



Making data visualisations like a pro: D3.js

Direction Access to and Reuse of Public Information

Unit EU Open Data and CORDIS

Sector EU Open Data

ISA2 programme



What's ISA2?

ISA2 supports the development of **digital solutions** enabling public administrations, businesses and citizens in Europe to benefit from **interoperable cross-border** and **cross-sector public services**.

How OP is involved in ISA2?

OP is aiming at improving open services in the areas of:

- Data visualisation
- Linked open data
- Persistent identification



Upcoming training & workshop sessions

Topic	Type of session	Lux.	Bxl.
Going beyond bars and lines	Training	-	30/09
Telling your story through data visualisation	Training	22/10	2/10
Making great online visualisations without coding	Training	23/10	4/10
Applying data visualisation in use cases	Workshop	24/10	-



Upcoming webinars



A webinar banner with a dark blue background. On the left is a circular data visualization with a yellow center and various colored segments. On the right, a calendar icon shows '26 SEPTEMBER' and a clock icon shows '10 CEST'. Below this, the text reads 'WEBINAR ON DATA VIZ' and 'Telling your story through data visualisation'.

Learn more details on webinar and registration on Joinup:

<https://joinup.ec.europa.eu/collection/joinup/event/register-now-telling-your-story-through-data-visualisation>



A webinar banner with a dark blue background. On the left is a circular data visualization with a yellow center and various colored segments. On the right, a calendar icon shows '10 OCTOBER' and a clock icon shows '10 CEST'. Below this, the text reads 'WEBINAR ON DATA VIZ' and 'Going beyond bars and lines practising non-standard data visualisation'.

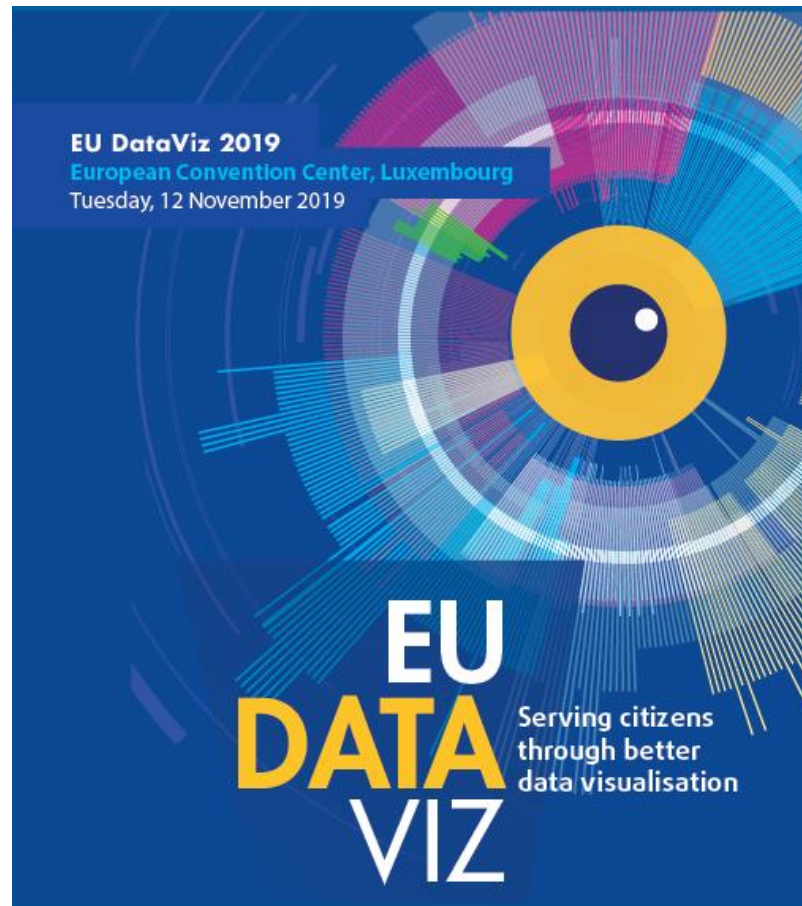
Learn more details on webinar and registration on Joinup:

<https://joinup.ec.europa.eu/collection/joinup/event/register-now-practising-non-standard-data-visualisation>

e-mail: op-odp-contact@publications.europa.eu



Conference EU DataViz, 12 November 2019



e-mail: op-eu-dataviz@publications.europa.eu



Agenda

09:00 Introduction

Web development 101

10:30 Coffee break

D3.js

Exercise: drawing with D3.js

12:00 - 13:00 Lunch

Exercise: An animated bubble chart with D3.js

14:30 Coffeekbreak

Exercise: An animated bubble chart with D3.js

16:30 Q&A



1. INTRODUCTION





Participants

Institution/DG and role?

What data and tools do you work with?

Experience in data visualisation?

Coding skills?





2.

WEB DEVELOPMENT 101



Webdev 101

html

HyperText Markup
Language

Structure of a webpage,
rendered by browsers

Consists of elements/tags,
in a hierarchical way

.html

```
<h1>Hello class!</h1>
```

```
<p>Today we are going to make awesome  
graphics <span>with D3!</span></p>
```

```

```



Webdev 101

svg

Scalable Vector Graphics

Scalable images for the web

Part of html

Text based

Animatable

```
<svg width="100"height="100">  
  <circle cx ="50" cy="50"  
    r="40"  
    stroke="green"  
    stroke-width="4"  
    fill="yellow"/>  
</svg>
```



Webdev 101

CSS

Cascading Style Sheets

How html elements should be displayed

In separate .css file, or inline in html

```
body {  
    font-family: Arial  
}
```

```
h1 {  
    font-size: 52px  
}
```

```
p {  
    font-size: 24px  
}
```

```
span {  
    background-color: #910000;  
    padding-left: 4px;  
    padding-right: 4px;  
    color: white;  
}
```



Webdev 101

javascript

Language to make
webpages dynamic

Update content

Animations

Control multimedia

...

.js

```
var circle =  
document.querySelector("circle");  
circle.addEventListener("click",  
function() {  
    circle.setAttribute("fill", "blue")  
}  
);
```



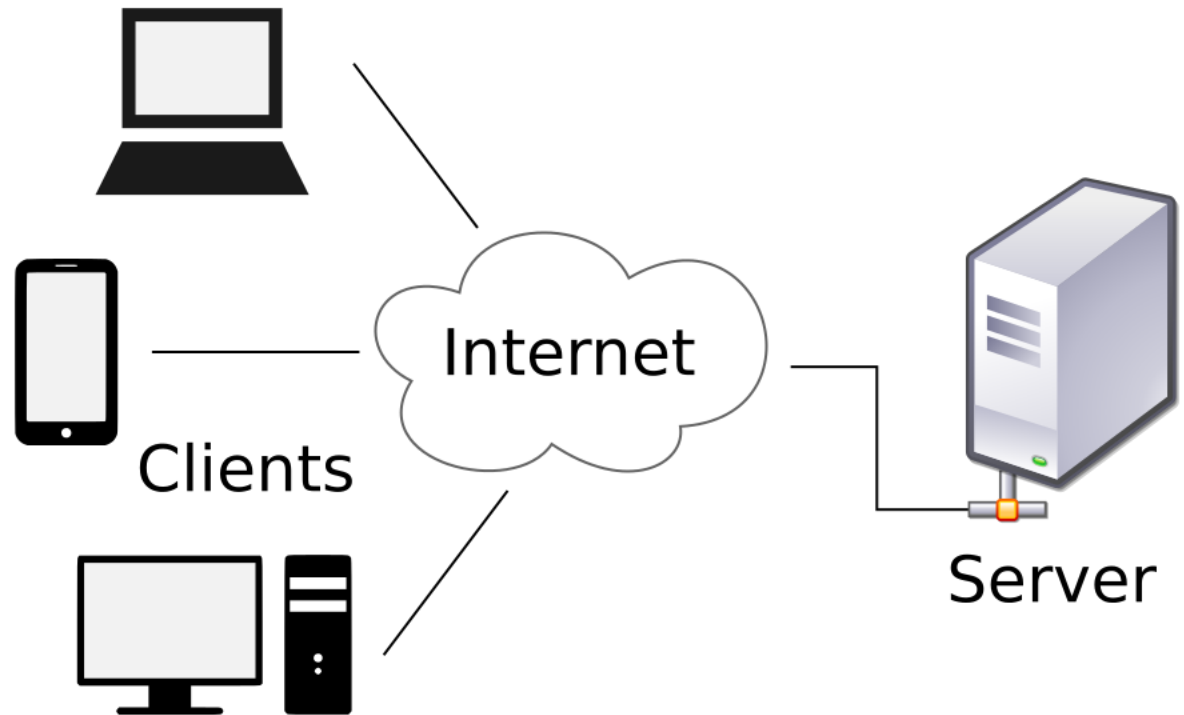
Webdev 101

Servers & clients

Files (.html, .css, .js) are served to the client by a server

To develop a web visualisation, you need a server

But we will use [jsbin](#) instead



Webdev 101

Exercise

Open webpage

View source: click-right => View page source

Inspect element: click-right => Inspect element

In Developer Tools:

- Inspector

- Styles

- Console

Webdev 101

Exercise: JSBin

Open jsbin.com/zukalsex/2/edit and play around a little bit

Add

```
console.log("Logging to the console");
```

to the javascript, and open the console tab

Add

```
var sum = 4 + 12;
```

```
console.log(sum);
```

to the javascript

2.

D3.JS



D3.js

Bind data to html- elements

[D3js.org](https://d3js.org)

Data Driven Documents

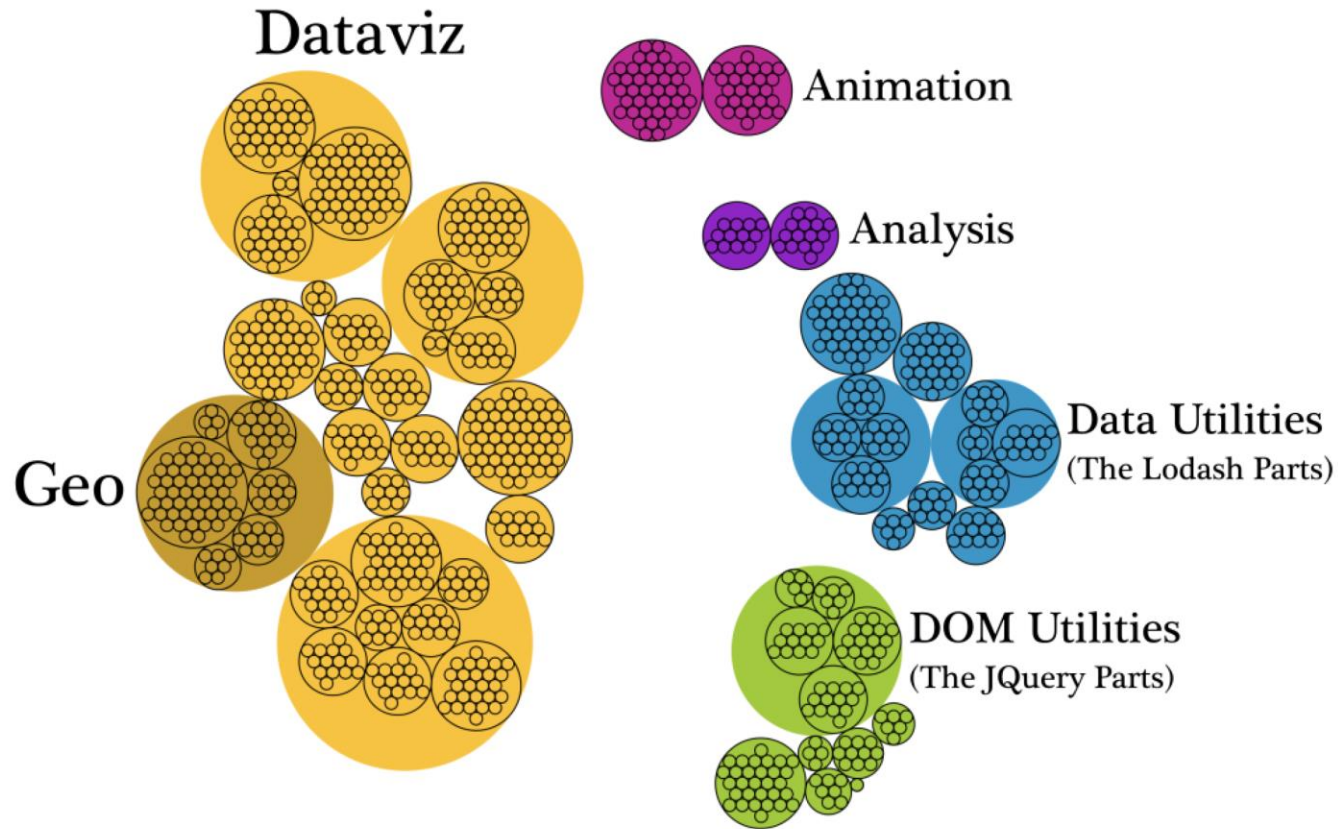
"A JavaScript library for manipulating documents based on data. **D3** helps you bring data to life using HTML, SVG, and CSS"



D3.js Functions

- Selecting elements
- Creating elements
- Data loading
- Data transformations
- Scales
- Colors
- Chart layouts
- Maps
- Number and date/time formatting

...



The D3 API

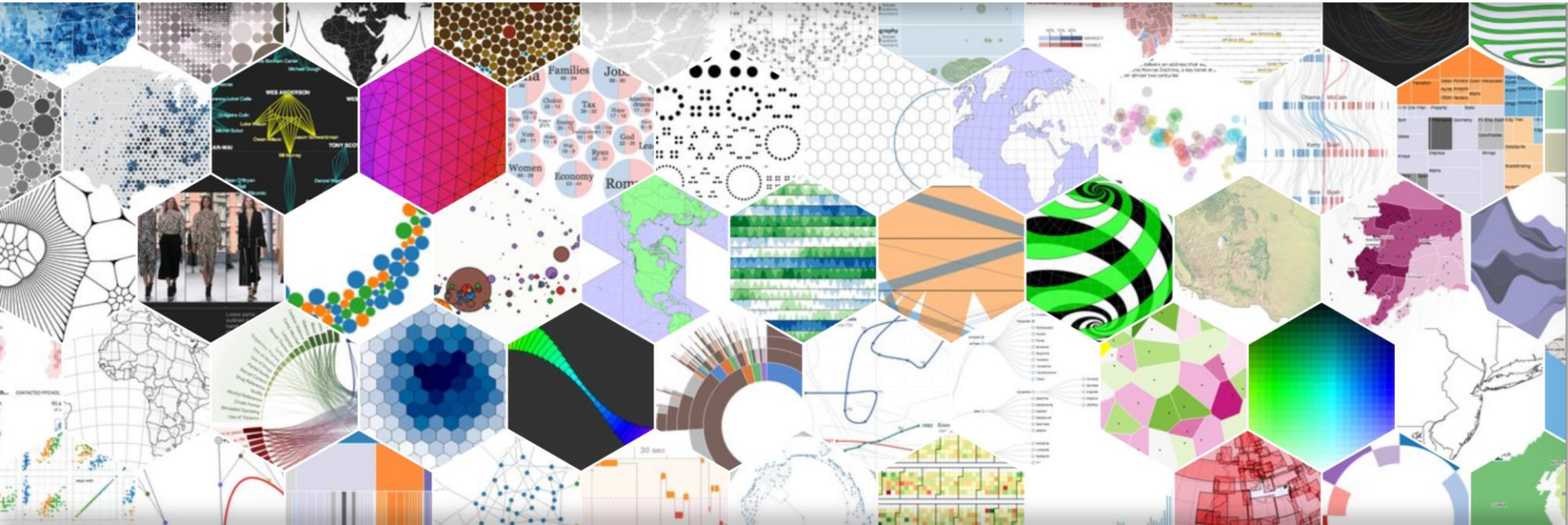


D3.js is not...

... a charting library, it has
no ready made charts

...very easy to learn

...a data analytics tool



D3.js Examples

Basic example: [Basic pie](#)

More examples:

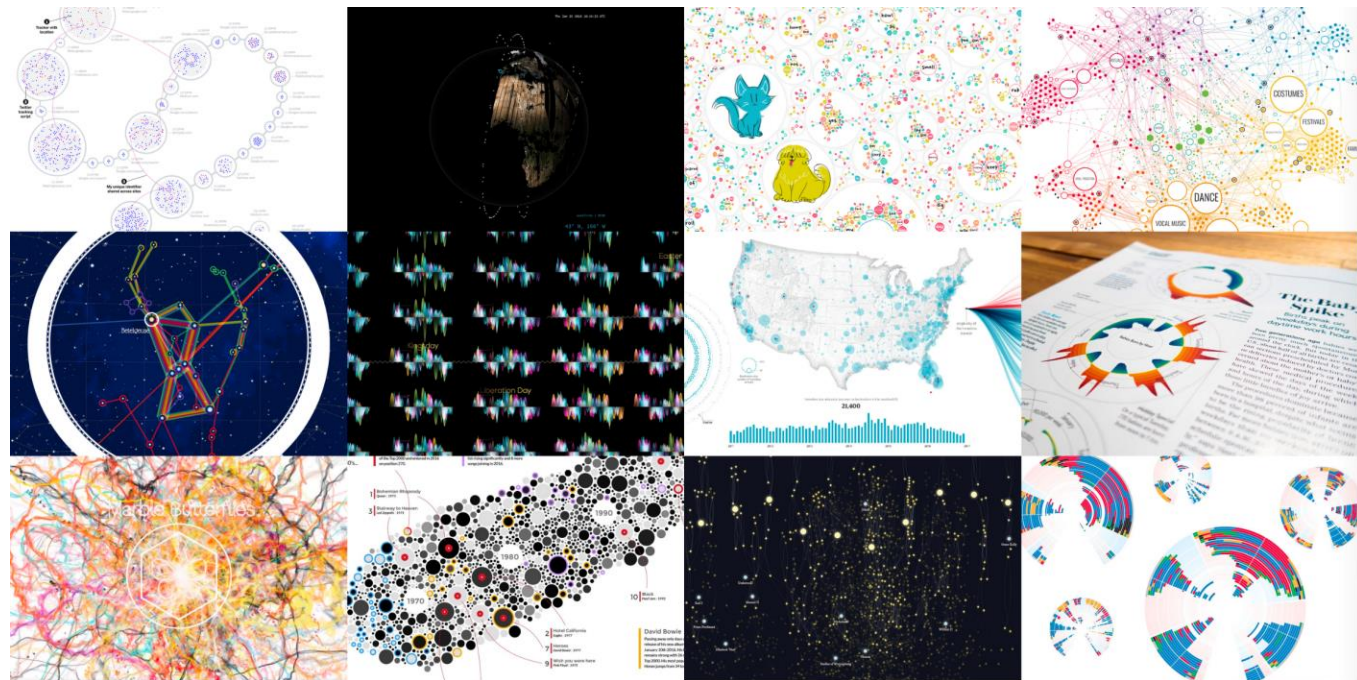
[Gallery](#)

[Blockbuilder](#) ([search](#))

Advanced:

[Nadieh Bremer](#)

[visualcinnamon.com](#)



D3.js

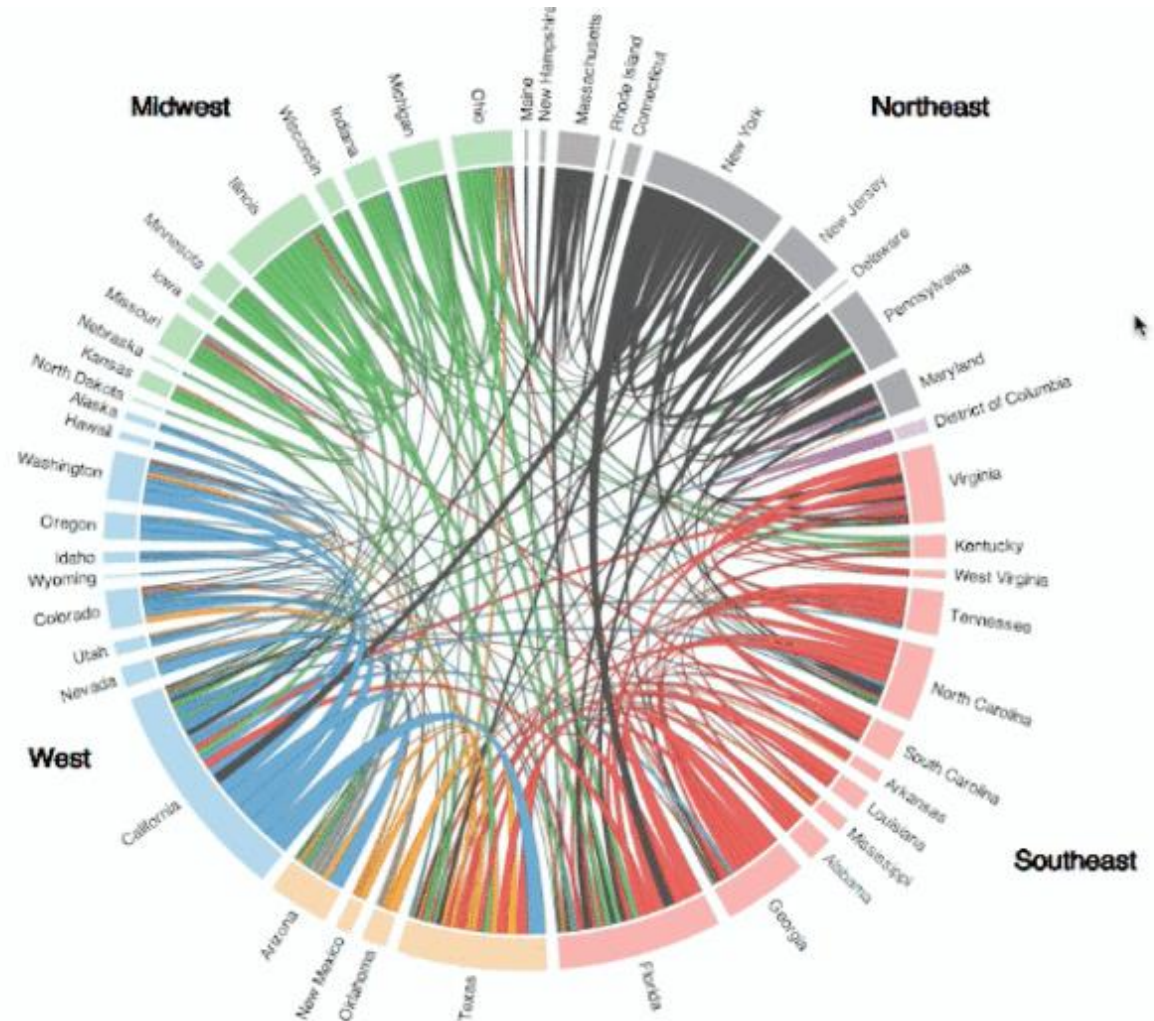
When to use

Animated charts

Dynamic charts

Custom chart types

Visualising data on the web





3.

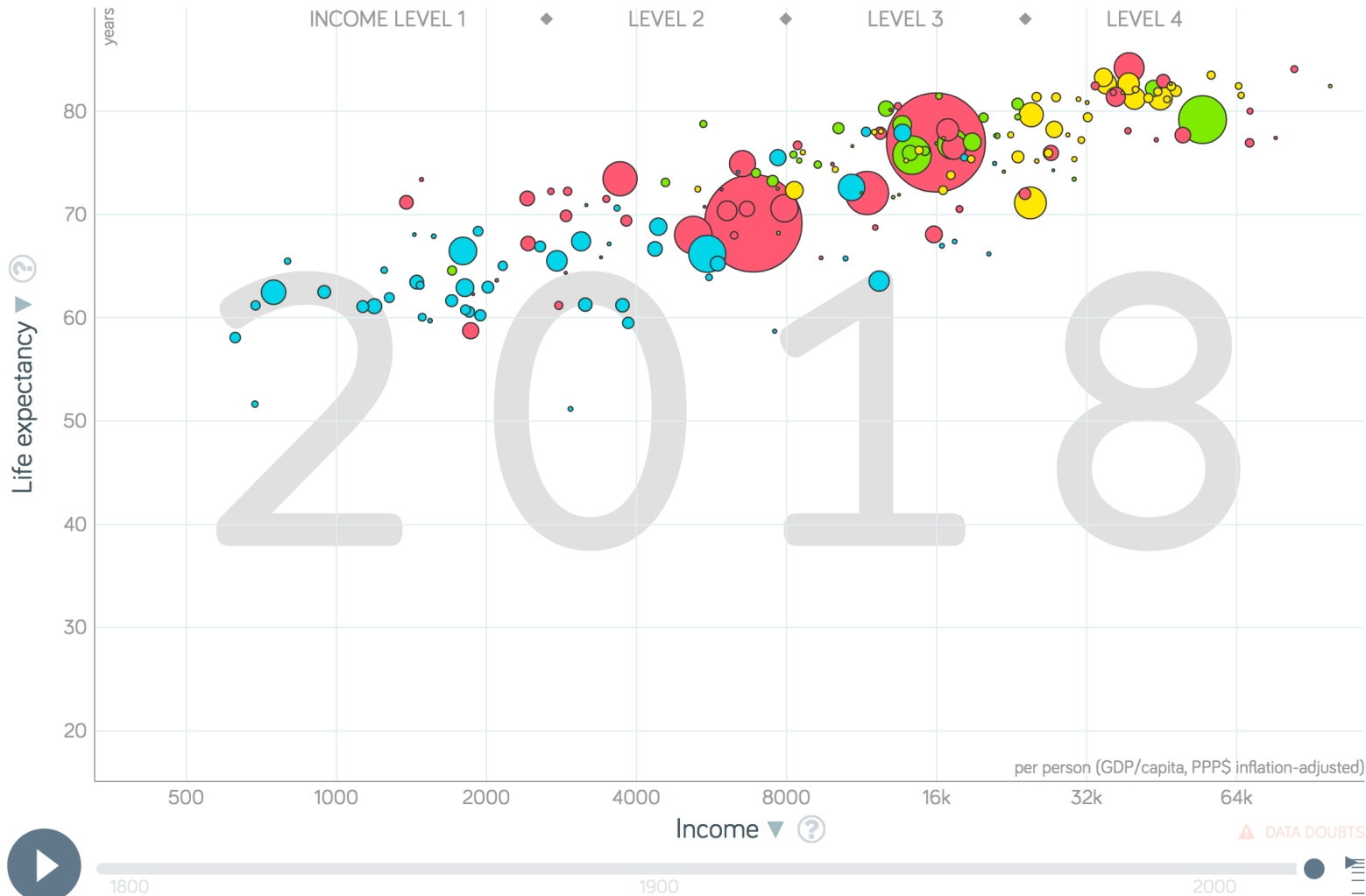
A BUBBLE CHART WITH D3.JS



D3.js

What we are going to make

Gapminder bubble chart



D3.js

Exercise: setup

Go to jsbin.com

Keep 1 jsbin open and try to follow me. Open the solutions if you get stuck

Load version 5 of D3 (see d3js.org homepage)

Set up svg, 800 pixels wide and 600 pixels high

Solution: jsbin.com/nipefeb/1/edit

Append a circle to the svg with d3

jsbin.com/nipefeb/2/edit

A bubble chart

Data

Inline data

```
var data = [  
  {"name": "datapoint1", "value": 20},  
  {"name": "datapoint2", "value": 33}  
]
```

Load csv

Log data

```
d3.csv()
```

```
console.log(data)
```



A bubble chart

Draw elements with data

Select elements

Bind data with `.data()`

`.enter()`

`.append()`

```
svg.selectAll("circle")  
  .data(circledata)  
  .enter()  
  .append("circle")  
  .attr("cx", (d) => d.x)  
  .attr("cy", (d) => d.y)  
  .attr("r", (d) => d.radius)
```



D3.js

Draw circles

Draw 2 (or more circles) from data with D3

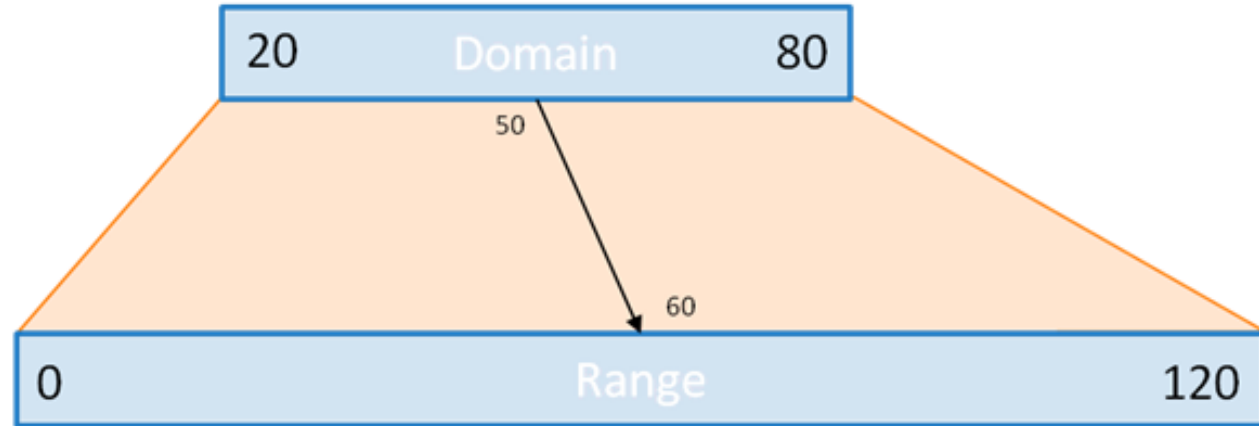
jsbin.com/nipefeb/4/edit

A bubble chart Scales

Map data to visual
properties of elements

From input domain to
output range

[d3.scaleLinear\(\)](#)



A bubble chart

Load data, set up scales

Load data with `d3.csv` and convert to numbers

Define linear X scale

Define linear Y scale (from bottom to top)

jsbin.com/nipefeb/7/edit

A bubble chart

Scales

`d3.scaleSqrt()` for radius

`d3.scaleOrdinal()` for colors

stroke & fill properties

2 ways of adding color: as
a style attribute, or
through classes and css

`d3.scaleLog()`



A bubble chart

Scale and fill circles, logarithmic scale

Scale circles with `d3.scaleSqrt()`

jsbin.com/nipefeb/8/edit

Convert X scale to logarithmic scale with `d3.scaleLog()`

jsbin.com/nipefeb/10/edit

Add scale to fill circles by continent

jsbin.com/nipefeb/11/edit

A bubble chart

Sort data

Sort data to show small bubbles on top

Not D3, but "vanilla" javascript

```
data.sort(function(a,b) {  
    return b.population - a.population;  
})
```



A bubble chart

Sort data

Sort the data (also try to revert the sorting)

jsbin.com/nipefeb/12/edit

A bubble chart

Plot margins

D3 margin convention

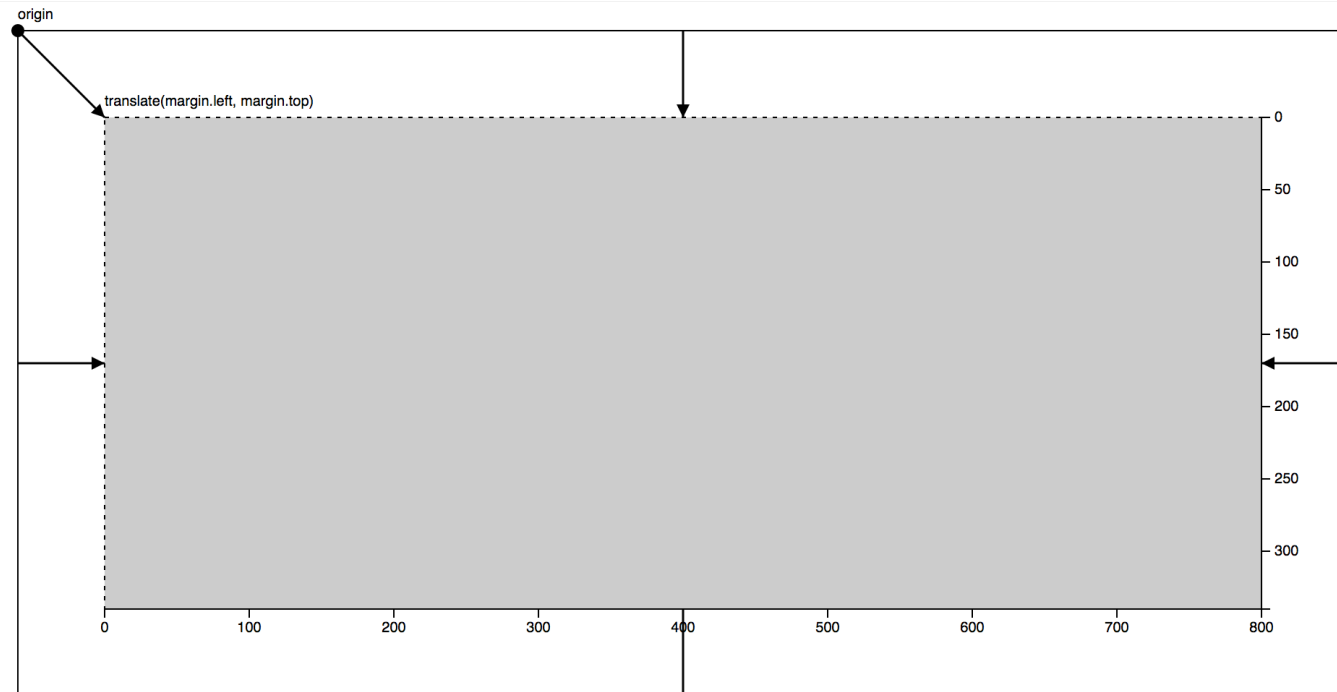
Add a `<g>` element

Transform

Adjust scales

`d3.axisBottom()`

`d3.axisLeft()`



A bubble chart

Margins convention, x and y axes

jsbin.com/nipefeb/14/edit

A bubble chart

Number formats

`axis.tickFormat()`

`axis.tickSizeInner()`

`.append("text")`

Style text with css



A bubble chart

Tick format and tick size

Format numbers

jsbin.com/nipefeb/15/edit

Add grid with negative inner tick size

jsbin.com/nipefeb/16/edit

Text for the year

jsbin.com/nipefeb/18/edit

A bubble chart

Interactivity: tooltips

Tooltip

Adding a div element

```
tooltip.on("mouseover", ...)
```

```
tooltip.on("mouseout", ...)
```



A bubble chart

Tooltips

Add a tooltip

jsbin.com/nipefeb/19/edit

A bubble chart

Interactivity: animation

New data

Convert new data to
numbers

```
<input type="radio">
```

```
.on("change", ...)
```



A bubble chart

Animation

Load and convert new csv file

jsbin.com/nipefeb/21/edit

Add radio buttons and add event listener

jsbin.com/nipefeb/23/edit

A bubble chart

Interactivity: animation

`.transition().duration()`



A bubble chart Animation

Add animation with `.transition()`

jsbin.com/nipefeb/24/edit

A bubble chart

Interactivity: animation

.easing()

Update text



A bubble chart Animation

Change the easing for 1 of the animations
jsbin.com/nipefeb/26/edit

Update the text to the selected year

4. OTHER CHARTS



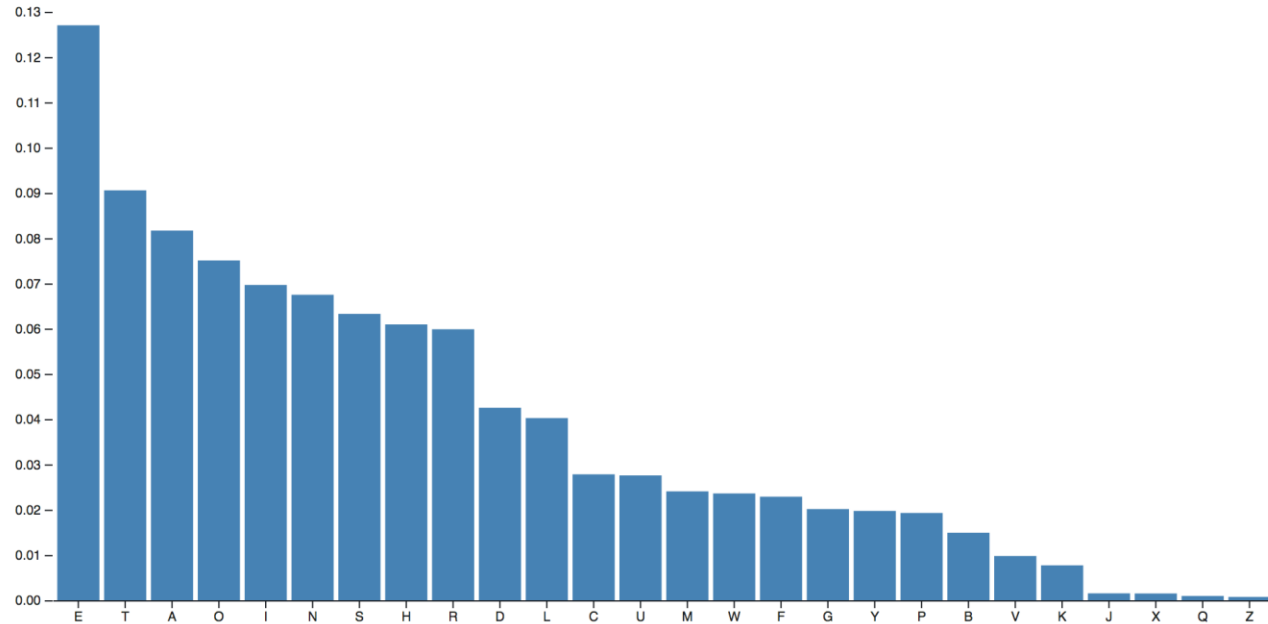
Other charts

Bar chart

Basic Bar Chart

d3.scaleBand()

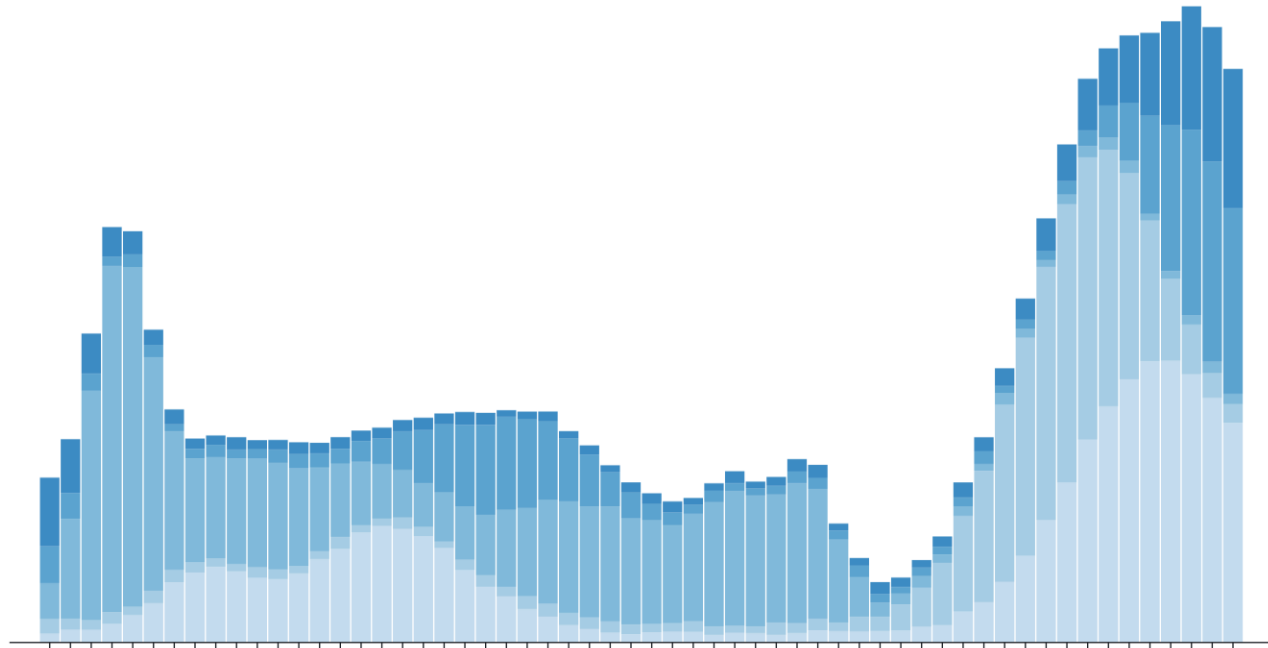
rect elements, with width and height (reversed y scale)



Other charts

Stacked bar chart

[d3.stack\(\)](#)



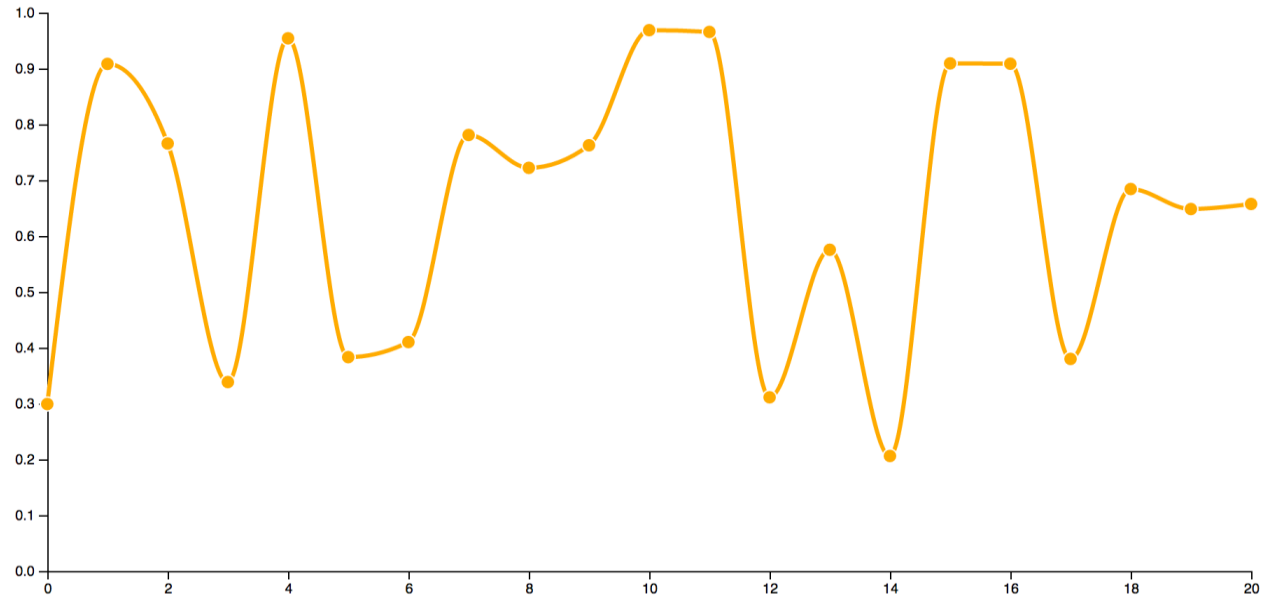
Other charts

Line and area charts

[d3.line\(\)](#)

[D3 v5 line chart](#)

[d3.scaleTime\(\)](#)



Other charts

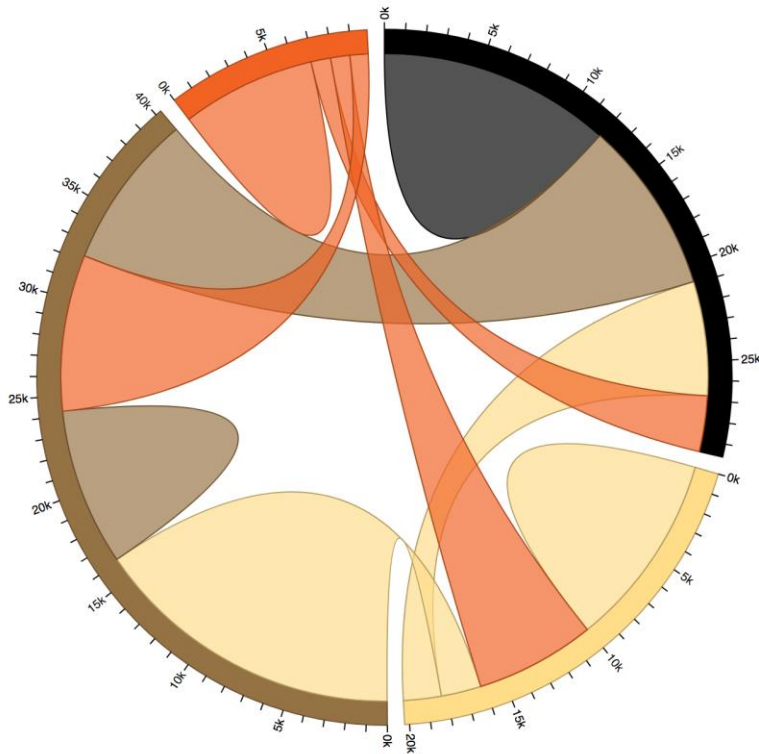
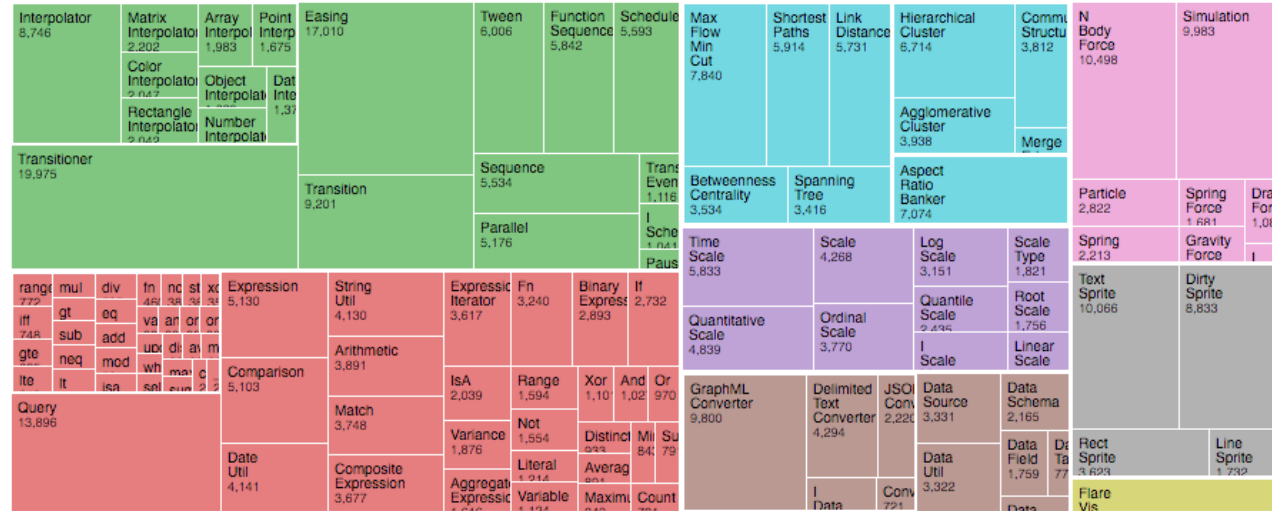
Layouts

[d3.treemap\(\)](#)

[d3.chord\(\)](#)

[d3.forceSimulation\(\)](#)

[D3 showreel](#)



Q&A



Resources

Sites

[D3.js](#)

[Blocks](#)

[Blockbuilder](#)

[Stack Overflow](#)

Books

[D3.js by Example](#)

[How to learn D3.js](#)

[Fullstack D3 and Data Visualization](#)

[Interactive Dataviz for the Web](#)

[D3.js in action](#)

[Best D3.js books for teaching yourself data visualisation with javascript](#)

Courses

[DashingD3js](#)

[Coursera](#)

[Udacity](#)

[Udemy](#)

[Pluralsight](#)

