

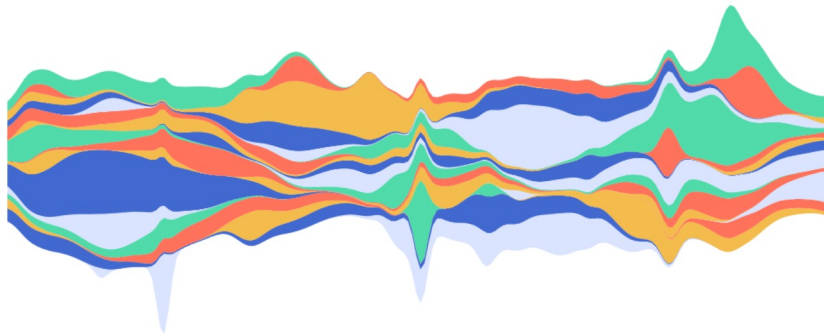


Introduction to D3

Session 1

[Observable notebook](#)

[YouTube video](#)



Introduction to D3

Prerequisites

- You should be somewhat familiar with:
 - Observable
 - JavaScript
 - HTML
 - CSS
- Beginner level is absolutely fine. If you have not already, check out the prerequisites in the course emails.



Agenda

1. What is D3?
2. Observable 101
3. HTML, CSS, JavaScript
4. SVG & the DOM
5. D3 first steps

What is D3?

What is D3?

- D3 stands for:
 - D
 - D
 - D

What is D3?

- D3 stands for:
 - Data
 - D
 - D

What is D3?

- D3 stands for:
 - Data
 - Driven
 - D

What is D3?

- D3 stands for:
 - Data
 - Driven
 - Documents

What is D3?

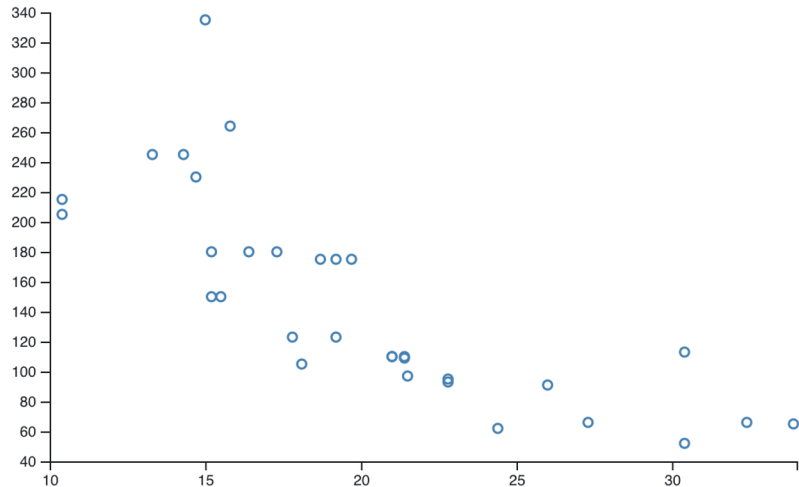
Data-driven documents, where document refers to the Document Object Model (DOM) standard that represents the contents of a webpage.

What is D3?

D3 is not a charting library in a traditional sense. It has no concepts of “charts.” When you visualize data with D3, you compose a variety of primitives. Let’s take a look:

What is D3?

Here is simple
Scatterplot made with
D3



What is D3?

This is all the code for
generating the
Scatterplot.

```
chart = {  
  
  // Specify the chart's dimensions.  
  const width = 500;  
  const height = 300;  
  const marginTop = 25;  
  const marginRight = 20;  
  const marginBottom = 35;  
  const marginLeft = 40;  
  
  // Prepare the scales for positional encoding.  
  const x = d3.scaleLinear()  
    .domain(d3.extent(cars, d => d.mpg)).nice()  
    .range([0, width]);  
  
  const y = d3.scaleLinear()  
    .domain(d3.extent(cars, d => d.hp)).nice()  
    .range([height, 0]);  
  
  // Create the SVG container.  
  const svg = d3.create("svg")  
    .attr("width", width + marginLeft + marginRight)  
    .attr("height", height + marginTop + marginBottom);  
  
  const g = svg.append("g")  
    .attr("transform", `translate(${marginLeft}, ${marginTop})`);  
  
  // Create the axes.  
  g.append("g")  
    .attr("transform", `translate(0,${height})`)  
    .call(d3.axisBottom(x).ticks(width / 80))  
  
  g.append("g")  
    .call(d3.axisLeft(y))  
  
  // Add a layer of dots.  
  g.append("g")  
    .attr("stroke", "steelblue")  
    .attr("stroke-width", 1.5)  
    .attr("fill", "none")  
    .selectAll("circle")  
    .data(cars)  
    .join("circle")  
    .attr("cx", d => x(d.mpg))  
    .attr("cy", d => y(d.hp))  
    .attr("r", 3);  
  
  return svg.node();  
}
```

What is D3?

Here we define the dimensions for the chart.

```
// Specify the chart's dimensions.  
const width = 500;  
const height = 300;  
const marginTop = 25;  
const marginRight = 20;  
const marginBottom = 35;  
const marginLeft = 40;
```

What is D3?

Specify the domain and range for the x and y scale.

```
// Prepare the scales for positional encoding.  
const x = d3.scaleLinear()  
  .domain(d3.extent(cars, d => d.mpg)).nice()  
  .range([0, width]);  
  
const y = d3.scaleLinear()  
  .domain(d3.extent(cars, d => d.hp)).nice()  
  .range([height, 0]);
```

What is D3?

Create our SVG container, which is what we'll return in the end.

```
// Create the SVG container.  
const svg = d3.create("svg")  
  .attr("width", width + marginLeft + marginRight)  
  .attr("height", height + marginTop + marginBottom);
```


What is D3?

Create subcontainers
and axes components.

```
const g = svg.append("g")
  .attr("transform", `translate(${marginLeft}, ${marginTop})`);

// Create the axes.
g.append("g")
  .attr("transform", `translate(0,${height})`)
  .call(d3.axisBottom(x).ticks(width / 80))

g.append("g")
  .call(d3.axisLeft(y))
```

What is D3?

Finally, create the circles for the scatterplot, using the container and scales defined before.

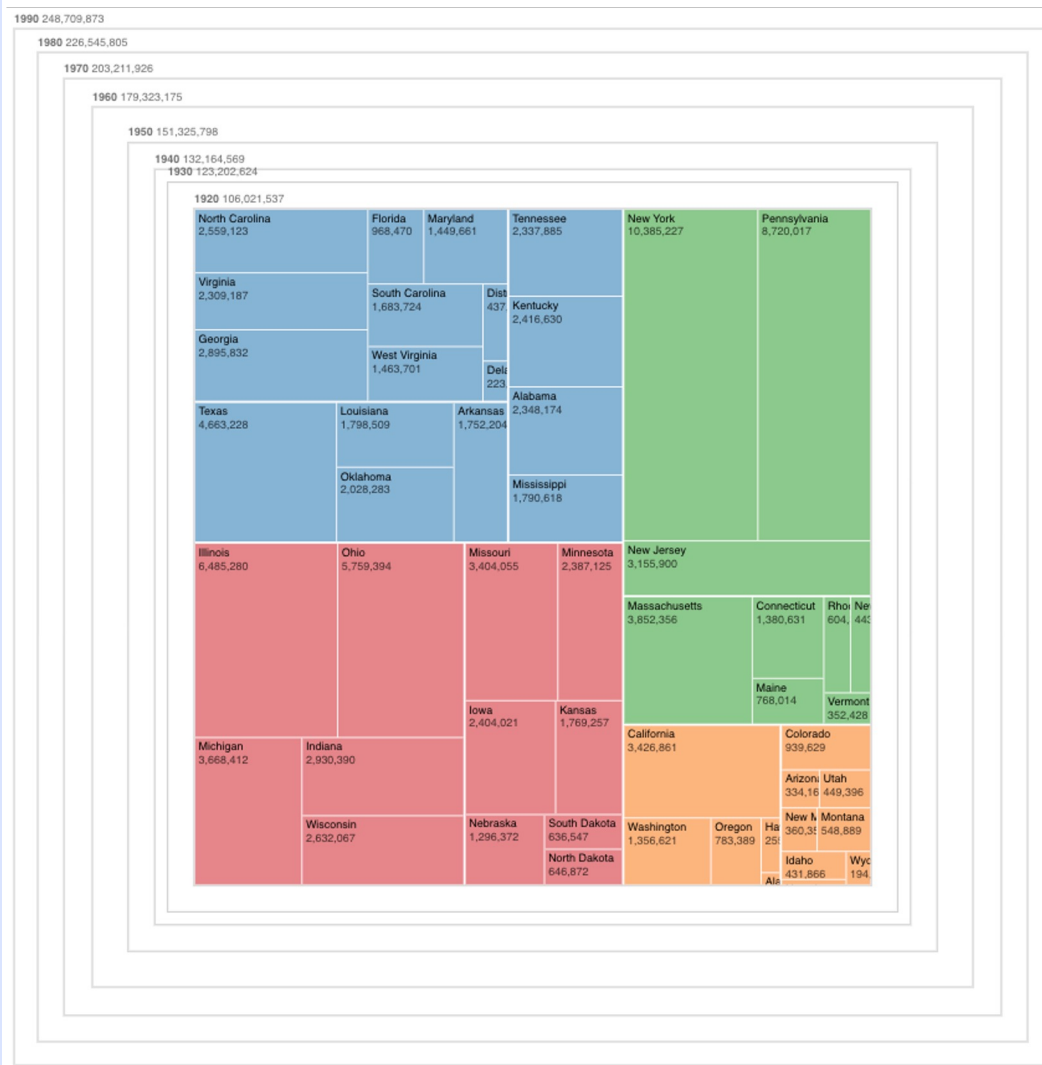
```
// Add a layer of dots.  
g.append("g")  
  .attr("stroke", "steelblue")  
  .attr("stroke-width", 1.5)  
  .attr("fill", "none")  
  .selectAll("circle")  
  .data(cars)  
  .join("circle")  
    .attr("cx", d => x(d.mpg))  
    .attr("cy", d => y(d.hp))  
    .attr("r", 3);
```

Why D3?

- Fully customizable, able to create complicated / novel chart forms, i.e. for **bespoke** visualizations
- Animations, interaction capabilities, i.e. for **dynamic** visualizations

What is D3?

Let's look at an
example of [a chart](#)
[that warrants](#) D3.



What is D3?

How about another?



Observable 101

Observable 101

Teaching D3 often means setting up environments for web development, having a text editor, Python installed, etc.

We're going to use Observable to teach D3 because all those logistics are already handled for us

Activity 1

HTML, CSS, JavaScript

HTML, CSS, JavaScript

These are the core technologies often used with D3 to build visualizations.

HTML, CSS, JavaScript

These are the core technologies often used with D3 to build visualizations. *We will not be covering them in any depth, but rather doing a very quick pass to cover a few crucial topics for working with D3.*

HTML, CSS, JavaScript

- HTML: the standard markup language for documents on the web.
- CSS: a markup language for styling, like adding colors, strokes, fonts.
- JavaScript: the programming language for the web. D3 is a JavaScript framework.

HTML, CSS, JavaScript

- HTML facts to know for D3:
 - Typically when working with D3, we're adding an SVG tag to an HTML document.
 - We often use HTML tags for selecting and inserting our visualization.
 - In Observable, we have methods for writing HTML in Javascript.

HTML, CSS, JavaScript

- CSS facts to know for D3:
 - CSS works for HTML and SVG, and allows us to style our elements.
 - CSS selectors is what we'll often use for D3 to grab the right elements.

HTML, CSS, JavaScript

- JavaScript facts to know for D3:
 - D3 is a JavaScript framework, and while you can do most of your work without having to write Vanilla JS, the more knowledge of JS you have, the more you will be able to do with D3.
 - We're often using IIFE (Immediately Invoked Function Expressions) with D3, and when working with an element with bound data, we get the datum and index for free.

Activity 2 & 3

SVG & the DOM

What is SVG?

SVG stands for **S**calable
Vector **G**raphics.



What is SVG?

SVG stands for **S**calable
Vector **G**raphics.



Raster
GIF, JPEG, PNG



Vector
SVG

What is SVG?

SVG stands for **S**calable
Vector **G**raphics.



```
<svg>  
  <circle r=10 cx=50 cy=50></circle>  
  <circle r=5 cx=75 cy=75></circle>  
  <circle r=20 cx=100 cy=100></circle>  
</svg>
```

SVG & the DOM

- SVG is to graphics what HTML is to text.
- There are specific tags for SVG that don't work in HTML, like circle, rect, path, etc.
- Like HTML, with SVG we're creating a hierarchy of elements, which can be viewed as the DOM.

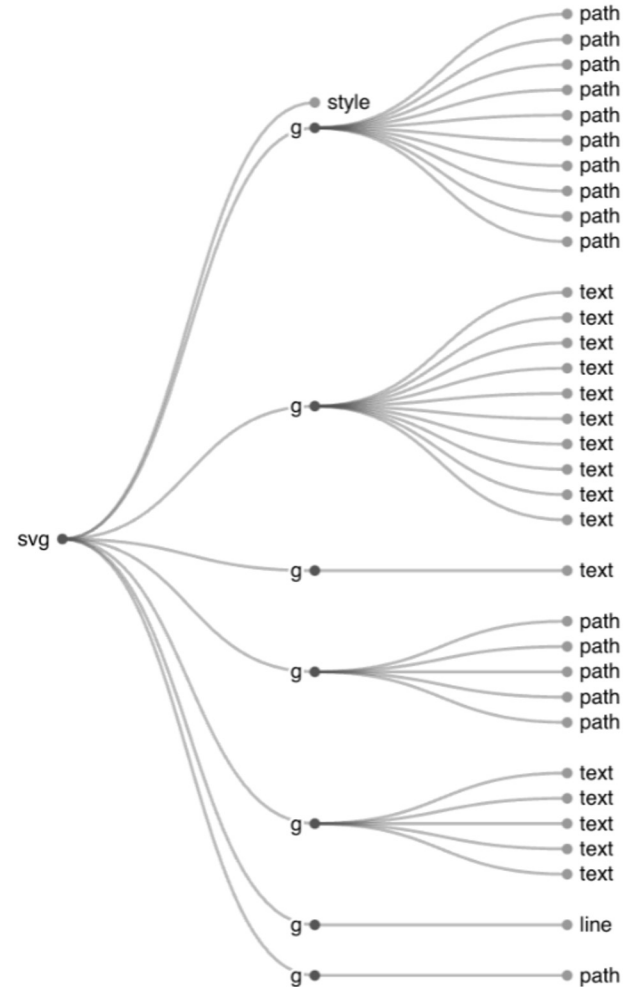
What is the DOM?

DOM stands for
Document **O**bject **M**odel
and is the data
representation of
elements on the page.



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Activity 4

D3 First Steps

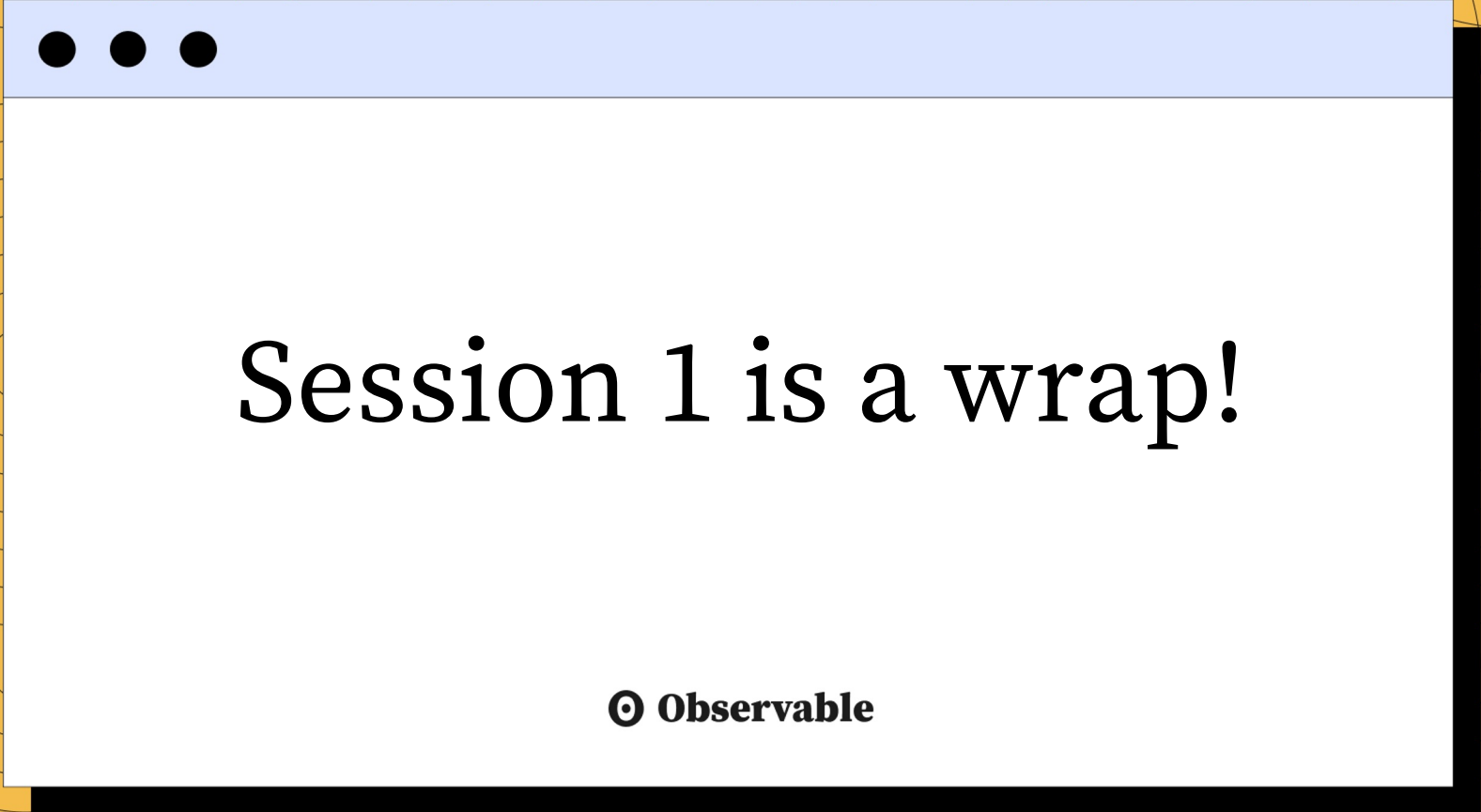
D3 First Steps

- `d3.select`
- `d3.selectAll`
- `.data()`
- `.style()`, `.attr()`

D3 First Steps

- d3.select - selects an element, using *selectors*, like what we did with CSS
- d3.selectAll - selects all the elements (one direction)
- .data() - binds data to elements
- .style(), .attr() - sets styles & attributes

Activity 5



Session 1 is a wrap!

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