

# D3.js - An Introduction

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By Ramesh Sampath

# Agenda

- What's D3
- D3 Examples
- Build some visualizations
- Resources

# What is D3

- Data Driven Documents
- An General purpose visualization Library written in JS
- Started at Stanford Visualization Group (Jeff Heer, Mike Bostock and many others)
- Open Source

# What is D3

“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” - [Source d3js.org](https://d3js.org)

# What is D3

A Labor of Love by Mike Bostock

Follow him: @mbostock

GitHub, Inc. [US] <https://github.com/mbostock>


Search GitHub

Pull requests Issues Gist

Overview Repositories Public activity

**Pinned repositories**

- d3/d3**  
Bring data to life with SVG, Canvas and HTML.
- topojson**  
An extension to GeoJSON that encodes topology.
- d3/d3-shape**  
Graphical primitives for visualization, such as lines and areas.
- d3/d3-scale**  
Encodings that map abstract data to visual representation.
- d3/d3-geo-projection**  
Extended geographic projections for D3.



**Mike Bostock**  
mbostock

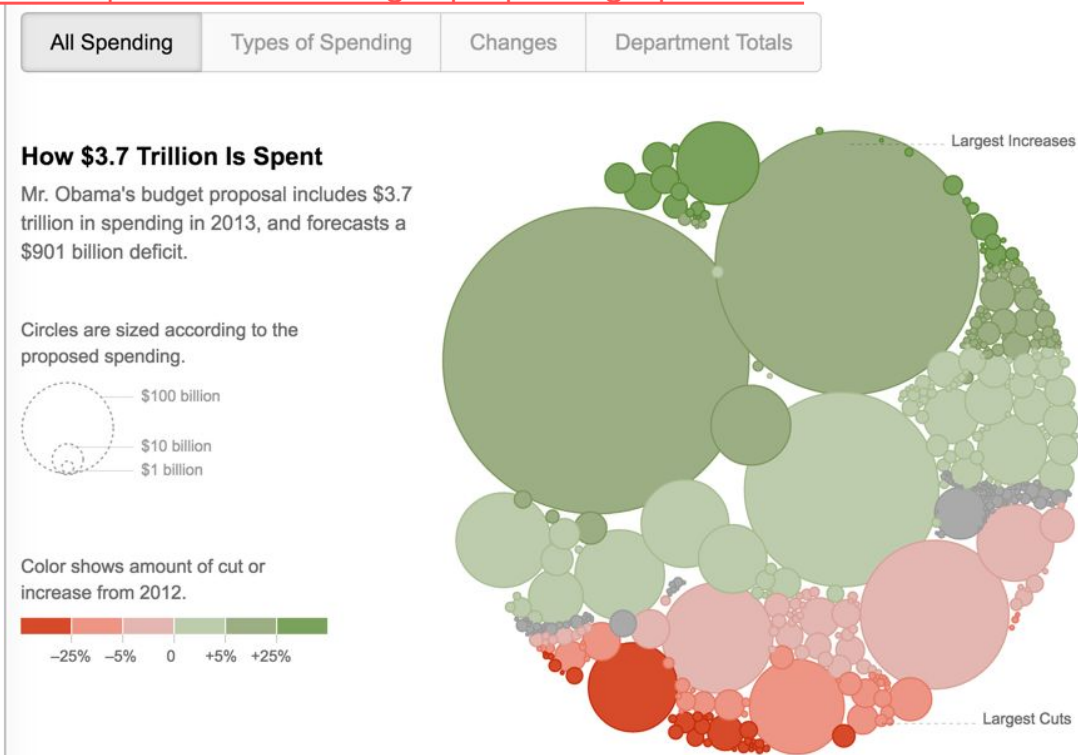
San Francisco, CA  
mike@ocks.org  
<https://bost.ocks.org>

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Examples

# Four ways to slice Obama's Budget (2012)

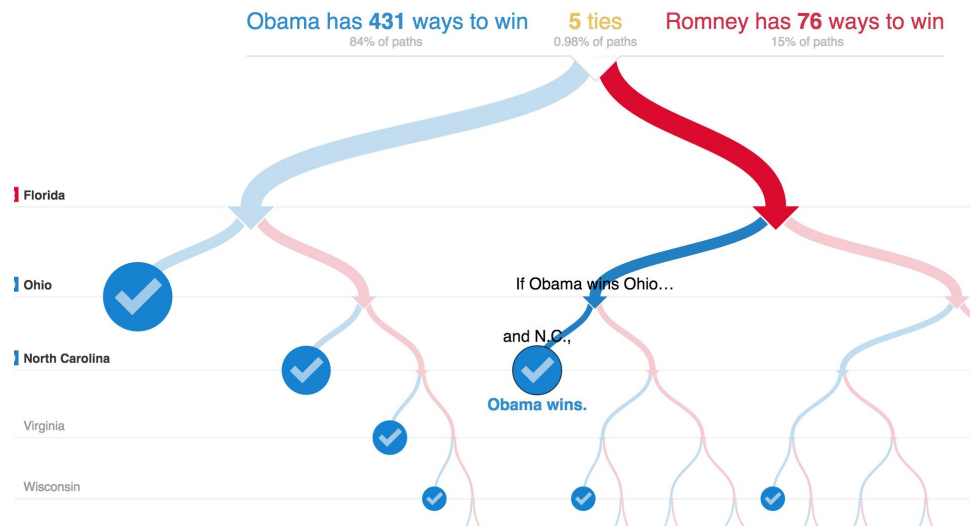
<http://www.nytimes.com/interactive/2012/02/13/us/politics/2013-budget-proposal-graphic.html>



# Elections 2012

<http://elections.nytimes.com/2012/results/president>

[http://www.nytimes.com/interactive/2012/11/02/us/politics/paths-to-the-white-house.html?\\_r=0](http://www.nytimes.com/interactive/2012/11/02/us/politics/paths-to-the-white-house.html?_r=0)



## President Map

Map | Big Board | Scenarios | Exit Polls

FACEBOOK | TWITTER

UPDATED NOV. 29

**332** Obama

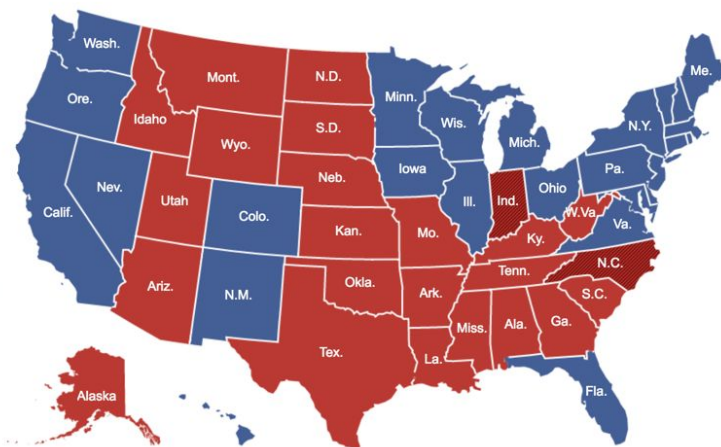
0  
undecided

Romney **206**

62,611,250 votes

270 to win

59,134,475 votes





# Facebook IPO

<http://www.nytimes.com/interactive/2012/05/17/business/dealbook/how-the-facebook-offering-compares.html>

## The Facebook Offering: How It Compares

< Prev Next > 1 2 3 4 5

Find a company

Company  
value  
In billions of  
today's dollars

### The Tech I.P.O.'s

Since 1980, there have been about 2,400 technology, Internet and telecom initial public offerings. Until this week, the largest by market capitalization was Google, which was valued at \$23 billion, or about \$28 billion in today's dollars.

Google went  
public in 2004

25 —

20 —

15 —

10 —

5 —

0 —

Apple went  
public in 1980

Microsoft

Year of I.P.O.

1980

1985

1990

1995

2000

2005

2010

2012

# Explained Visually

<http://setosa.io/ev/conditional-probability/>

$$P(B|A) = \frac{P(A|B)P(B)}{P(A)}$$

$P(A) = 0.200$  or 20.0%



$P(B) = 0.200$  or 20.0%



$P(A \cap B) = 0.100$  or 10.0%

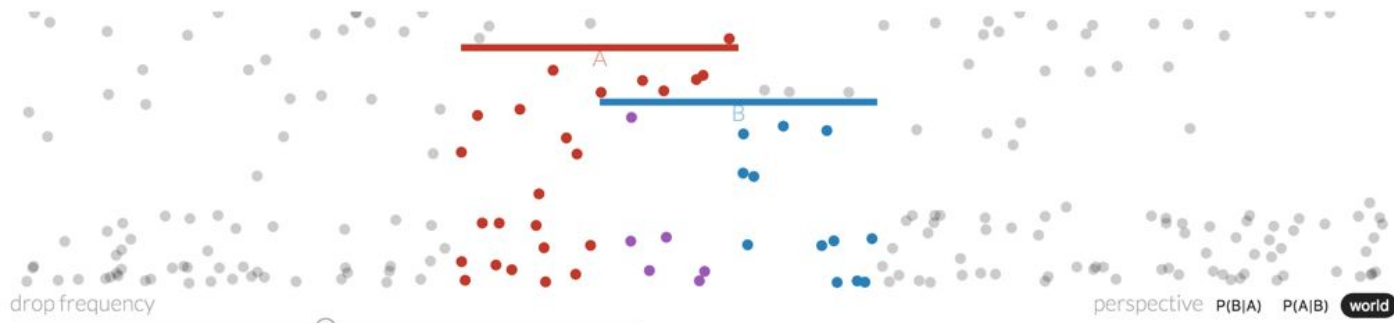


$P(B|A) = 0.500$  or 50.0%

If we have a ball and we know it hit the **red** shelf, there's a 50.0% chance it also hit the **blue** shelf.

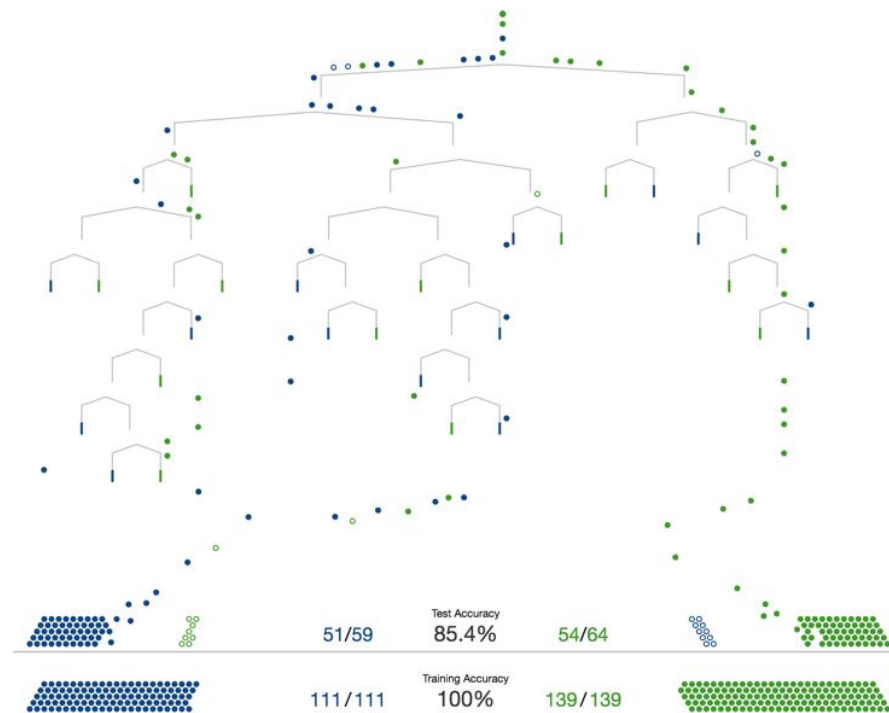
$P(A|B) = 0.500$  or 50.0%

If we have a ball and we know it hit the **blue** shelf, there's a 50.0% chance it also hit the **red** shelf.



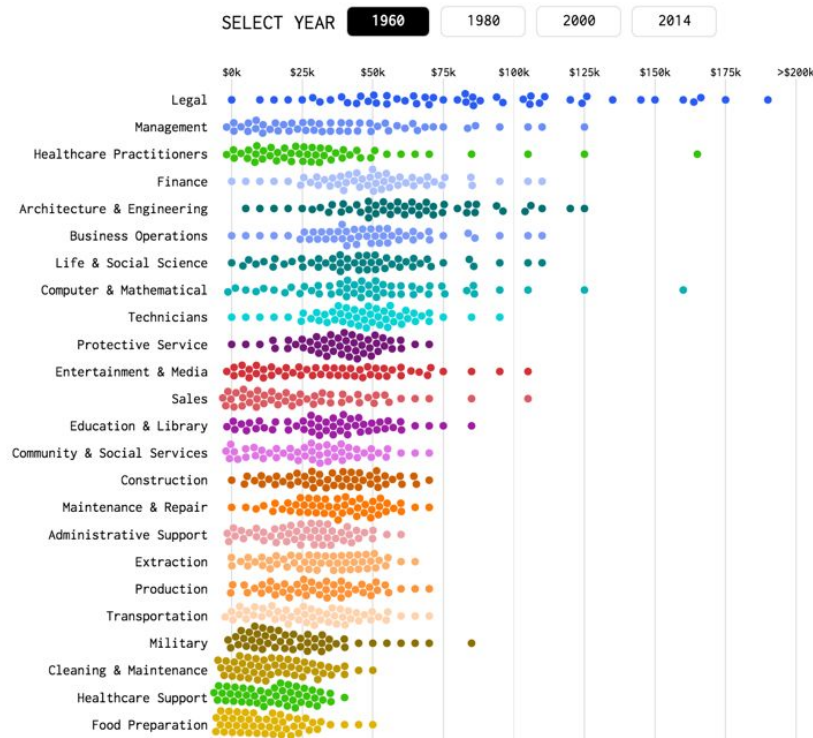
# Visual Introduction to ML

<http://www.r2d3.us/visual-intro-to-machine-learning-part-1/>



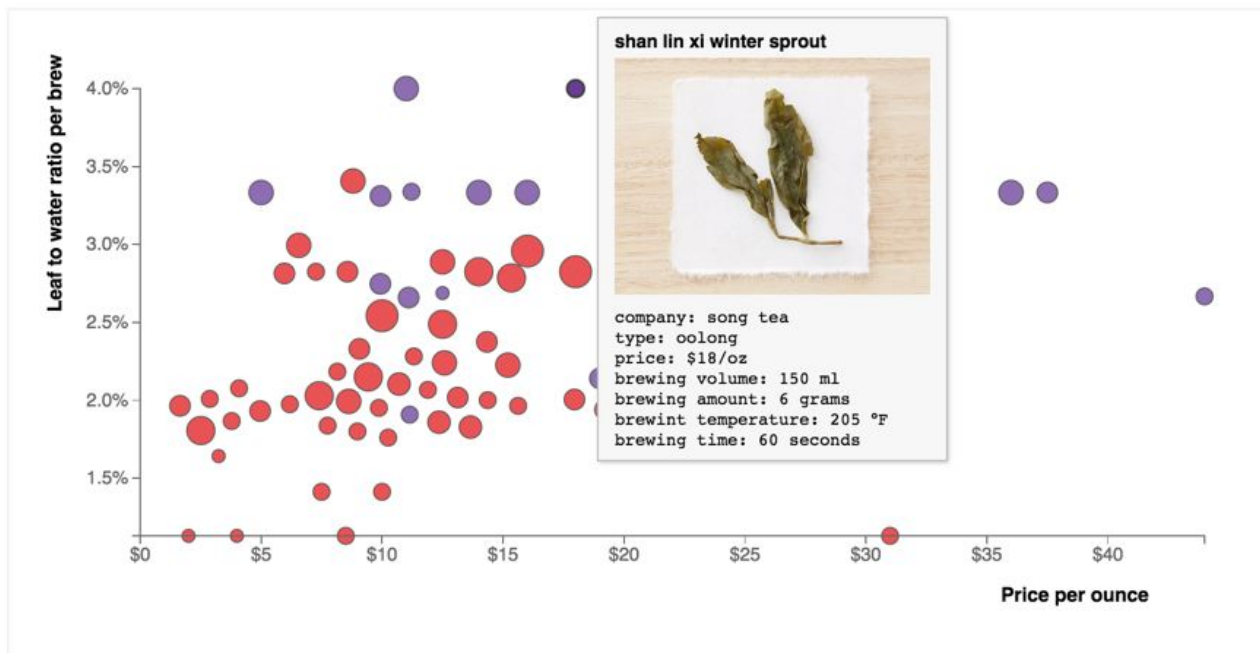
# Income Changes by Profession

<http://flowingdata.com/2016/06/28/distributions-of-annual-income/>



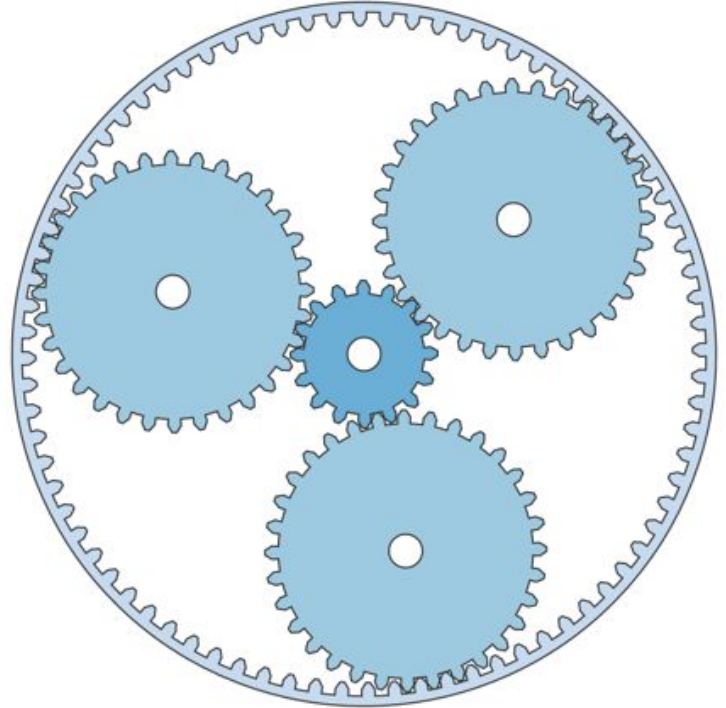
# Teaswarm

<https://bl.ocks.org/dhoboy/ccafe73e24cf9c36353f2641a4469314>



# Epicyclic Gearing

<https://blocks.org/mbostock/1353700>



## More Select Examples

- <https://bost.ocks.org/mike/nations/>
- <https://bl.ocks.org/mbostock/346f4d967650b27c0511>
- <https://bl.ocks.org/kerryrodden/7090426>
- Bostock Blocks - <http://bl.ocks.org/mbostock>
- Tons more at [https://bost.ocks.org/<github\\_handle>](https://bost.ocks.org/<github_handle>)

# Design Process

- <http://chartsnthings.tumblr.com>
- <http://kpq.github.io/chartsnthings/>



## What's D3

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

Data to Visual Elements on the HTML Document

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Before we can get started with D3...

# WEB Standards

- HTML - Content, CSS - Style
- JS - Dynamic Scripting
- Data Visualization
  - Canvas - Paint shapes
  - SVG - DOM Shape elements
  - Web GL - 3D (Not going to talk about it)

Let's learn some JS

<http://jsbin.com/>

# Build SVG by Hand

- Step 0 <https://jsfiddle.net/sampathweb/79sxsc69/1/>

## Reference:

- [http://www.w3schools.com/graphics/svg\\_intro.asp](http://www.w3schools.com/graphics/svg_intro.asp)
- <https://developer.mozilla.org/en-US/docs/Web/SVG/Element>

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## Getting Started with D3

## Creating SVG

```
svg = d3.select("#chart").append("svg")
```

## Creating SVG

```
svg = d3.select("#chart").append("svg")
```



# Selecting Elements

**.selectAll(selector)**

**.select(selector)**

Selects Elements on HTML Document

# Append Elements

**.append(element)**

Appends an Child element on the page

# Setting Attributes

**.attr(properties)**

Set Properties for the selected element

# Setting Style

**.style(properties)**

Set Style properties (CSS) for the selected  
element

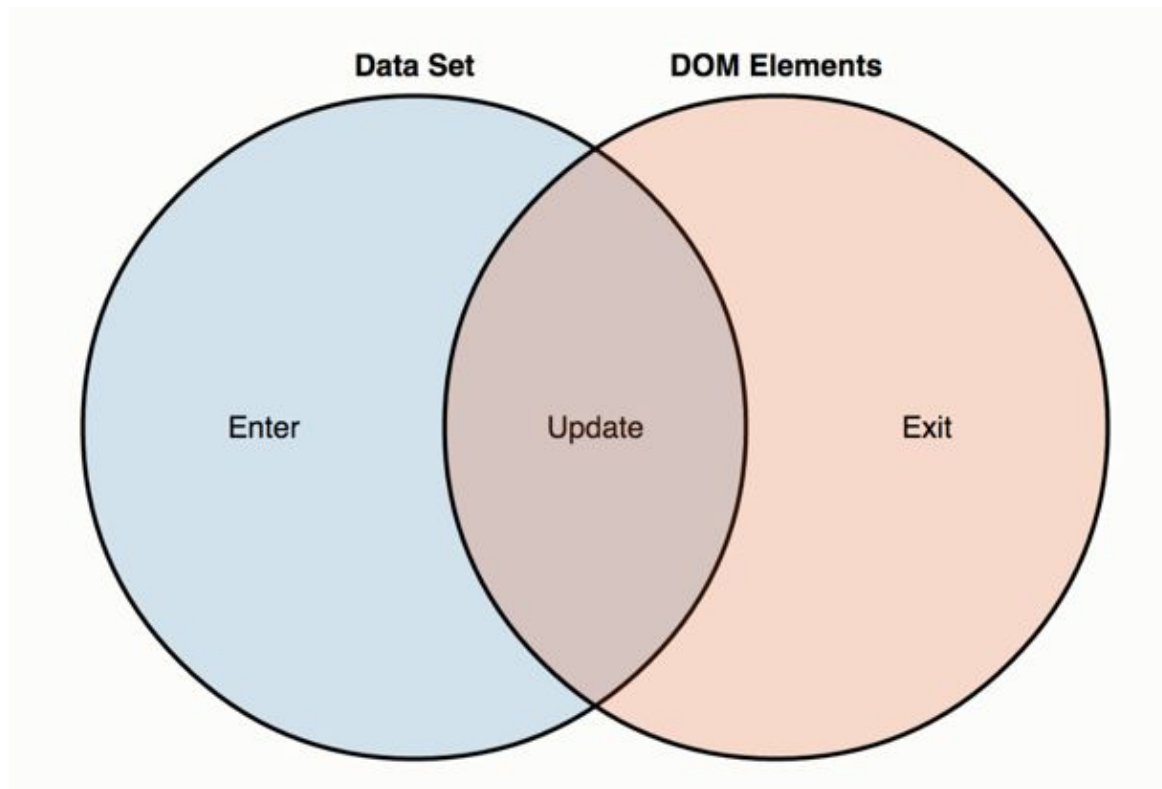
## Chaining

```
var chart = d3.select("#chart")  
  .append("svg")  
  .attr("width", 450)  
  .attr("height", 300);
```

## D3 - Practice

- <https://jsfiddle.net/sampathweb/9mavumdj/4/>
- Selections <https://jsfiddle.net/sampathweb/fxuoooutu/3/>

# D3 Data Join



## D3 Data Join

**.data()**

Binds Data to DOM Elements



`.enter()`

**`.enter()`**

Add new Elements to DOM

`.exit()`

**`.exit()`**

Removes existing elements from DOM

## D3 Enter / Update / Exit Pattern

- Binding Data & Enter Selection <https://jsfiddle.net/sampathweb/uomdc945/5/>
- Updating Data <https://jsfiddle.net/sampathweb/cmj1p2r0/3/>
- Transition <https://jsfiddle.net/sampathweb/dh7g3k6k/3/>
- Transition & Reset: <https://jsfiddle.net/sampathweb/qgfa5yxf/1/>
- Interactions with CSS: <https://jsfiddle.net/sampathweb/ruj4rzn7/1/>
- Interactions with D3: <https://jsfiddle.net/sampathweb/0hnd241r/2/>

## D3 Selections & General Update Pattern

- Three little circles
- How selections work
- Thinking with joins
- General Update Pattern
- General Update Pattern II
- General Update Pattern III
- Transitions

## There's Lot more to D3

- Scale
- Axis
- Layouts
- Maps
- Canvas Rendering
- And many more...

# D3 Examples Gallery

- <https://d3js.org>
- <https://github.com/d3/d3/wiki/Gallery>
- <http://bl.ocks.org/>

# D3 Community

- <http://blockbuilder.org/> (Blocks Editor)
- <http://kpq.github.io/> (NY Times)
- <http://christopheviau.com/d3list/> (Alternative D3 Gallery)
- <https://www.jasondavies.com/> (Maps)
- <http://www.meetup.com/Bay-Area-d3-User-Group/>  
(Bay Area D3 Meetup)

# Alternatives

- [plot.ly](https://plot.ly)
- Bokeh Plotting Library
- [plottablejs.org](https://plottablejs.org)
- Tableau
- Many more

But nothing beats the amazing library of examples in D3.



# Will you love D3?

- Maybe?
- Some people love d3, others find it too cumbersome
- Find Examples posted by Mike or others
- Ask questions, it's a supportive community

**Just the Beginning ....  
of your Data Visualization Journey**