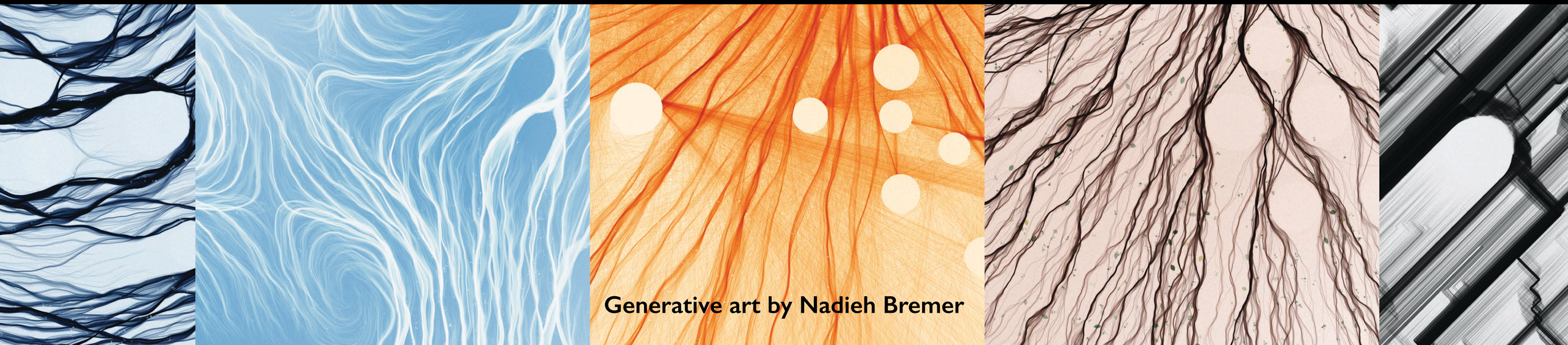
2023 Great Lakes Data & Analytics Summit



The language and dialects of

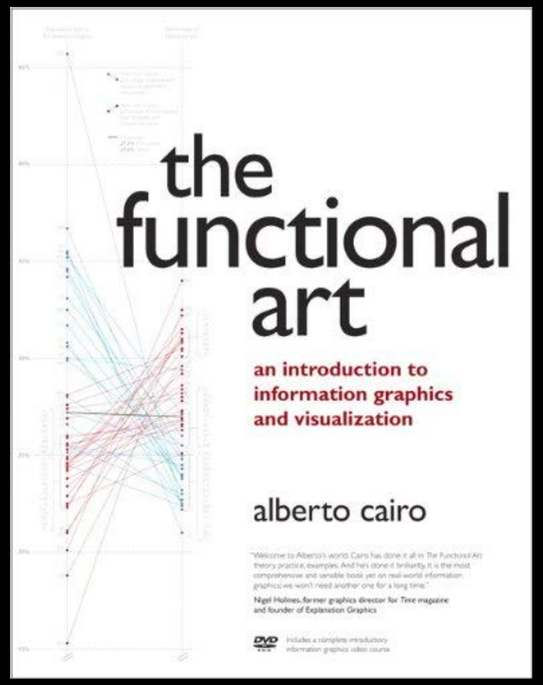
DATA VISUALIZATION

Alberto Cairo

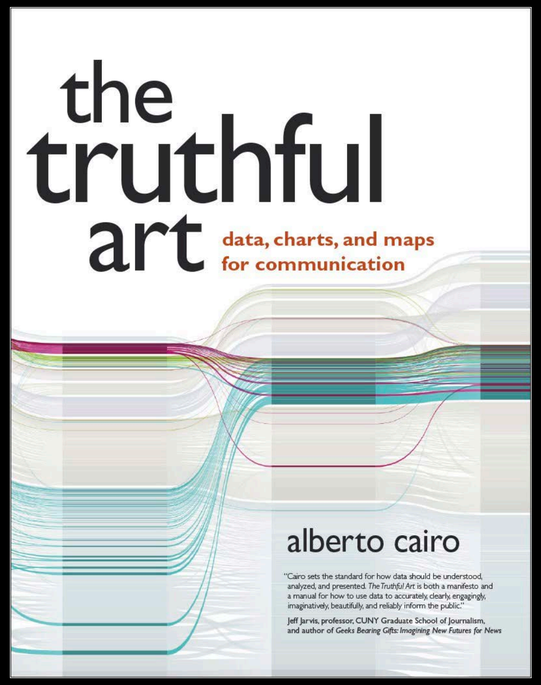


Generative art by Nadieh Bremer

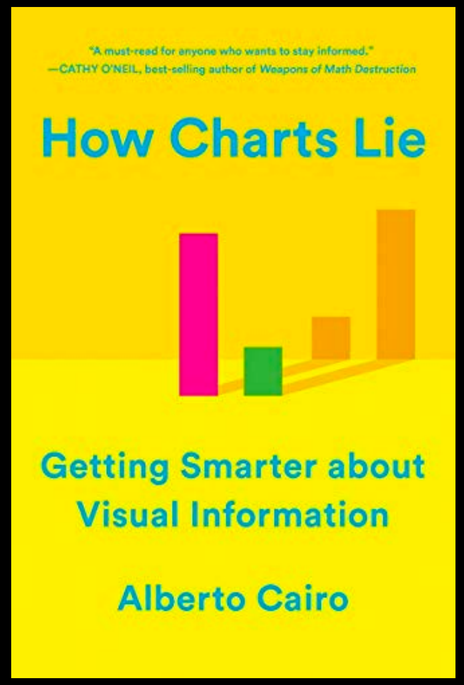
2012



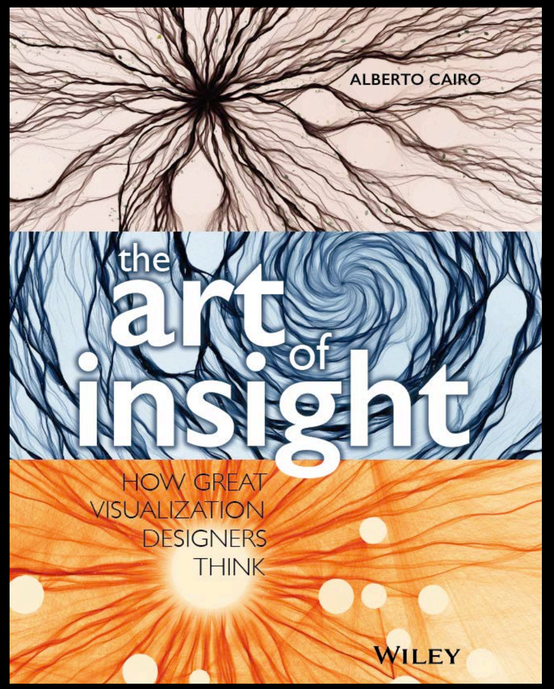
2016



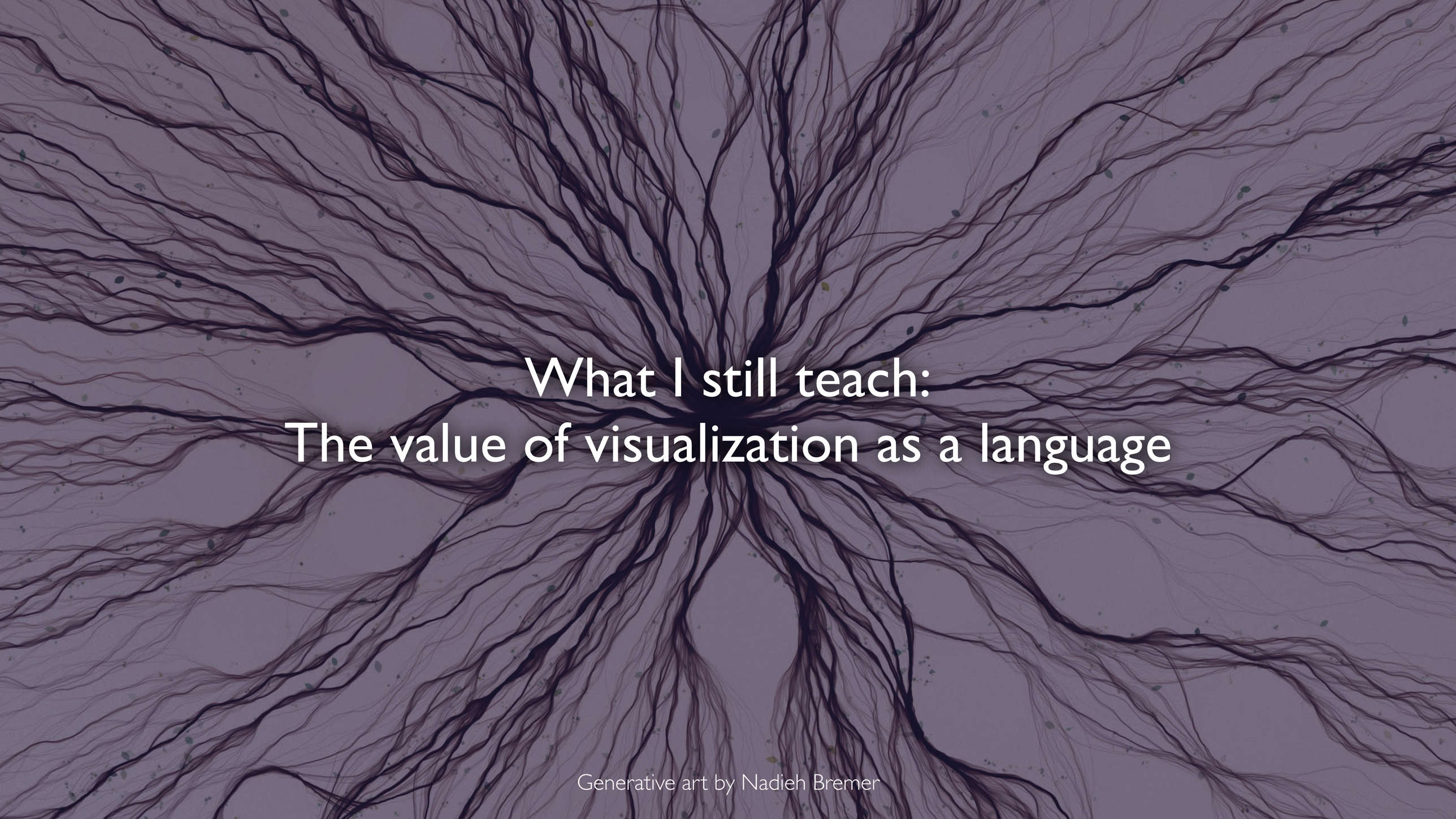
2019



November of 2023



'The Art of Insight' is, in part, about how the way
I **teach** and **think** about data visualization has evolved.


What I still teach:
The value of visualization as a language
Generative art by Nadieh Bremer

The most-viewed story *ever* published by The Washington Post online

Sections

The Washington Post
Democracy Dies in Darkness

Alberto Cairo To...

2.6k

Health

Why outbreaks like coronavirus spread exponentially, and how to "flatten the curve"

By Harry Stevens March 14, 2020

PLEASE NOTE

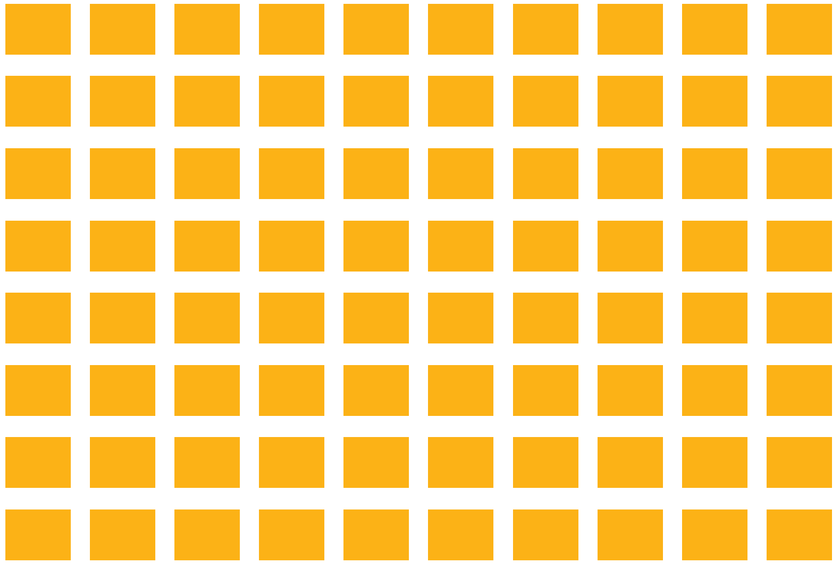
The Washington Post is providing this story for free so that all readers have access to this important information about the coronavirus. For more free stories, sign up for our daily Coronavirus Updates newsletter.

https://www.washingtonpost.com/graphics/2020/world/corona-simulator/

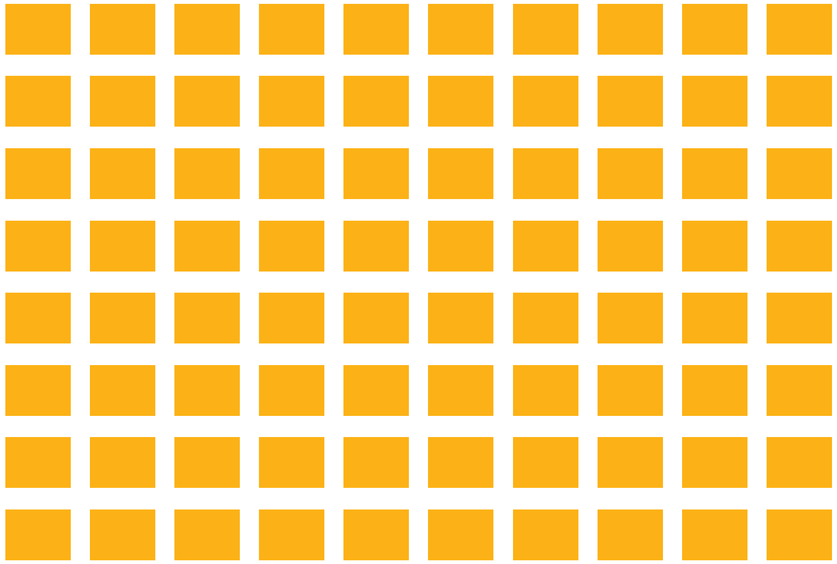
The Post's visual journalism, which involves staff throughout the newsroom, has attracted large audiences and contributed to record subscriber growth. Six of the seven most visited stories in The Washington Post's history have been graphics, including the coronavirus simulator that became the most visited article in The Post's history, with more than three times as many visits as the second. It also includes this year's Democratic candidate quiz, which set the record for converting readers to subscribers.

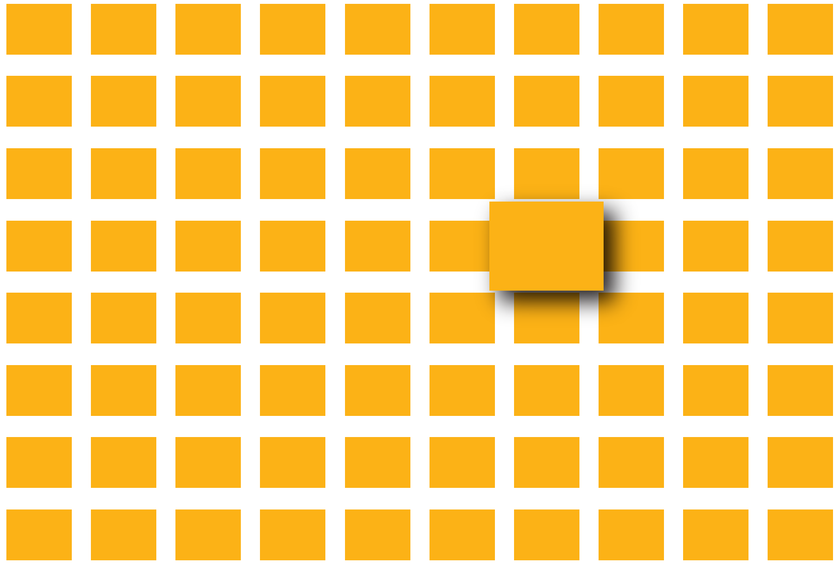
https://www.washingtonpost.com/pr/2020/06/26/washington-post-expand-graphics-design-teams-with-14-new-positions/

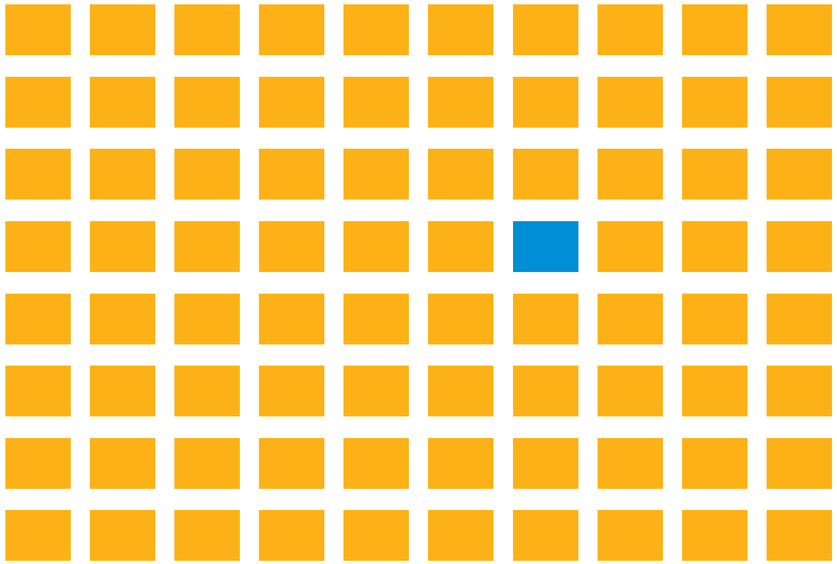
The human brain evolved to detect **patterns**…

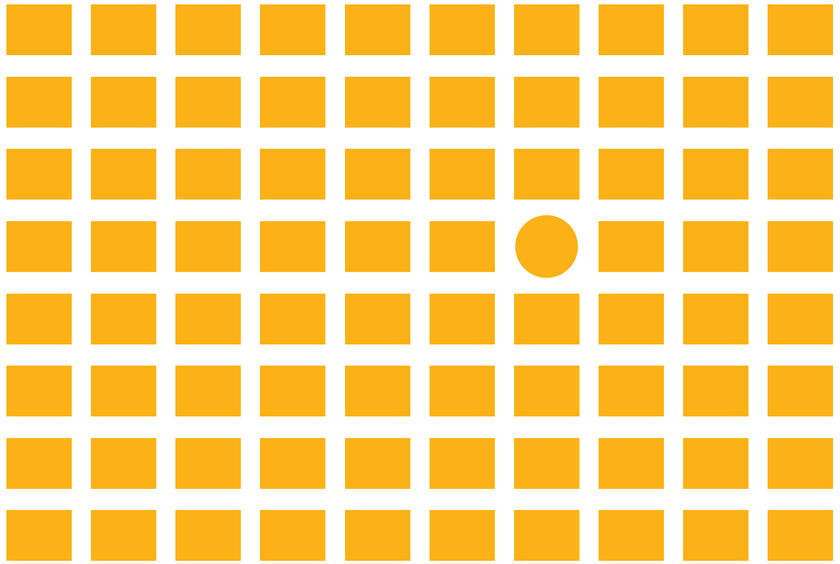


The human brain evolved to detect **patterns**…



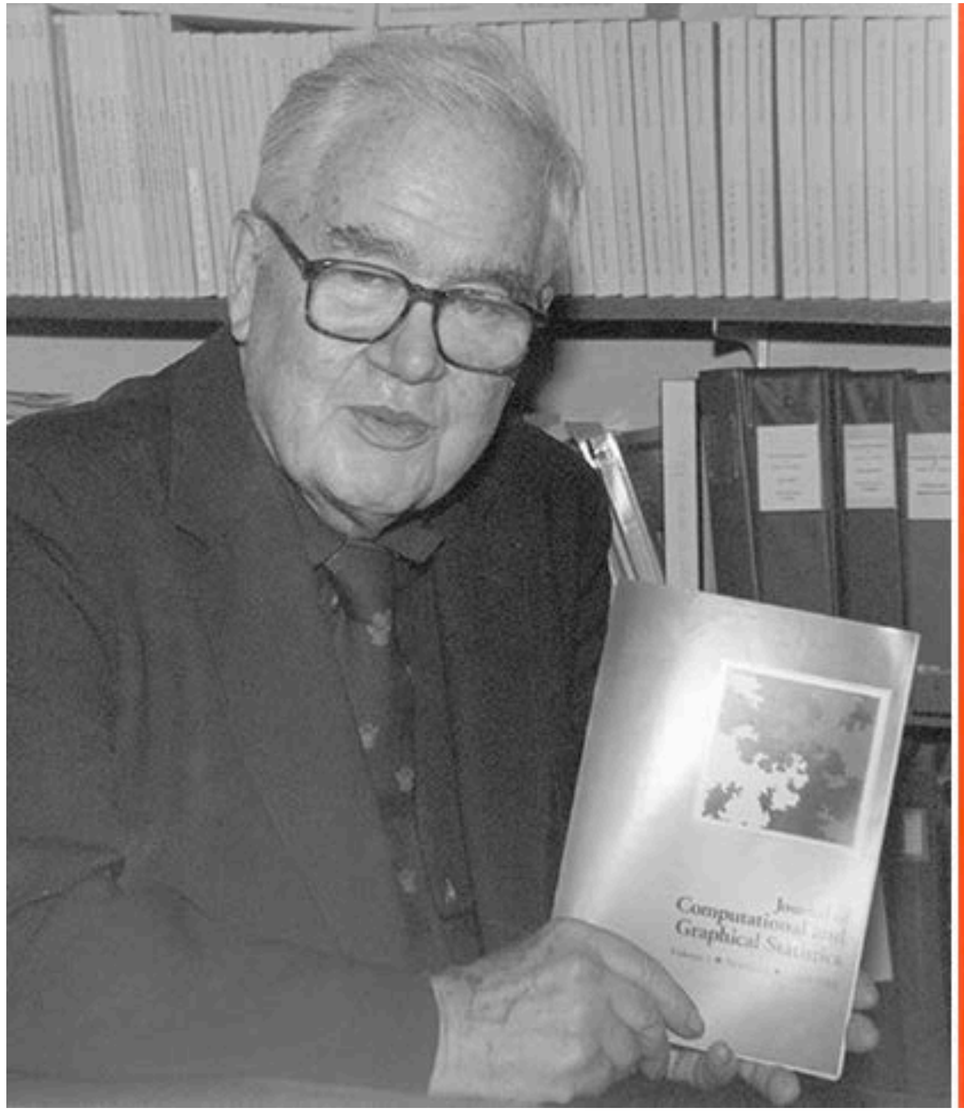


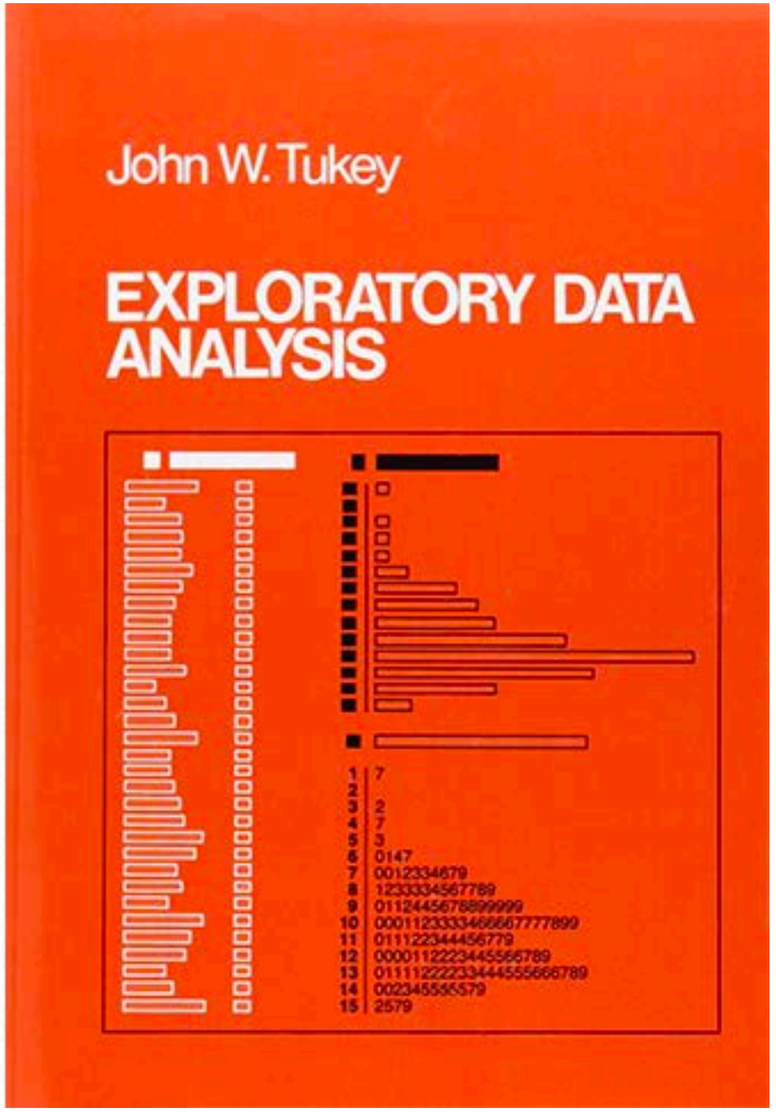




…and the **exceptions** and **departures** from those patterns.

The relationship between patterns and their exceptions is a key principle of data exploration: uncover patterns and trends, but don't forget the exceptions to those patterns and trends.

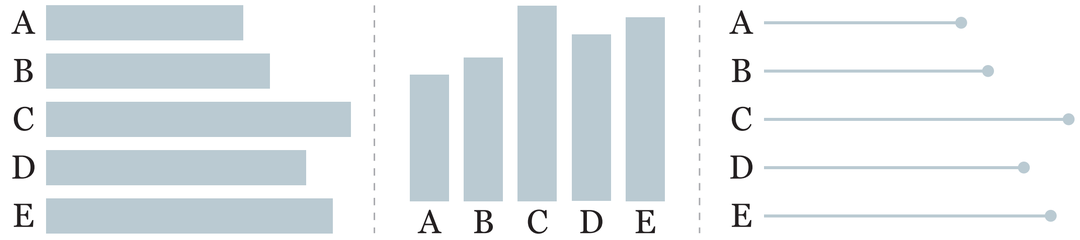




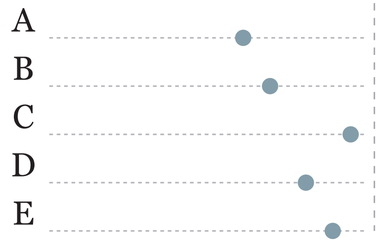
"The greatest value of a picture is when it forces us to notice what we never expected to see."

John W. Tukey

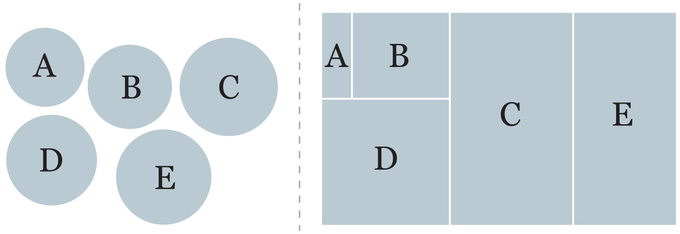
Length or height



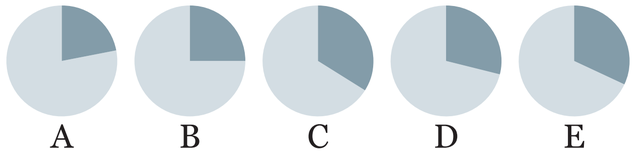
Position



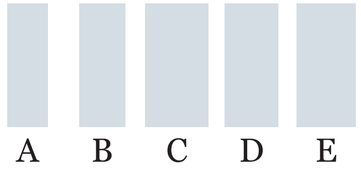
Area



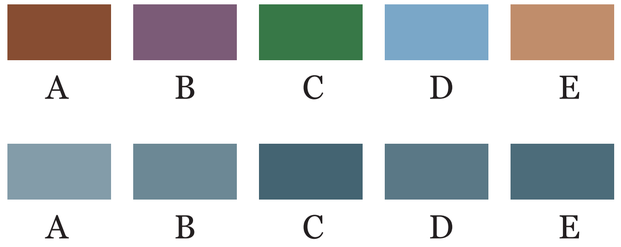
Angle/area



Line weight



Hue and shade



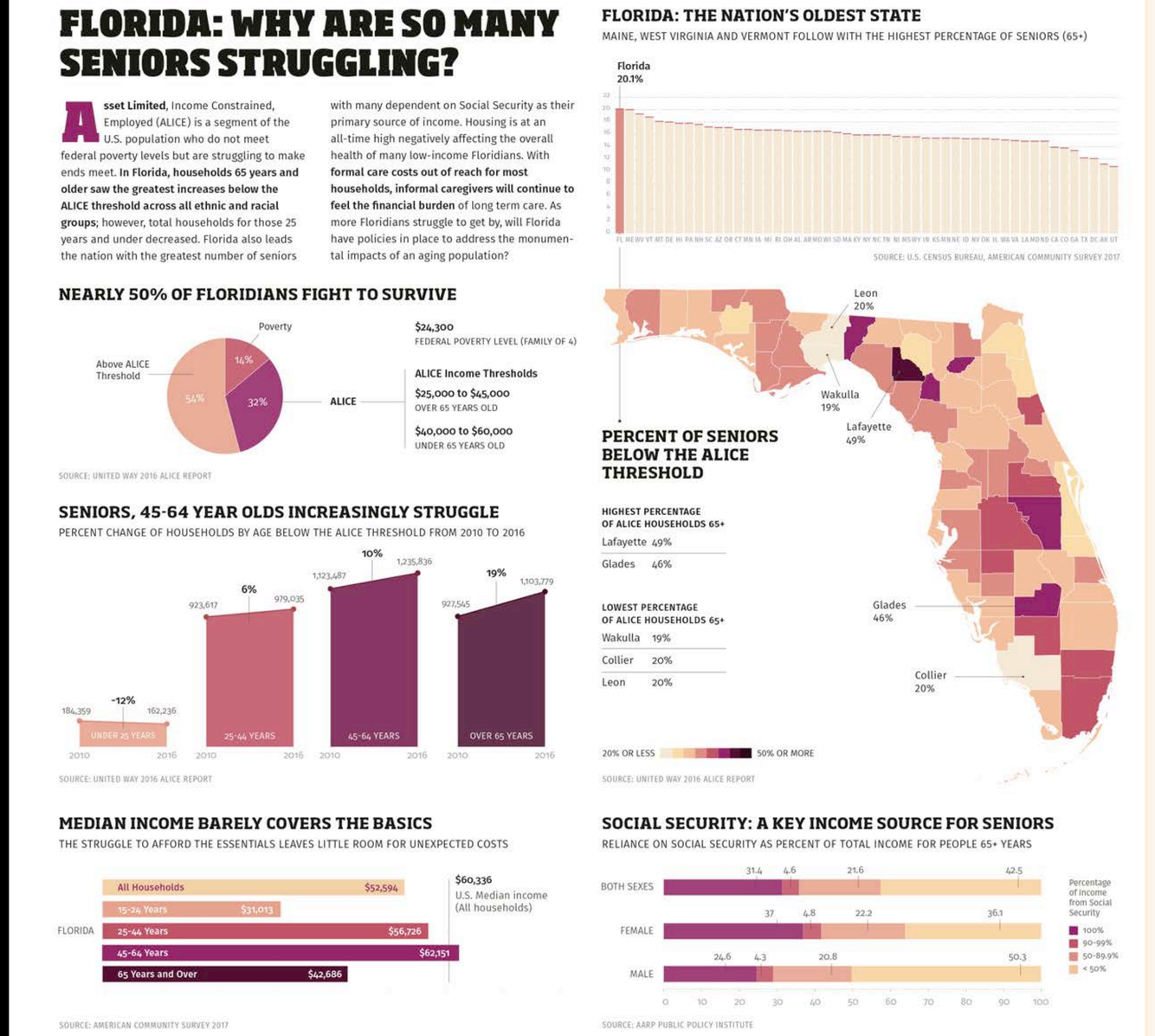
Figures represented in all these graphics: 22%, 25%, 34%, 29%, 32%

Encoding data

Data visualization consists of mapping data onto attributes of objects—commonly abstract shapes.

And the great news is that this stuff isn't magic.

The same way that anybody can learn to write well, anybody can learn to design pretty decent data visualizations and data stories.



https://www.deb.is/

And the great news is that this stuff isn't magic.

The same way that anybody can learn to write well, anybody can learn to design pretty decent data visualizations and data stories.

Sometimes it does require a bit of pain, though…

SK

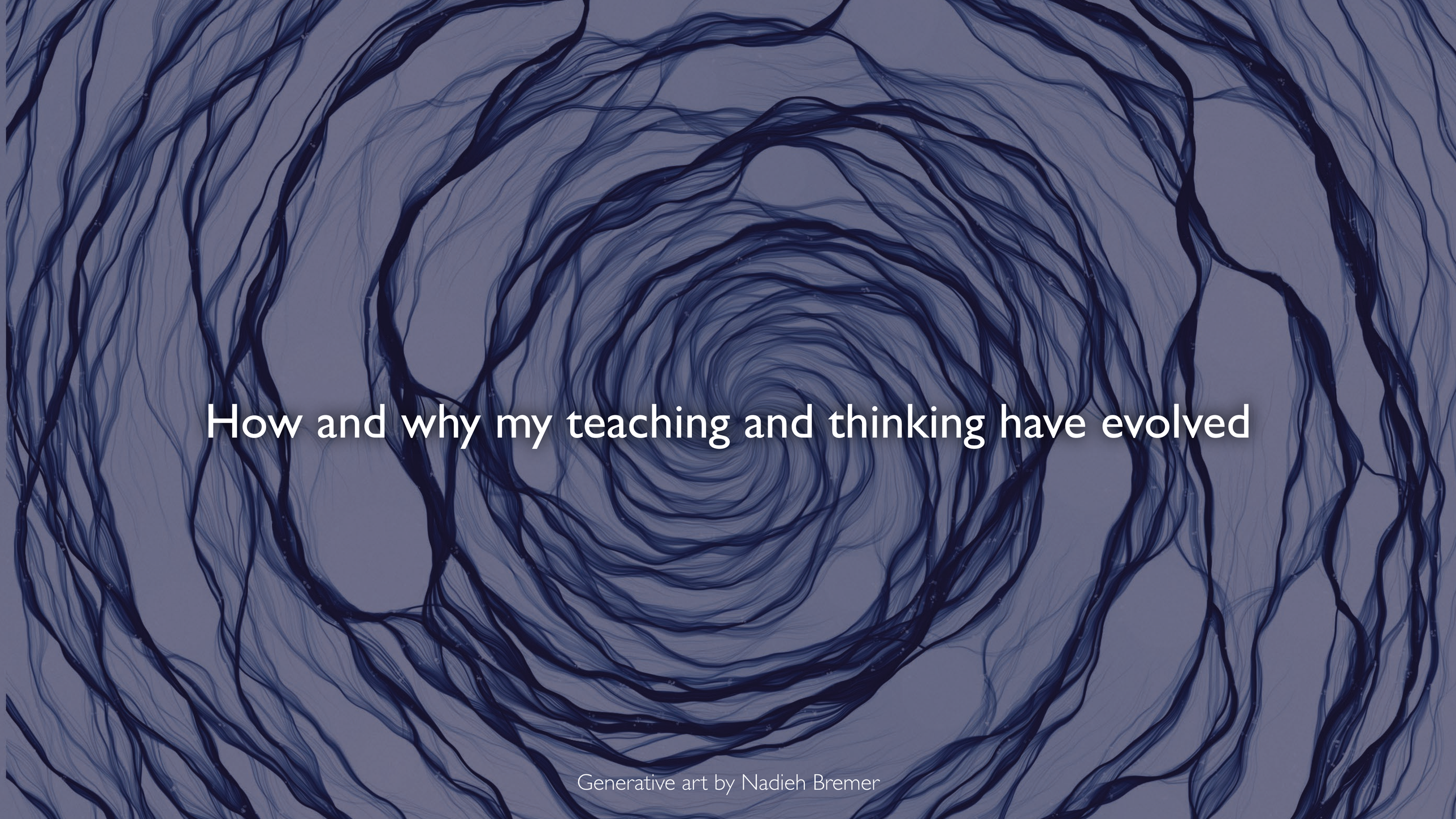
[redacted]

To: Cairo, Alberto

Wed 4/26/2023 5:08 PM

I have really enjoyed this course, wanted to pull my hair out many times, but it has completely changed the way I think about charts and design.

https://www.deb.is/

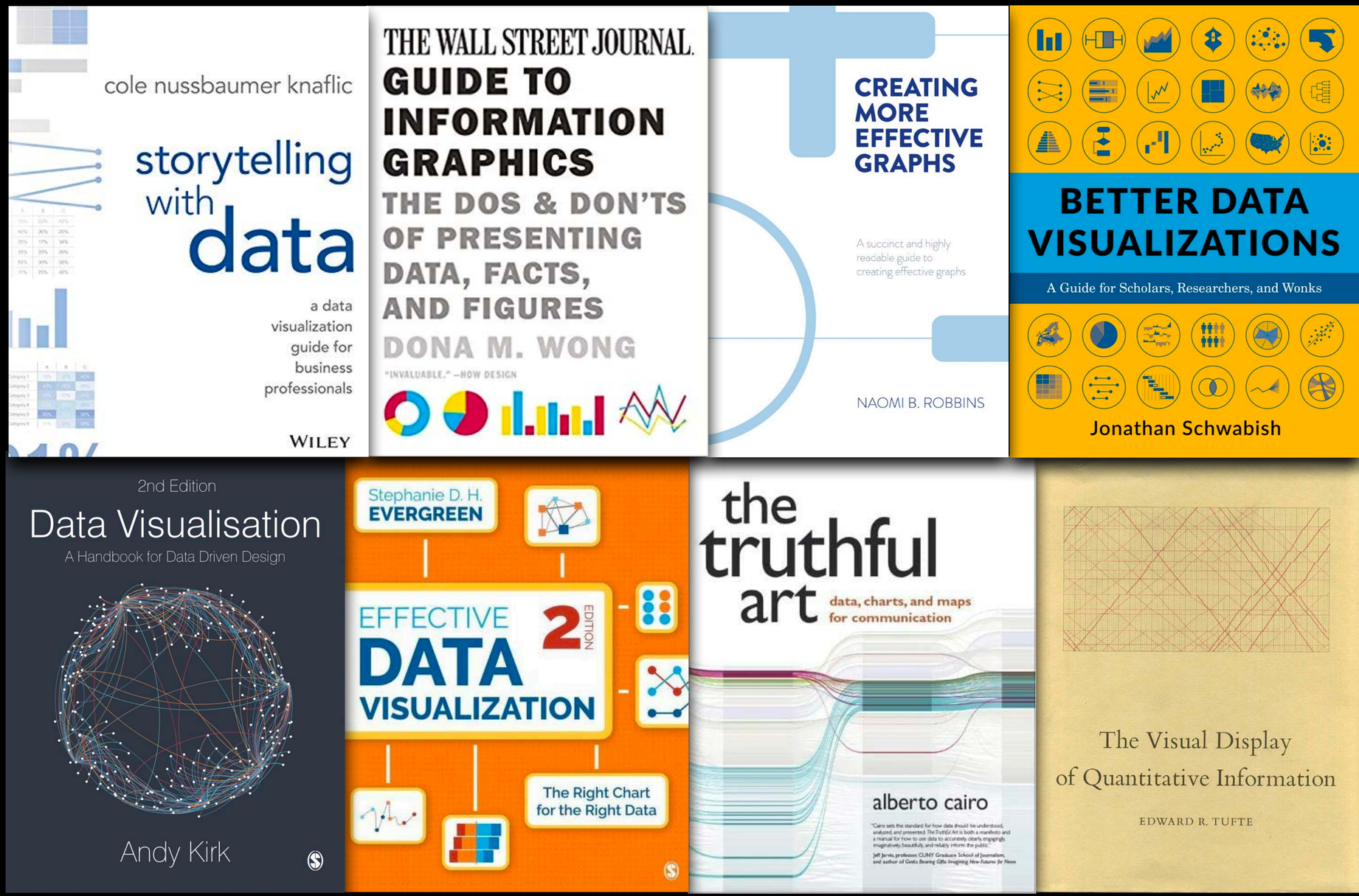

How and why my teaching and thinking have evolved
Generative art by Nadieh Bremer

The first reason is that I get variations of this question regularly:

"What are the **rules** of data visualization design"?

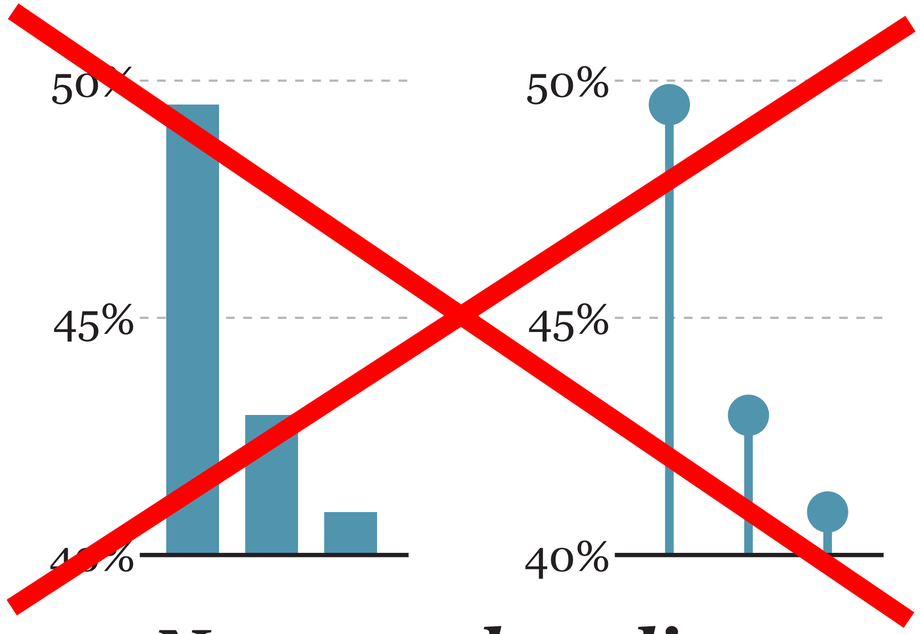
“Rules”?

Some of these books are very intimidating to beginners because of how **stern** and **prescriptive** they are.

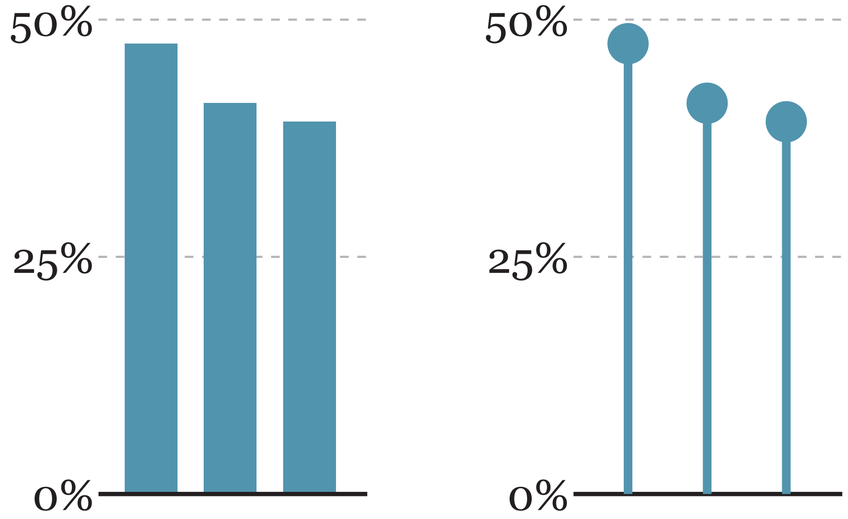


Even what the most common “rules” of visualization have shaky foundations and can be questioned

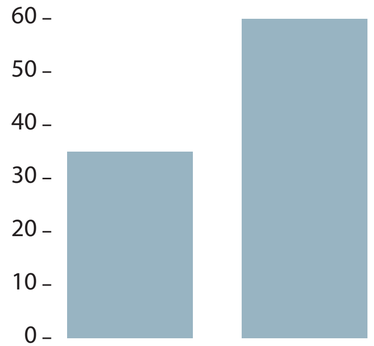
“Bar graphs must always start at 0”



Non-zero baseline



Zero baseline



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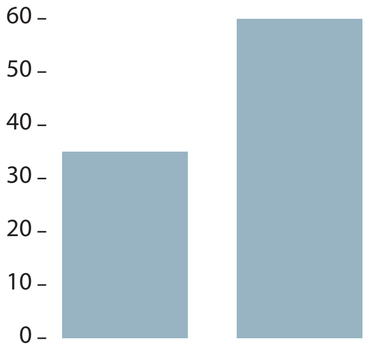

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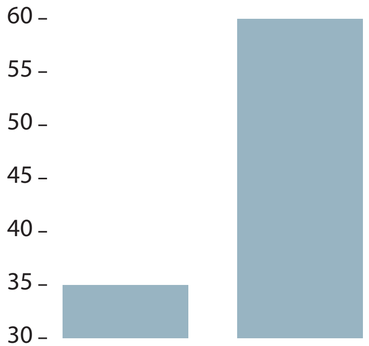
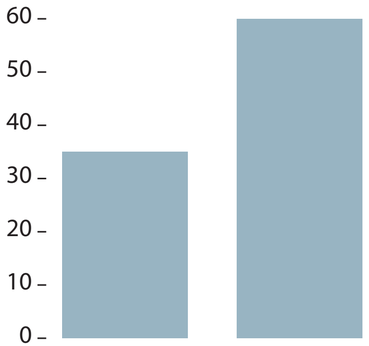


This is bad, never do it!



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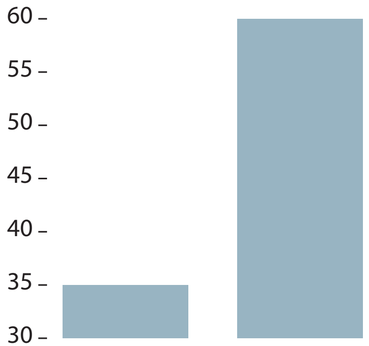

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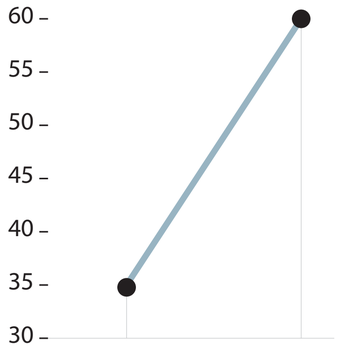
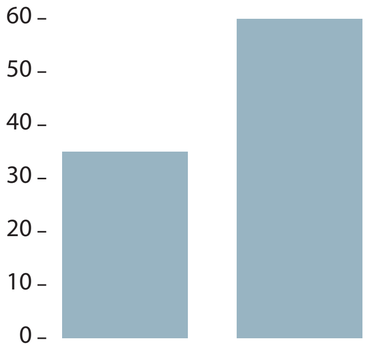


But this is fine (in theory…)



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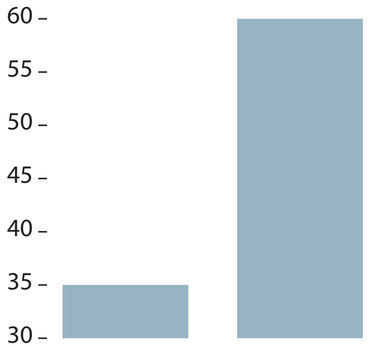

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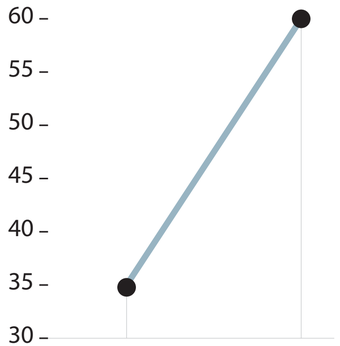
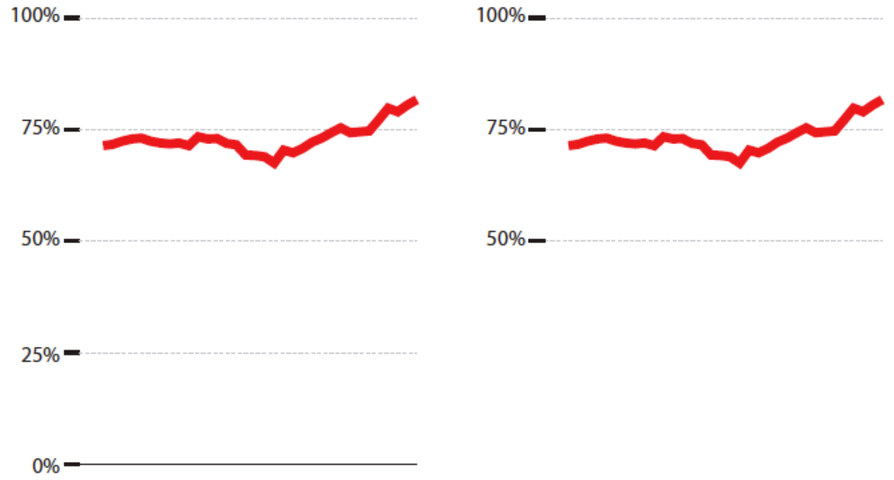
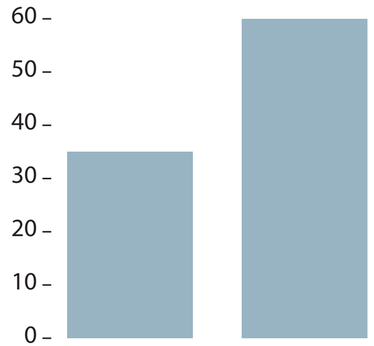


But this is fine (in theory…)

From 'How Charts Lie':

The encodings in a line chart are position and angle, and these don't get distorted if we set a baseline that is closer to the first data point. These two lines look exactly the same, and neither lies; the only difference is that on the first one I emphasize the baseline —because it's 0— and on the second I don't —as the baseline is like any other gridline, and I want to make clear *that it's not 0*:





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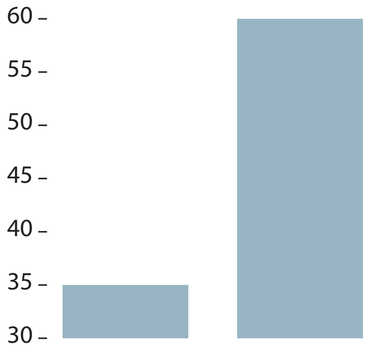

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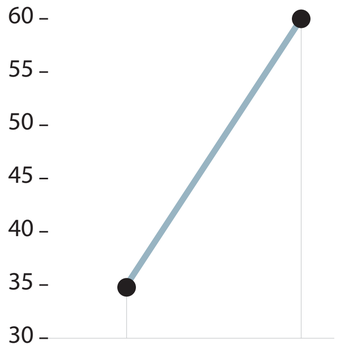

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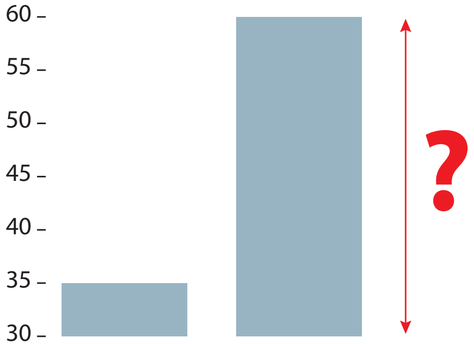
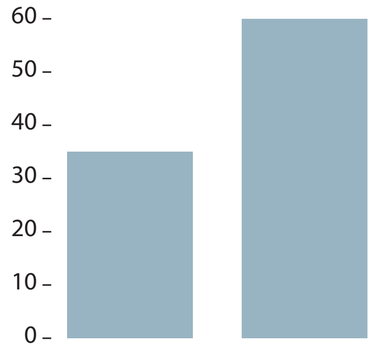
However…



Do readers focus on height when reading a bar graph?



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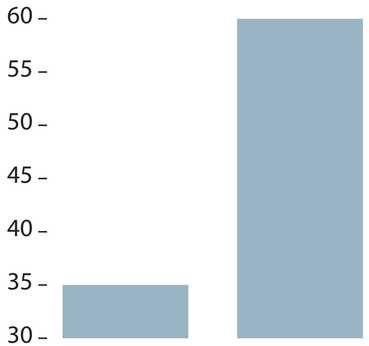

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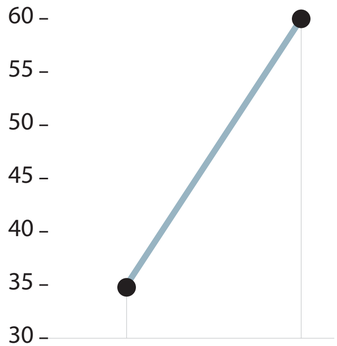

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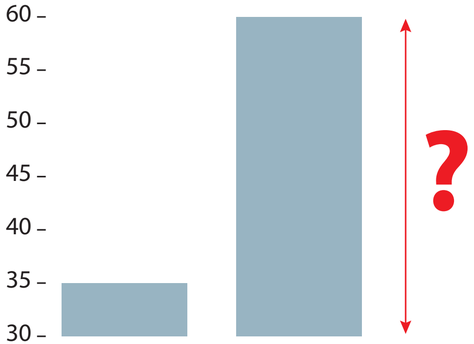

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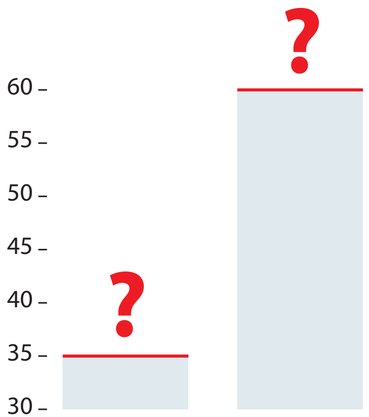
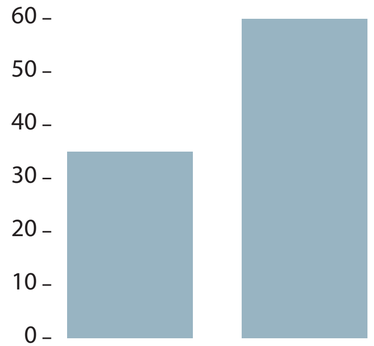


Or do they focus mostly on the upper edges and read the Y-axis scale?



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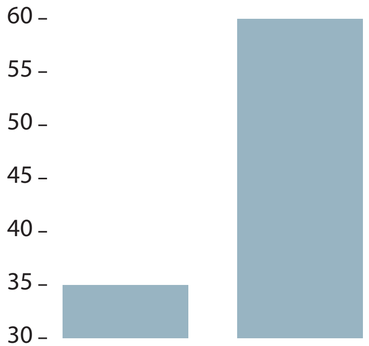

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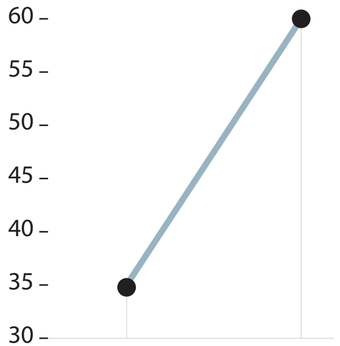

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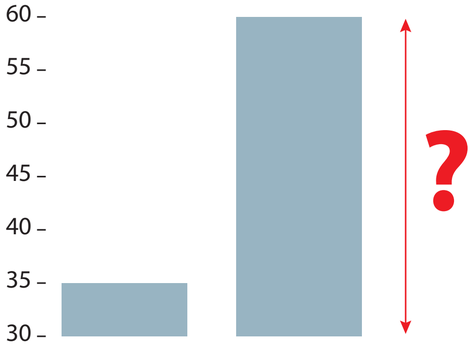

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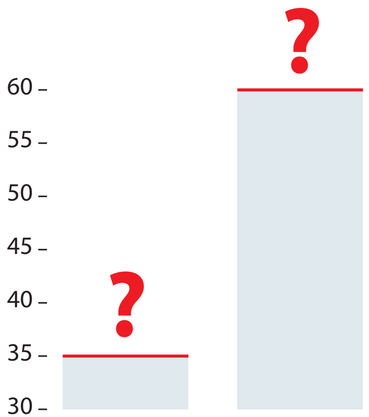
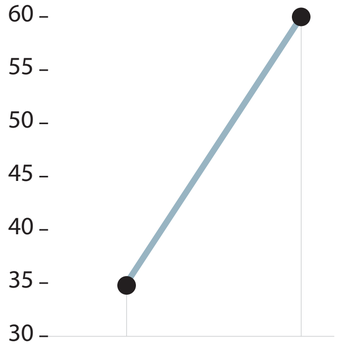
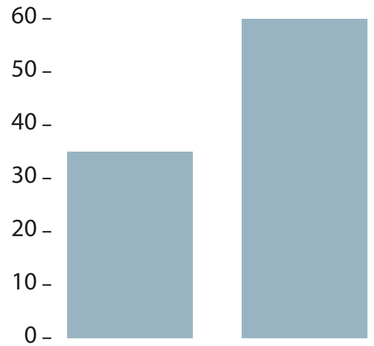


Or do they focus mostly on the upper edges and read the Y-axis scale?

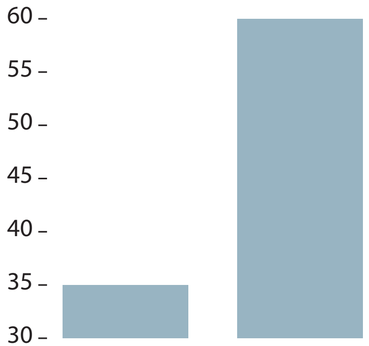
=



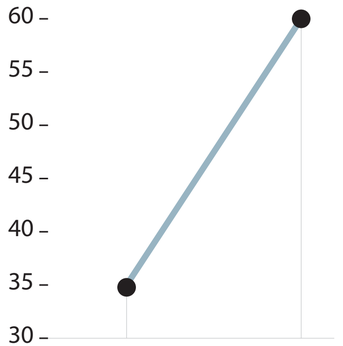
…In which case a non-0 bar graph is neither better nor worse than a non-0 line graph



Bar graphs must always start at 0!

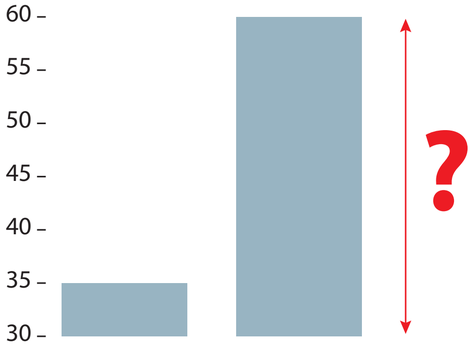


This is bad, never do it!

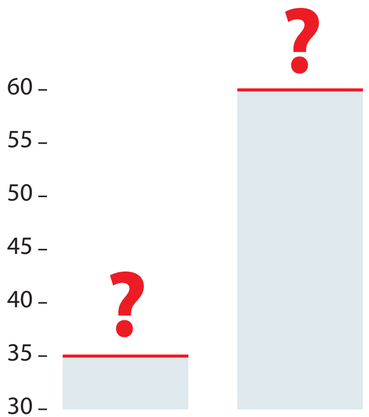


But this is fine

However…



Do readers focus on height when reading a bar graph?



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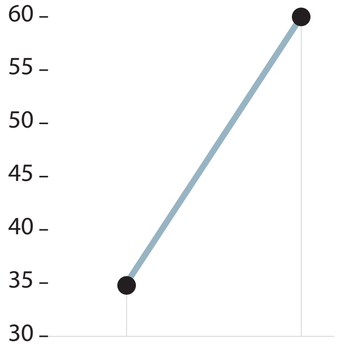

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This said, **I still recommend that bar graphs start at 0.** The **reason** isn't that they may be misleading otherwise, but that the encoding we use when building them is height/length. Therefore, bar height/length should be proportional to the quantities they represent (a line graph, on the other hand, uses relative position as encoding).

For more information:

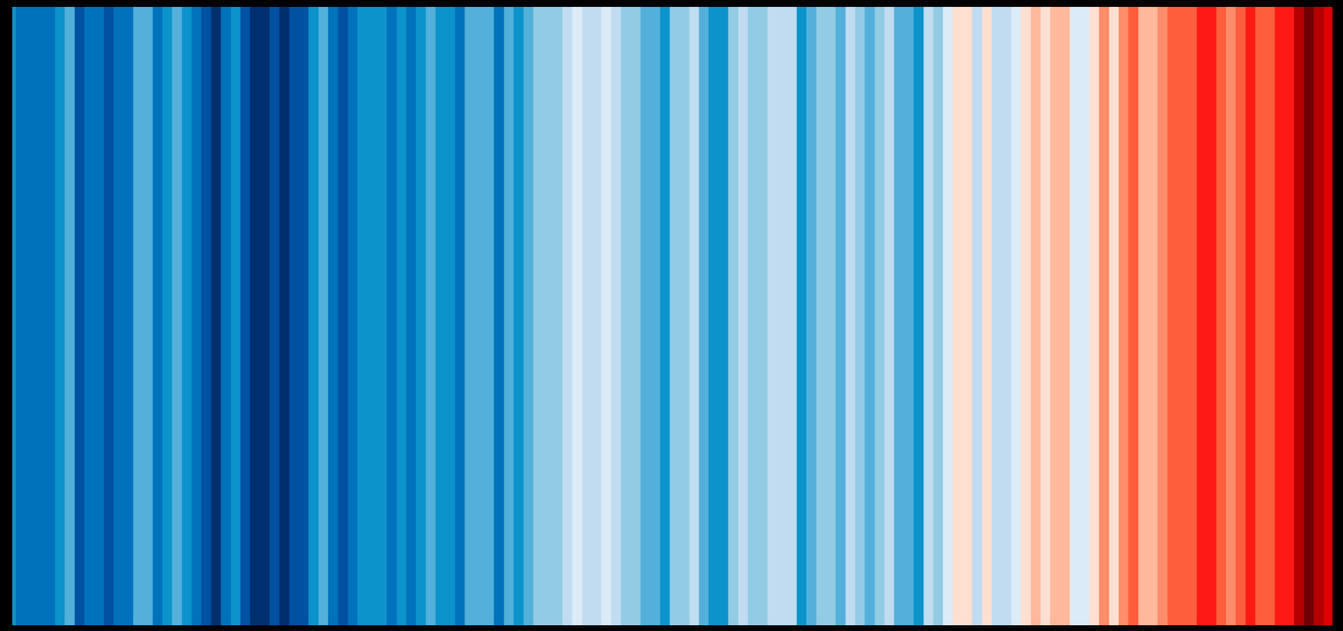
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2566968

https://eagereyes.org/papers/an-empire-built-on-sand

The second reason for changing the way I teach visualization is observing its diversity:

Ed Hawkins's 'Warming stripes' (read more: https://chezvoila.com/blog/warmingstripes/)

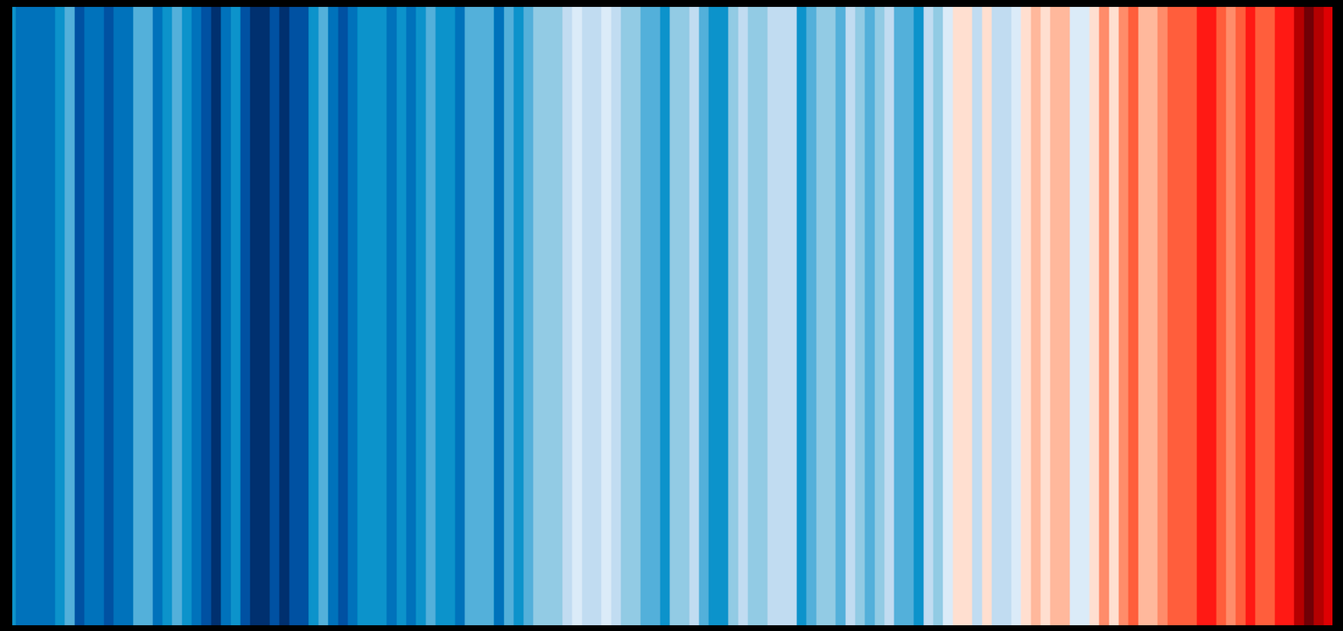
No labels?
No scales?
WTF?



Ed Hawkins defined a **goal**:
He wanted general audiences to pay attention to the main point his chart makes.
Not to understand the data in depth, or to analyze it. Just to look at it and become curious.

He also made the graphic look colorful and fun.

Hawkins designed his graphic knowing little about data visualization "rules" or "principles".



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Not to understand the data in depth, or to analyze it. Just to look at it and become curious.

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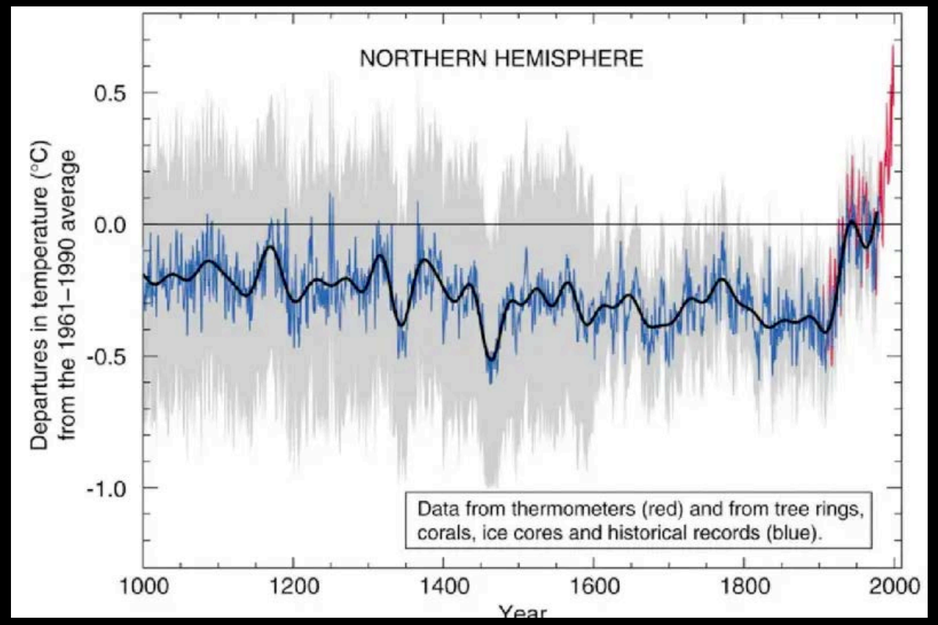
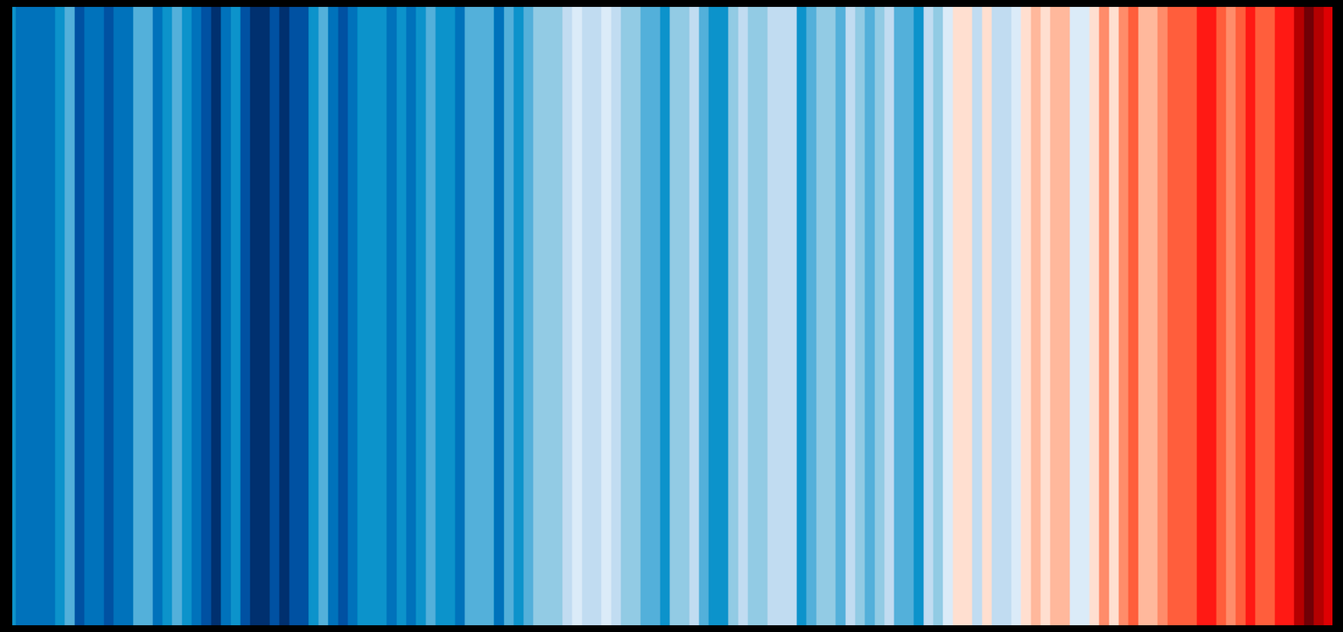
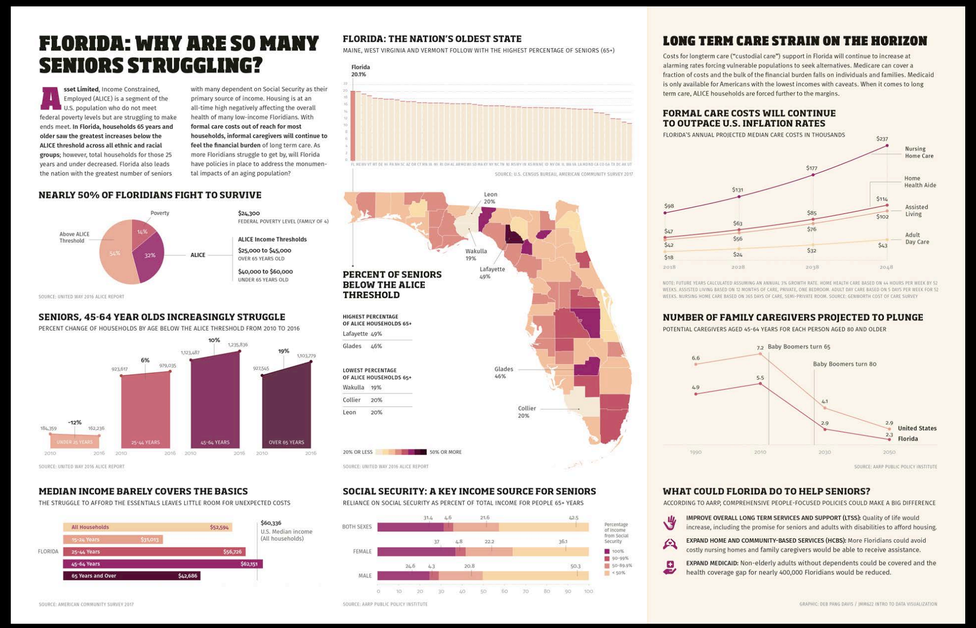
Are most people more likely to look at this…?

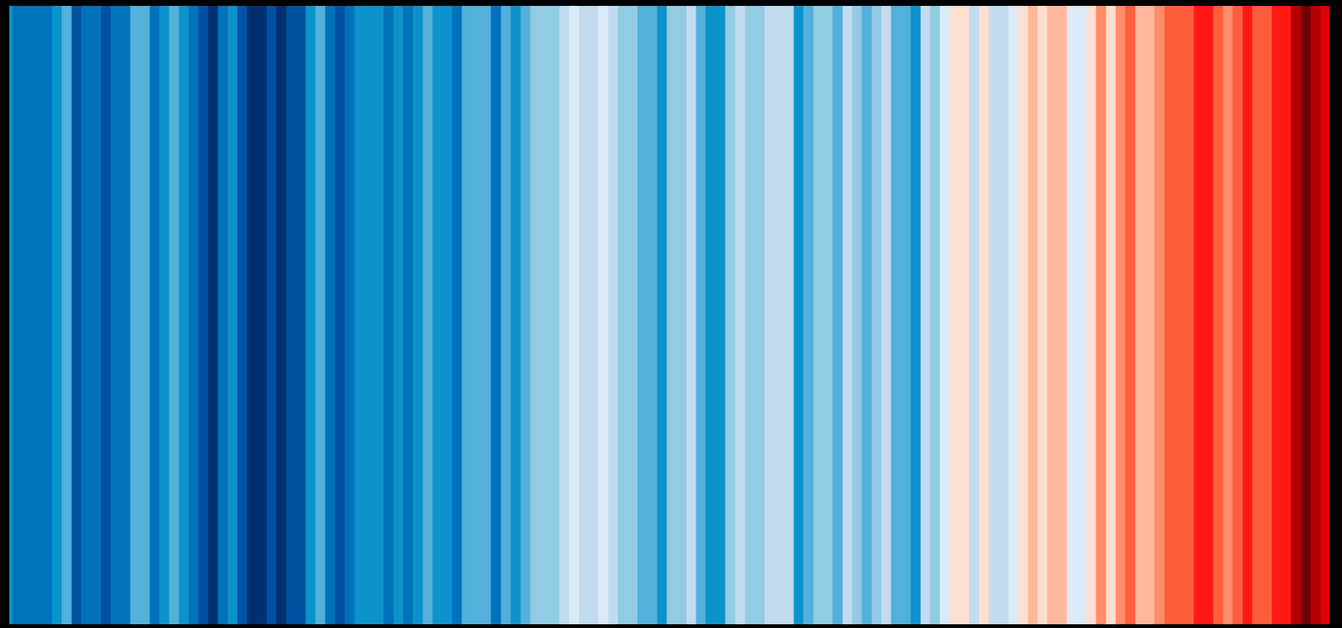


…or at this?



I've come to realize that these visualizations share an underlying **grammar** but they differ in fundamental ways. They might be examples of different visualization **dialects**.





I've come to realize that these visualizations share an underlying **grammar** but they differ in fundamental ways. They might be examples of different visualization **dialects**.

Explorative
Expositive
Explanative
Emotive

Explorative
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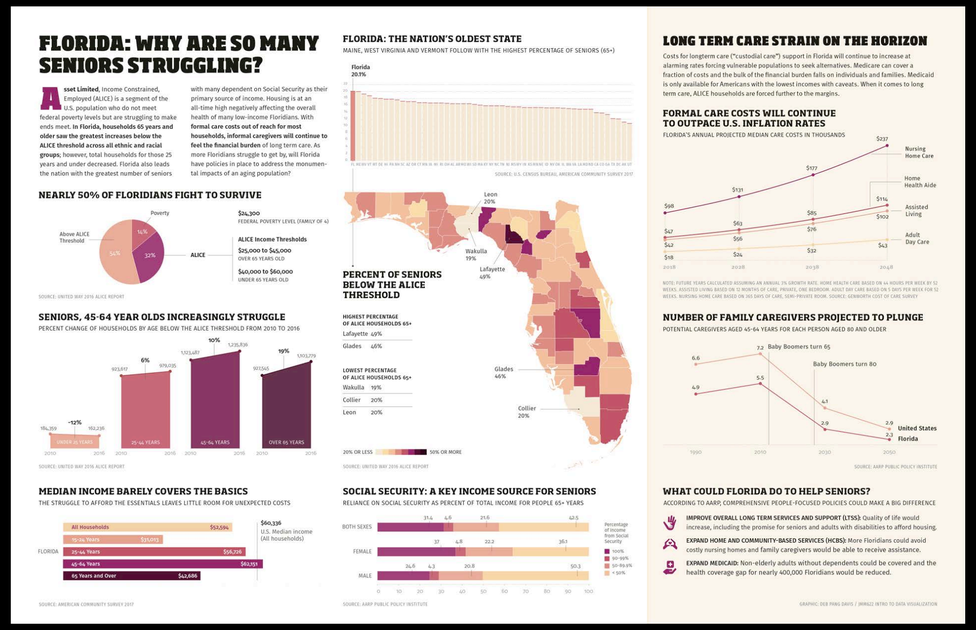


FLORIDA: WHY ARE SO MANY SENIORS STRUGGLING?

Asset Limited, Income Constrained, Employed (ALICE) is a segment of the U.S. population who do not meet federal poverty levels but are struggling to make ends meet. **In Florida, households 65 years and older saw the greatest increases below the ALICE threshold across all ethnic and racial groups;** however, total households for those 25 years and under decreased. Florida also leads the nation with the greatest number of seniors with many dependent on Social Security as their primary source of income. Housing is at an all-time high negatively affecting the overall health of many low-income Floridians. With **formal care costs out of reach for most households, informal caregivers will continue to feel the financial burden** of long term care. As more Floridians struggle to get by, will Florida have policies in place to address the monumental impacts of an aging population?

NEARLY 50% OF FLORIDIANS FIGHT TO SURVIVE

Poverty 14%
Above ALICE Threshold 54%
ALICE 32%

$24,300
FEDERAL POVERTY LEVEL (FAMILY OF 4)

ALICE Income Thresholds
$25,000 to $45,000
OVER 65 YEARS OLD
$40,000 to $60,000
UNDER 65 YEARS OLD

SOURCE: UNITED WAY 2016 ALICE REPORT

SENIORS, 45-64 YEAR OLDS INCREASINGLY STRUGGLE

PERCENT CHANGE OF HOUSEHOLDS BY AGE BELOW THE ALICE THRESHOLD FROM 2010 TO 2016

SOURCE: UNITED WAY 2016 ALICE REPORT

MEDIAN INCOME BARELY COVERS THE BASICS

THE STRUGGLE TO AFFORD THE ESSENTIALS LEAVES LITTLE ROOM FOR UNEXPECTED COSTS

SOURCE: AMERICAN COMMUNITY SURVEY 2017

FLORIDA: THE NATION'S OLDEST STATE

MAINE, WEST VIRGINIA AND VERMONT FOLLOW WITH THE HIGHEST PERCENTAGE OF SENIORS (65+)

SOURCE: U.S. CENSUS BUREAU, AMERICAN COMMUNITY SURVEY 2017

PERCENT OF SENIORS BELOW THE ALICE THRESHOLD

HIGHEST PERCENTAGE OF ALICE HOUSEHOLDS 65+

Lafayette	49%
Glades	46%

LOWEST PERCENTAGE OF ALICE HOUSEHOLDS 65+

Wakulla	19%
Collier	20%
Leon	20%

20% OR LESS — 50% OR MORE

SOURCE: UNITED WAY 2016 ALICE REPORT

SOCIAL SECURITY: A KEY INCOME SOURCE FOR SENIORS

RELIANCE ON SOCIAL SECURITY AS PERCENT OF TOTAL INCOME FOR PEOPLE 65+ YEARS

SOURCE: AARP PUBLIC POLICY INSTITUTE

LONG TERM CARE STRAIN ON THE HORIZON

Costs for longterm care ("custodial care") support in Florida will continue to increase at alarming rates forcing vulnerable populations to seek alternatives. Medicare can cover a fraction of costs and the bulk of the financial burden falls on individuals and families. Medicaid is only available for Americans with the lowest incomes with caveats. When it comes to long term care, ALICE households are forced further to the margins.

FORMAL CARE COSTS WILL CONTINUE TO OUTPACE U.S. INFLATION RATES

FLORIDA'S ANNUAL PROJECTED MEDIAN CARE COSTS IN THOUSANDS

NOTE: FUTURE YEARS CALCULATED ASSUMING AN ANNUAL 3% GROWTH RATE. HOME HEALTH CARE BASED ON 44 HOURS PER WEEK BY 52 WEEKS. ASSISTED LIVING BASED ON 12 MONTHS OF CARE, PRIVATE, ONE BEDROOM. ADULT DAY CARE BASED ON 5 DAYS PER WEEK FOR 52 WEEKS. NURSING HOME CARE BASED ON 365 DAYS OF CARE, SEMI-PRIVATE ROOM. SOURCE: GENWORTH COST OF CARE SURVEY

NUMBER OF FAMILY CAREGIVERS PROJECTED TO PLUNGE

POTENTIAL CAREGIVERS AGED 45-64 YEARS FOR EACH PERSON AGED 80 AND OLDER

SOURCE: AARP PUBLIC POLICY INSTITUTE

WHAT COULD FLORIDA DO TO HELP SENIORS?

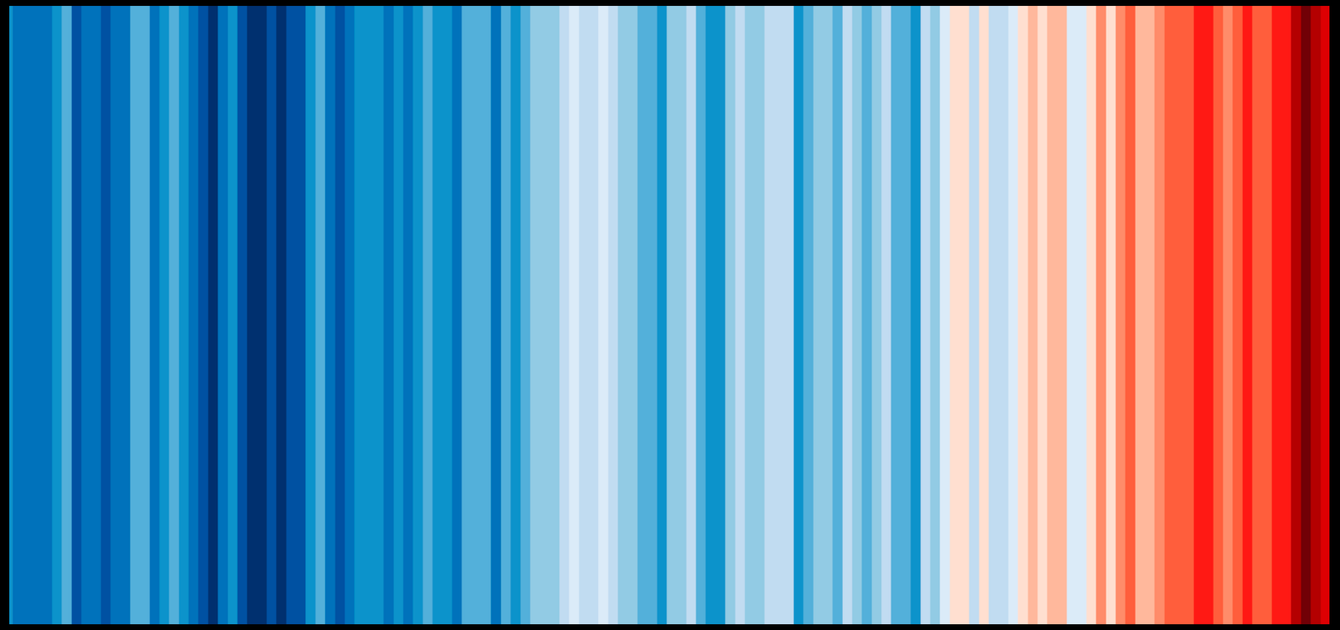
ACCORDING TO AARP, COMPREHENSIVE PEOPLE-FOCUSED POLICIES COULD MAKE A BIG DIFFERENCE

IMPROVE OVERALL LONG TERM SERVICES AND SUPPORT (LTSS): Quality of life would increase, including the promise for seniors and adults with disabilities to afford housing.

EXPAND HOME AND COMMUNITY-BASED SERVICES (HCBS): More Floridians could avoid costly nursing homes and family caregivers would be able to receive assistance.

EXPAND MEDICAID: Non-elderly adults without dependents could be covered and the health coverage gap for nearly 400,000 Floridians would be reduced.

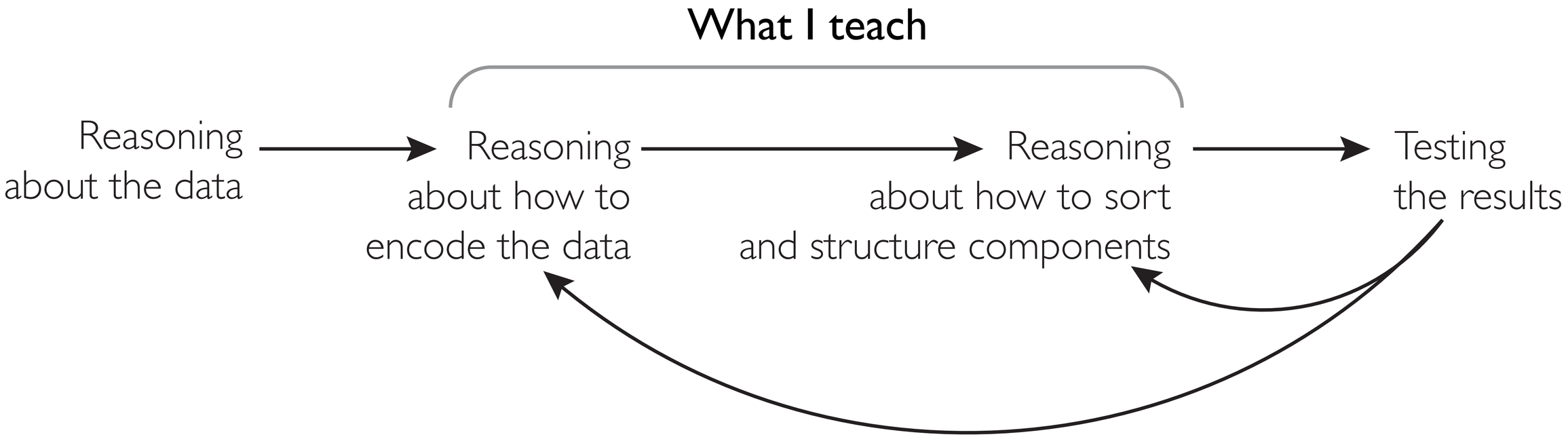
GRAPHIC: DEB PANG DAVIS / JWM622 INTRO TO DATA VISUALIZATION



Teaching visualization:

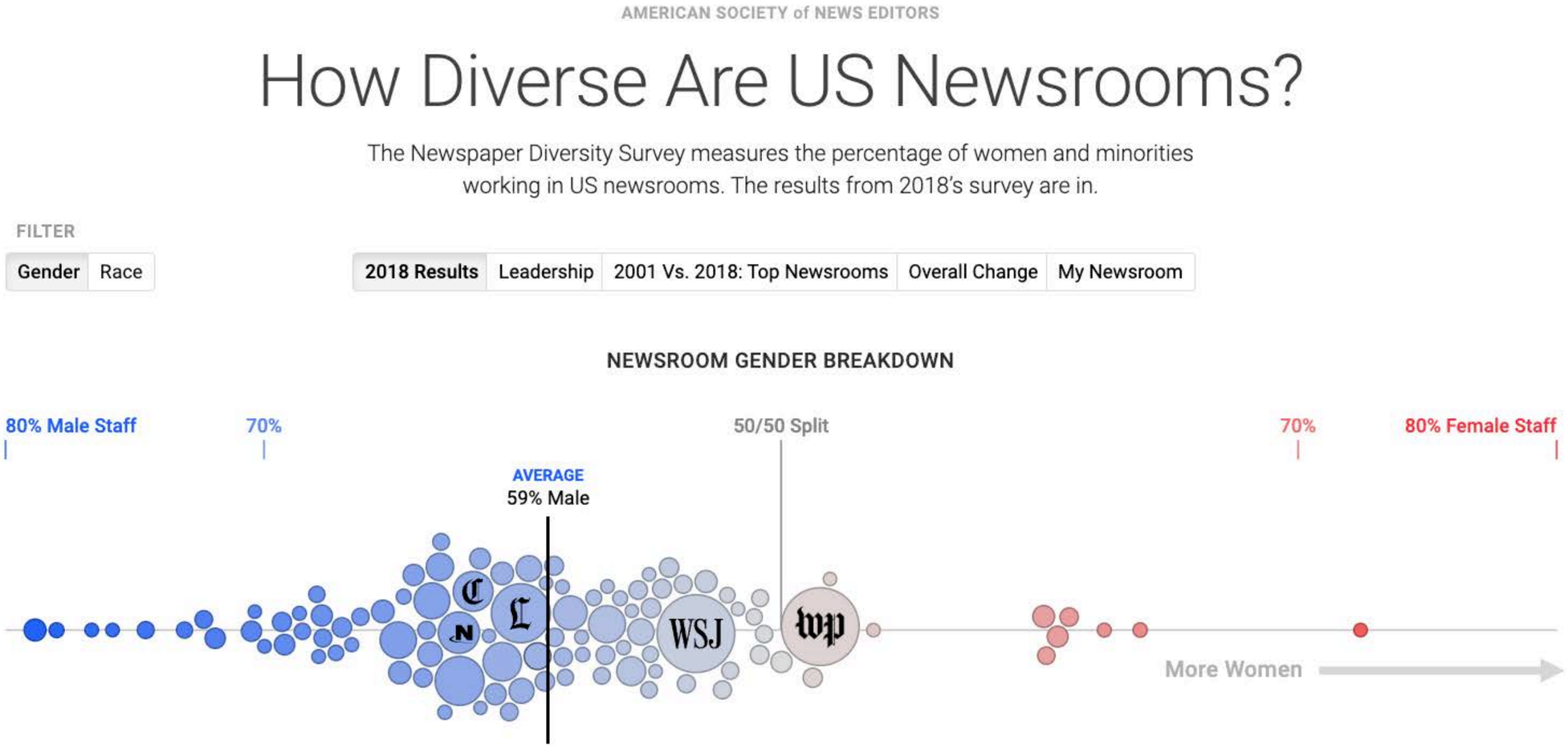
Pretty much like writing, visualization design doesn't consist of applying "**rules**".

Rather, it's based on making **justifiable** —ethically, functionally, aesthetically— **choices** considering **goals** and **constraints.**


What I teach
Reasoning about the data
Reasoning about how to encode the data
Reasoning about how to sort and structure components
Testing the results

A good exercise: Reverse-engineering existing visualizations

"If I were the designer who created this, what choices would lead me to this solution?"



https://googletrends.github.io/asne/

AMERICAN SOCIETY of NEWS EDITORS

How Diverse Are US Newsrooms?

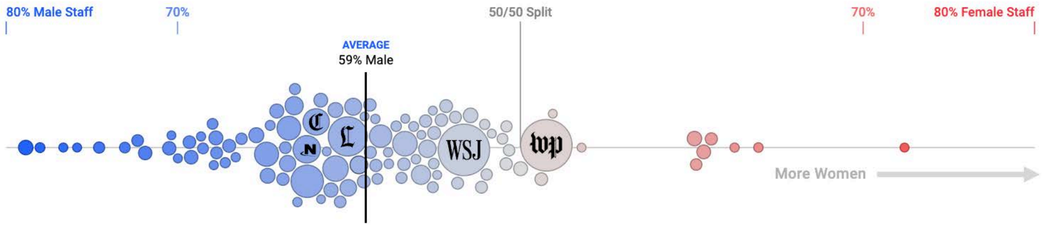
The Newspaper Diversity Survey measures the percentage of women and minorities working in US newsrooms. The results from 2018's survey are in.

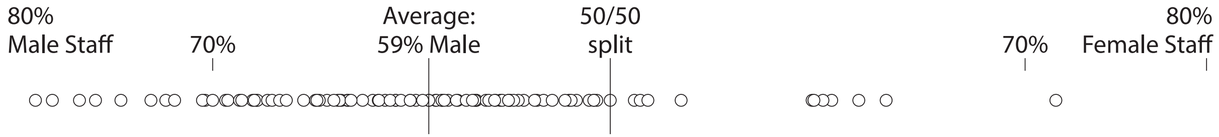
FILTER

Gender | Race

2018 Results | Leadership | 2001 Vs. 2018: Top Newsrooms | Overall Change | My Newsroom

NEWSROOM GENDER BREAKDOWN





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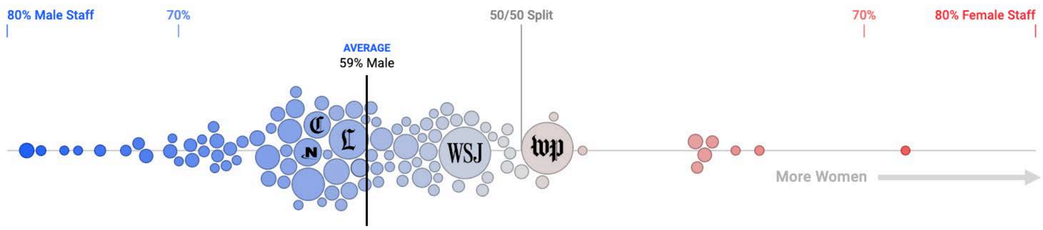

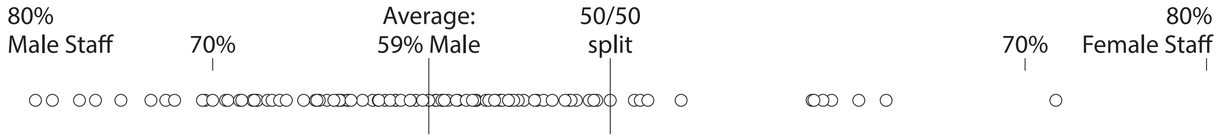

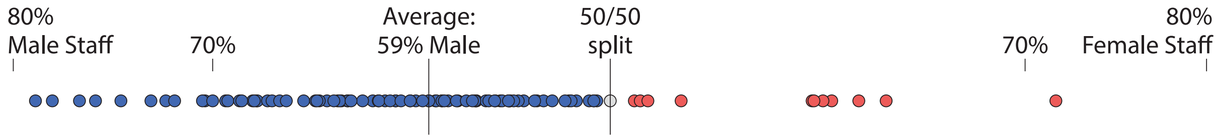

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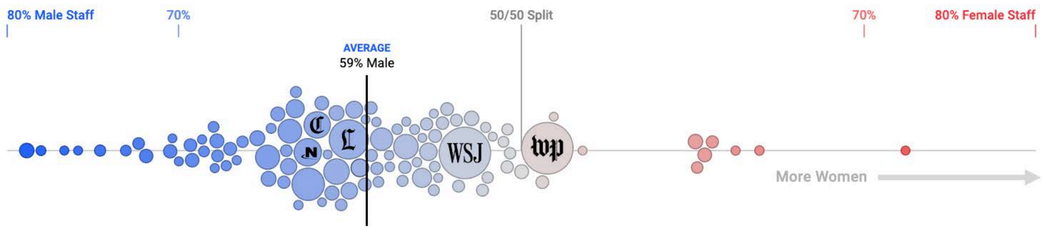

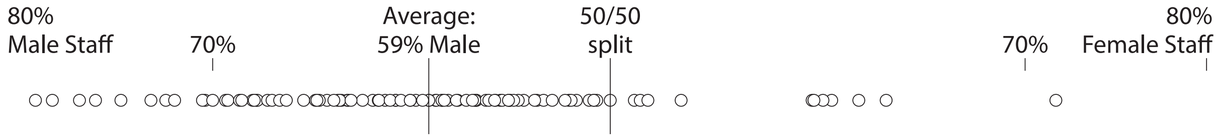

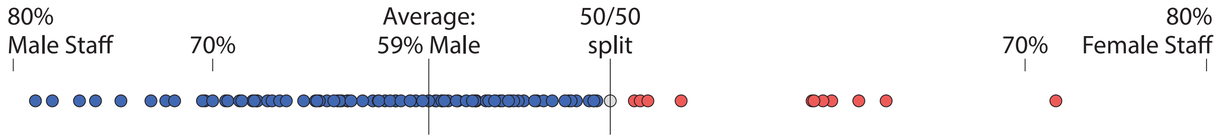

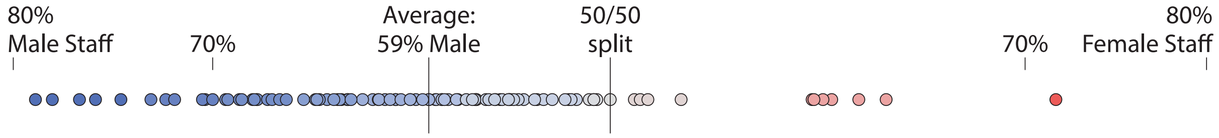

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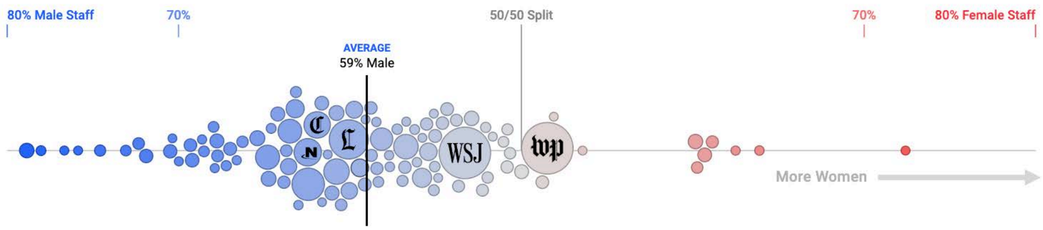

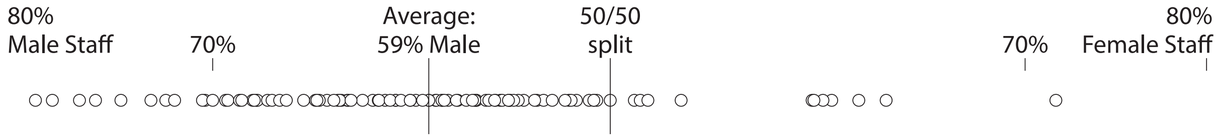

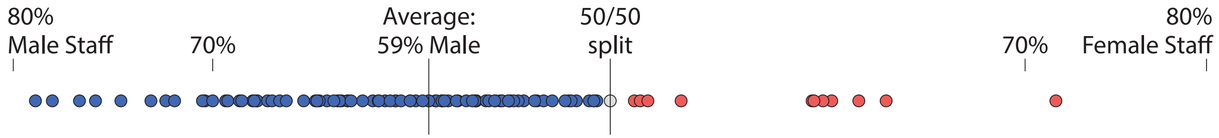

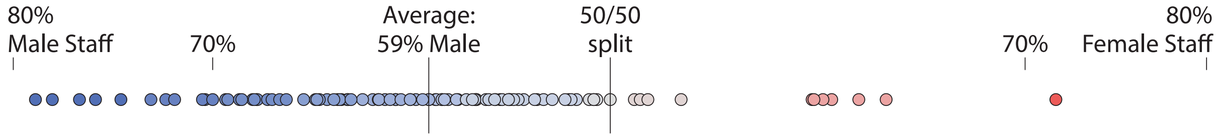

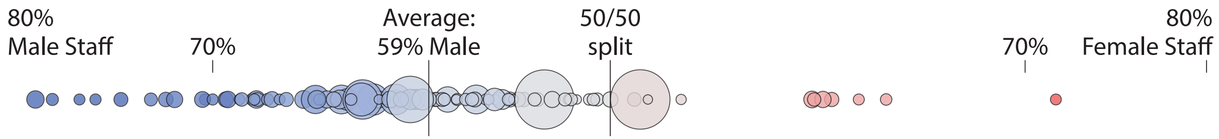

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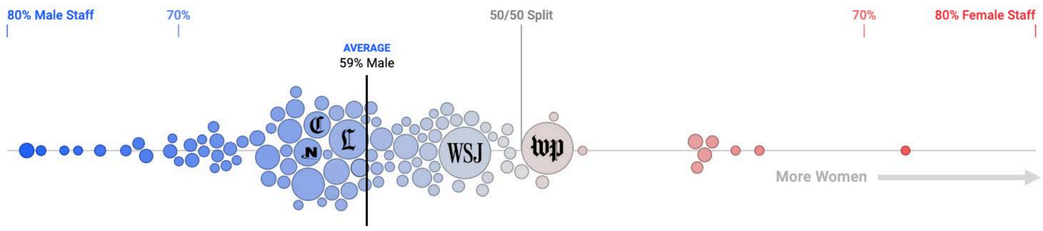

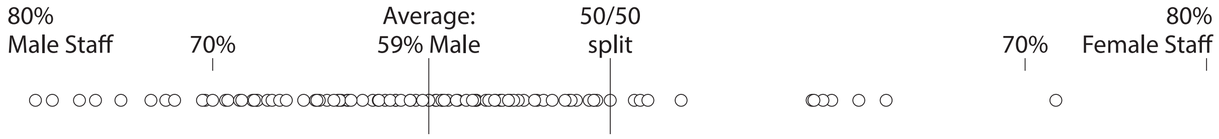

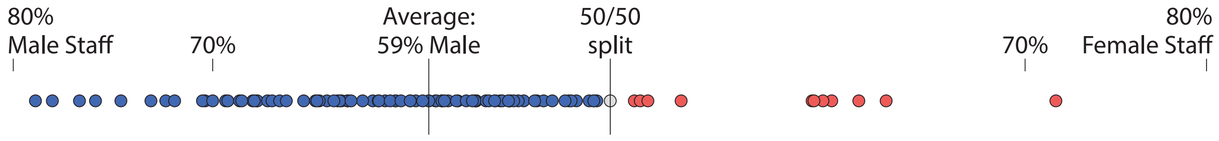

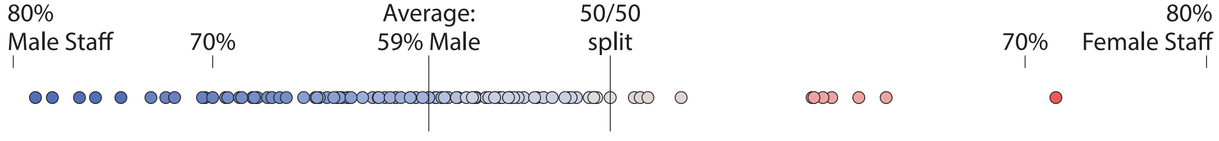

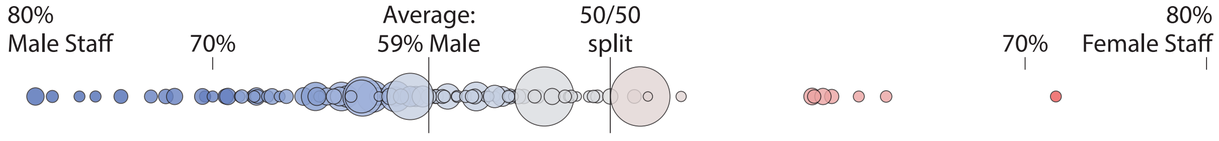

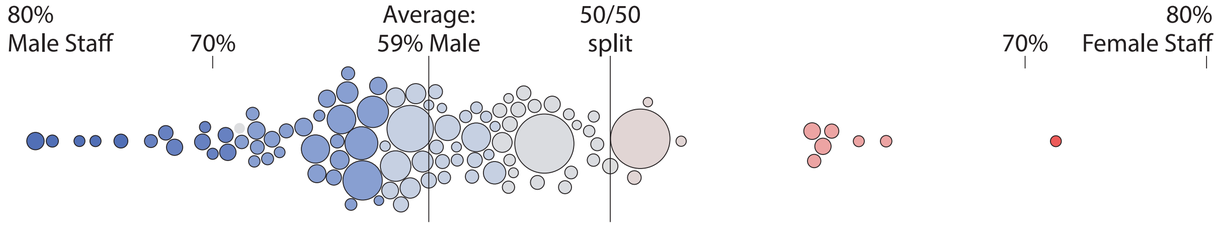

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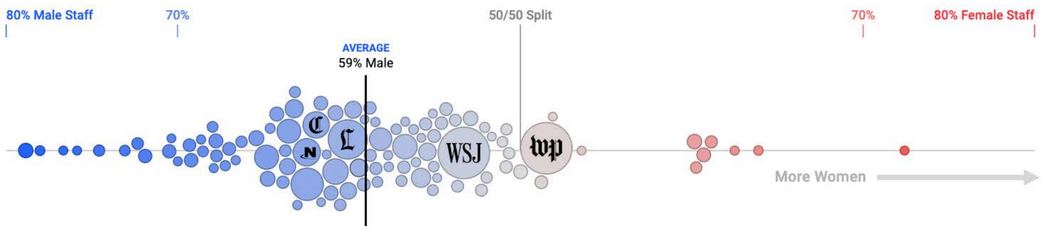
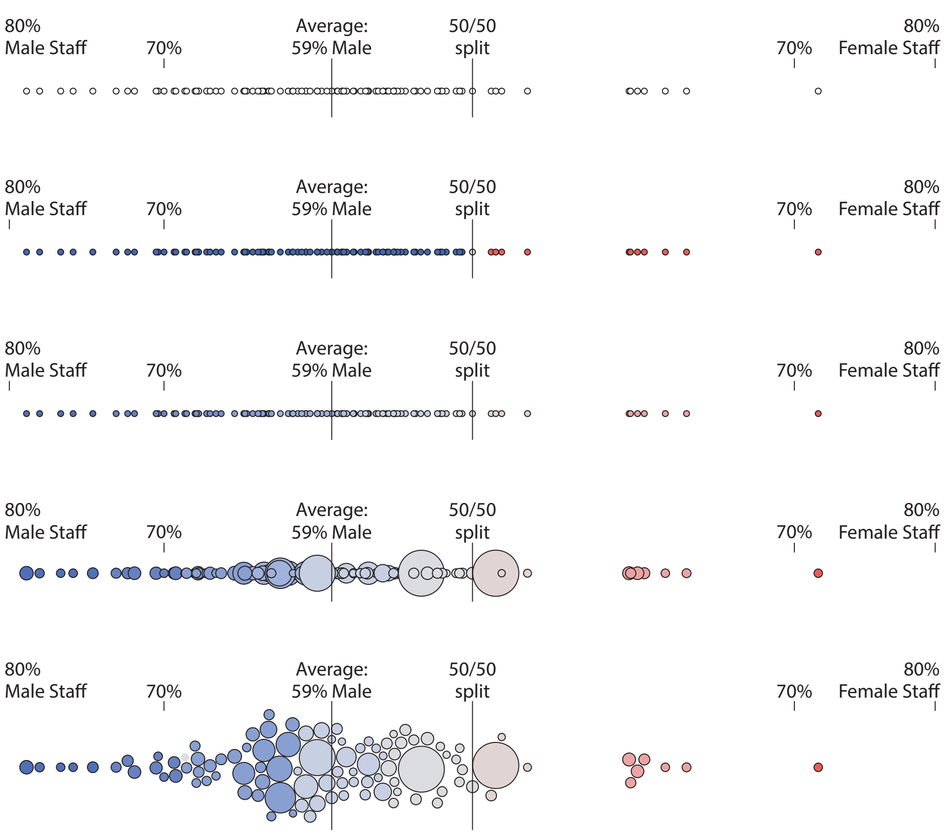


Decisions related to axis scales and encodings

Decisions related to emphasis and increasing attractiveness

Decisions to improve legibility



Decisions related to layout and annotations

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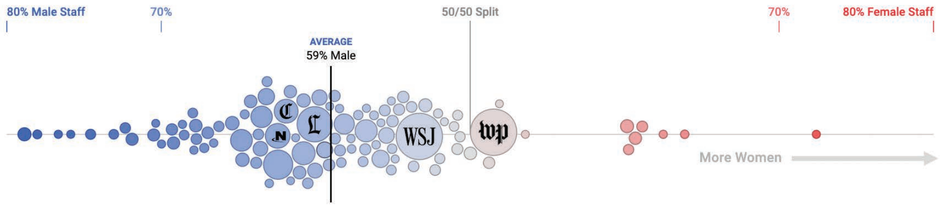
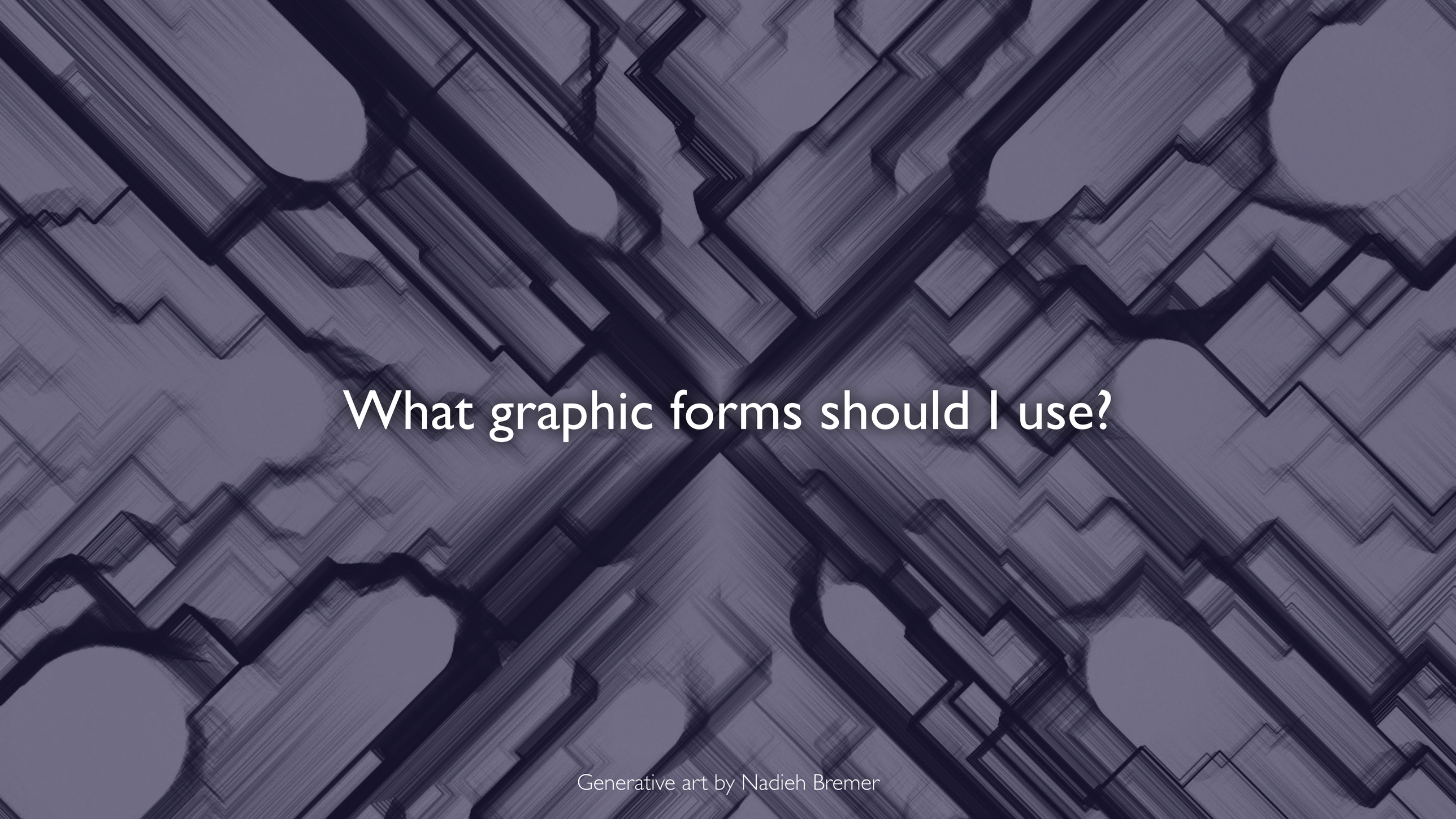
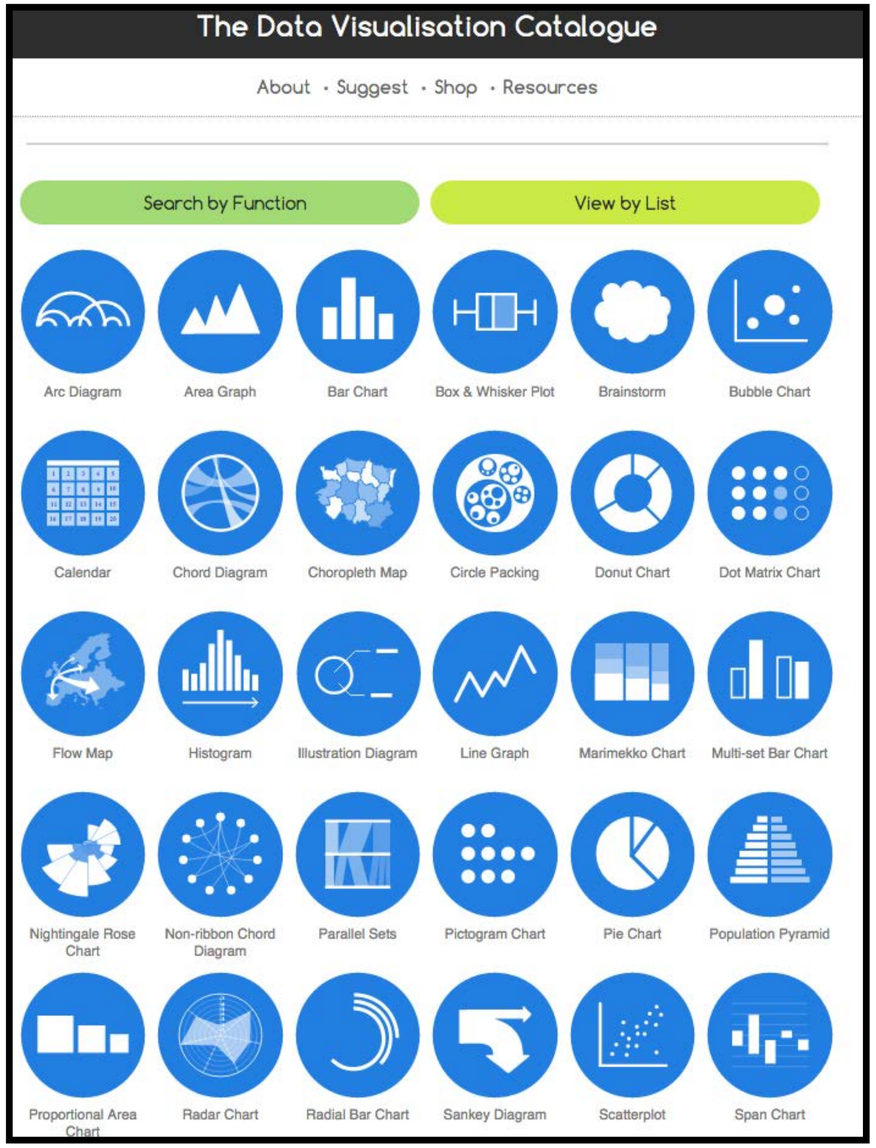
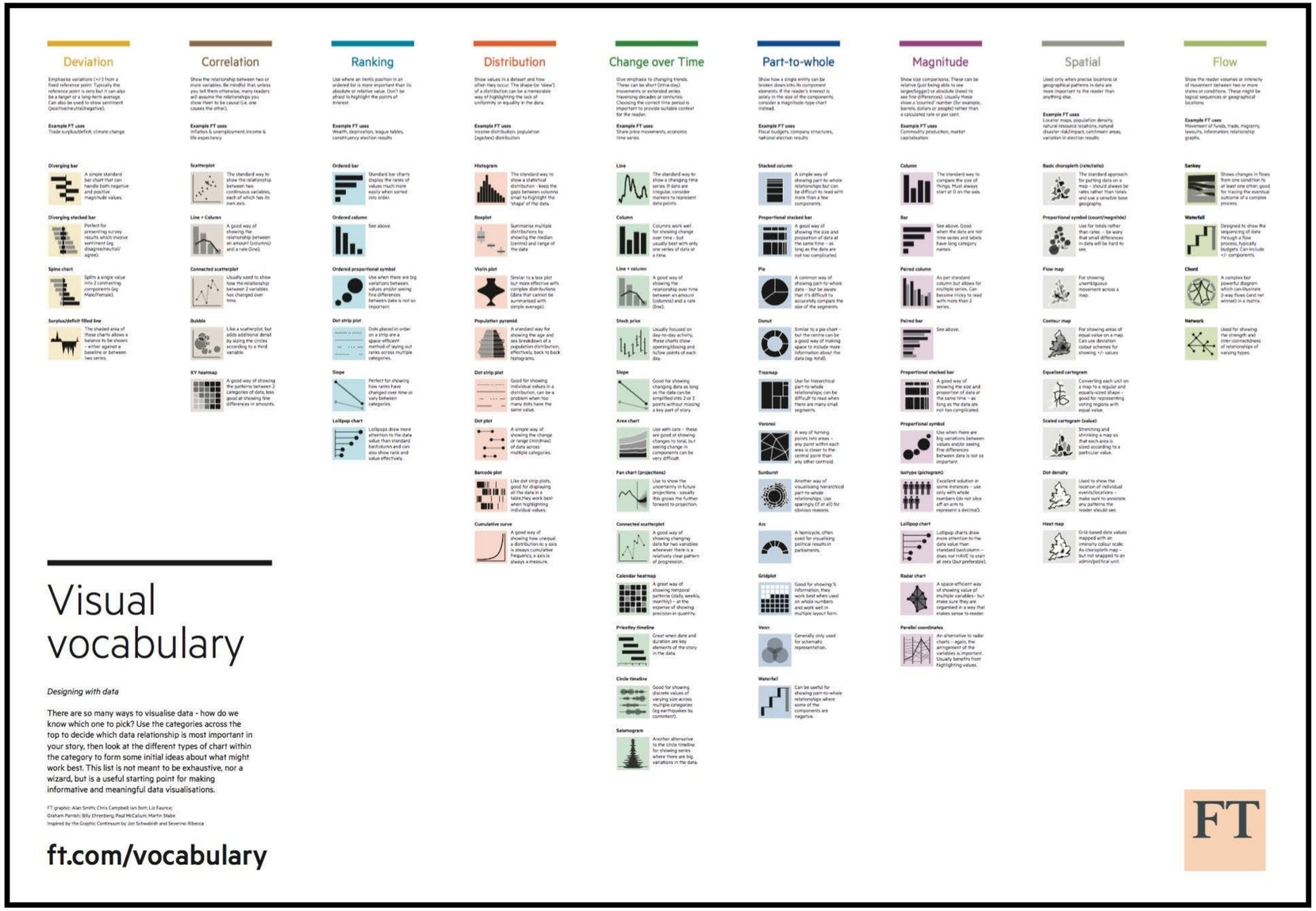
NEWSROOM GENDER BREAKDOWN




What graphic forms should I use?
Generative art by Nadieh Bremer

I still recommend resources like these to my students:





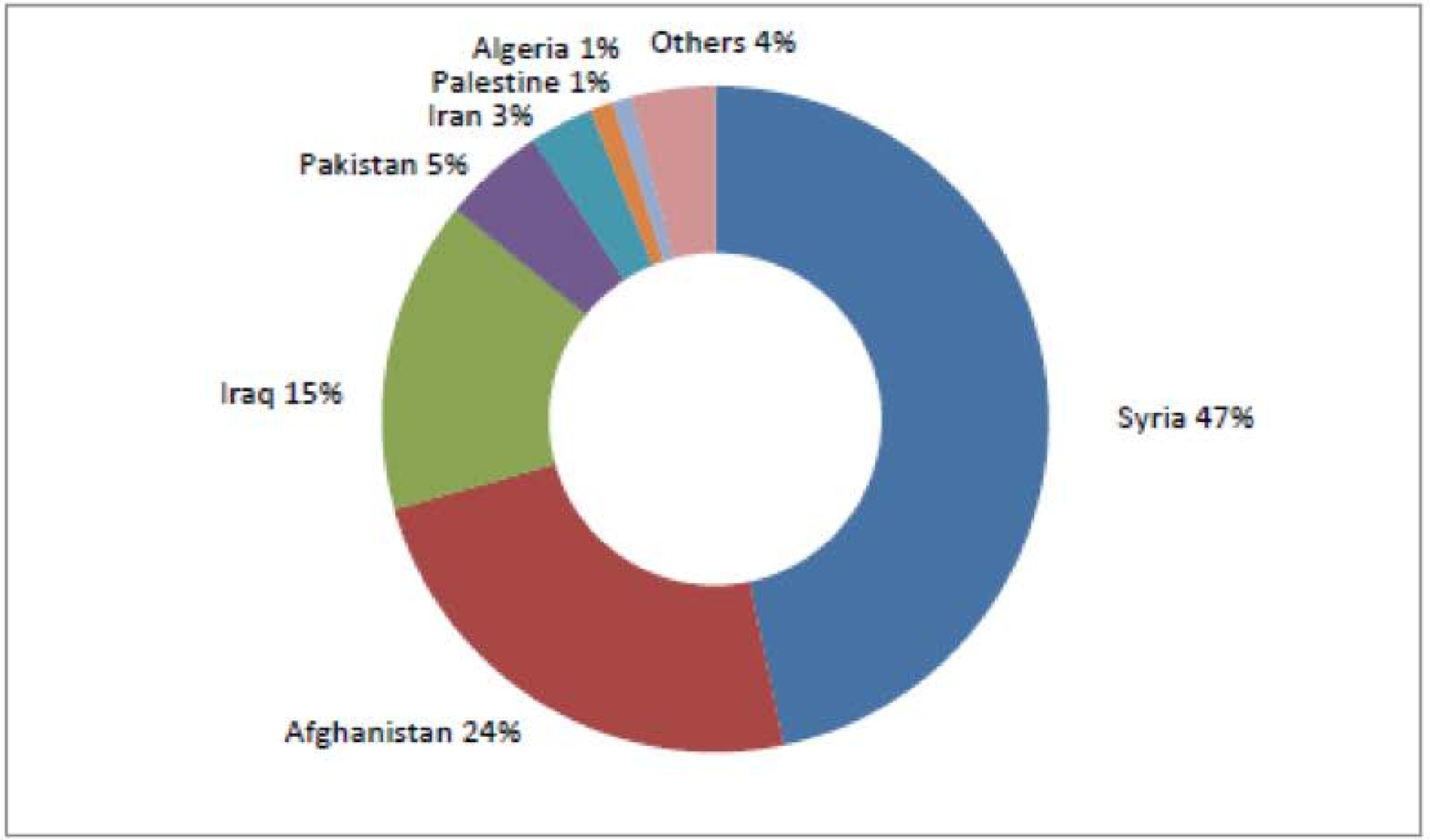
http://www.datavizcatalogue.com/

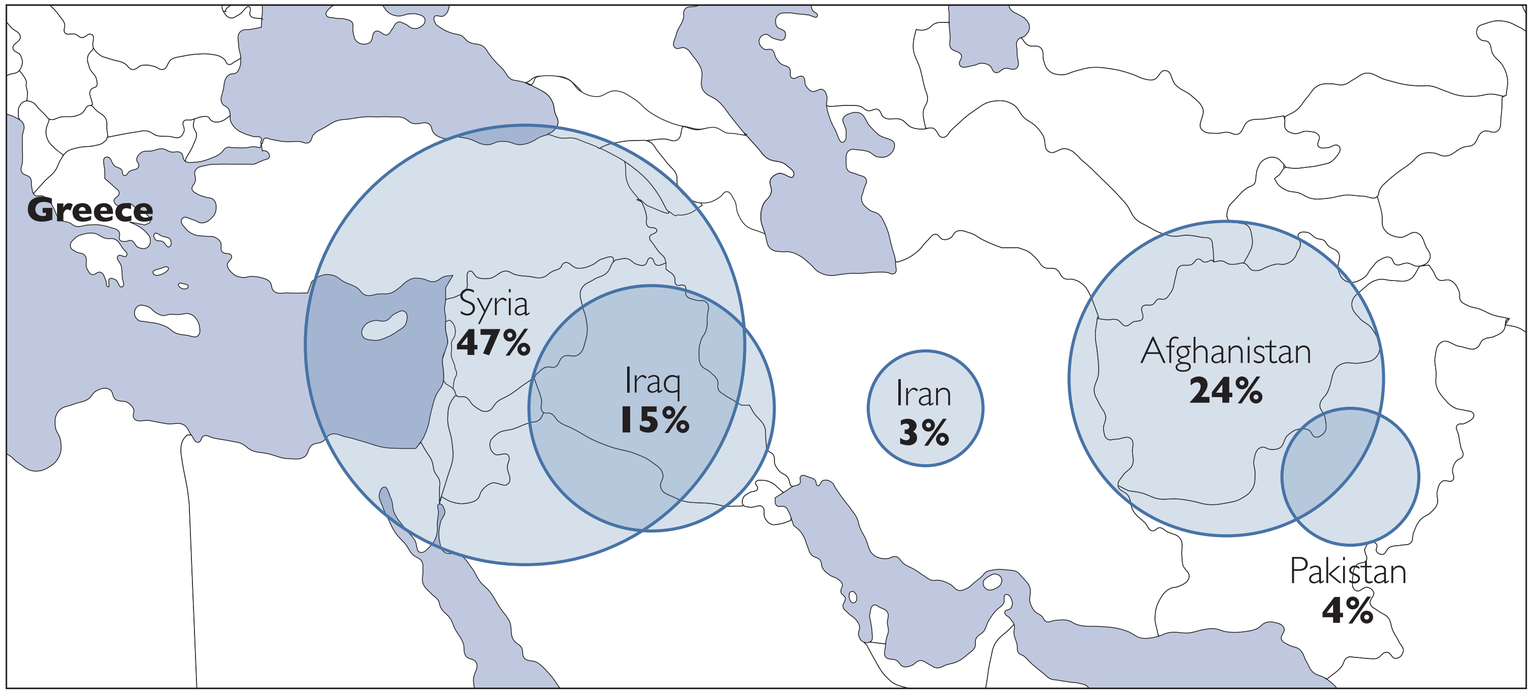
https://github.com/ft-interactive/chart-doctor/blob/master/visual-vocabulary/Visual-vocabulary.pdf

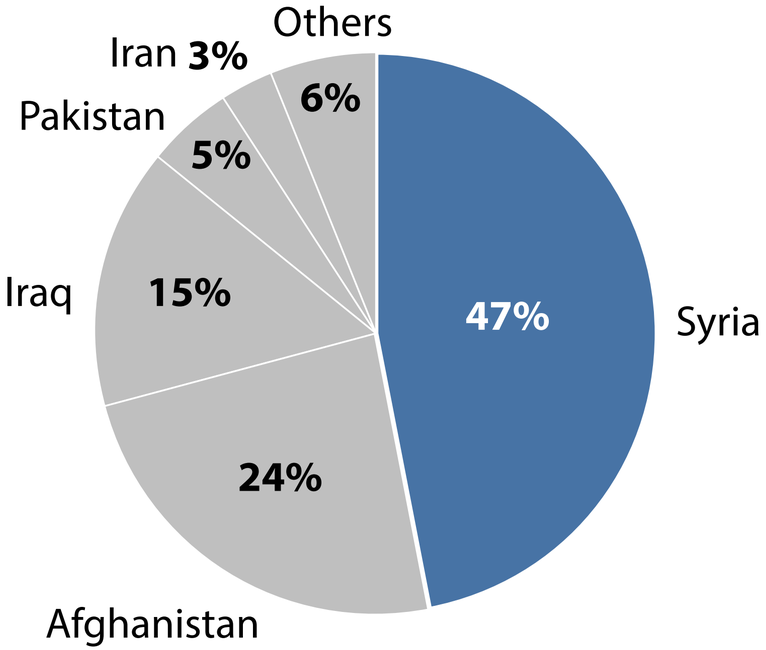
But I also try to teach them how to reason about their choices

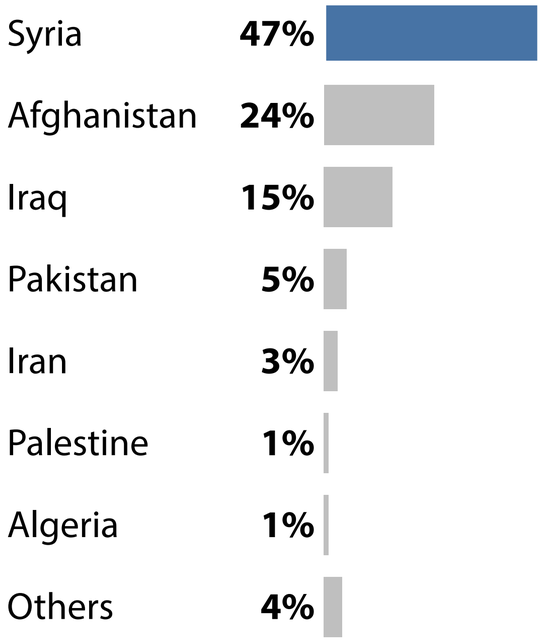
Figure 2 - Main nationalities of arriving migrants – 2016

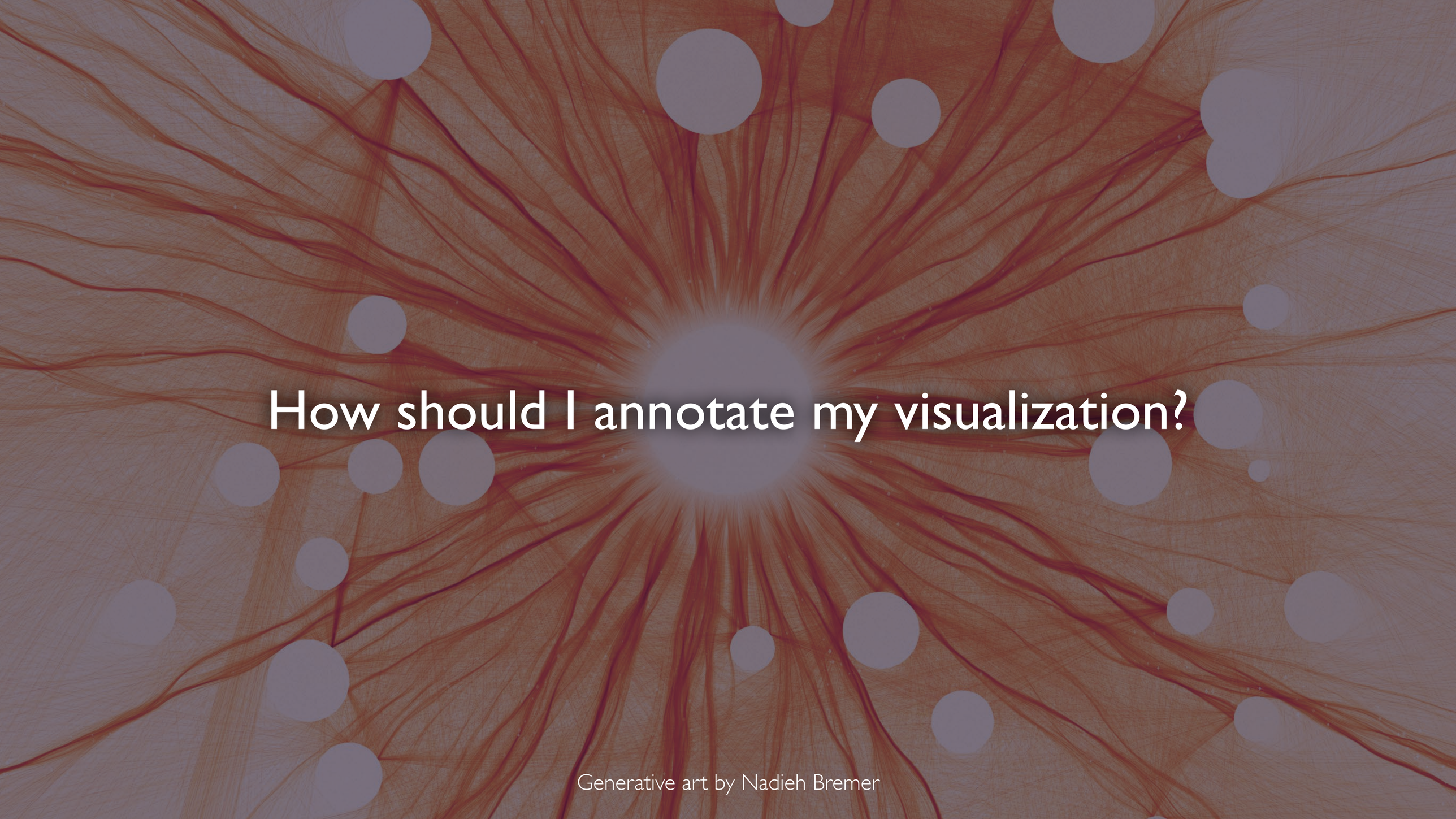
Greece

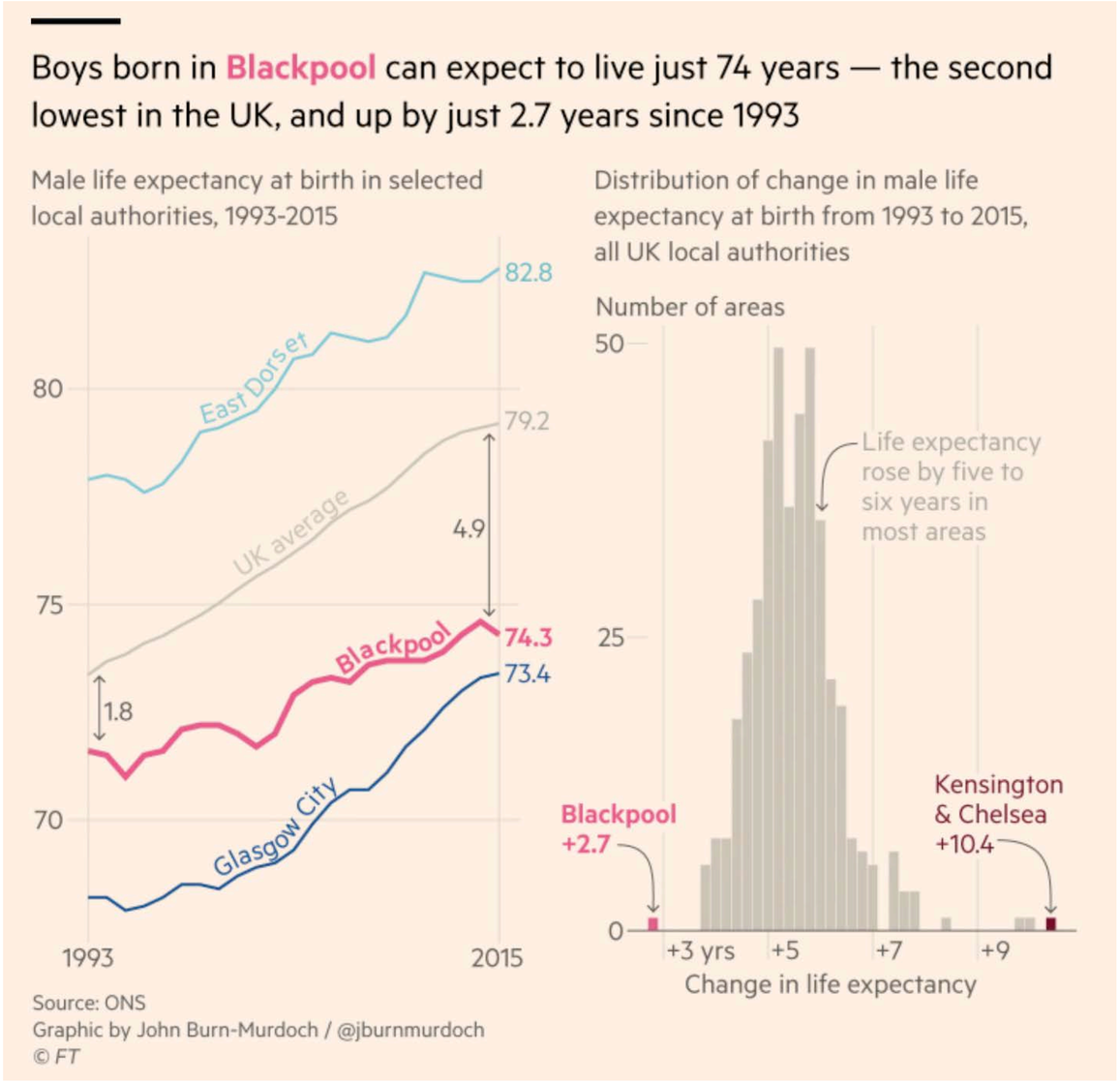



Greece
Syria
47%
Iraq
15%
Iran
3%
Afghanistan
24%
Pakistan
4%


Others
6%
Iran 3%
Pakistan
5%
Iraq
15%
47%
Syria
24%
Afghanistan


Syria 47%
Afghanistan 24%
Iraq 15%
Pakistan 5%
Iran 3%
Palestine 1%
Algeria 1%
Others 4%


How should I annotate my visualization?
Generative art by Nadieh Bremer



"Design secrets behind the FT's best charts of the year"
https://www.ft.com/content/4743ce96-e4bf-11e7-97e2-916d4fbac0da

"I and my colleagues here at the FT, we really do think one of the most valuable things we can do as data visualization practitioners is add this expert annotation layer."

John Burn-Murdoch
Financial Times
https://policyviz.com/podcast/episode-155-john-burn-murdoch/

Am I paying enough attention to visual design?
Generative art by Nadieh Bremer

Multi-scale Modeling and Assessment of Malaria Risk in Northern South America

Alimi, T. O.[1]; Fuller, D. O.[1,2] and Beier, J.C.[1,3]

[1] Abess Center for Ecosystem Science and Policy; [2] Department of Geography and Regional Studies; [3] Department of Epidemiology and Public Health, University of Miami

UNIVERSITY OF MIAMI
ABESS CENTER for ECOSYSTEM SCIENCE & POLICY

1. Introduction

The public health problem posed by malaria has made it a top priority for control efforts and the general consensus globally, is that its elimination is crucial for continued international development. Consequently, there is ongoing research in different regions including South America (SA) to better understand the disease dynamics with the intent that findings may establish scientific framework that would support the development of new intervention strategies for malaria elimination in areas with seasonal malaria. One of such investigations is undertaken by the International Centers of Excellence in Malaria Research (ICEMR) under a National Institutes of Health (NIH) grant.

While only about 3% of the global malaria burden is borne by SA[1], undertaking malaria research in the region is currently important because an estimated 23million people are still at risk[2] and approximately about 80% of clinical cases are found in Northern South America (NSA)[3]. A key factor limiting effective control is lack of data and uneven implementation of control measures, including use of bed-nets, sprays, early diagnosis, and treatment. As part of the ICEMR investigation, this project seeks to model the spatial patterns of malaria risk in NSA through vector distribution and land-use changes. Furthermore, I intend to investigate the perceptions of malaria risk in order to identify barriers to adoption and how they can be circumvented.

2. Significance

Spatial distribution of malaria risk is still perceived as broadly categorized by the WHO's traditional risk maps which are highly generalized, of low resolution and have broad categories with uncertain boundaries (see da Nunes-Silva et al. 2012). There is need for up- to-date high resolution risk maps which can aid malaria control efforts. Secondly, modeling distribution of principal malaria vectors and land use changes which may explain the observed distribution and risk are useful tools which would guide future management strategies. Finally, understanding the perceptions of at risk populations may help address barriers to adoption of interventions and influence policies. Overall, findings will empower NMCPs to achieve effective control and move them closer to elimination.

3. Specific Aims

- Specific Aim 1: Model the spatial patterns of malaria risk through vector distribution and land use changes
  - Hypothesis 1.1: GIS-based Multi-Criteria Evaluation (MCE) model can accurately predict spatial extent of malaria risk areas. Objective: Generate risk maps that represent risk of malaria transmission.
  - Hypothesis 1.2: The Maximum Entropy (Maxent) model can accurately depict actual and predict potential distribution of three *Anopheles* species. Objective: Model observed and potential spread of *An. albimanus, An. darlingi,* and *An. nuneztovari.*
  - Hypothesis 1.3: Land- use changes can explain the variations in predicted malaria risk. Objective: Characterize land use land cover (LULC) and investigate changes in areas of risk.
- Specific Aim 2: Investigate the perceptions of malaria risk in order to identify barriers to adoption and how they can be circumvented.
  - Hypothesis 2.1: Knowledge of perception of malaria risk can aid design of malaria control strategies. Objective: Obtain and analyze data on subjective perceptions of risk.
  - Hypothesis 2.2: Identification of barriers to adoption of malaria control interventions provide means of tackling them. Objective: Analyze data addressing perceived barriers and policy implications

*Only ongoing work on Hypothesis 1.1 in presented here

4. Materials and Methods

- Study Area: is NSA comprising of ten countries- Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Panama, Peru, Suriname and Venezuela. These countries account for approximately 90% of clinical cases in the region hence, the choice as study area (Fig. 1).

Figure1: Map of study area

- Research Approach: Due to the complexity of malaria problem, I'm employing an interdisciplinary approach to address the problem (Fig. 2).

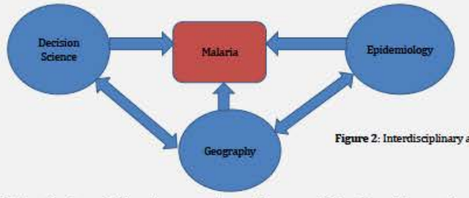


Figure 2: Interdisciplinary approach

- Materials: Raster data layers of environmental, climatic and anthropogenic parameters from satellite imageries, weather monitoring stations, global land cover and population data were collected from Worldclim, Digital Charts of the World, Globcover and Landscan. Vector data was collected from field sampling by our collaborators and the Walter Reed Biosystematics Unit. Sociological data would be collected through questionnaires to be administered in one of the study area. Other data will be collected as needed.
- Procedure: To test hypothesis 1.1, raster data of parameters that influence mosquito distribution (rivers, wetlands, urban areas, roads, population and elevation) were combined using a Multi-Criteria Evaluation in Idrisi GIS package. This produced a map of potential exposure to malaria vectors which is used as a proxy for risk of malaria transmission. All the data layers were gridded at 1km spatial resolution. A set of distance layers had been created for discrete factors using standard GIS operations. All factors were subsequently standardized into a continuous common numeric range on a byte 0-255 probability scale using a fuzzy function based on knowledge of mosquito interaction with the factor. Weights were generated for each factor based on the importance of the factor to malaria transmission by expert opinions and then assigned using Analytical Hierarchy Process. The risk maps produced were validated statistically using data on *An. darlingi* distribution and malaria case data from some parts of the study area. See preliminary results (Fig. 3,4,5)

5. Preliminary Results

- Areas of high to moderate risk corresponded with locations of some of the anophelines collected.

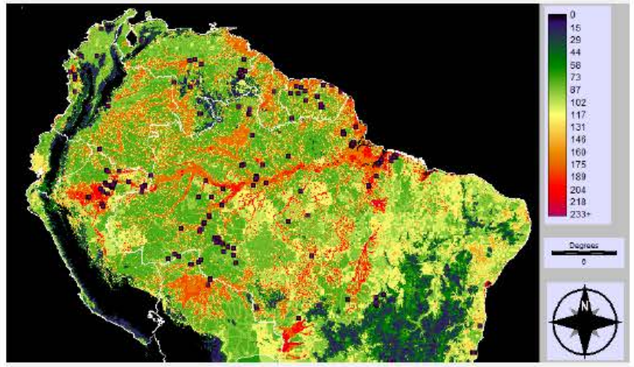


Figure 3: Potential risk of exposure to malaria vectors across NSA (0 indicate little or no risk while 233 indicate high risk)

- Risk scores for mosquito occurrence points were significantly higher than those generated randomly (Fig. 4).

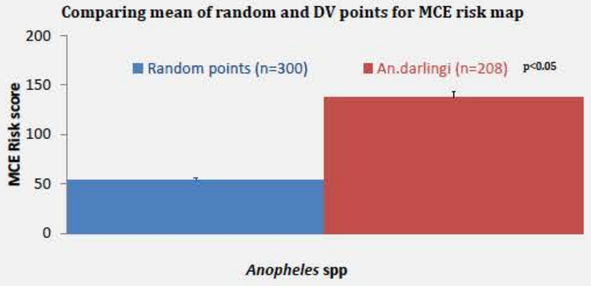


Figure 4: Plot showing the MCE risk values for randomly sampled points and for occurrence points of a DV, *An. darlingi*

6. Conclusion

Findings from preliminary results suggest that the MCE approach is a viable method to modeling spatial risk. The high resolution risk map produced aligned well with sampled vector points and may therefore be used to plan control of malaria vectors. Further analysis is planned to generate and validate risk maps with actual measures of malaria transmission, results of which could be used to plan containment of future outbreaks.

References

1. WHO. (2007). MALARIA ELIMINATION: A field manual for low and moderate endemic countries
2. PAHO (2012) PAHO Honors 2012 Malaria Champions of the Americas. Available: http://new.paho.org/hq/index.php?option=com_content&view=article&id=7429&Itemid=39639
3. Gusmao R. (1999) Overview of malaria control in the Americas. Parasitologia 41:355-60.
4. Da Silva-Nunes, M., Moreno, M., Conn, J.E., Gamboa, D., Abeles, S., Vinetz, J.M., and Ferreira, M.U. (2012) Amazonian malaria: Asymptomatic human reservoirs, diagnostic challenges, environmentally driven changes in mosquito vector populations, and the mandate for sustainable control strategies. *Acta Tropica* **121** (3): 281-29

Multi-scale Modeling and Assessment of Malaria Risk in Northern South America

Alimi, T. O.[1]; Fuller, D. O.[1,2] and Beier, J.C.[1,3]

UNIVERSITY OF MIAMI
ABESS CENTER for ECOSYSTEM SCIENCE & POLICY

INTRODUCTION

Malaria as a public health problem has become a priority for control efforts worldwide. The global consensus is that **its elimination is crucial for continual development**. Ongoing research projects in different regions, including South America (SA), try to improve our understanding of the disease dynamics. Their goal is to establish a new framework that would lead to new intervention strategies for malaria elimination in areas where the disease is seasonal. **One of such investigations is undertaken by the International Centers of Excellence in Malaria Research (ICEMR) under a National Institutes of Health grant.**

While only about 3% of the global malaria burden is borne by SA1, undertaking malaria research in the region is currently important because an estimated 23million people are still at risk 2 and approximately about 80% of clinical cases are found in **Northern South America (NSA)** 3. A key factor limiting eective control is lack of data and uneven implementation of control measures, including use of bednets, sprays, early diagnosis, and treatment. As part of the ICEMR investigation, this project seeks to model the spatial patterns of malaria risk in NSA through vector distribution and land-use changes. Furthermore, I intend to investigate the perceptions of malaria risk in order to identify barriers to adoption and how they can be circumvented.

SIGNIFICANCE

Spatial distribution of malaria risk is still perceived as broadly categorized by the WHO's traditional risk maps which are highly generalized, of low resolution and have broad categories with uncertain boundaries (see da Nunes-Silva et al. 2012). There is need for up- to-date high resolution risk maps which can aid malaria control eorts . Secondly, modeling distribution of principal malaria vectors and land use changes which may explain the observed distribution and risk are useful tools which would guide future management strategies . Finally, understanding the perceptions of at risk populations may help address barriers to adoption of interventions and influence policies. Overall, findings will empower NMCPs to achieve eective control and move them closer to elimination .

AIMS

Specific Aim 1: Model the spatial patterns of malaria risk through vector distribution and land use changes

- **Hypothesis 1.1:** GIS-based Multi-Criteria Evaluation (MCE) model can accurately predict spatial extent of malaria risk areas. **Objective:** Generate risk maps that represent risk of malaria transmission
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Specific Aim 2: Investigate the perceptions of malaria risk in order to identify barriers to adoption and how they can be circumvented.

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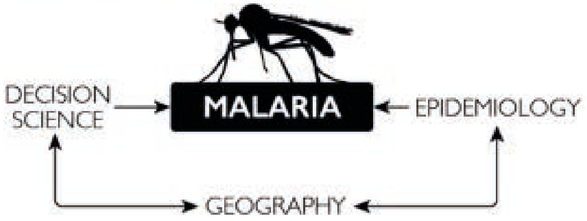
***Only ongoing work on Hypothesis 1.1 in presented here**

MATERIALS AND METHODS

NSA comprising of ten countries - Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Panama, Peru, Suriname and Venezuela. These countries account for approximately 90% of clinical cases in the region

Research approach: Due to the complexity of malaria problem, I'm employing an interdisciplinary approach to address the problem.



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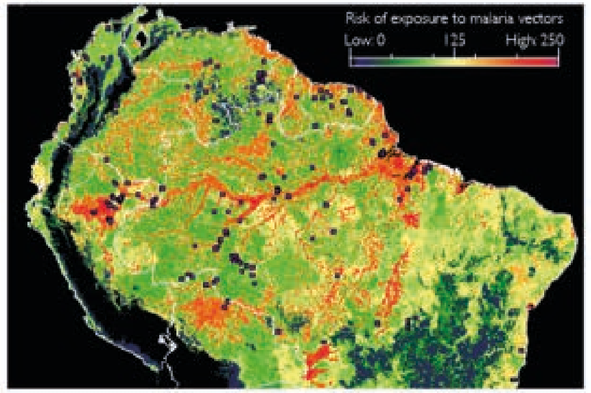
RESULTS

Areas of high to moderate risk corresponded with locations of some of the anophelines collected.



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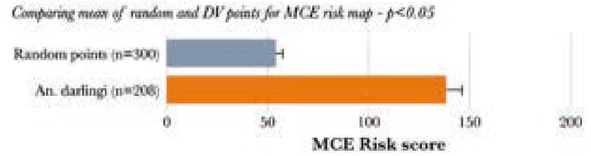

CONCLUSION

Findings from preliminary results suggest that the MCE approach is a viable methods to modeling spatial risk. The high resolution risk map produced aligned well with sample vector points and may therefore be used to plan control of malaria vectors. Further analysis is planned to generate and validate risk maps with actual measures of malaria transmission, results of which could be used to plan containment of future outbreaks.

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Visualization doesn’t always need to be clear and efficient.
Depending on its purpose, we can prioritize other goals.
Generative art by Nadieh Bremer

https://www.archivosjaimeserra.com/archivos

Documental: Jaime Serra III

Jaime Serra Palol. Periodista y artista multidisciplinar. En los últimos 25 años ha dirigido la infografía de algunos de los principales medios de Europa, EE.UU. y Latinoamérica.
En su trabajo artístico utiliza los métodos y el lenguaje propio de la infografía científica para tratar temáticas pertenecientes a su propio mundo personal.
Su obra se ha expuesto en Estados Unidos, Argentina, México y España. Reconocido por la prestigiosa Society for News Design como el infografista más influyente del periodo 1992-2012.
Es, desde octubre del 2007, responsable de las infografías de 'La Vanguardia'.

Tres historias verdaderas

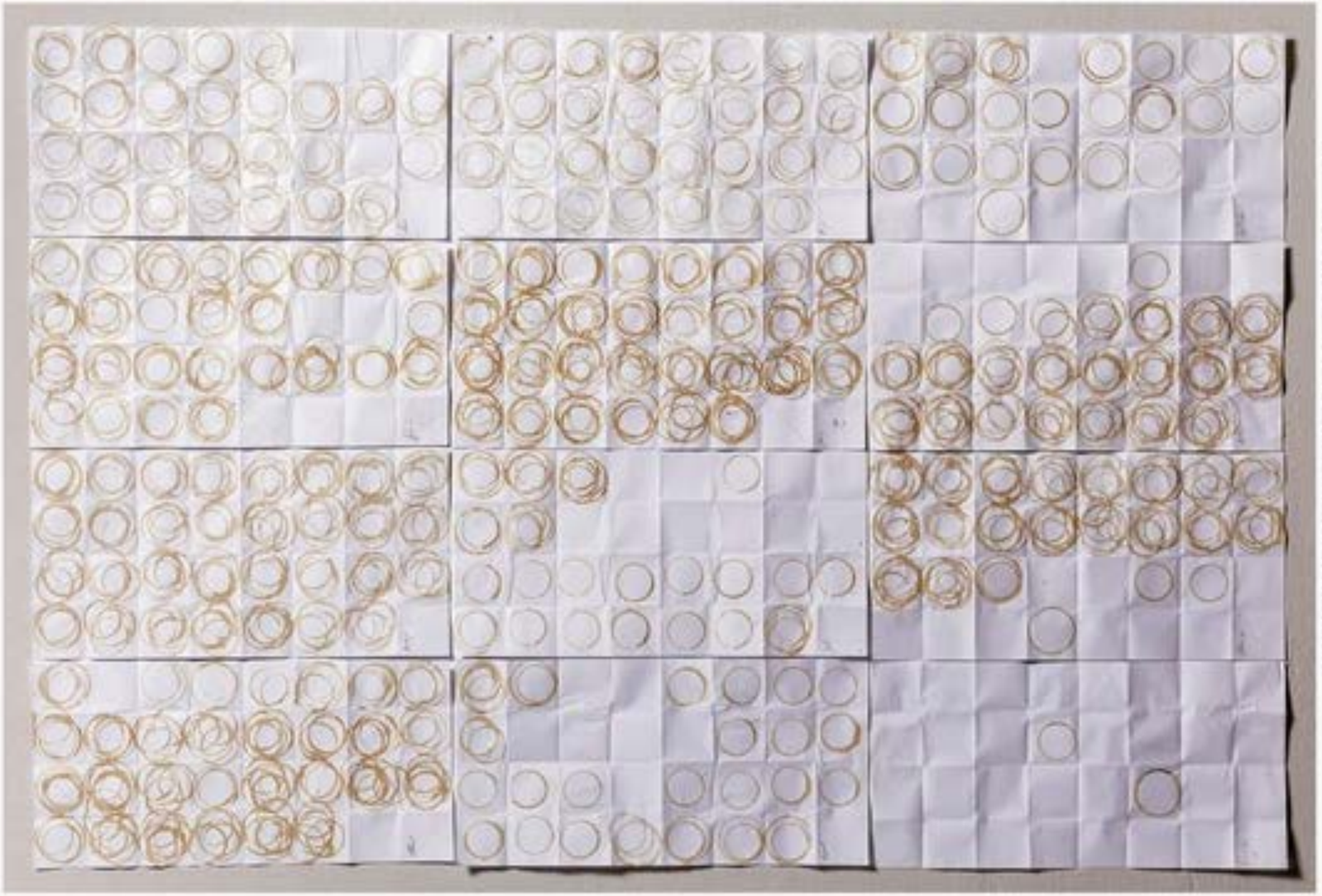
Los datos son materia prima, en bruto no tienen utilidad. Deben ser procesados y transcritos a un lenguaje visual para ser comprendidos. La herramienta que dibuja la información que contienen es la infografía. Una herramienta de comunicación habitualmente asociada a la divulgación científica pero que, como cualquier otra herramienta de comunicación humana, puede narrar hechos o verdades, realidad o ficción. Los datos colectivos, recogidos con las actuales tecnologías capaces de prescindir de la intermediación del individuo, son objetivos. Precisamente por eso no pueden aportar nada sobre el individuo: no pueden ser verdad. La verdad confiesa un componente de interpretación que permite que cada individuo disponga de la suya propia. Son los datos aplicados a lo que hace una persona concreta, en un momento dado concreto, sobre un tema concreto lo que puede resultar revelador para otro individuo. Porque en la intimidad todos los seres humanos, por analogía u oposición, nos encontramos

PATROCINADO POR
endesa

enero febrero marzo abril

mayo junio julio agosto

septiembre octubre noviembre diciembre



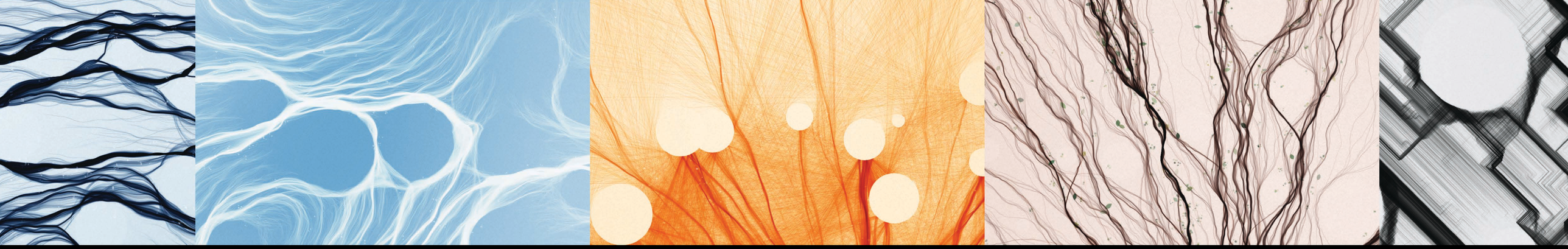
Café a diario

La relación que mantengo con el café es dual: por una parte puedo llegar a consumirlo de modo compulsivo, casi como una adicción, por otra parte la reacción de mi organismo a los lácteos –no me gusta solo– me obliga a reducir o abandonar por completo su consumo durante días.

Durante el año 2013 cuantifiqué las tazas de café que tomaba a partir de las manchas que dejaban sobre hojas de papel.

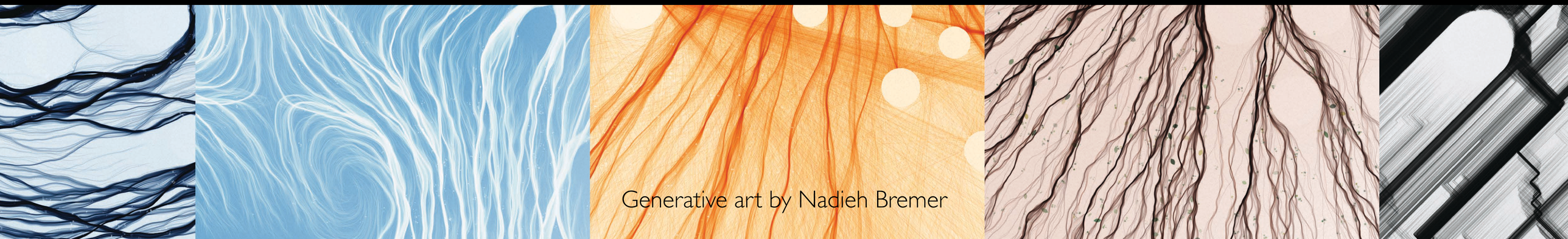
Del número total de tazas existen dos tipologías: café cortado y café con leche, usando un modelo de taza de diferente diámetro para cada caso. Con el fin de otorgarle mayor exactitud a la datificación, utilicé las mismas tazas todo el año.

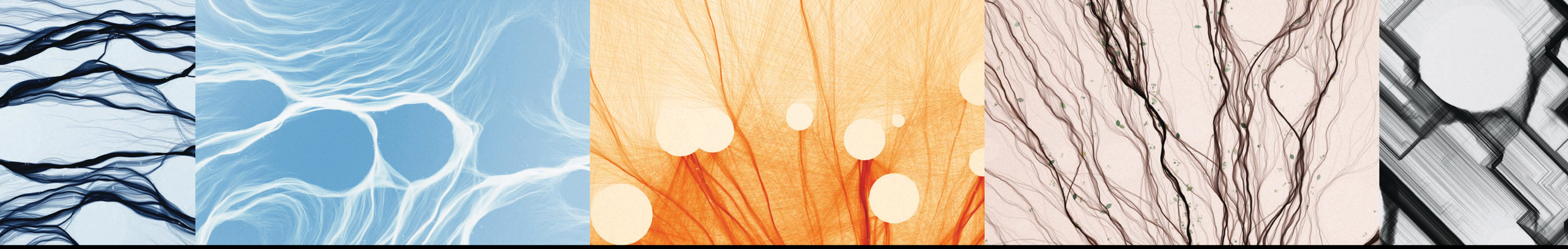
Para la visualización utilicé una hoja de 25 cm x 50 cm para cada mes. Como debía transportar las hojas a todas partes era necesario doblarla. La dimensión de la hoja elegida permitía que, doblada cinco veces sobre su mitad y nuevamente desplegada, dibujase treinta y dos cuadrados de 6 cm cada uno, una forma ligeramente mayor que el diámetro de la taza de café con leche. A modo de calendario, cada cuadrado corresponde a un día, reservando el último para el nombre del mes y otras anotaciones.



We use written language for multiple purposes:

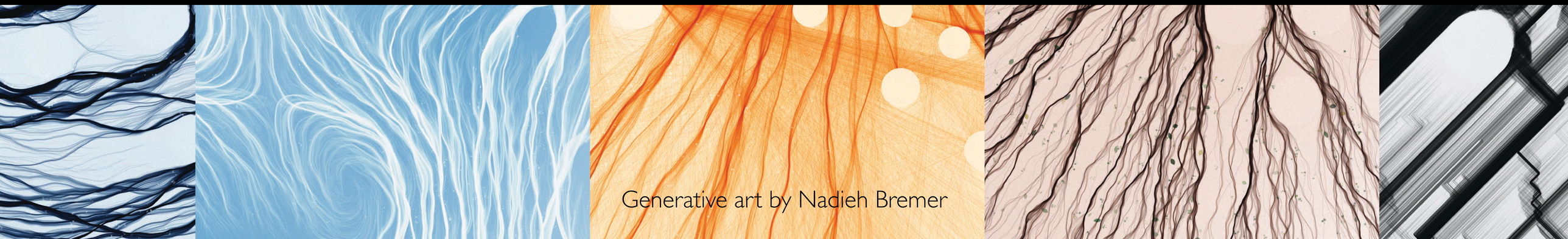
To communicate clearly, or to explore ideas, or to arouse emotions…

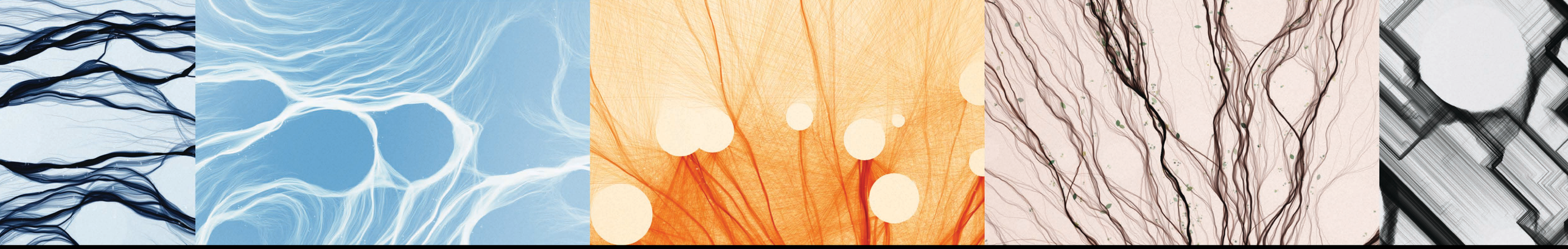




We use written language for multiple purposes:
To communicate clearly, or to explore ideas, or to arouse emotions…

Depending on our purpose, written language can be sparse and direct, or tentative and essayistic, or poetic, or playful, and so on.





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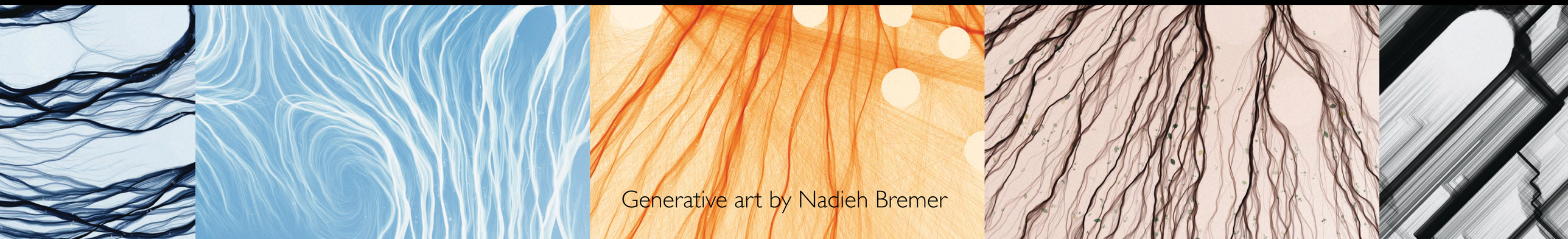
Why should visualization be different?