TOPICS IN DATAVIZ

# Pros and Cons of Chart Taxonomies

**Amanda Makulec** • September 17, 2019

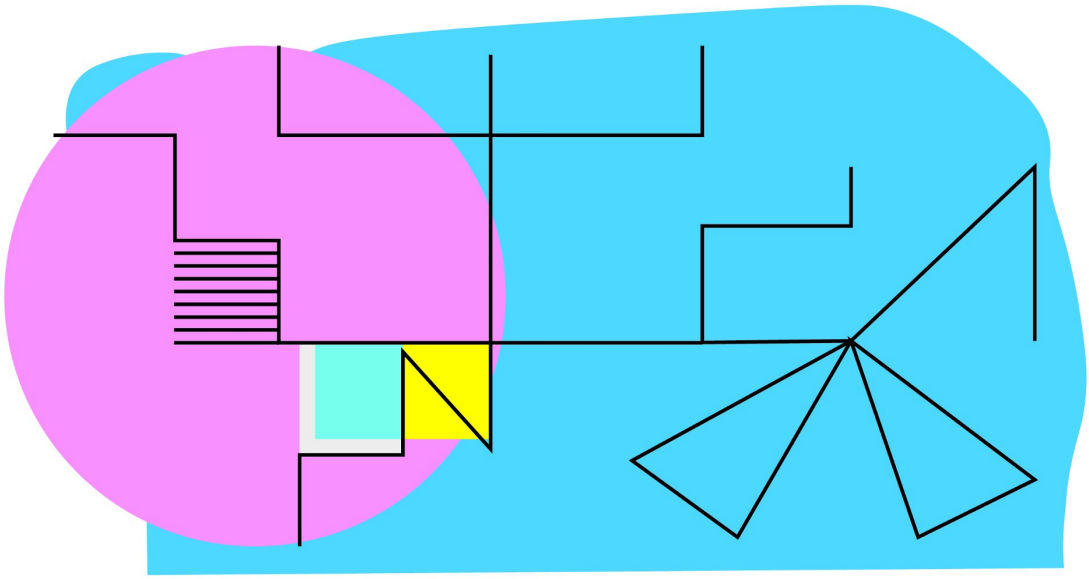


Illustration by Jason Forrest.

Chart taxonomies are a popular starting place for people new to data visualization, but do they unnecessarily constrain our thinking and ignore the fundamentals of data visualization design? These taxonomies can help analysts and designers make better-informed decisions

to make sense of what can feel like an overwhelming list of options.

But experts in data visualization have also suggested that these same taxonomies oversimplify chart selection and limit innovation in dataviz design. Alberto Cairo was sharing insights from the recent Symposium on Data Science and Statistics and stated that Leland Wilkinson (author of The Grammar of Graphics) went so far as to say taxonomies of charts are harmful.


Prompted by Alberto Cairo's tweet, a group of semantics and data viz enthusiasts parsed the pros and cons of chart taxonomies in a recent conversation on the Data Visualization Society's (DVS) Terminology channel.

## Defining chart taxonomy

Fundamentally, we needed to ensure we were speaking the same language. Chart taxonomy had a different meaning across DVS members.

**For the purpose of this discussion, chart taxonomies are defined as classification tools that group charts based on their purpose, type, or function.**

When well crafted, chart taxonomies today typically live either in these tools or on websites, like The Data Viz Project. (Early iterations were even simpler than the interactive tools.)

Multiple people reflected that chart taxonomies may have roots in some of the early graphic interfaces that enabled analysts to create charts without writing code:

"*My assumption (keeping in mind that I was in diapers at the time!) is that things must have congealed a lot when the 'desktop publishing' revolution brought 'chart chooser' dialog boxes into the world and people around the world started make the same chart over and over instead of hand-crafting them. One of the main reasons I think we approach a dataviz problem with 'which of these typical charts should I choose' is because most people start out by using a tool like Excel, where there really are a set of chart types to choose from.*" — *Amelia Wattenberger*

Over time, experts have created more refined taxonomies that classify charts according to their analytical function or other characteristics such as shape, like the examples above. These taxonomies may have the greatest utility for beginners learning data visualization, who are trying to navigate the complexities of chart selection.

In our discussion, data visualization experts and enthusiasts made a case for two opposite perspectives on chart taxonomies:

**Taxonomies oversimplify and allow us to be lazy (ignoring other fundamentals around data and its visualization).**

Or

Let's unpack the supporting points for each perspective.

## Taxonomies oversimplify and allow us to be lazy (ignoring other fundamentals around data and its visualization).

### 1. Taxonomies assume charts are the lowest common unit, which is inconsistent with how data visualizations are developed

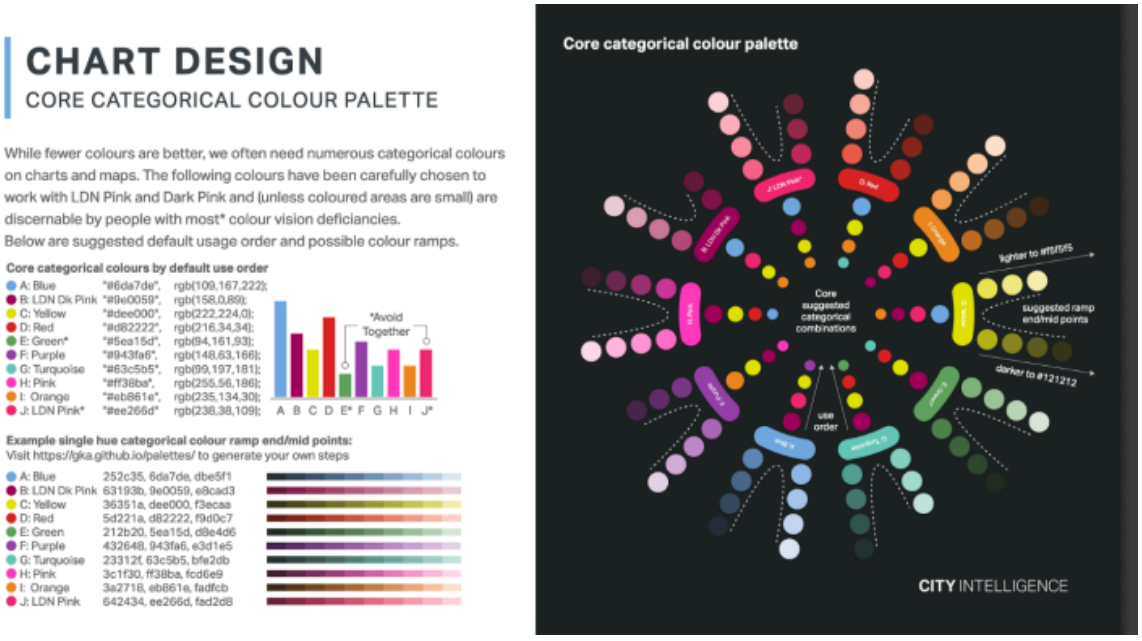
*"Dataviz can be so overwhelming. I prefer an alternative way of breaking the space down, which is identifying the different _types_ of data and learning the different ways of visualizing each metric (size, position, color, etc), and the pros/cons of each." — Amelia Wattenberger*

Taxonomies can create the impression that charts are themselves the irreducible units of visualization. "One argument against chart taxonomies is that learning chart types themselves **don't** allow practitioners to understand concepts behind or beyond the the charts themselves," wrote Stephanie Tuerk. Taxonomies ignore the need to understand the visual encodings that make up each chart, including marks, color, movement, legends, text, and other features.

*"Without the essential components of a 'chart' — a scaled space and at least one marker — data visualization cannot function." —*

"*I think the real trick is simultaneously thinking of charts as composed out of smaller building blocks and also in some way as irreducible. Just like you can think of words as sequences of atomic sounds, but also sentences as sequences of atomic words.*" — *Alex Wein*

(Perhaps this is where well constructed dataviz style guides can further reinforce best practices though, when considered alongside a taxonomy.)




Examples from the London City Intelligence style guide (Source)

## 2. Chart choosers allow practitioners to ignore fundamentals.

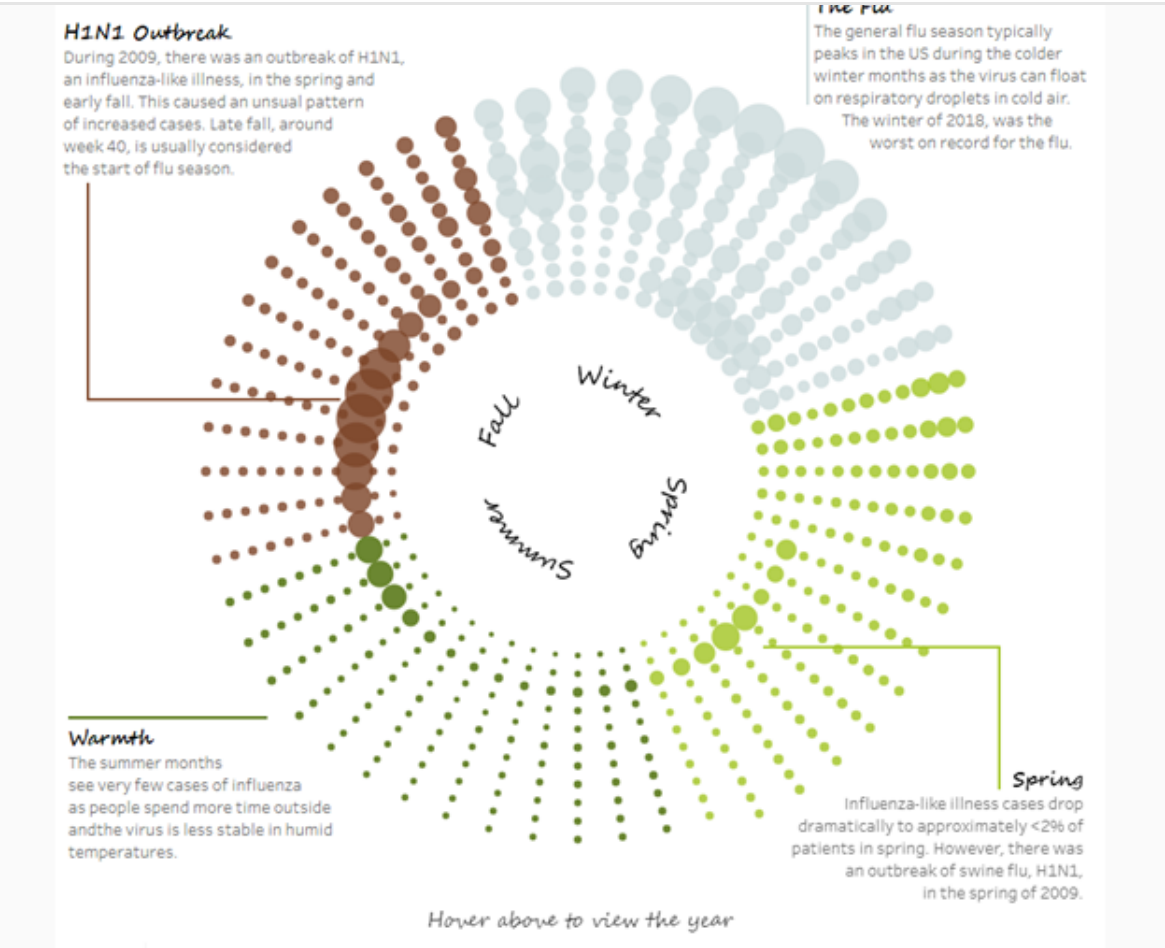
Data visualization designers should understand the principles of those visual encodings and have at least a basic understanding of

*"The process of choosing a chart involves a larger ecosystem of information than just the charts on their own. Once you ask people to start considering whether their data is categorical, ordinal, or interval data, and if interval, whether continuous or discrete, it is THAT part that begins to develop fundamental understandings of data and its relationship to its graphic representation." — Stephanie Tuerk*

Chart taxonomies ignore that larger ecosystem of information, and can oversimplify the process of chart selection by ignoring those fundamental principles.

### 3. Taxonomies that force individual chart types into specific "boxes" are unnecessarily constraining and don't promote innovation.

Limiting design decisions to a list of charts for a given function — like lines for time — would eliminate so much innovation in the data visualization space. If we always showed time series data on a line, we would miss out on visual innovations like Lindsey Betzendahl's Cycle of Influenza.




Screenshot of Cycle of Influenza (Source)

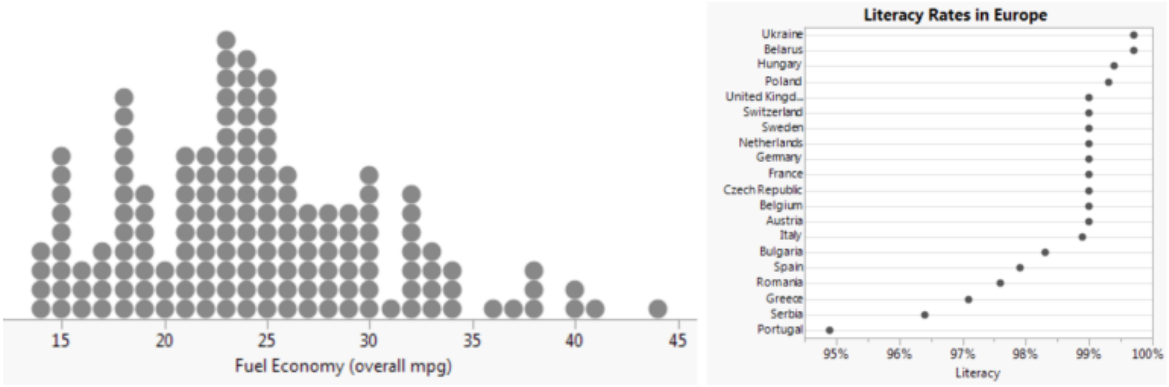
As new designers dabble in data visualization, learning visualization with chart taxonomies does them a disservice.

*"I've seen people get 'locked in' to whatever they learn early on, thinking for example, 'line charts are for time-series (only, and vice-versa) and bar charts are for categorical data' or 'scatter plots have two continuous axes and if one axis is categorical then it's a dot-plot which is totally different or scatter plots, line charts, connected-scatterplots and slope charts are different things.' These are pretty arbitrary distinctions which get baked into various chart-chooser approaches and which I find people have trouble breaking out of."* — Nicolas Kruchten

*"Others in this thread have pointed out other problems with taxonomies: not just that they create artificial bins and boundaries, but that they are self-limiting. An understanding of visualization based on a grammar of graphics, on the other hand, opens the door to endless innovation." — Alberto Cairo*

## 4. Too many different names for the same kind of chart make chart choosers unreliable and confusing.

*"The names that sometimes get authoritatively attached to certain types of plots in various chart taxonomies aren't particularly unique or well-accepted. As an example, there are at least two common types of plots called "dot plots" (outlined in the Wikipedia page) and as far as I can tell, 'needle plot' and 'lollipop chart' refer to the same thing." — Nicolas Kruchten*




Example of a "Wilkinson" dot plot versus a "Cleveland" dot plot (Source)

## 5. Too much effort from the dataviz community is invested in creating and debating these classification tools.

*heuristic devices that have their own social lives in the production of so much dataviz, that the question of selection among them seems to occupy so much space in the realm of dataviz discourse.*" — *Stephanie Tuerk*

The focus on charts (or their equivalents) extends beyond the discourse to research on data visualization.

"A *lot of empirical research on information visualization is about evaluating visualization techniques, which are the same thing as charts, perhaps a bit more complex and with some interactive features. The discussion is all at the level of the visualization technique, which makes it very difficult to explain and generalize findings.*" — *Pierre Dragicevic*

If we focus on researching and discussing chart types, we invest time and energy that could be more fruitful when focused on the fundamentals of visualization.

"*Discussion of the harmfulness of taxonomies of charts has to be a distraction from something more fruitful?* No? *Working out a taxonomy can be a useful way to think through underlying variables and structure. Taking a taxonomy as transcendentally true is a mediocre way to stop thinking, but also just not a very big deal.*" — *Anonymous*

## Taxonomies are useful and play a valuable role in the data visualization field.

Chart taxonomies can help beginners organize options when considering how to visualize a given dataset or analysis result. While there are more fundamental principles that can lay a more robust foundation in data visualization design, we should not throw away taxonomies entirely since they have some proven utility.

"*Since data visualization can be quite intimidating to learn, taxonomies really help new practitioners to not only understand the options, but also the concepts behind different types of data. As the most common data visualizations are straightforward reports, the ability to quickly learn the basics is paramount to increasing our overall cultural data literacy. As practitioners continue to learn the rules, the taxonomies often fall away in time, just as anyone who learns a subject tends to bend the rules based on more advanced use cases.*" — *Jason Forrest*

Chart taxonomies can be one (of many) helpful learning tools, and perhaps are most useful for professionals who have to create an occasional chart but aren't developing data visualization as a full time job or are just learning. They can be particularly valuable when starting out by helping newbies learn the rules (before breaking them).

## 2. Creating shared language for a new(ish) field

As the field of data visualization evolves and matures (and we reach back into the historical annals of visualization design),

*"I am a major fan of taxonomies/typologies because I find they actively help me think. When making them, grouping things into categories of what's similar vs what's different is a way to think systematically about What Matters. When using them, I like to consider descriptive power (when talking about existing things, they help you describe with an appropriate level of precision — abstracting away what you don't care about, yet allowing you to specify precisely what you do care about), generative power (they help you make new things), and evaluative power (they help you assess something)." — Tamara Munzner*

As data visualization design and development is increasingly made more accessible beyond the realm of specialists, chart taxonomies may be the appropriate level of detail to learn so we can effectively communicate.

*"In the context of the potential democratization of data in the business world (and other worlds), will the expectation be that one understands The Grammar of Graphics or the application of the most appropriate chart to convey the right message? Will innovation in data visualization be reserved to those that have a more formal education in information graphics? It's something I struggle with. How much do I need to learn in my 'world' in order to communicate data effectively?" — Wendy Small*

Examples from the Visual Vocabulary tool

## 3. People find chart taxonomies helpful and like using them

One of the great things about data visualization is the wide number of people and tools involved. We all benefit when even the most infrequent visualizers have tools and resources that help make better chart selections.

If taxonomies didn't have a function and appeal to some audiences, tools like the Visual Vocabulary wouldn't be as popular as they have proven to be. We should embrace tools that make learning visualization design more accessible, rather than investing time criticizing them for their flaws.

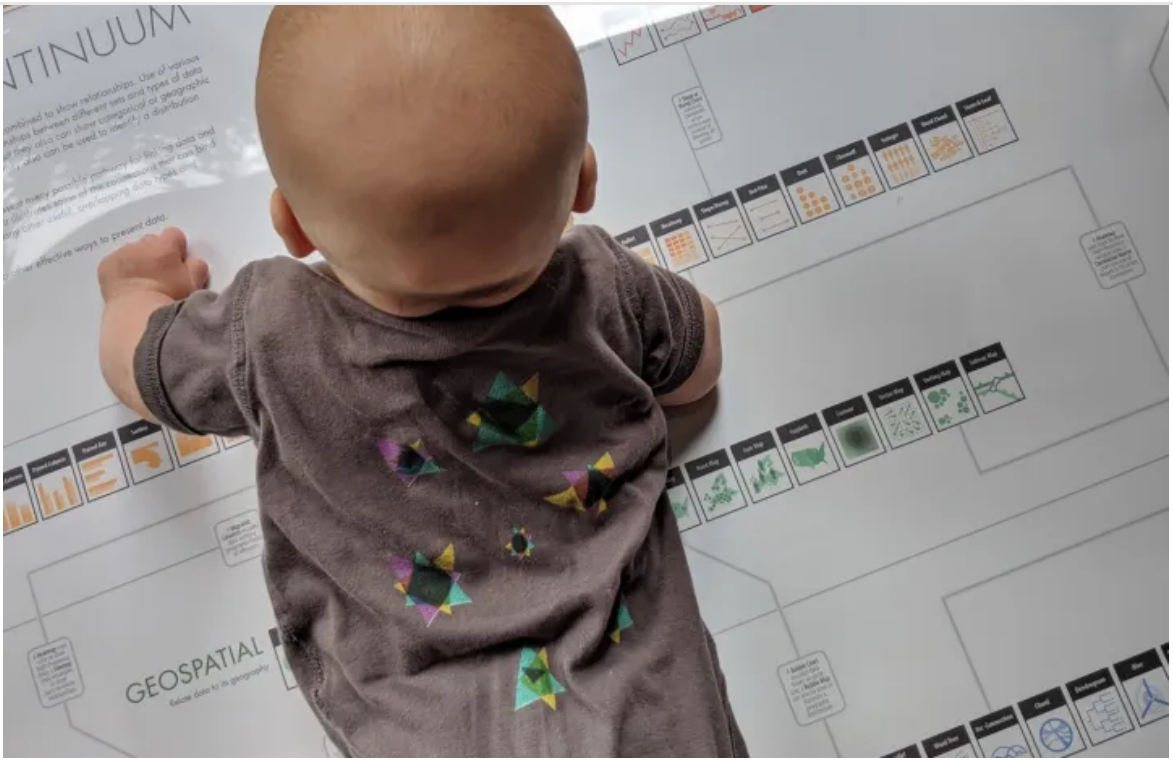
*"I also think their value changes over time — when you're wandering lost in the jungle it can be wonderful to find a path instead of slashing your way through thick vegetation with a machete at every step and it's a breath of fresh air; when a field is much more mature, then what was once useful guidance could harden into a straightjacket and it's stultifying." — Tamara Munzner*


Financial Times Visual Vocabulary

## 4. Taxonomies can be designed as compelling visual displays to prompt conversation and discussion.

Some taxonomies are designed for printing — for example, the Graphic Continuum (available as a poster and handout) and the Financial Times Visual Vocabulary. Some data visualization enthusiasts enjoy displaying taxonomies as wall art, where they can function as a starting point for discussion or a fun visual reference of varied chart types.

Personally, I've gotten many compliments on my Graphic Continuum poster, and loved how it showcased my love for data visualization to colleagues who stopped by. Plus, it makes an excellent background to show off our DVS swag (suitable for even the youngest of data visualization enthusiasts).




My son enjoying his DVS onesie and making the case that taxonomies can be great for (very) early learners.

What are your thoughts? Have you used or do you promote the use of chart taxonomies in your data visualization work?

Share your thoughts in the comments, and join the #topic-terminology channel over on the DVS slack for more robust conversations like these.

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*An Incomplete List of Chart Taxonomies for Reference*

Data Viz Project | Data Visualisation Catalogue | Graphic Continuum | Depict Data Studio Chart Chooser | Financial Times Visual Vocabulary (+ Tableau Edition) | Juice Labs Chart

*Many thanks to the #topic-terminology members who contributed their expertise to this conversation including Alberto Cairo, Nicholas C, Pierre Dragicevic, Jason Forrest, Nicolas Kruchten, Wendy Small, Stephanie Tuerk, and Amelia Wattenberger. An added thanks to Stephanie Tuerk whose editing ensured our conversation was accurately articulated for wider reading and Alyssa Bell for her brilliant editing.*

Author profile

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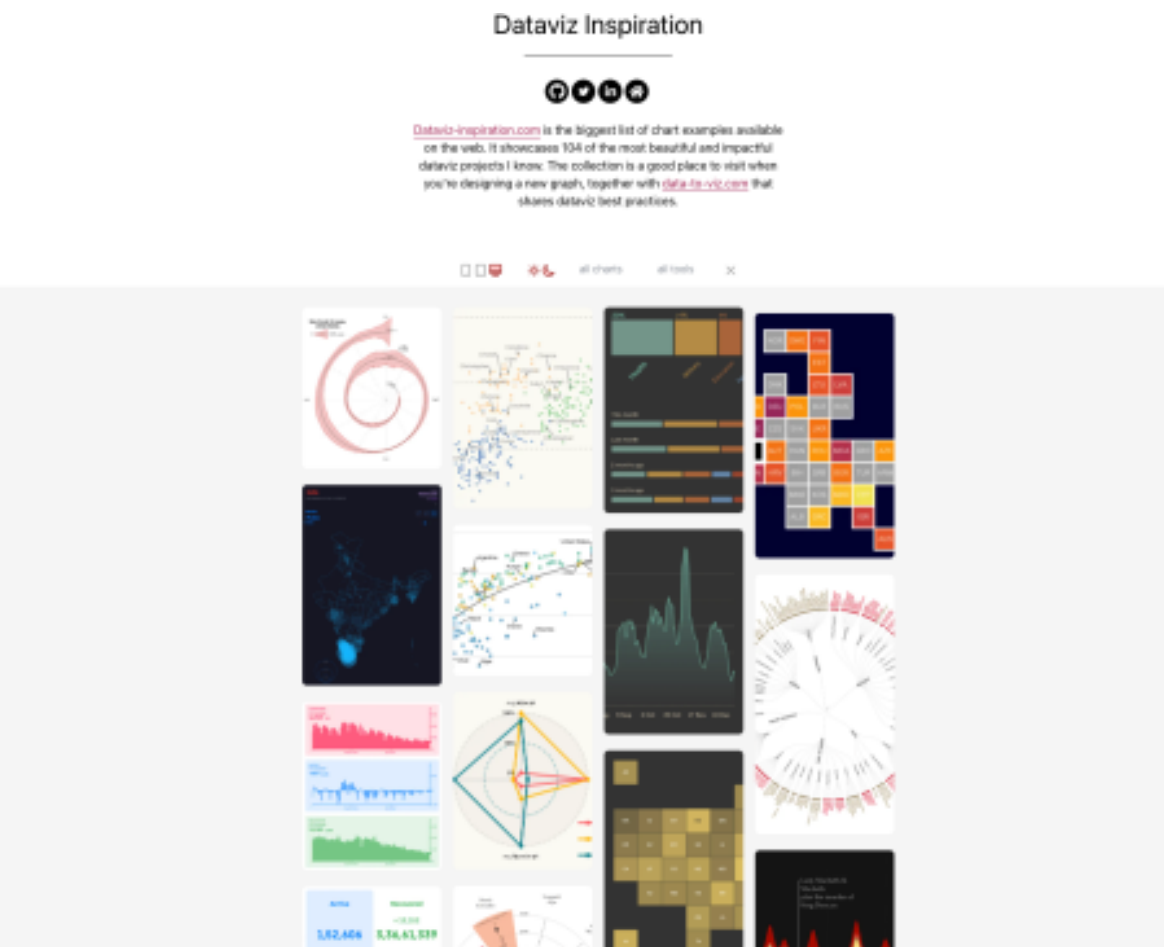


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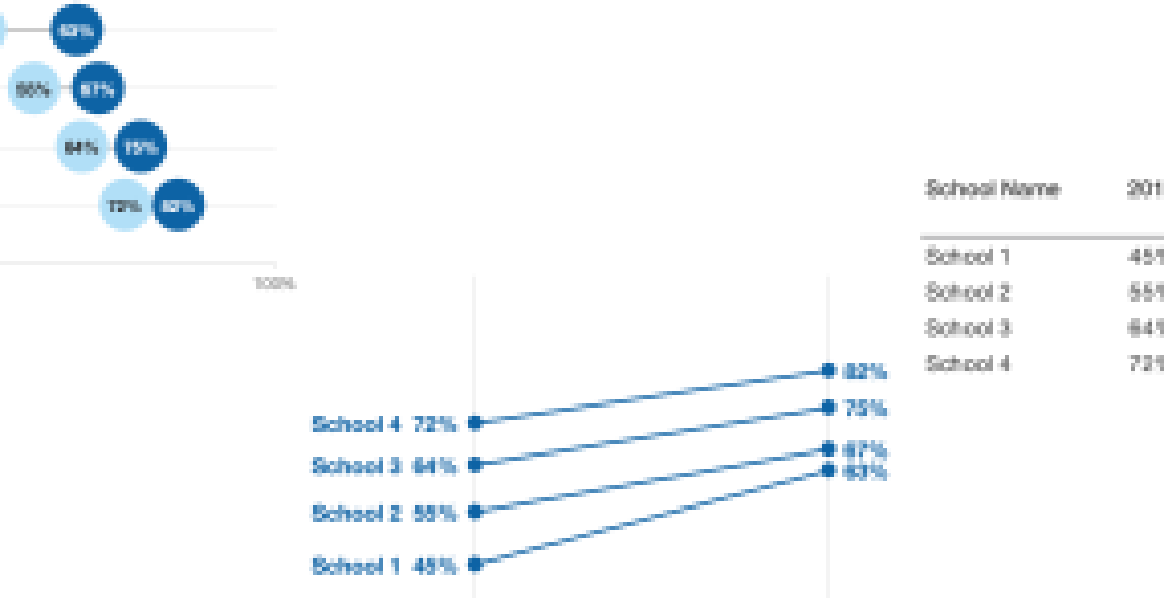

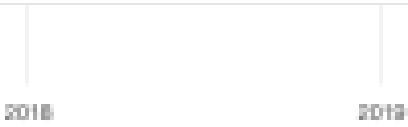

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