Intro to D3

Slides adapted from...

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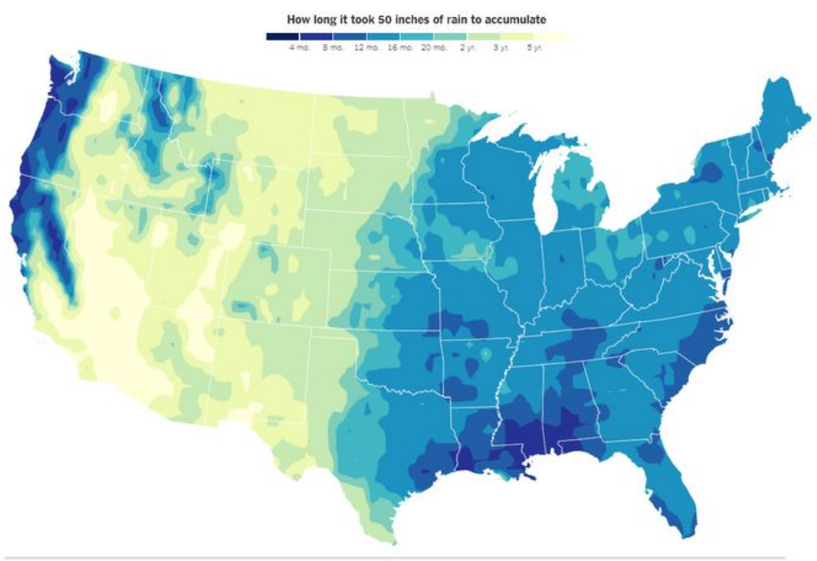

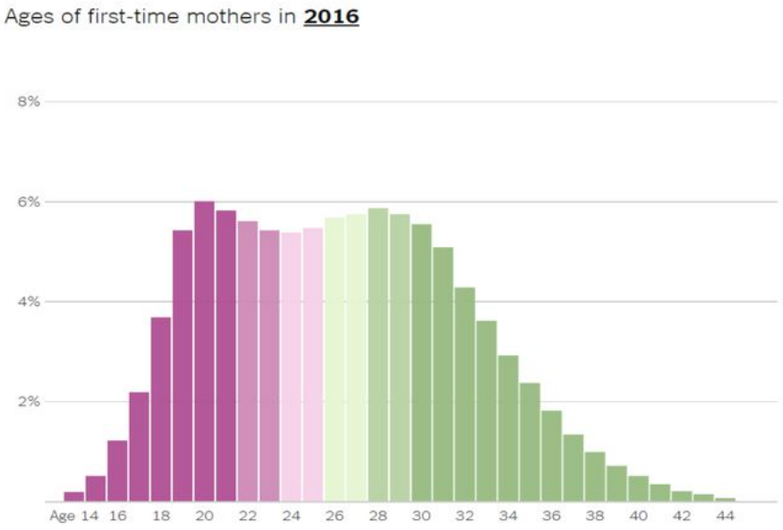

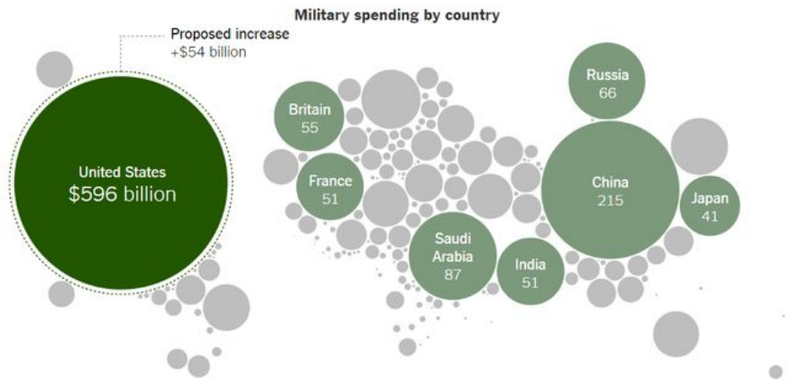

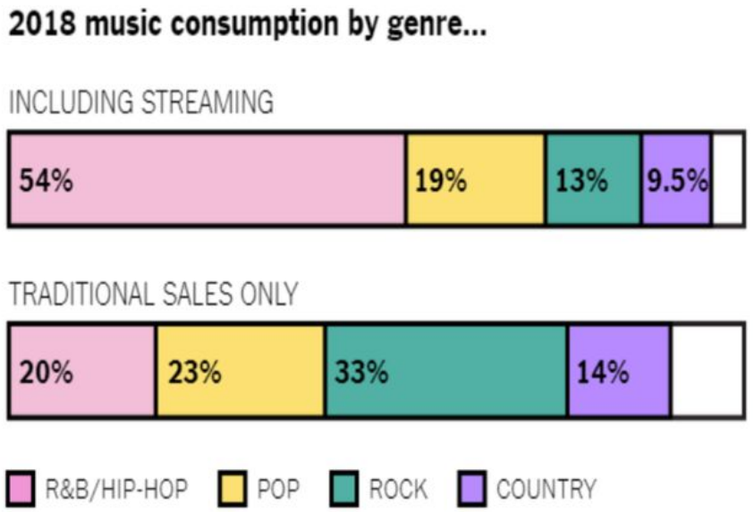

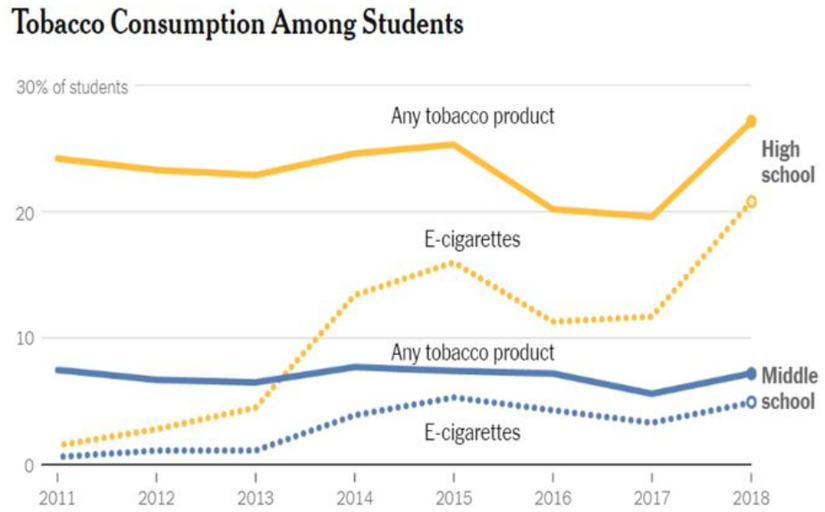

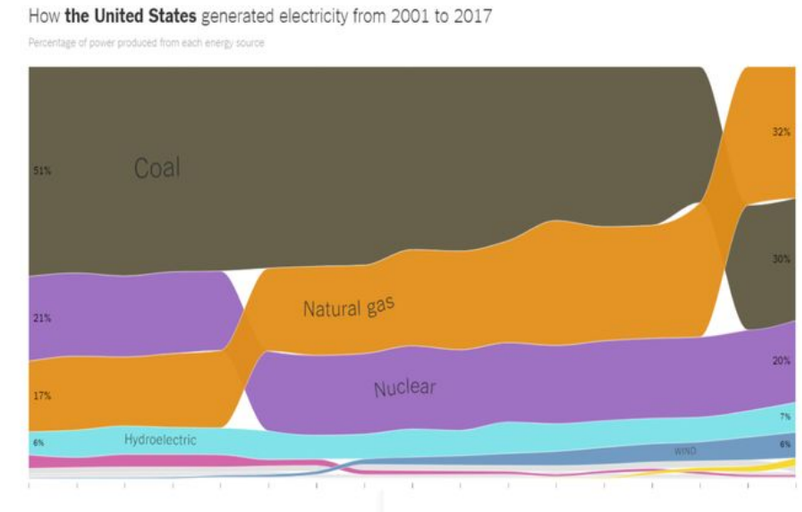

The New York Times

D3.js is a JavaScript library for manipulating documents based on data. D3 helps you bring data to life using HTML, SVG, and CSS. D3's emphasis on web standards gives you the full capabilities of modern browsers without tying yourself to a proprietary framework, combining powerful visualization components and a data-driven approach to DOM manipulation.

https://d3js.org/

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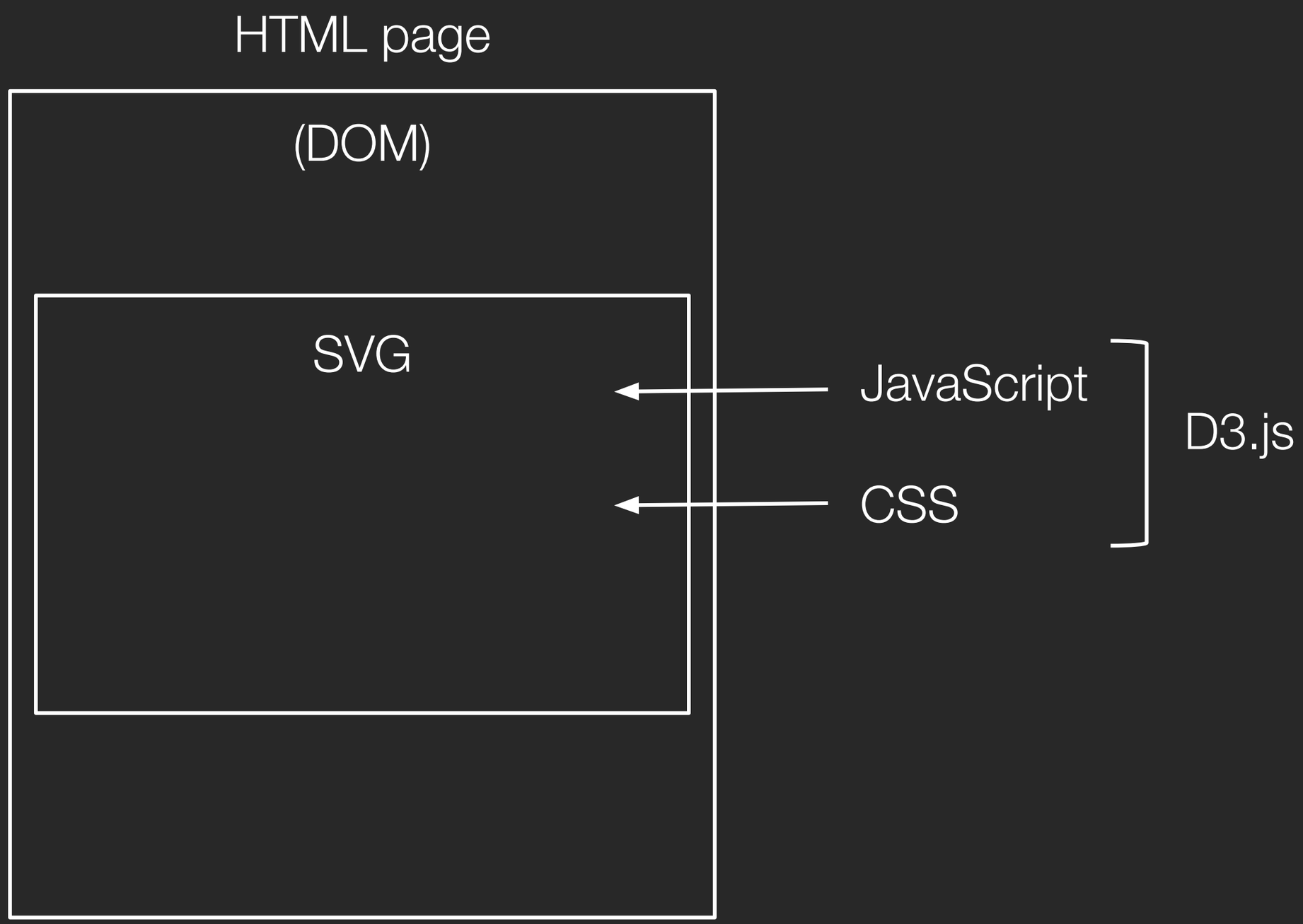
What we will cover today (and Wednesday)...

very customizable

built for web



I. HTML

```
<html>

  <head>



  </head>

  <body>
    Hello world!<br>

  </body>



</html>
```

I. HTML

```
<html>

  <head>



  </head>

  <body>
    Hello world!<br>
    <svg id='vis'></svg>
  </body>



</html>
```

I. HTML

```
<html>

  <head>
    <link rel='stylesheet'
          type='text/css'
          href='styles.css'>

  </head>

  <body>
    Hello world!<br>
    <svg id='vis'></svg>
  </body>



</html>
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    <link rel='stylesheet'
          type='text/css'
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  </head>

  <body>
    Hello world!<br>
    <svg id='vis'></svg>
  </body>

  <script src='makevis.js'></script>

</html>
```

I. HTML

```
<html>

  <head>
    <link rel='stylesheet'
          type='text/css'
          href='styles.css'>
    <script src='https://d3js.org/d3.v5.min.js'></script>
  </head>

  <body>
    Hello world!<br>
    <svg id='vis'></svg>
  </body>

  <script src='makevis.js'></script>

</html>
```

Running your code

```
cd path/to/directory
python -m http.server          (3.x)
python -m SimpleHTTPServer     (2.x)
```

shell

```
http://localhost:8000/
http://localhost:8000/mainpage.html
```

browser

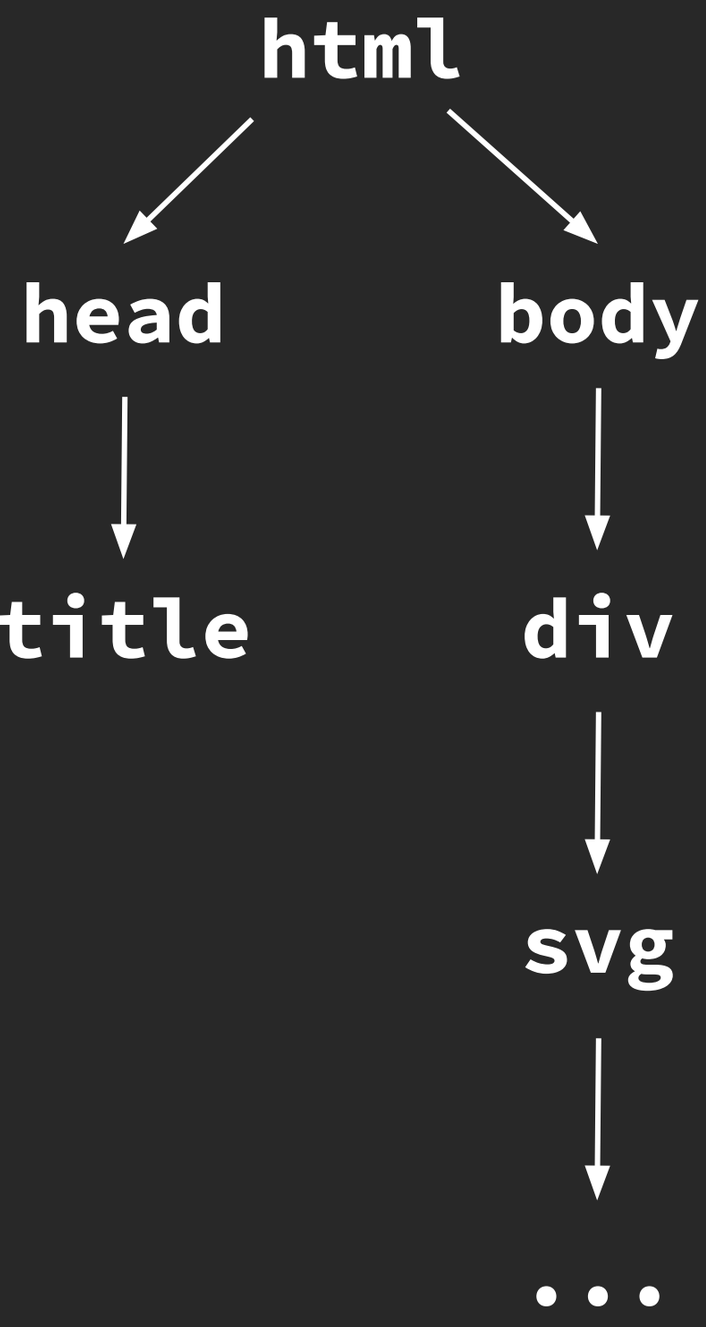
II. JavaScript

II. JavaScript

DOM (Document Object Model)

II. JavaScript

```
<html>
  <head>
    <title></title>
  </head>
  <body>
    <div>
      <svg></svg>
    </div>
  </body>
</html>
```



II. JavaScript

Add to and manipulate DOM with D3

II. JavaScript

```
<script>
  var svg = d3.select('#vis');
```

```
</script>
```

II. JavaScript

```
<script>
  var svg = d3.select('#vis');
  var circle = svg.append('circle');
```

```
</script>
```

II. JavaScript

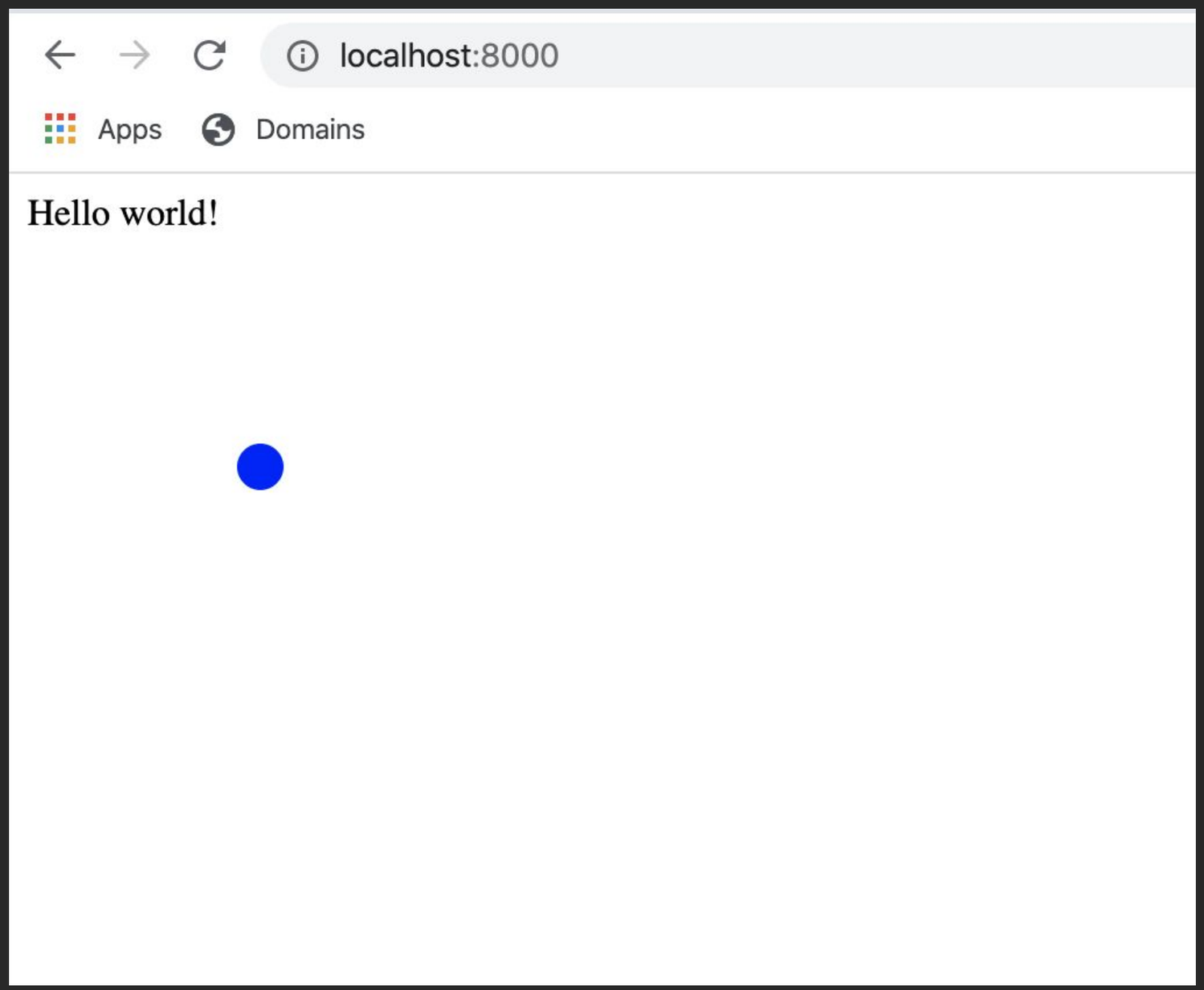
```
<script>
  var svg = d3.select('#vis');
  var circle = svg.append('circle');

  circle.attr('r', 10)
        .attr('cx', 100)
        .attr('cy', 100)
        .style('fill', 'blue');


</script>
```

II. JavaScript

`what shows up`



II. JavaScript

id	animal	weight	height
1	cat	10	3
2	cat	3	3
3	cat	9	9
4	cat	3	5
5	cat	6	5
6	cat	5	6
7	cat	1	8
8	dog	9	2
9	dog	8	9
10	dog	7	7
11	dog	2	3
12	dog	8	3

```
<html>

  <head>
    <script src='https://d3js.org/d3.v5.min.js'></script>
  </head>

  <body>
    This is our plot.

  </body>

  <script>

  </script>

</html>
```

```
<html>

  <head>
    <script src='https://d3js.org/d3.v5.min.js'></script>
  </head>

  <body>
    This is our plot.
    <svg id='vis'></svg>
  </body>

  <script>

  </script>

</html>
```

```
<html>

  <head>
    <script src='https://d3js.org/d3.v5.min.js'></script>
  </head>

  <body>
    This is our plot.
    <div id='vis'></div>
  </body>

  <script>
    /* Here we will make our visualization magic */
  </script>

</html>
```

```
<script>
  var plotWidth = 800;
  var plotHeight = 600;
  var buf = 15;



</script>
```

```
<script>
  var plotWidth = 800;
  var plotHeight = 600;
  var buf = 15;

  var svg = d3.select('#vis').append('svg')
    .attr('width', plotWidth)
    .attr('height', plotHeight);
```

```
</script>
```

```
...

var allData;
d3.csv('animals.csv', function(d) {
  // process data

}).then(function(data) {
  // do something with data


});

</script>
```

```
...

var allData;
d3.csv('animals.csv', function(d) {
  return {
    id: +d.id,
    species: d.animal,
    weight: +d.weight,
    height: +d.height
  };
}).then(function(data) {
  // do something with data


});

</script>
```

```
...

var allData;
d3.csv('animals.csv', function(d) {
  return {
    id: +d.id,
    species: d.animal,
    weight: +d.weight,
    height: +d.height
  };
}).then(function(data) {
  allData = data;
  drawAxes();
  drawPoints(data);
});

</script>
```

```
...

function drawAxes() {
  var xaxis = svg.append('line')
    .attr('x1', buf)
    .attr('x2', plotWidth - buf)
    .attr('y1', plotHeight - buf)
    .attr('y2', plotHeight - buf)
    .attr('stroke', black);
  var yaxis = svg.append('line')
    .attr('x1', buf)
    .attr('x2', buf)
    .attr('y1', buf)
    .attr('y2', plotHeight - buf)
    .attr('stroke', black);
  }
</script>
```

```
...

function drawPoints(data) {
  var points = svg.selectAll('circle');

  }


</script>
```

```
...

function drawPoints(data) {

  }

</script>
```

```
...

function drawPoints(data) {
  var points = svg.selectAll('circle');
  var pointsData = points.data(data, d=>d.id);



  }

</script>
```

```
...

function drawPoints(data) {
  var points = svg.selectAll('circle');
  var pointsData = points.data(data, d=>d.id);
  var circles = pointsData.enter().append('circle')



  }

</script>
```

```
...

function drawPoints(data) {
  var points = svg.selectAll('circle');
  var pointsData = points.data(data, d=>d.id);
  var circles = pointsData.enter().append('circle')
    .attr('r', 5)
    .attr('cx', function(d){ return x(d.weight); })
    .attr('cy', function(d){ return y(d.height); })



  }


</script>
```

```
...

function drawPoints(data) {
  var points = svg.selectAll('circle');
  var pointsData = points.data(data, d=>d.id);
  var circles = pointsData.enter().append('circle')
    .attr('r', 5)
    .attr('cx', function(d){ return x(d.weight); })
    .attr('cy', function(d){ return y(d.height); })
    .style('fill', function(d){
      return d.species == 'cat' ? 'orange' : 'blue';
    })

  }


</script>
```

```
...

function drawPoints(data) {
  var points = svg.selectAll('circle');
  var pointsData = points.data(data, d=>d.id);
  var circles = pointsData.enter().append('circle')
    .attr('r', 5)
    .attr('cx', function(d){ return x(d.weight); })
    .attr('cy', function(d){ return y(d.height); })
    .style('fill', function(d){
      return d.species == 'cat' ? 'orange' : 'blue';
    })
  pointsData.exit().remove();
}


</script>
```

```
...

var x = d3.scaleLinear()
  .domain([0, 11])
  .range([buf, plotWidth - buf]);

var y = d3.scaleLinear()
  .domain([0, 10])
  .range([plotHeight - buf, buf]);




</script>
```

```
...

function drawPoints(data) {
  ...
  circles
    ...
}
```

```
...

function drawPoints(data) {
  ...
  circles
    .on('mouseover', function(d) {

    })


  ...
}
```

```
...

function drawPoints(data) {
  ...
  circles
    .on('mouseover', function(d) {
      svg.append('text')
        .attr('x', x(d.weight) + 10)
        .attr('y', y(d.height) + 5)
        .text(d.species);
    })



  ...
}
```

```
...

function drawPoints(data) {
  ...
  circles
    .on('mouseover', function(d) {
      svg.append('text')
        .attr('x', x(d.weight) + 10)
        .attr('y', y(d.height) + 5)
        .text(d.species);
    })
     .on('mouseout', function(d) {
       svg.selectAll('text').remove();
    });

  ...
}
```

```
<html>

  <head>
    <script src='https://d3js.org/d3.v5.min.js'></script>
  </head>

  <body>
    This is our plot.
    <div id='vis'></div>
  </body>

  <script>
    /* Here we will make our visualization magic */




  </script>
</html>
```

```
<html>

  <head>
    <script src='https://d3js.org/d3.v5.min.js'></script>
  </head>

  <body>
    This is our plot.
    <div id='vis'></div>
    <button data-filter='dog'>Remove cats</button>
  </body>

  <script>
    /* Here we will make our visualization magic */




  </script>
</html>
```

```
<html>

  <head>
    <script src='https://d3js.org/d3.v5.min.js'></script>
  </head>

  <body>
    This is our plot.
    <div id='vis'></div>
    <button data-filter='dog'>Remove cats</button>
  </body>

  <script>
    var button = document.querySelector('button');
    button.addEventListener('click', function() {
      var newData = allData.filter(d =>
                    d.species == button.dataset.filter);
      drawPoints(newData);
    });
  </script>
</html>
```

Tips for D3

Change not showing up? Clear your cache.

Use the console to see what’s happening.

Too slow? Made a mistake? Kill and restart your http server.

Utilize HTML to add input fields.

Can use pure CSS if something doesn’t have to change.

Learn by example.

What D3 can do for you

Scales

Axes

Paths, shapes, areas

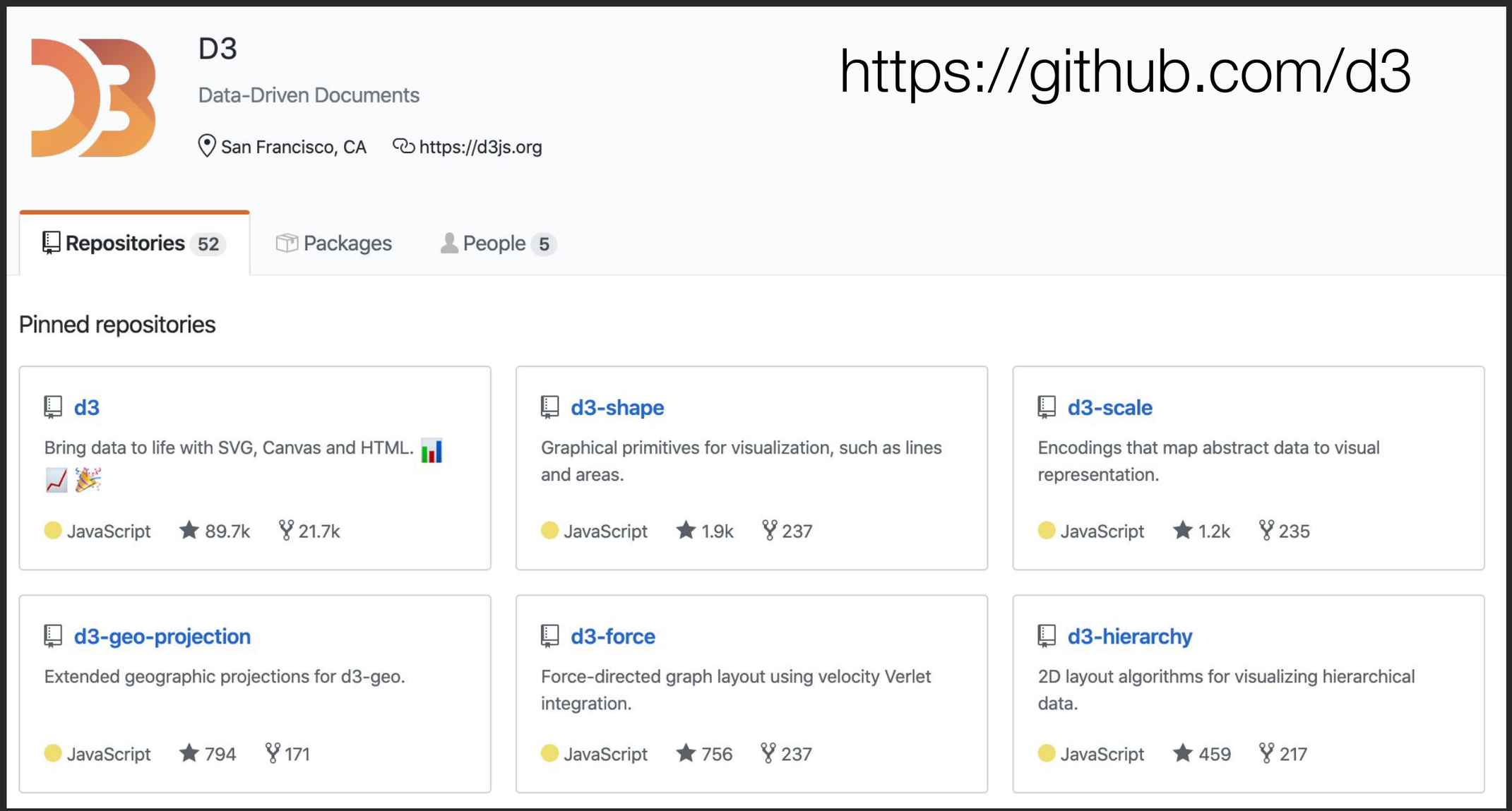
Maps

Hierarchical layouts

… all have subpackages dedicated to them.

Resources

D3 API Reference v5.0
https://github.com/d3/d3/blob/master/API.md



Resources

d3-csv
d3-scale
d3-geo

Lots of examples at…
https://github.com/d3/d3/wiki/Gallery
https://observablehq.com/@d3

Helpful tiny examples (i.e. making shapes) at…
https://www.dashingd3js.com/table-of-contents