

Visualización para ciencia de datos

Visualización de datos multivariados

Contenido

1

Tablas organizadas

2

Expresar: Valores cuantitativos

3

**Separar, ordenar y alinear: Regiones
categóricas**

4

Orientación del eje espacial

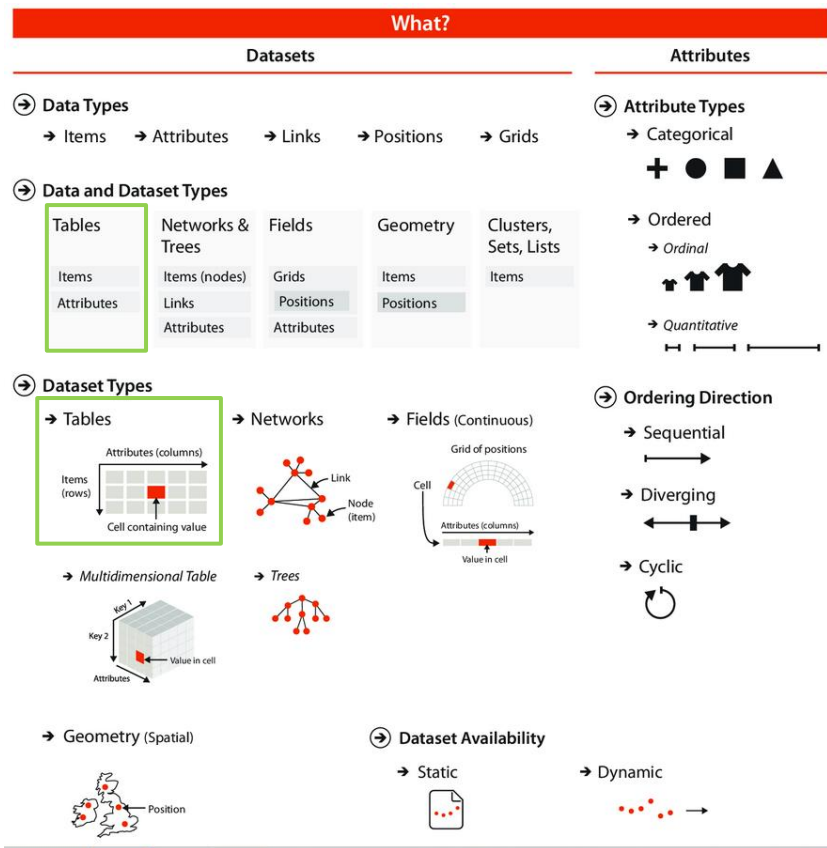


Tablas organizadas

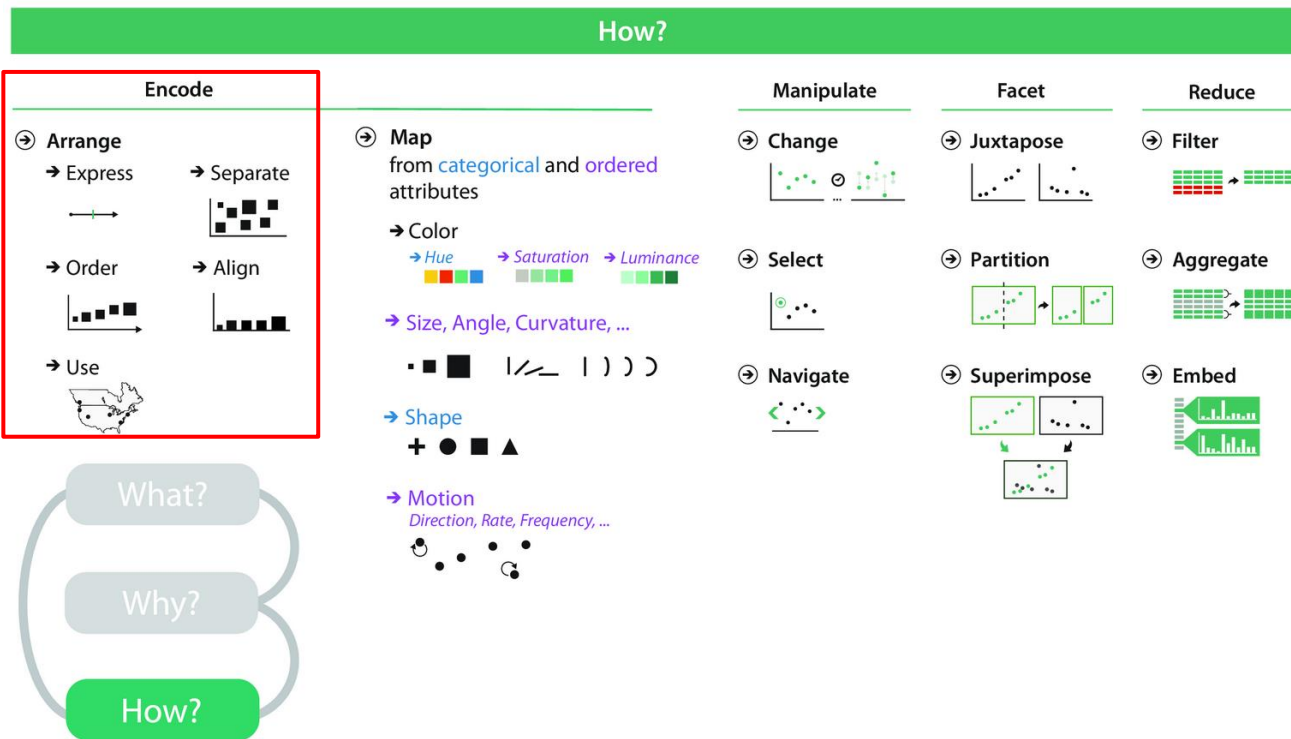
¿Por qué organizar?

El espacio es el canal más importante

Contexto



Contexto



Contexto

Arrange Tables

→ Express Values



→ Separate, Order, Align Regions

→ Separate



→ Order



Datos categoricos

→ Align



→ 1 Key
List



→ 2 Keys
Matrix



→ 3 Keys
Volume



→ Many Keys
Recursive Subdivision



→ Axis Orientation

→ Rectilinear



→ Parallel



→ Radial



Datos categoricos
Datos ordenados cuantitativos

Llaves y valores

Modismos: ¿Cuántas claves y cuántos valores tiene?

Llaves

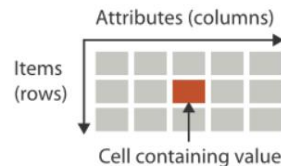
- Atributo independiente
- Se usa como índice único para buscar elementos en una tabla
- Pueden ser categóricos u ordinales



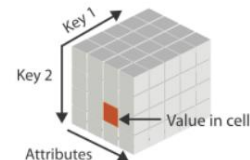
Valores

- Atributo dependiente
- Valor en la celda
- Pueden ser categóricos, ordinales o cuantitativos

→ Tables



→ Multidimensional Table



Expresar: Valores cuantitativos

El uso del espacio para expresar
atributos cuantitativos es un uso directo
del canal de posición espacial para
codificar visualmente los datos

Gráfico de dispersión

No tiene llaves, sólo valores

| Idiom | Scatterplots |
|-------------|---|
| What: Data | Table: two quantitative value attributes. |
| How: Encode | Express values with horizontal and vertical spatial position and point marks. |
| Why: Task | Find trends, outliers, distribution, correlation; locate clusters. |
| Scale | Items: hundreds. |

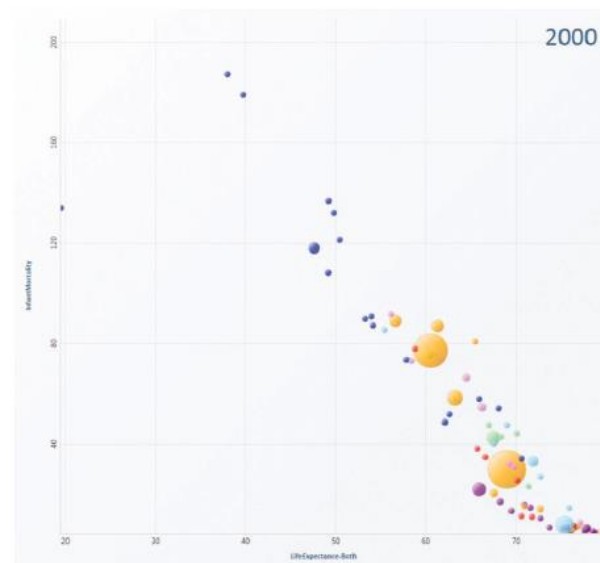
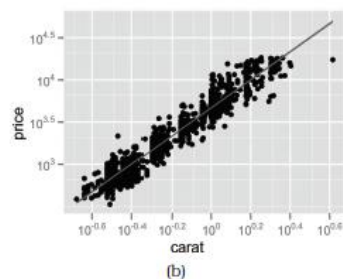
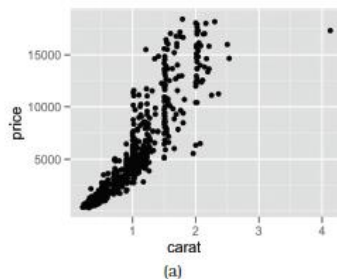


Gráfico de burbujas

Ejemplo: <https://www.nytimes.com/interactive/2018/02/08/learning/13WGOITGraphLN.html>

Separar, ordenar y alineal: Regiones categóricas

La semántica de los atributos
categóricos sí se ajusta a la idea de la
idea de una región espacial: las regiones
son áreas contiguas delimitadas que son
distintas entre sí.

Regiones categóricas

Separar

- Necesaria
- Según un atributo categórico

→ Separate



Ordenar

- Necesaria
- Según un atributo ordenado
- El atributo debe tener una semántica ordenada \neq categórico

→ Order



Alinear

- Opcional
- Según un atributo ordenado
- El atributo debe tener una semántica ordenada \neq categórico

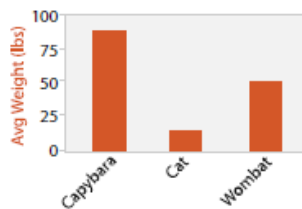
→ Align



Gráfico de barras

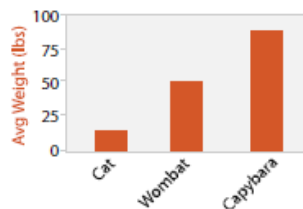
Una llave, un valor

| | |
|-------------|--|
| Idiom | Bar Charts |
| What: Data | Table: one quantitative value attribute, one categorical key attribute. |
| How: Encode | Line marks, express value attribute with aligned vertical position, separate key attribute with horizontal position. |
| Why: Task | Lookup and compare values. |
| Scale | Key attribute: dozens to hundreds of levels. |



Animal Type

(a)

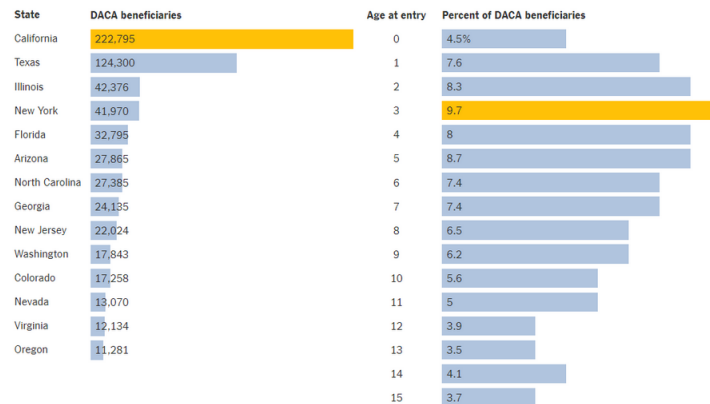


Animal Type

(b)

WHAT'S GOING ON IN THIS GRAPH?

What's Going On in This Graph? | Dec. 5, 2018



<https://www.nytimes.com/2018/11/29/learning/whats-going-on-in-this-graph-dec-5-2018.html>

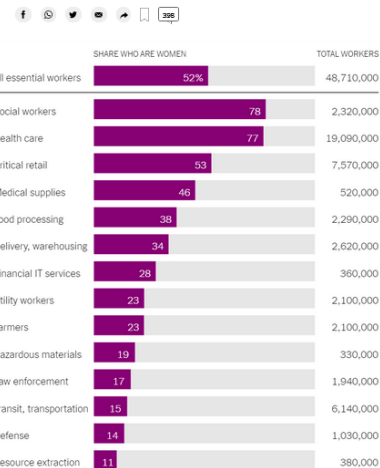
Grafico de barras apilado

Dos llaves, un valor

| | |
|-------------|--|
| Idiom | Stacked Bar Charts |
| What: Data | Multidimensional table: one quantitative value attribute, two categorical key attributes. |
| How: Encode | Bar glyph with length-coded subcomponents of value attribute for each category of secondary key attribute. Separate bars by category of primary key attribute. |
| Why: Task | Part-to-whole relationship, lookup values, find trends. |
| Scale | Key attribute (main axis): dozens to hundreds of levels. Key attribute (stacked glyph axis): several to one dozen |

What's Going On in This Graph?| Essential Workers

Who are our essential workers?



Source: American Community Survey microdata, 2014-18; ipums.org - By The New York Times

<https://www.nytimes.com/2020/09/24/learning/whats-going-on-in-this-graph-essential-workers.html>

Gráficos de barras apiladas normalizado

| | |
|---------------|---|
| Idiom | Normalized Stacked Bar Charts |
| What: Data | Multidimensional table: one quantitative value attribute, two categorical key attributes. |
| What: Derived | One quantitative value attribute (normalized version of original attribute). |
| Why: Task | Part-whole relationship. |
| How: Encode | Line marks with length channel; rectilinear layout. |
| Scale | One dozen categories for stacked attribute. Several dozen categories for axis attribute. |

Stacked Bar Chart

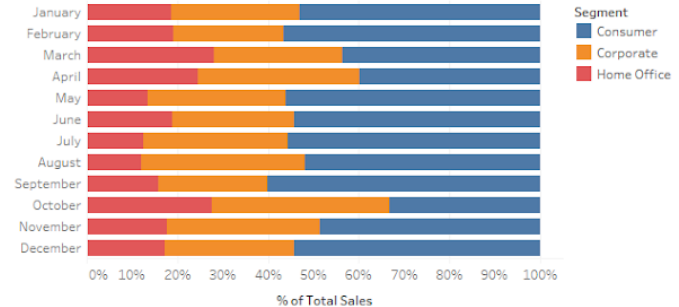
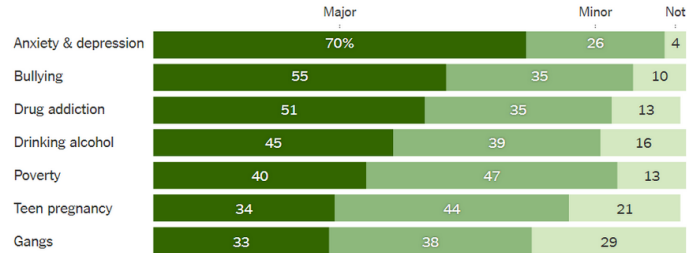


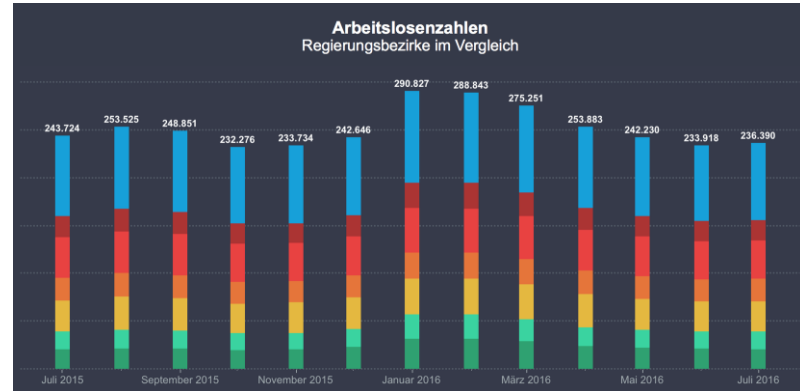
Grafico de barras apilado

What's Going On in This Graph? | Mental Health of Teenagers

What percentage of teenagers see problems like anxiety, bullying, drug addiction and gangs as either major or minor among their peers?



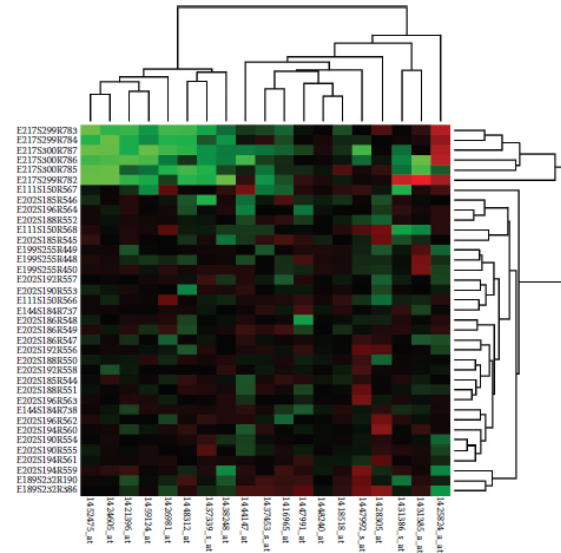
<https://www.nytimes.com/2020/03/12/learning/whats-going-on-in-this-graph-mental-health-of-teenagers.html>



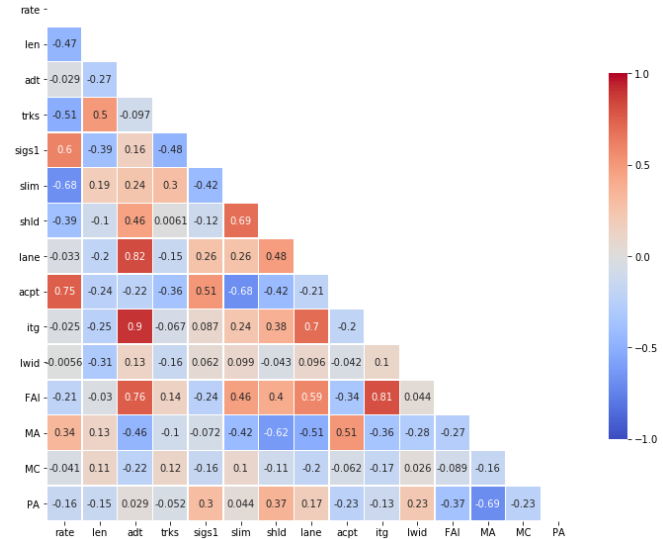
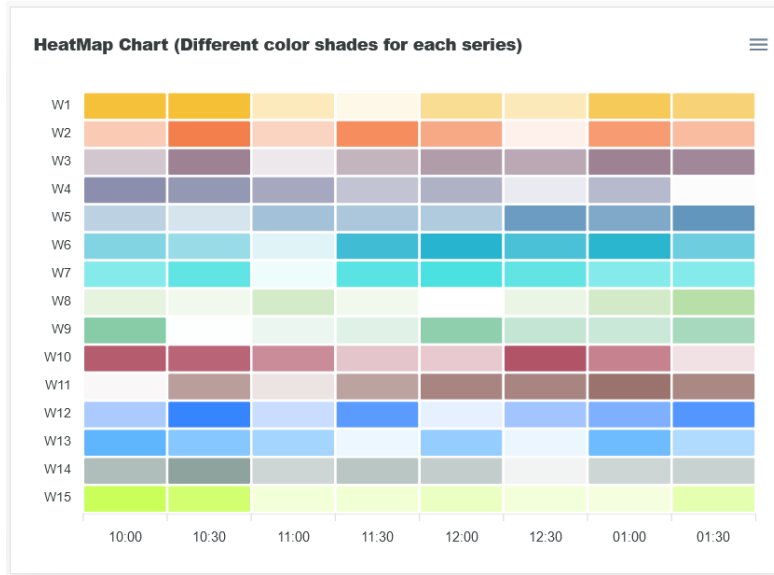
<https://eagereyes.org/techniques/stacked-bars-are-the-worst>

Mapa de calor

| | |
|---------------|--|
| Idiom | Heatmaps |
| What: Data | Table: two categorical key attributes (genes, conditions), one quantitative value attribute (activity level for gene in condition). |
| How: Encode | 2D matrix alignment of area marks, diverging color-map. |
| Why: Task | Find clusters, outliers; summarize. |
| Scale | Items: one million. Categorical attribute levels: hundreds. Quantitative attribute levels: 3–11. |
| Idiom | Cluster Heatmaps |
| What: Derived | Two cluster hierarchies for table rows and columns. |
| How: Encode | Heatmap: 2D matrix alignment, ordered by both cluster hierarchies. Dendrogram: connection line marks for parent–child relationships in tree. |



Mapa de calor



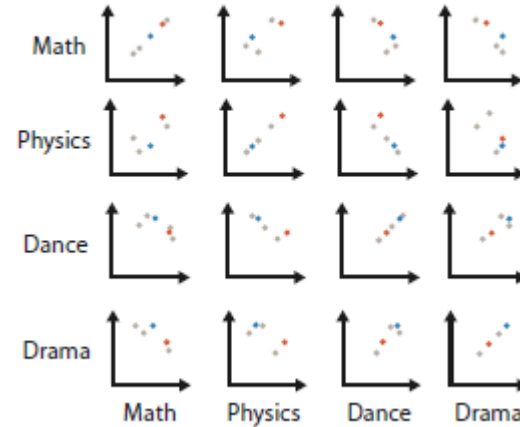
<https://apexcharts.com/angular-chart-demos/heatmap-charts/multiple-colors/>

<https://towardsdatascience.com/annotated-heatmaps-in-5-simple-steps-cc2a0660a27d>

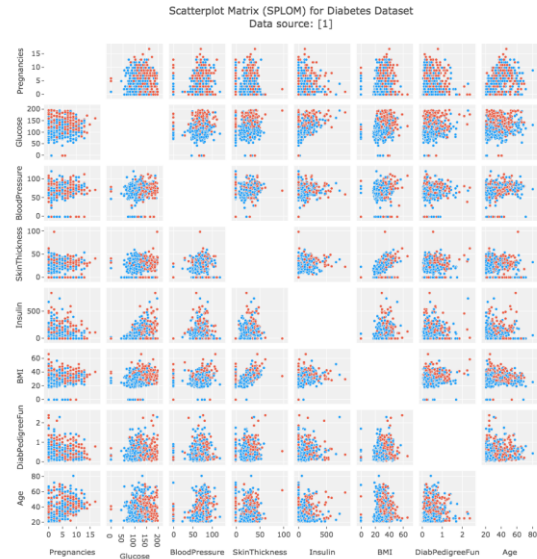
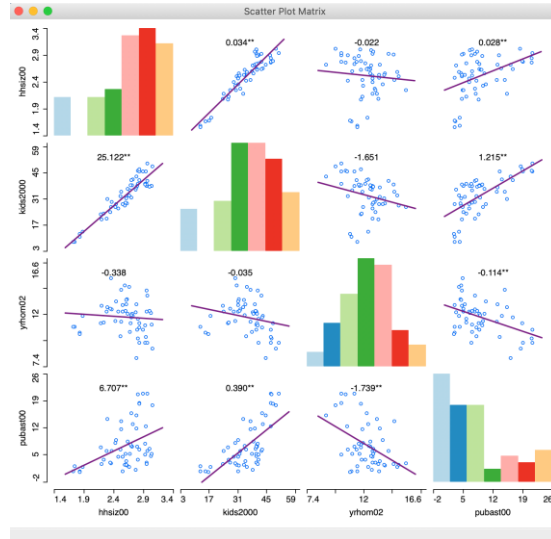
Matriz de dispersión (SPLOM)

| | |
|---------------|--|
| Idiom | Scatterplot Matrix (SPLOM) |
| What: Data | Table. |
| What: Derived | Ordered key attribute: list of original attributes. |
| How: Encode | Scatterplots in 2D matrix alignment. |
| Why: Task | Find correlation, trends, outliers. |
| Scale | Attributes: one dozen. Items: dozens to hundreds. |

Scatterplot Matrix



Matriz de dispersión (SPLOM)



https://geodacenter.github.io/workbook/2b_edata_multi/lab2b.html

<https://blog.plotly.com/post/174657459542/what-is-a-splom-chart-making-scatterplot-matrices>

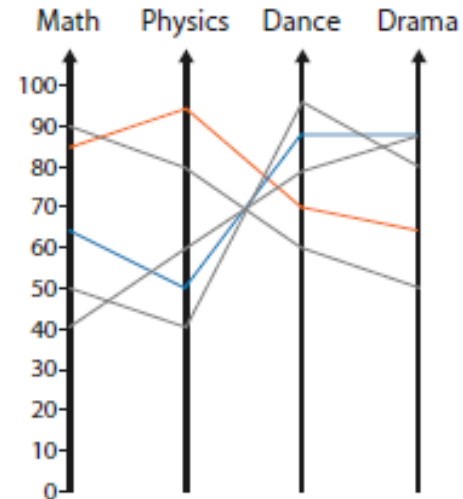
Orientación del eje espacial

Otra opción de diseño con el uso del espacio es cómo orientar los ejes espaciales: si se utiliza una disposición rectilínea (los que acabamos de ver), paralela o radial.

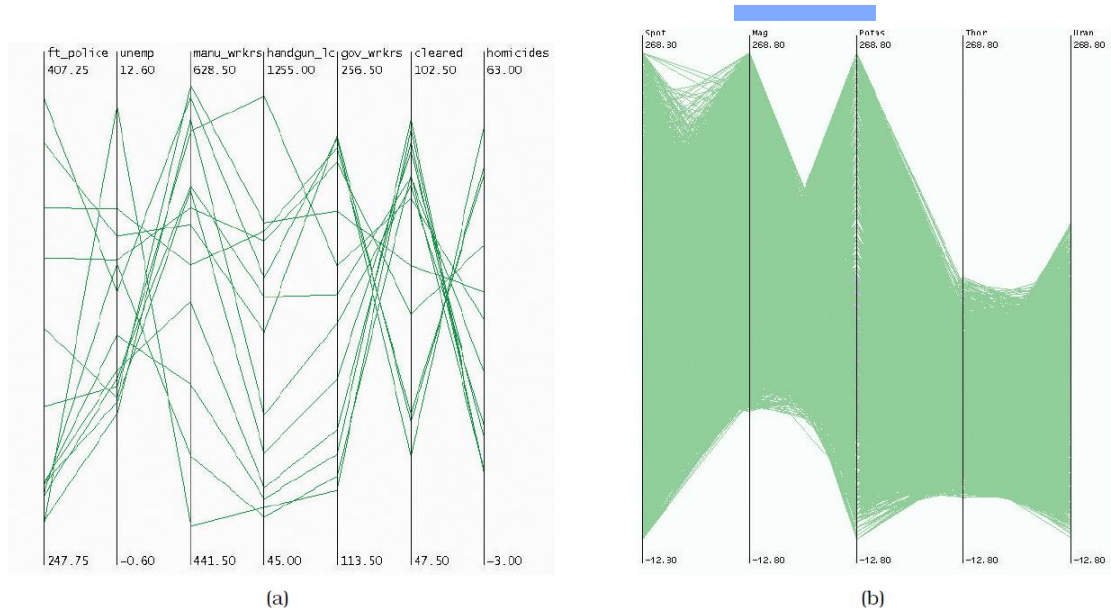
Coordenadas paralelas

| | |
|-------------|--|
| Idiom | Parallel Coordinates |
| What: Data | Table: many value attributes. |
| How: Encode | Parallel layout: horizontal spatial position used to separate axes, vertical spatial position used to express value along each aligned axis with connection line marks as segments between them. |
| Why: Tasks | Find trends, outliers, extremes, correlation. |
| Scale | Attributes: dozens along secondary axis. Items: hundreds. |

Parallel Coordinates



Coordenadas paralelas

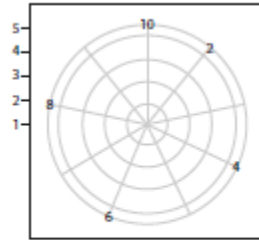


¡Hay que
entrenar al
usuario!

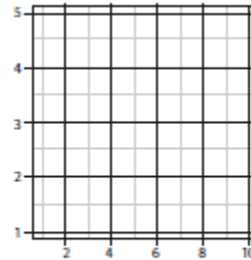
Figure 7.14. Parallel coordinates scale to dozens of attributes and hundreds of items, but not to thousands of items. (a) Effective use with 13 items and 7 attributes. (b) Ineffective use with over 16,000 items and 5 attributes. From [Fua et al. 99, Figures 1 and 2].

Distribuciones radiales

En una disposición espacial radial, los elementos se distribuyen alrededor de un círculo utilizando el canal angular además de uno o más canales espaciales lineales, a diferencia de las distribuciones rectilíneas que utilizan sólo dos canales espaciales.



(a)



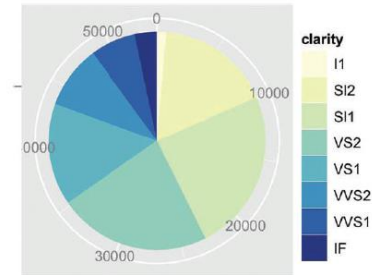
(b)



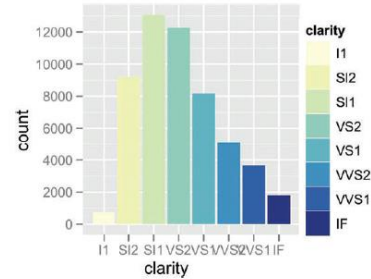
(c)

Gráficos de torta

| | |
|-------------|---|
| Idiom | Pie Charts |
| What: Data | Table: one quantitative attribute, one categorical attribute. |
| Why: Task | Part-whole relationship. |
| How: Encode | Area marks (wedges) with angle channel; radial layout. |
| Scale | One dozen categories. |

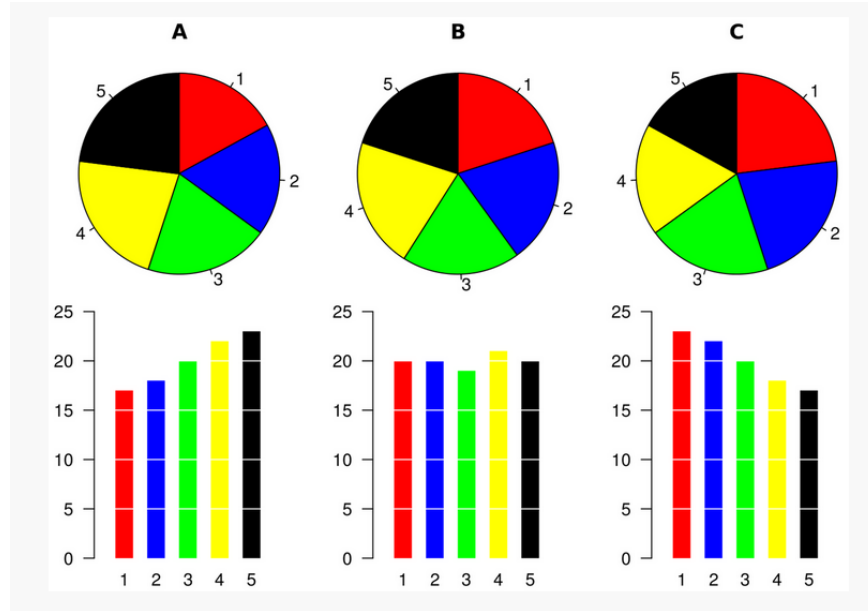


(a)



(b)

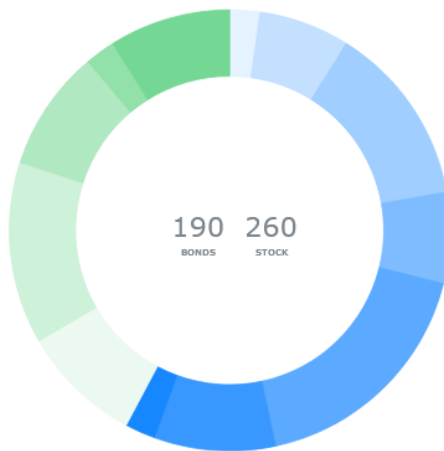
Gráficos de torta



Donut chart

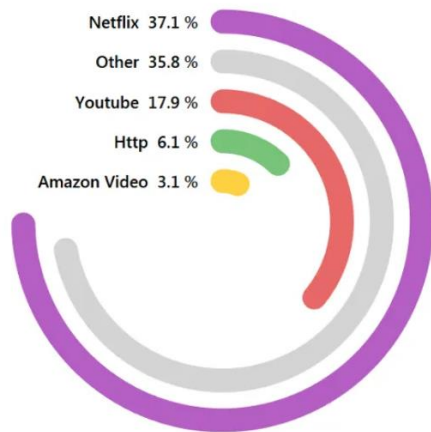


Donut chart with grouped points
and custom interactivity

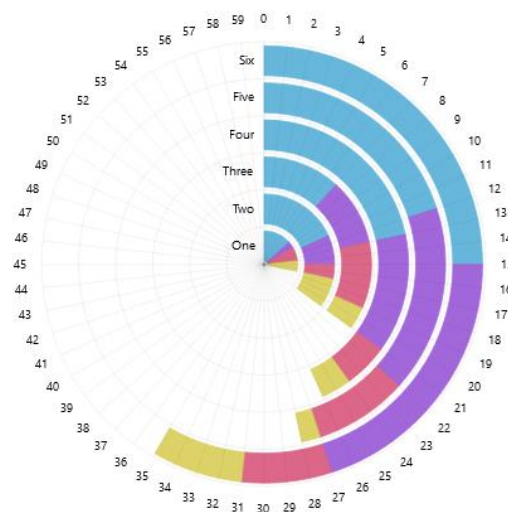


https://www.anychart.com/es/products/anychart/gallery/Pie_and_Donut_Charts/Donut_Chart_with_Custom_Categories.php

Gráficos de barras radiales y apiladas



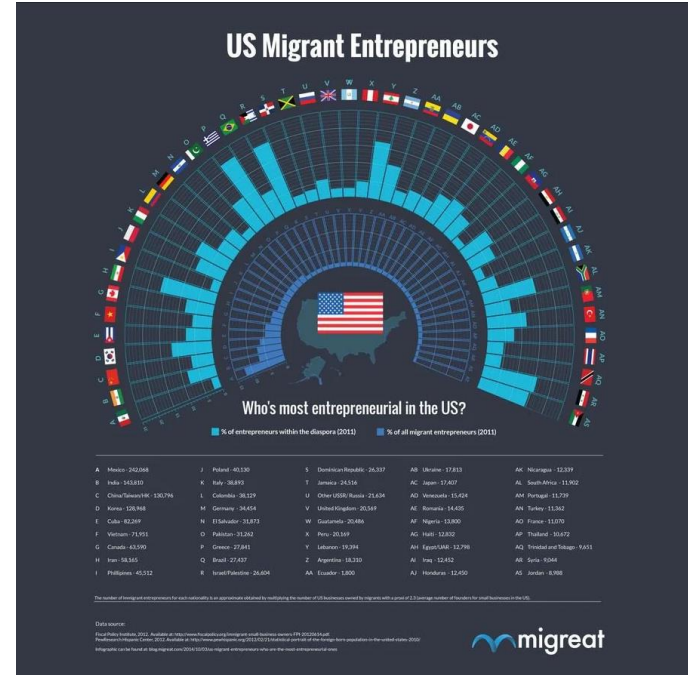
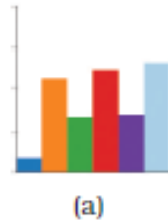
<https://tableaumagic.com/radial-bar-chart-tutorial/>



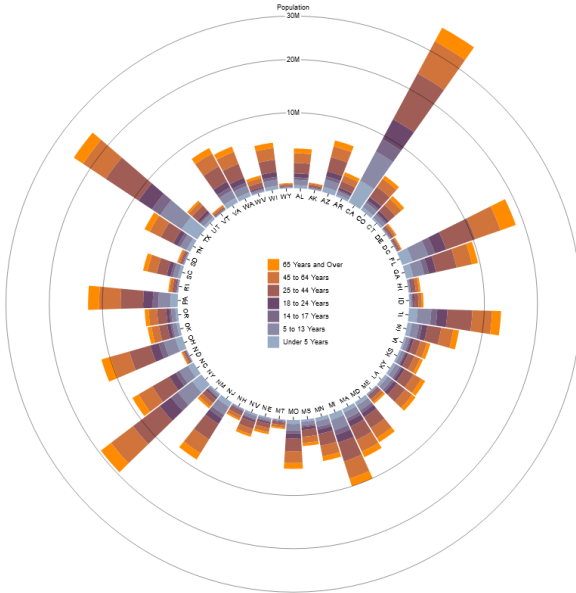
<https://www.amcharts.com/demos/radial-bar-chart/>

Gráficos de barras radiales

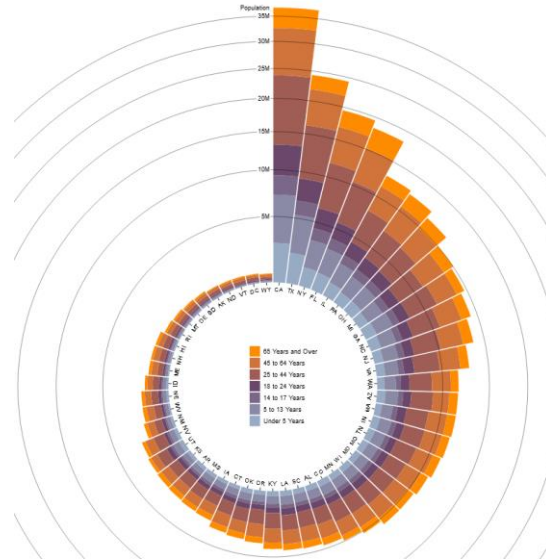
| | |
|-------------|---|
| Idiom | Radial Bar Charts |
| What: Data | Table: one quantitative attribute, one categorical attribute. |
| How: Encode | Length coding of line marks; radial layout. |



Gráficos de barras radiales apiladas



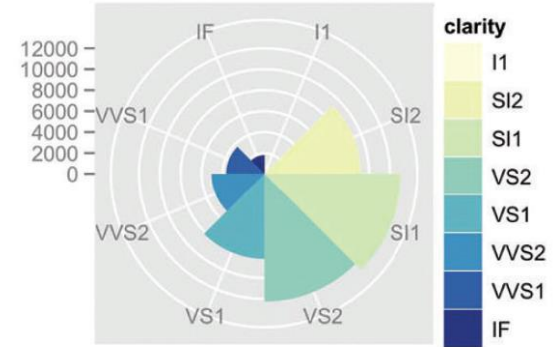
<https://observablehq.com/@d3/radial-stacked-bar-chart>



<https://observablehq.com/@d3/radial-stacked-bar-chart-ii>

Gráfico de áreas polares

| Idiom | Polar Area Charts |
|-------------|---|
| What: Data | Table: one quantitative attribute, one categorical attribute. |
| Why: Task | Part-whole relationship. |
| How: Encode | Area marks (wedges) with length channel; radial layout. |
| Scale | One dozen categories. |



¡Este (casi) siempre es mejor!

Gracias!

¿Preguntas?