

Spatial Data Capture and Analysis

Interactive Visualisation 4: Graphs, Charts and Libraries



Steven Gray



1

Introduction to Databases

2

Introduction to SQL

3

Advanced SQL

4

Data Importing and Handling

5

Data Analysis

6

Data Mining

7

Interactive Viz 1: HTML + CSS

8

Interactive Viz 2:

9

Server Side Coding: Node.JS

10

Real-time data visualisation

1

Introduction to Databases

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Advanced SQL

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Data Importing and Handling

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Interactive Viz 1: HTML + CSS

8

Interactive Viz 2:

9

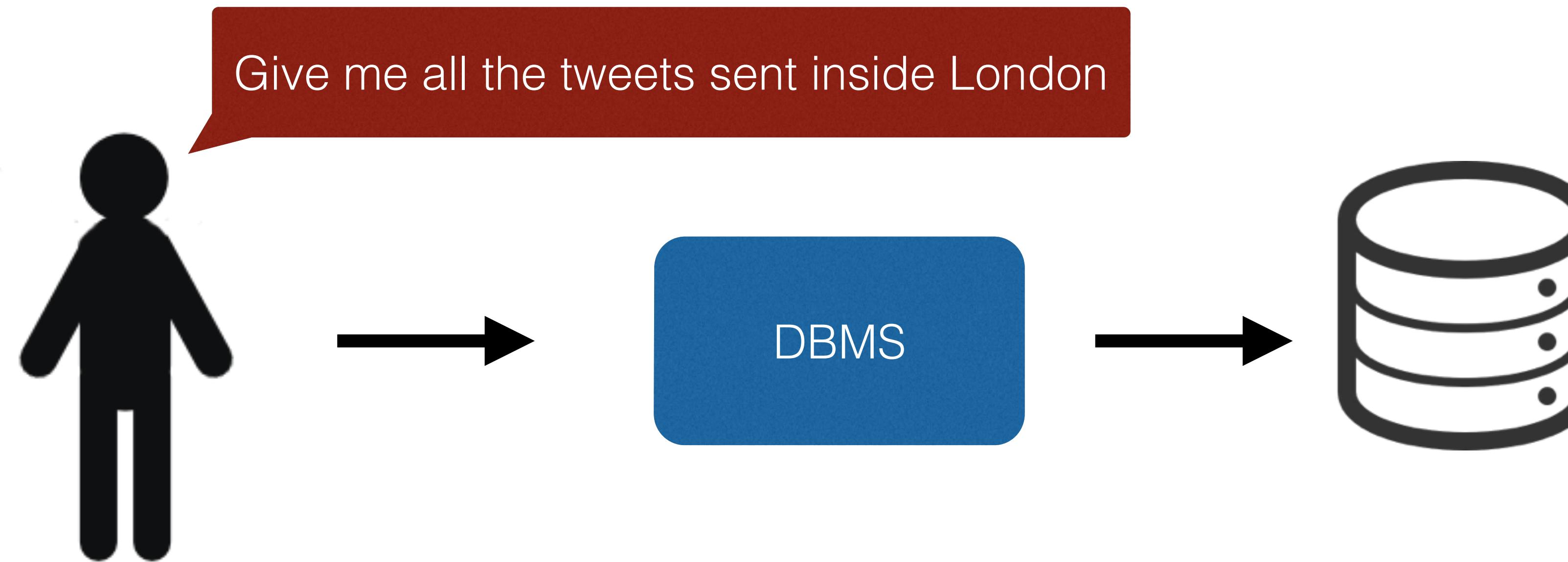
Server Side Coding: Node.JS

10

Graphs, Charts and Libraries

Building an API

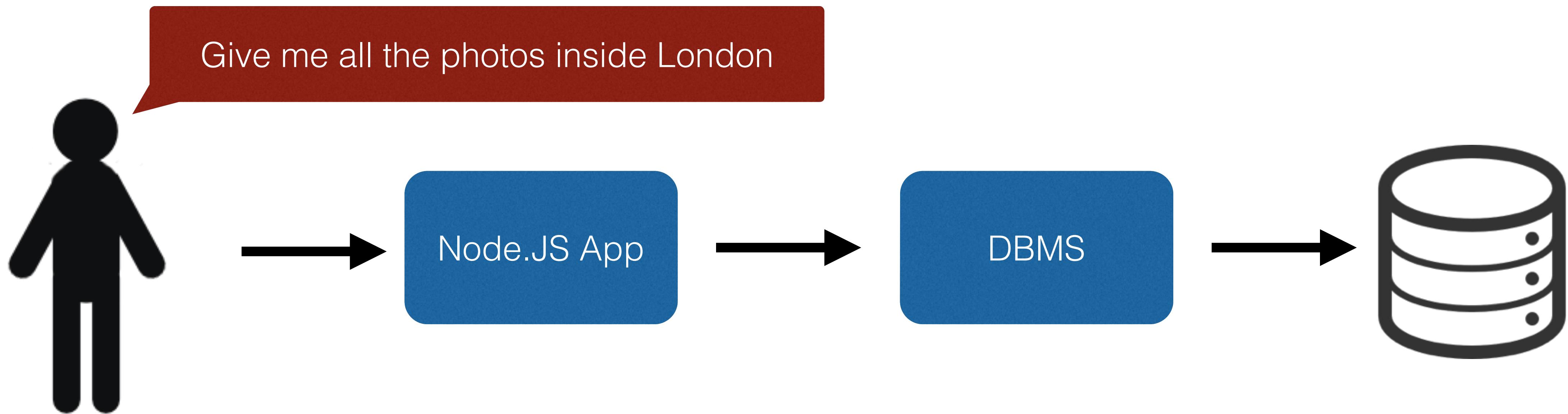
Behind the scenes



DBMS sits between user and the Data within the Database

Building an API

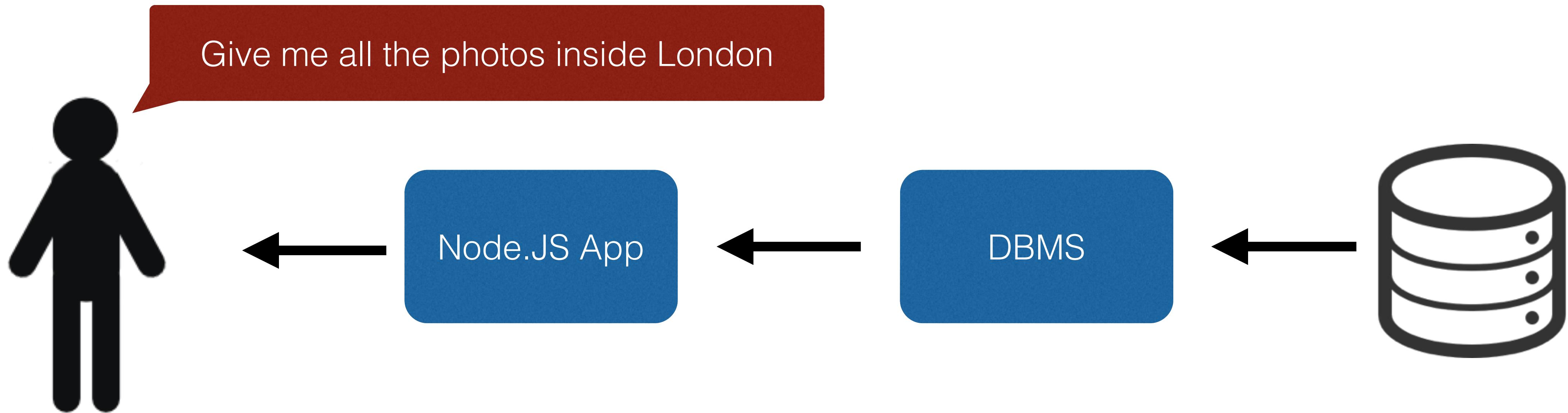
Behind the scenes



Node Application makes the call for us to Database and returns the data

Building an API

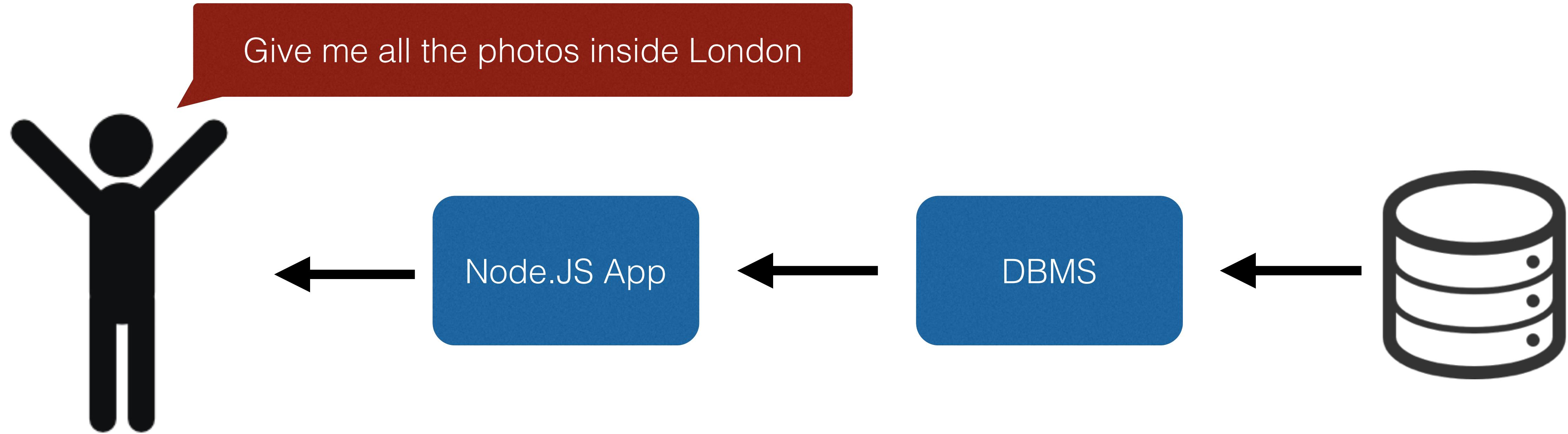
Behind the scenes



Node Application makes the call for us to Database and returns the data

Building an API

Behind the scenes



Node Application makes the call for us to Database and returns the data

This week

3rd Party API'S, Graphs and Realtime Visualisation

Highcharts

JS Library to drawing graphs on HTML pages

<http://www.highcharts.com>

JS



ABOUT US OUR PRODUCTS CONTACT
HOME DEMO DOCS SUPPORT PLUGINS SHOP

MAKE **YOUR DATA** COME ALIVE

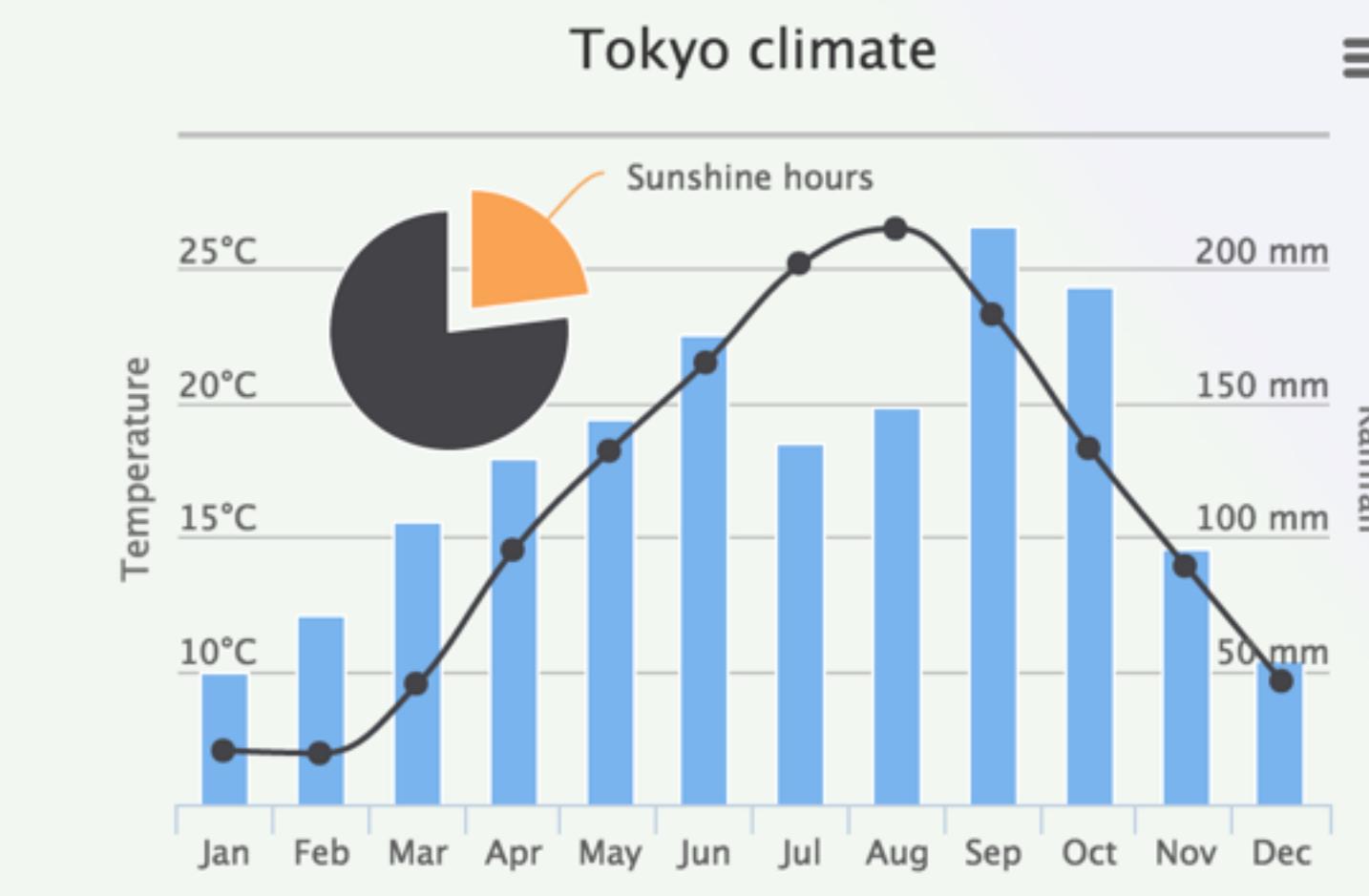
HIGHCHARTS

Create interactive charts easily for your web projects.

Used by tens of thousands of developers and 61 out of the world's 100 largest companies, Highcharts is the simplest yet most flexible charting API on the market.

[READ MORE »](#)

[DOWNLOAD »](#)



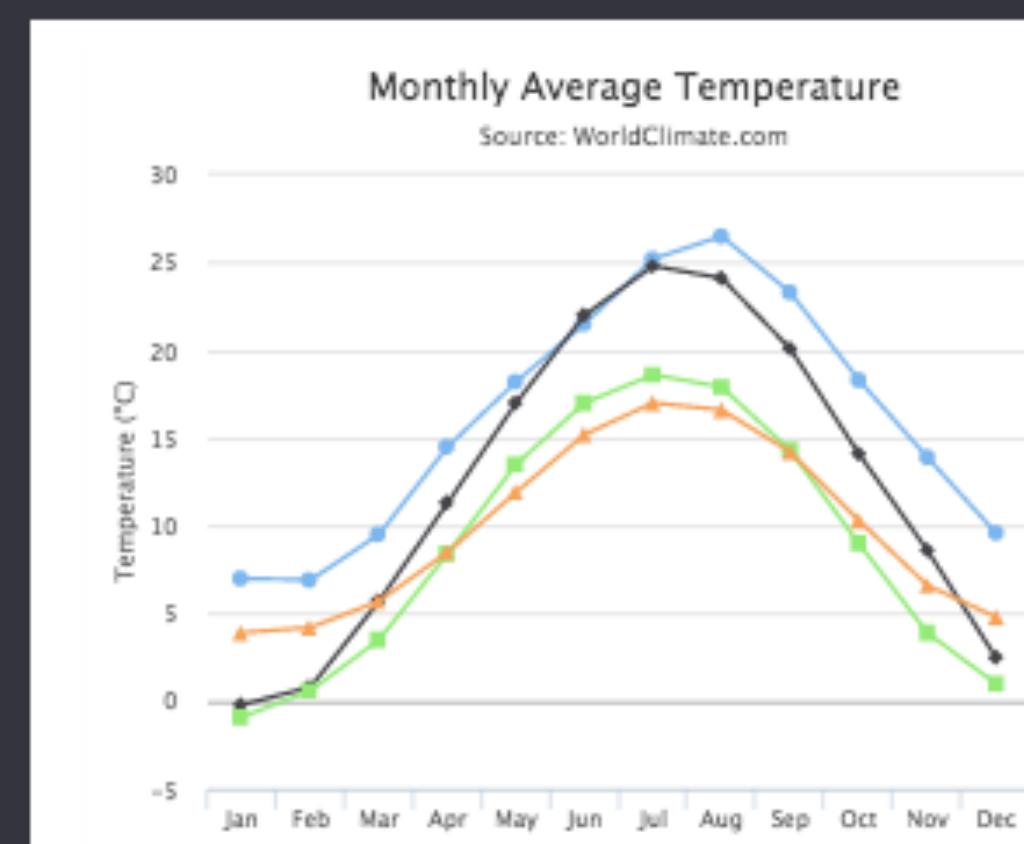
Highcharts.com

Highcharts

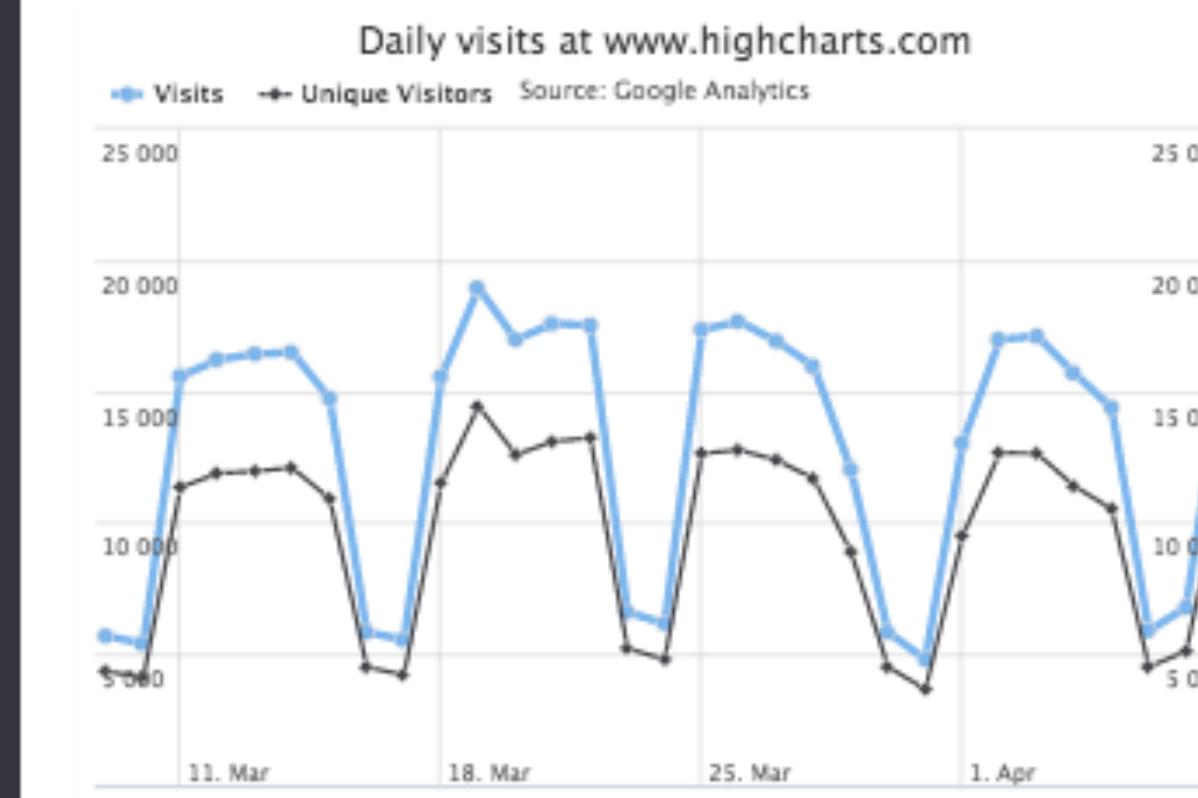
JS Library to drawing graphs on HTML pages

<http://www.highcharts.com>

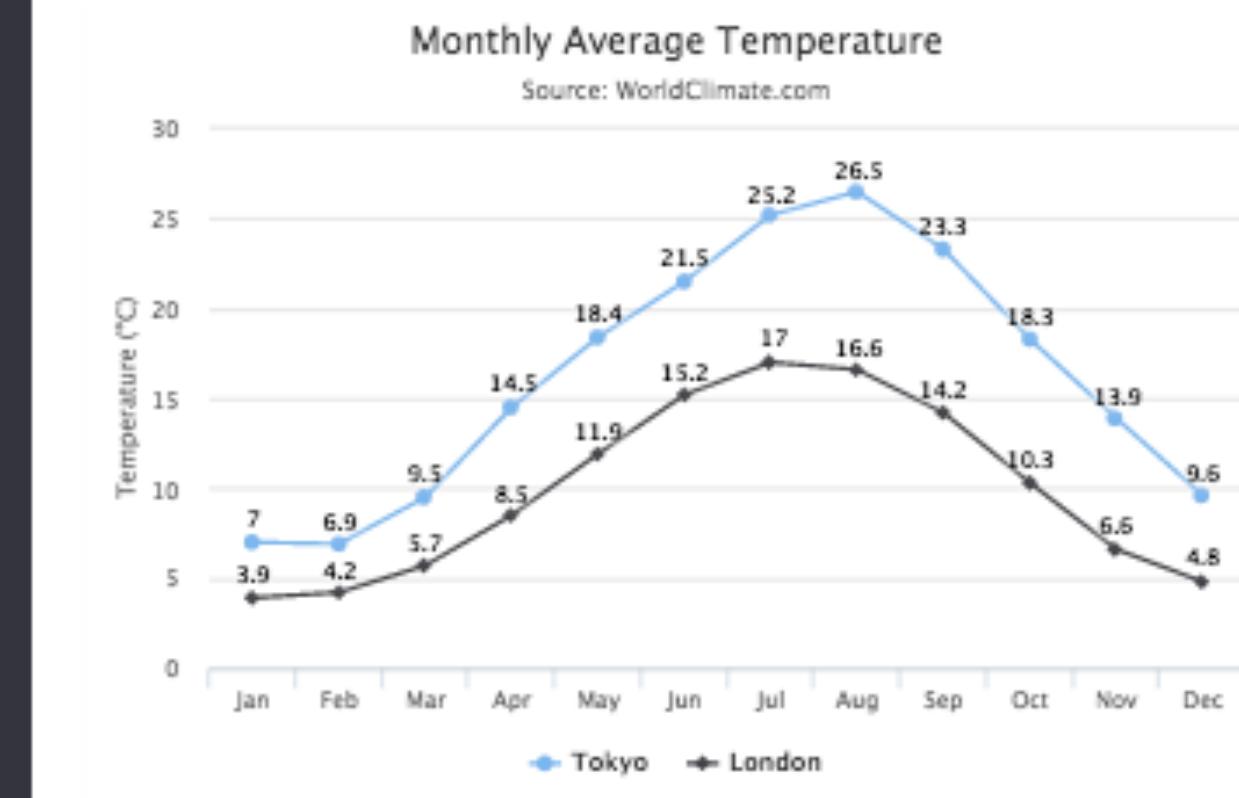
JS



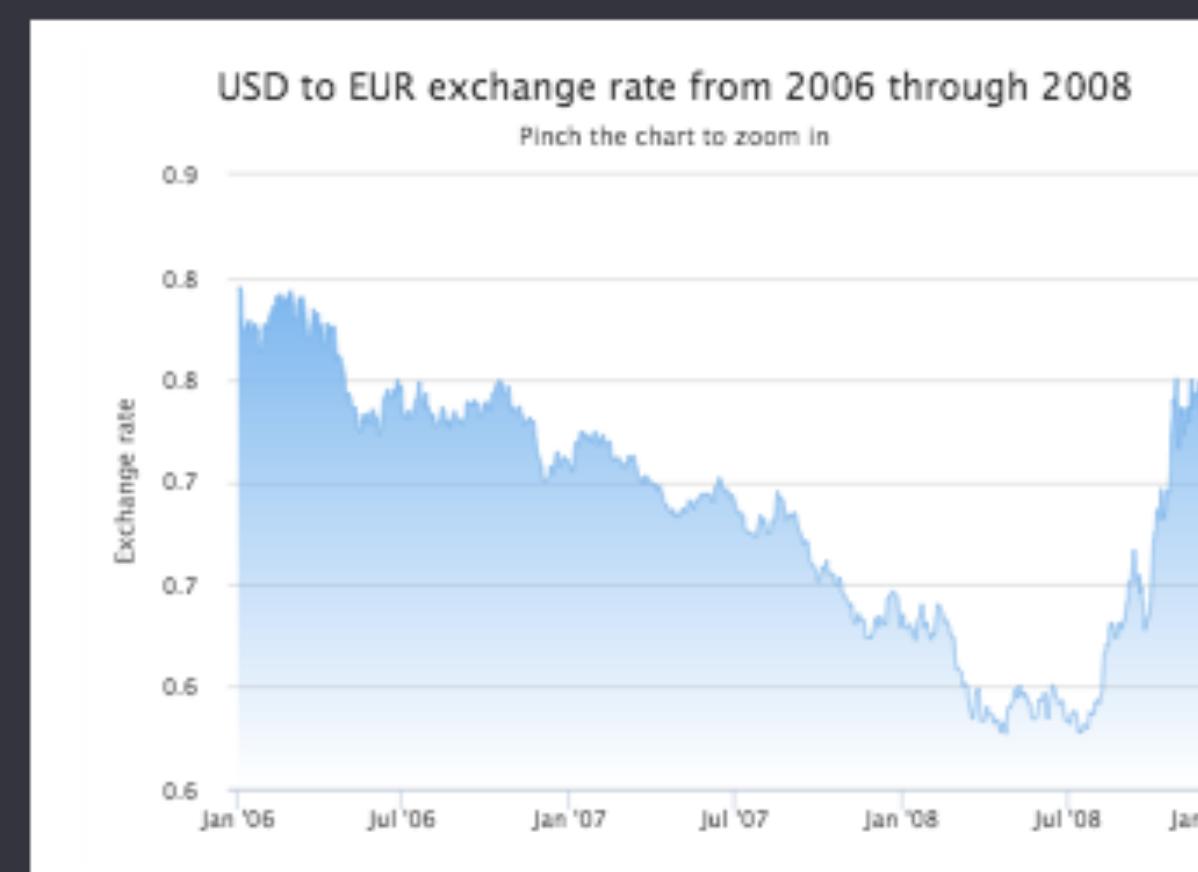
Basic line



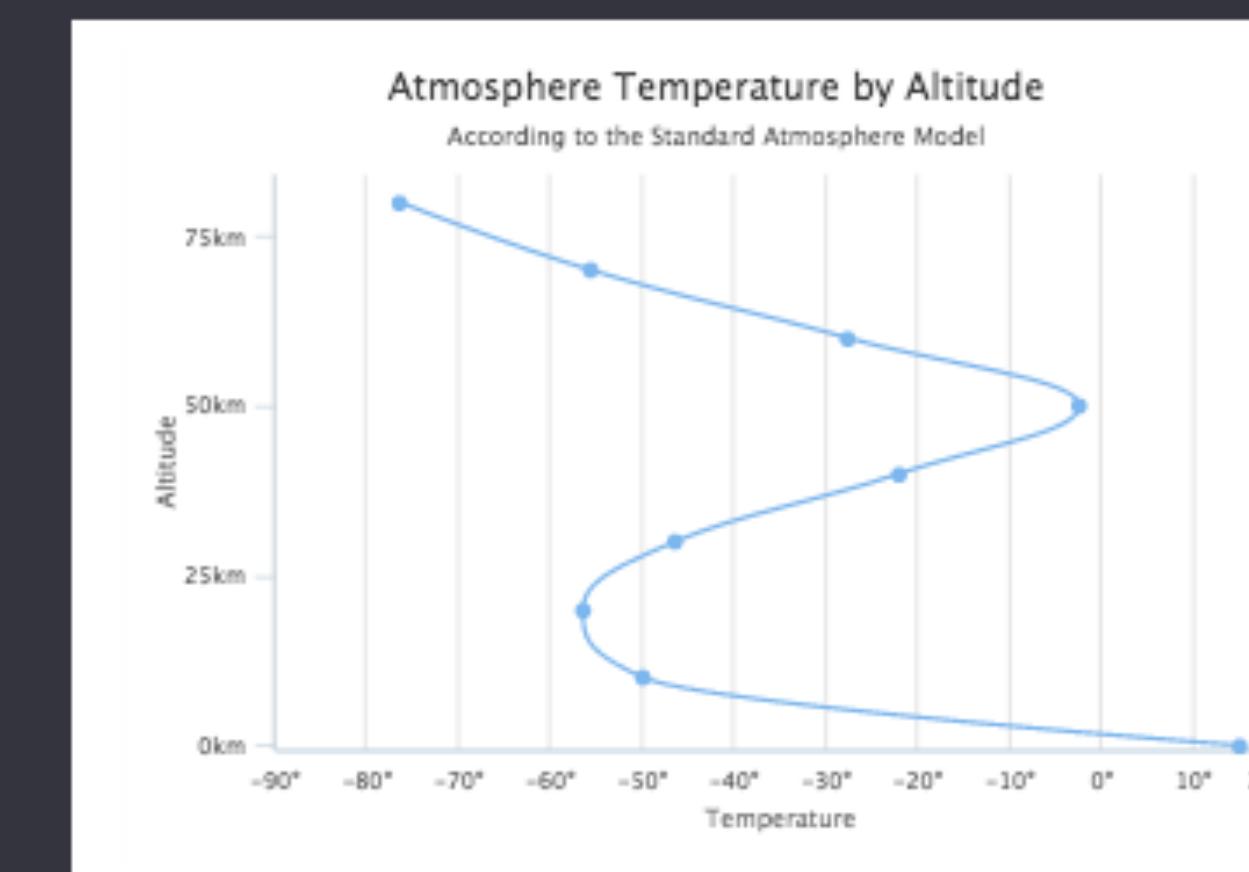
Ajax loaded data, clickable points



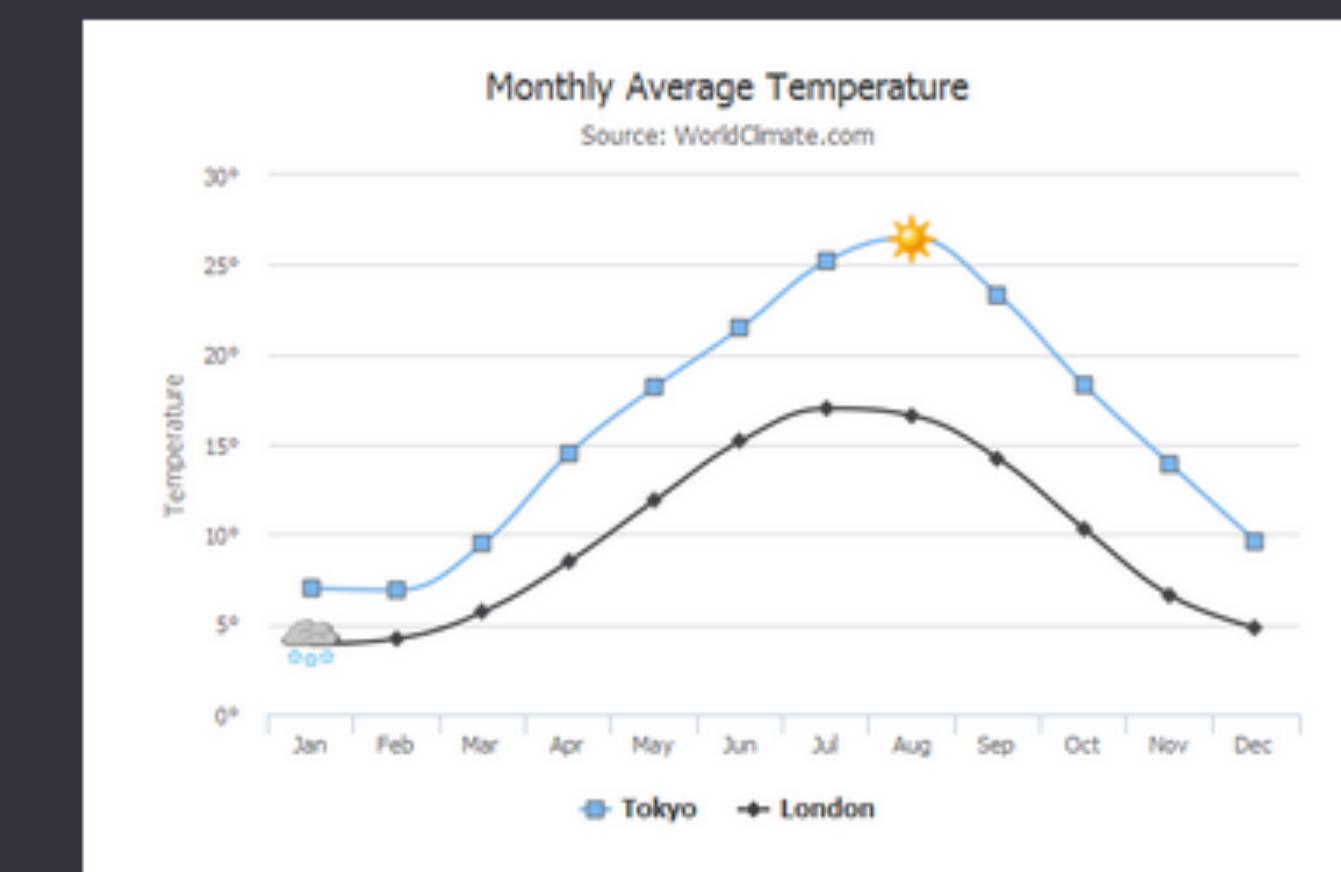
With data labels



Time series, zoomable



Spline with inverted axes

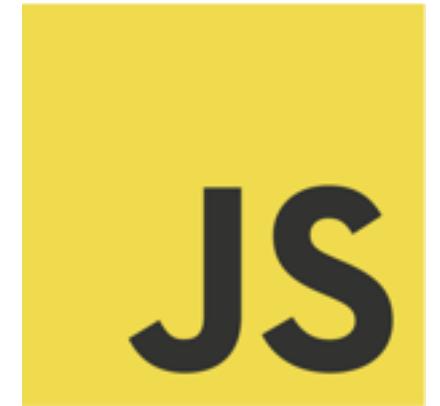


Spline with symbols

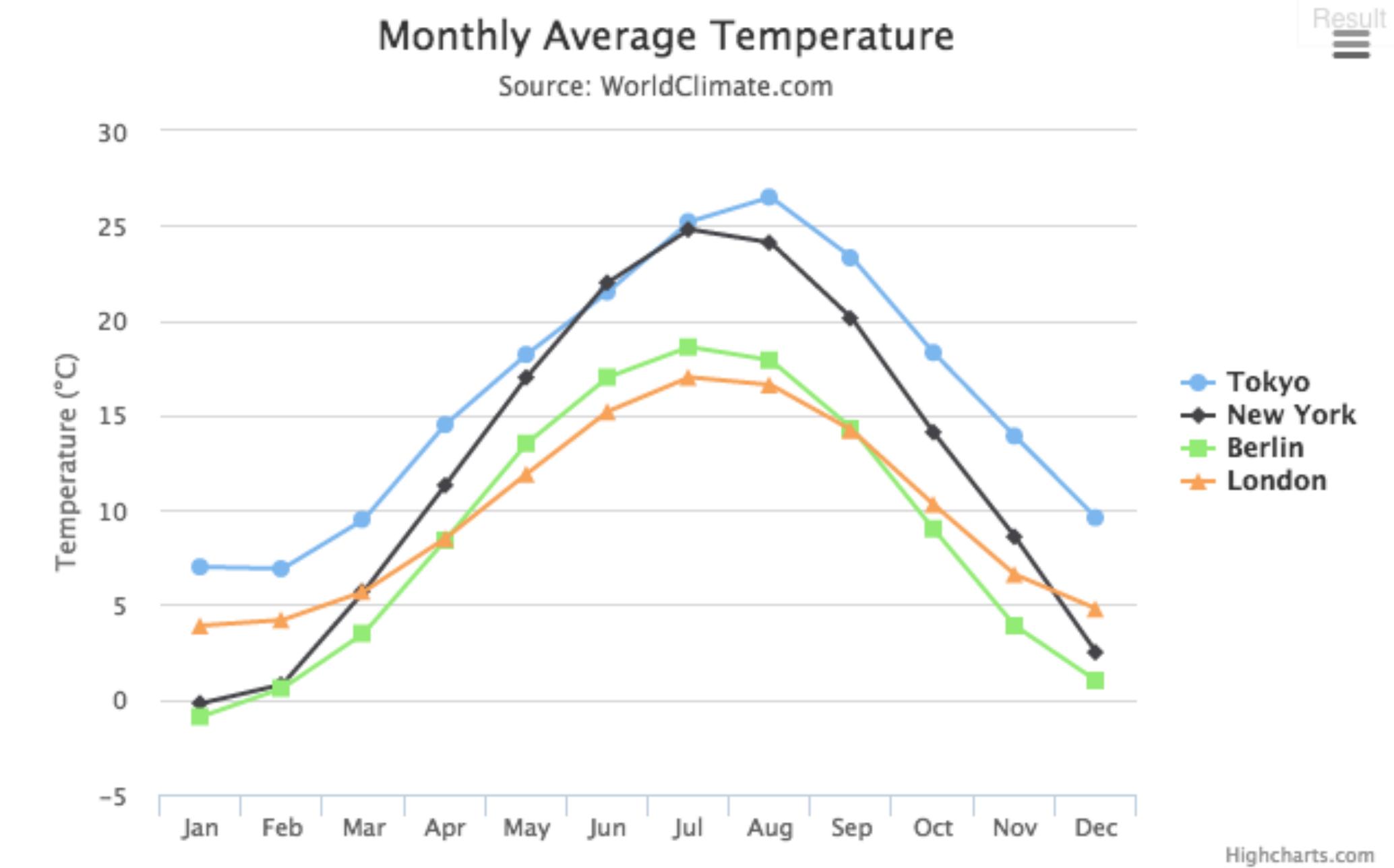
Highcharts

JS Library to drawing graphs on HTML pages

<http://www.highcharts.com>



```
$(function () {
    $('#container').highcharts({
        title: {
            text: 'Monthly Average Temperature',
            x: -20 //center
        },
        subtitle: {
            text: 'Source: WorldClimate.com',
            x: -20
        },
        xAxis: {
            categories: ['Jan', 'Feb', 'Mar', 'Apr', 'May', 'Jun',
                'Jul', 'Aug', 'Sep', 'Oct', 'Nov', 'Dec']
        },
        yAxis: {
            title: {
                text: 'Temperature (°C)'
            },
            plotLines: [{
                value: 0,
                width: 1,
                color: '#808080'
            }]
        },
        tooltip: {
            valueSuffix: '°C'
        },
        legend: {
            layout: 'vertical',
            align: 'right',
            verticalAlign: 'middle',
            borderWidth: 0
        },
        series: [{
            name: 'Tokyo',
            data: [7.0, 6.9, 9.5, 14.5, 18.2, 21.5, 25.2, 26.5, 23.3, 18.3, 13.9, 9.6]
        }, {
```

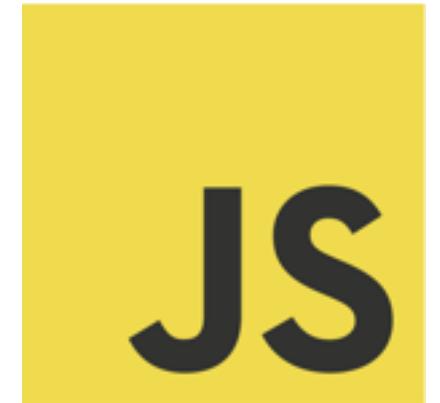


Highcharts.com

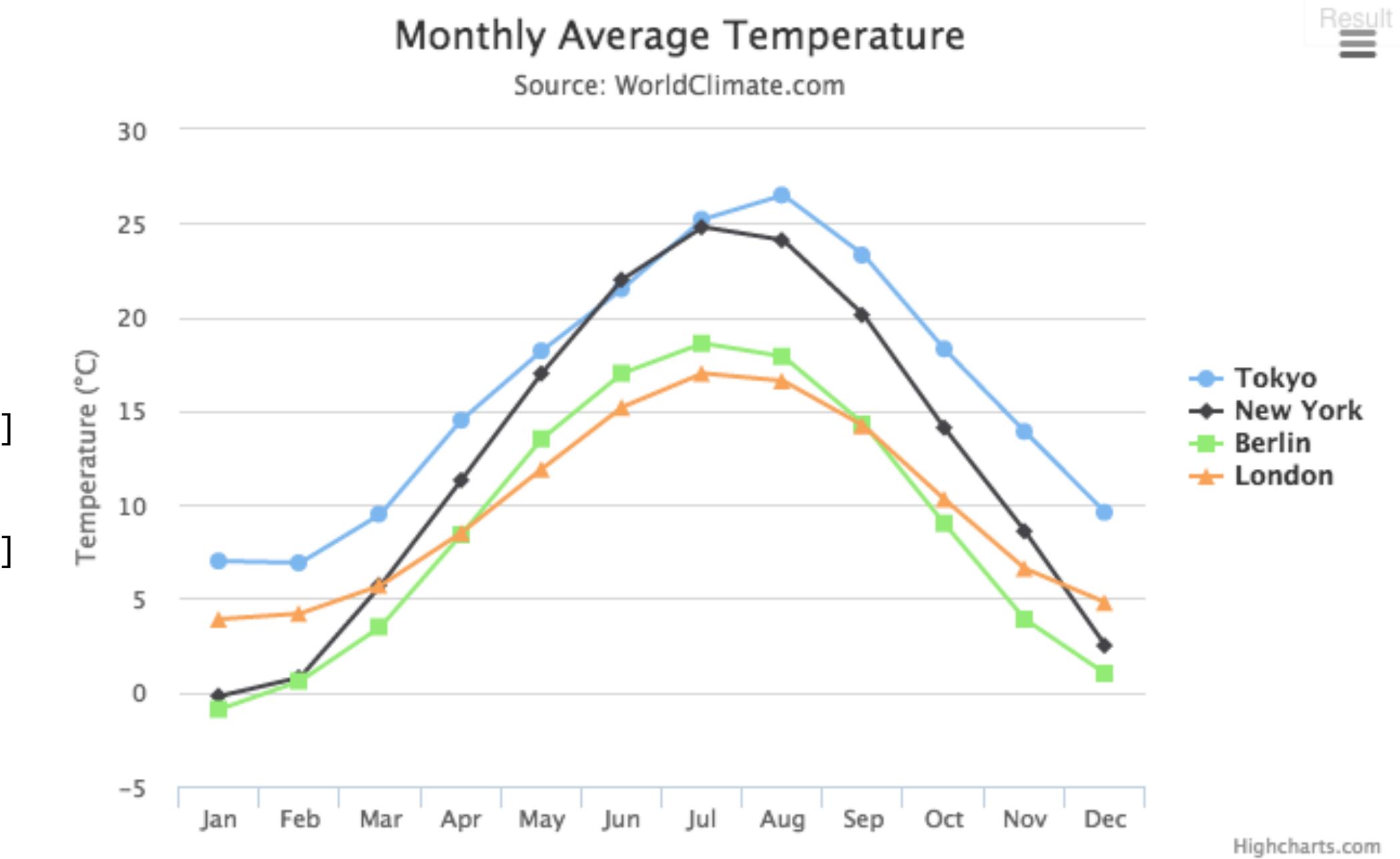
Highcharts

JS Library to drawing graphs on HTML pages

<http://www.highcharts.com>



```
tooltip: {
    valueSuffix: '°C'
},
legend: {
    layout: 'vertical',
    align: 'right',
    verticalAlign: 'middle',
    borderWidth: 0
},
series: [
    {
        name: 'Tokyo',
        data: [7.0, 6.9, 9.5, 14.5, 18.2, 21.5, 25.2, 26.5, 23.3, 18.3, 13.9, 9.6]
    },
    {
        name: 'New York',
        data: [-0.2, 0.8, 5.7, 11.3, 17.0, 22.0, 24.8, 24.1, 20.1, 14.1, 8.6, 2.5]
    },
    {
        name: 'Berlin',
        data: [-0.9, 0.6, 3.5, 8.4, 13.5, 17.0, 18.6, 17.9, 14.3, 9.0, 3.9, 1.0]
    },
    {
        name: 'London',
        data: [3.9, 4.2, 5.7, 8.5, 11.9, 15.2, 17.0, 16.6, 14.2, 10.3, 6.6, 4.8]
    }
]);
});
```

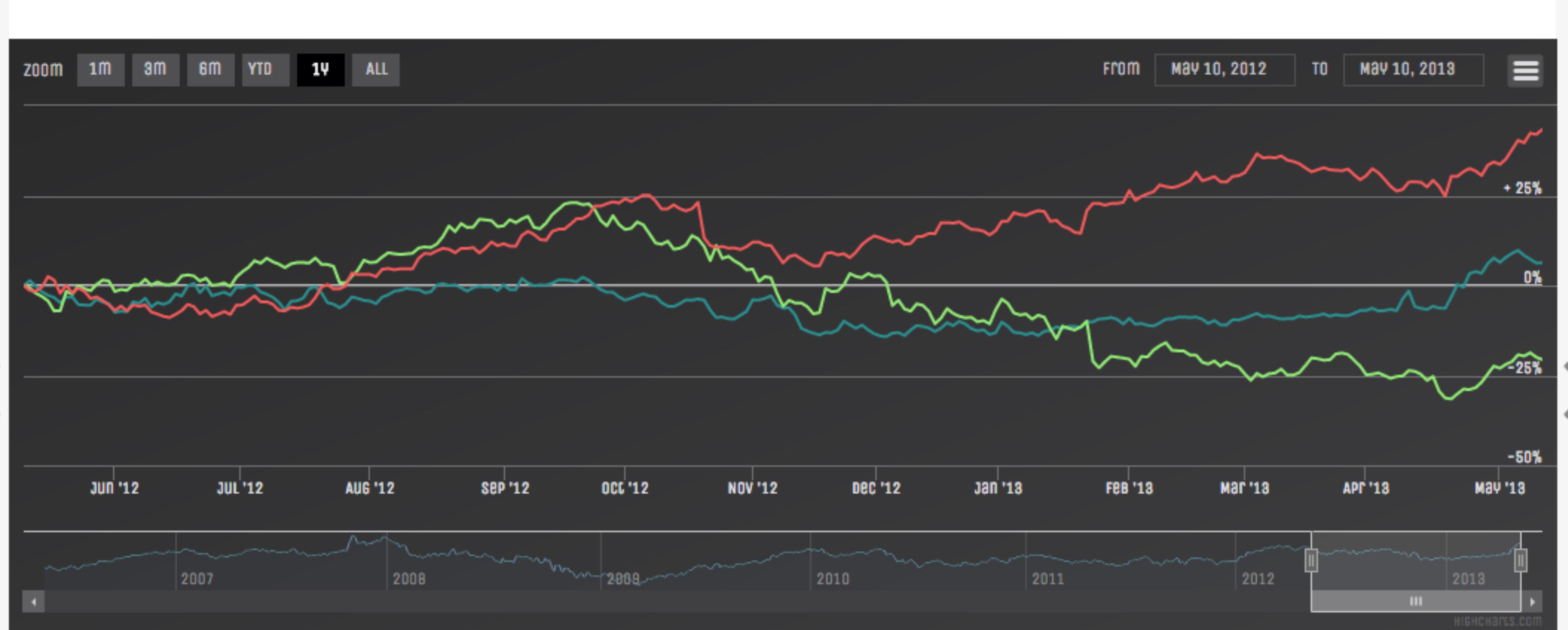


Highcharts

JS Library to drawing graphs on HTML pages

<http://www.highcharts.com>

JS



Zoomable and dynamic search on the data native to library ([Demo](#))

Other 3rd Party Libraries

Extending Functionality of your Web App

D3.js

JS Library to drawing dynamic visuals

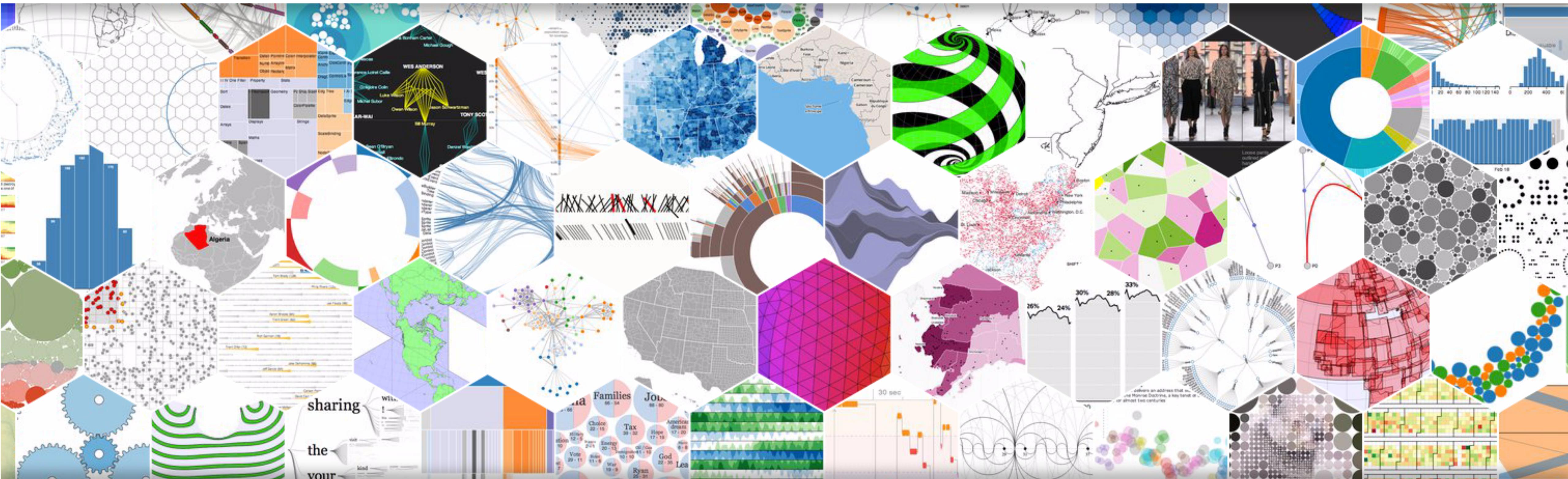
<http://d3js.org>

JS

[Overview](#) [Examples](#) [Documentation](#) [Sources](#)



Data-Driven Documents



MetricsGraphics.js

JS Library to deal with graphs



MetricsGraphics.js

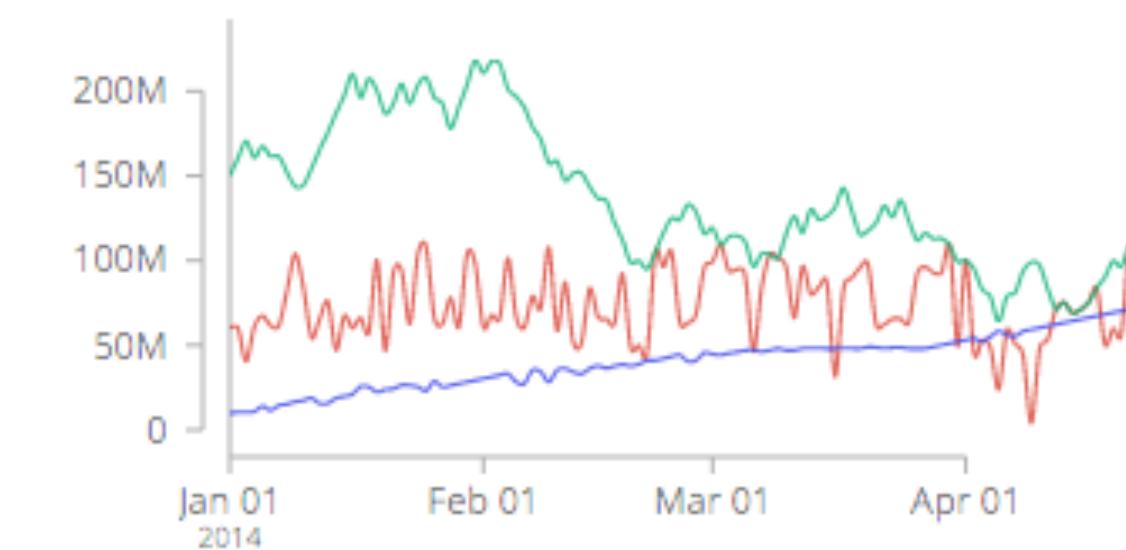
<http://metricsgraphicsjs.org>

JS

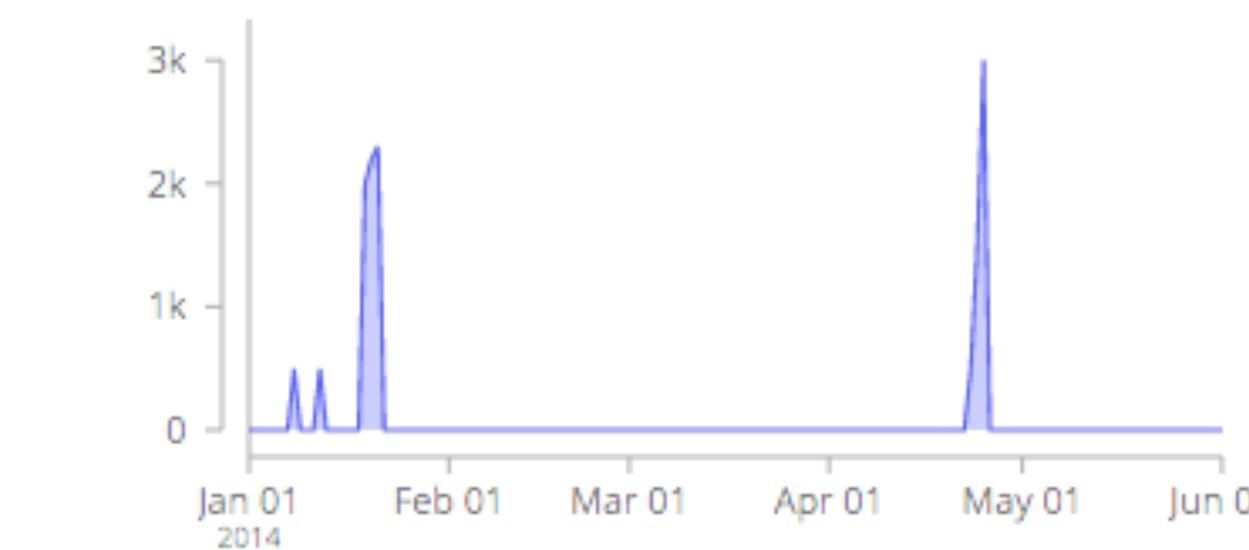
Line Chart ?



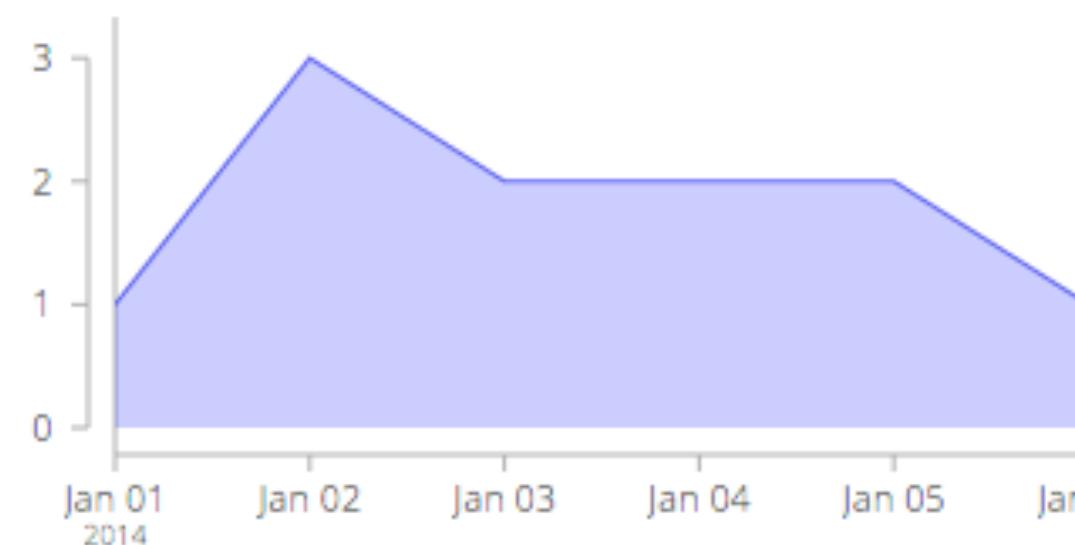
Multi-Line Chart ?



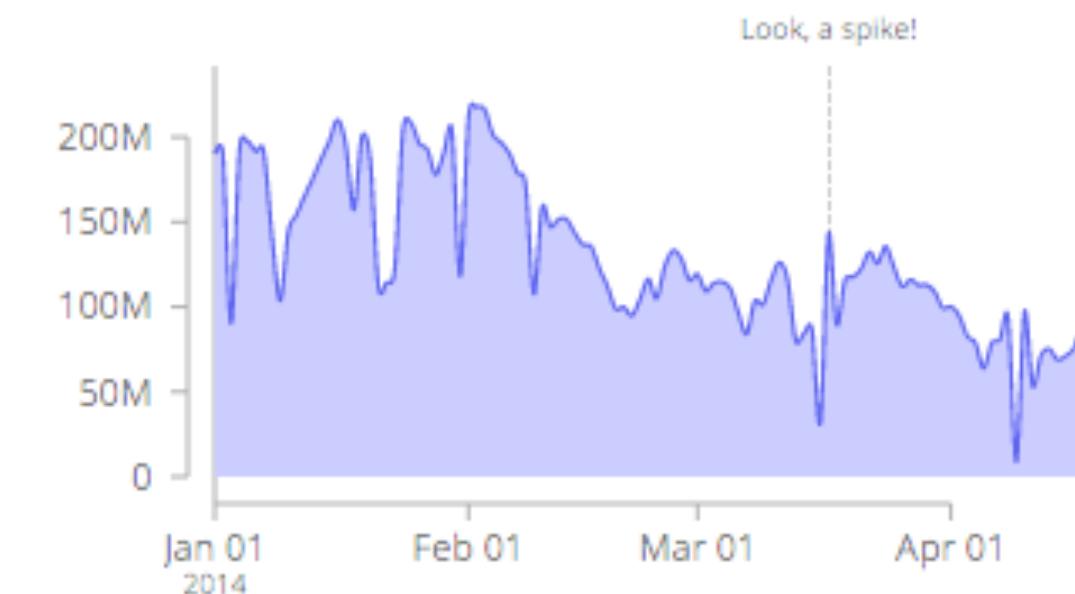
Few Observations ?



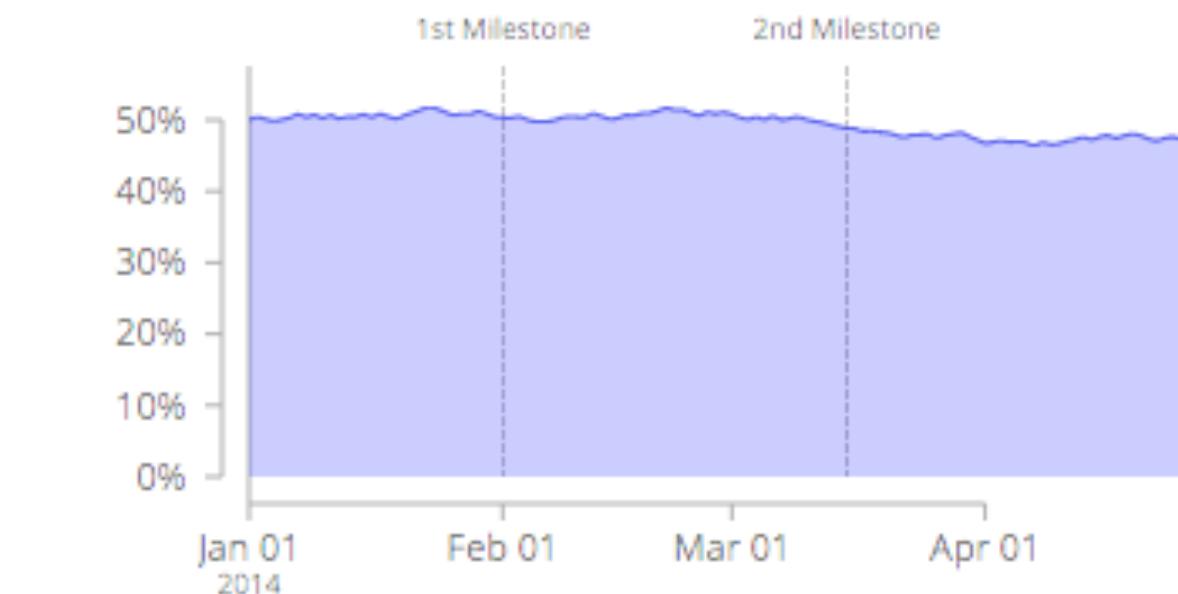
Small Range of Integers ?



Annotations ?



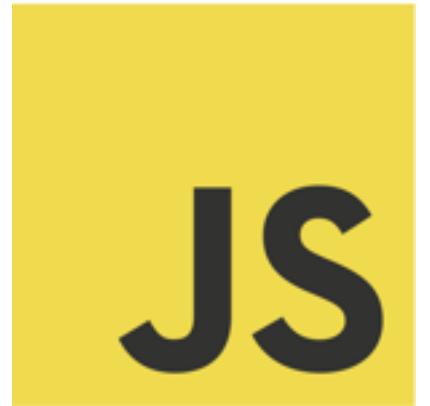
Some Percentages ?



XDate.js

JS Library to deal with dates

<http://arshaw.com/xdate/>



Introduction

Constructors

Getters

Setters

Adding

Diffing

Parsing

Formatting

UTC Methods

UTC Mode

Utilities

Chaining

Inconsistencies

Deprecated

XDate

A Modern JavaScript Date Library

XDate is a thin wrapper around JavaScript's native [Date](#) object that provides enhanced functionality for parsing, formatting, and manipulating dates. It implements the same methods as the native Date, so it should seem very familiar.

Also, it is non-destructive to the DOM, so it can safely be included in third party libraries without fear of side effects.

Download:

[xdate.js](#)

Size: 7.2k (3.0k gzipped)

Version: 0.8

Released: Mar 30th, 2013

[Development Version](#)

[Project on Github](#)

[Issue Tracker](#)

Dual-licensed under [MIT](#) or [GPL](#)



Constructors

`new XDate()`

Creates a new XDate with the current date and time

`new XDate(xdate)`

Moment.js

Another JS Library to deal with dates

<http://momentjs.com>

JS



MOMENT



MOMENT
TIMEZONE

Home

Docs

Tests

Fork on GitHub



Moment.js 2.9.0

Parse, validate, manipulate, and display dates in JavaScript.

Download

moment.js

moment.min.js 11.6k gz

moment+locales.js

Install

```
bower install moment --save # bower  
npm install moment --save # npm  
Install-Package Moment.js # NuGet  
spm install moment --save # spm  
meteor add momentjs:moment # meteor
```

Firebase

JS Library to deal with realtime data

<https://www.firebaseio.com>

JS



OVERVIEW

GETTING STARTED

PRICING

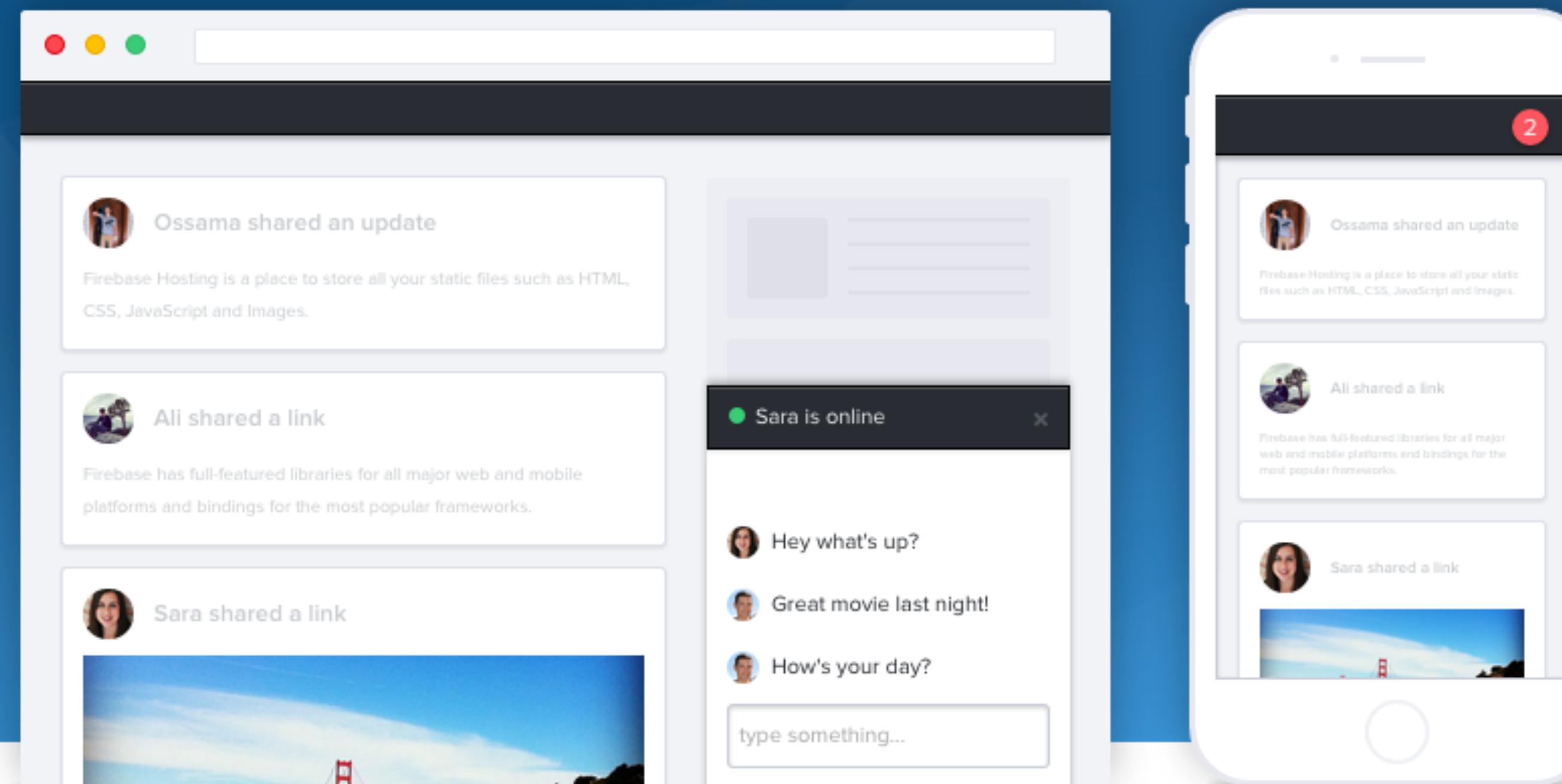
DOCS

LOGIN

SIGN UP

Build Realtime Apps

A powerful API to store and sync data in realtime.



Socket.io

Another JS Library to deal with realtime data

<http://socket.io>



A screenshot of the socket.io homepage. At the top left is the socket.io logo (a lightning bolt icon). To its right are navigation links: Home, Demos, Get started, Docs, Blog, and Slack (with a badge showing 48). On the far right are a 'Star' button with the number 16,116 and a 'Download v1.3.5' button.

SOCKET.IO 1.0 IS HERE

FEATURING THE FASTEST AND MOST RELIABLE REAL-TIME ENGINE

A screenshot of a terminal window titled '~/.Projects/tweets/index.js'. The code shown is:

```
1. var io = require('socket.io')(80);
2. var cfg = require('./config.json');
3. var tw = require('node-tweet-stream')(cfg);
4. tw.track('socket.io');
5. tw.track('javascript');
6. tw.on('tweet', function(tweet){
7.   io.emit('tweet', tweet);
8. });
```

A screenshot of a web browser window with the URL 'https://your-node-app.com'. The page displays a list of tweets from various users. The first tweet is from a user with a yellow profile picture and the text 'RT @JoindaHunt: iOS Chat error using socket.io by co... 1'. The second tweet is from a user with a pink profile picture and the text 'Mobile App Wanted! iOS Chat error using socket.io by... 1'. The third tweet is from a user with an orange profile picture and the text 'RT @engineersftw: [video] Realtime remote monitorin... 2'. A scroll bar is visible on the right side of the browser window.

Leaflet

Open Source Maps using Open Street Map

<http://leafletjs.com>

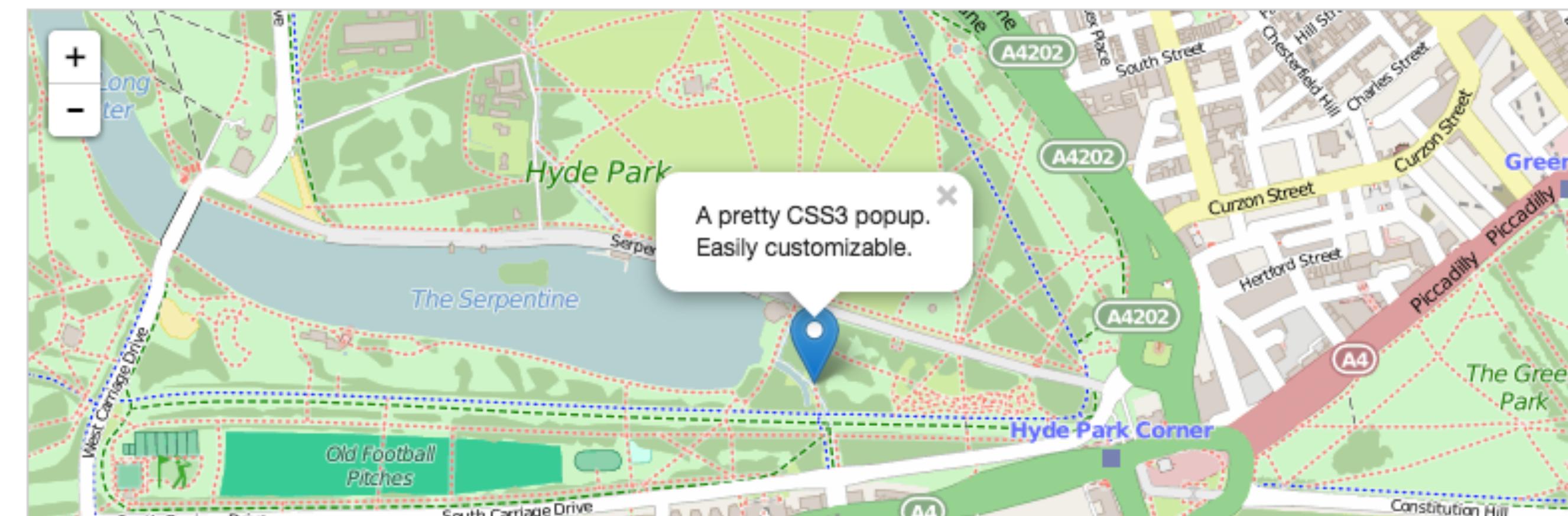
JS

The screenshot shows the official Leaflet.js website. At the top left is the Leaflet logo with a green leaf icon. To its right are social media sharing buttons for GitHub (Star, 10,110), Twitter (Tweet, Follow, 12.6K followers), and Facebook (Like, 5.5k). Below the logo is the tagline "An Open-Source JavaScript Library for Mobile-Friendly Interactive Maps". A navigation bar below the tagline includes links for Overview, Features, Tutorials, API, Download, Plugins, Blog, GitHub, Twitter, and Forum. The main content area contains a paragraph about Leaflet's purpose and development, mentioning Vladimir Agafonkin and contributors. It also highlights its design principles of simplicity, performance, and usability, and its extensive ecosystem of plugins and documentation.

Leaflet is a modern open-source JavaScript library for mobile-friendly interactive maps. It is developed by [Vladimir Agafonkin](#) with a team of dedicated [contributors](#). Weighing just about 33 KB of JS, it has all the [features](#) most developers ever need for online maps.

Leaflet is designed with *simplicity, performance and usability* in mind. It works efficiently across all major desktop and mobile platforms out of the box, taking advantage of HTML5 and CSS3 on modern browsers while still being accessible on older ones. It can be extended with a huge amount of [plugins](#), has a beautiful, easy to use and [well-documented API](#) and a simple, readable [source code](#) that is a joy to [contribute](#) to.

Used by: Flickr foursquare Pinterest craigslist Data.gov IGN Wikimedia OSM Meetup WSJ Mapbox CartoDB GIS Cloud ...



Leaflet

Open Source Maps using Open Street Map

<http://leafletjs.com>

JS

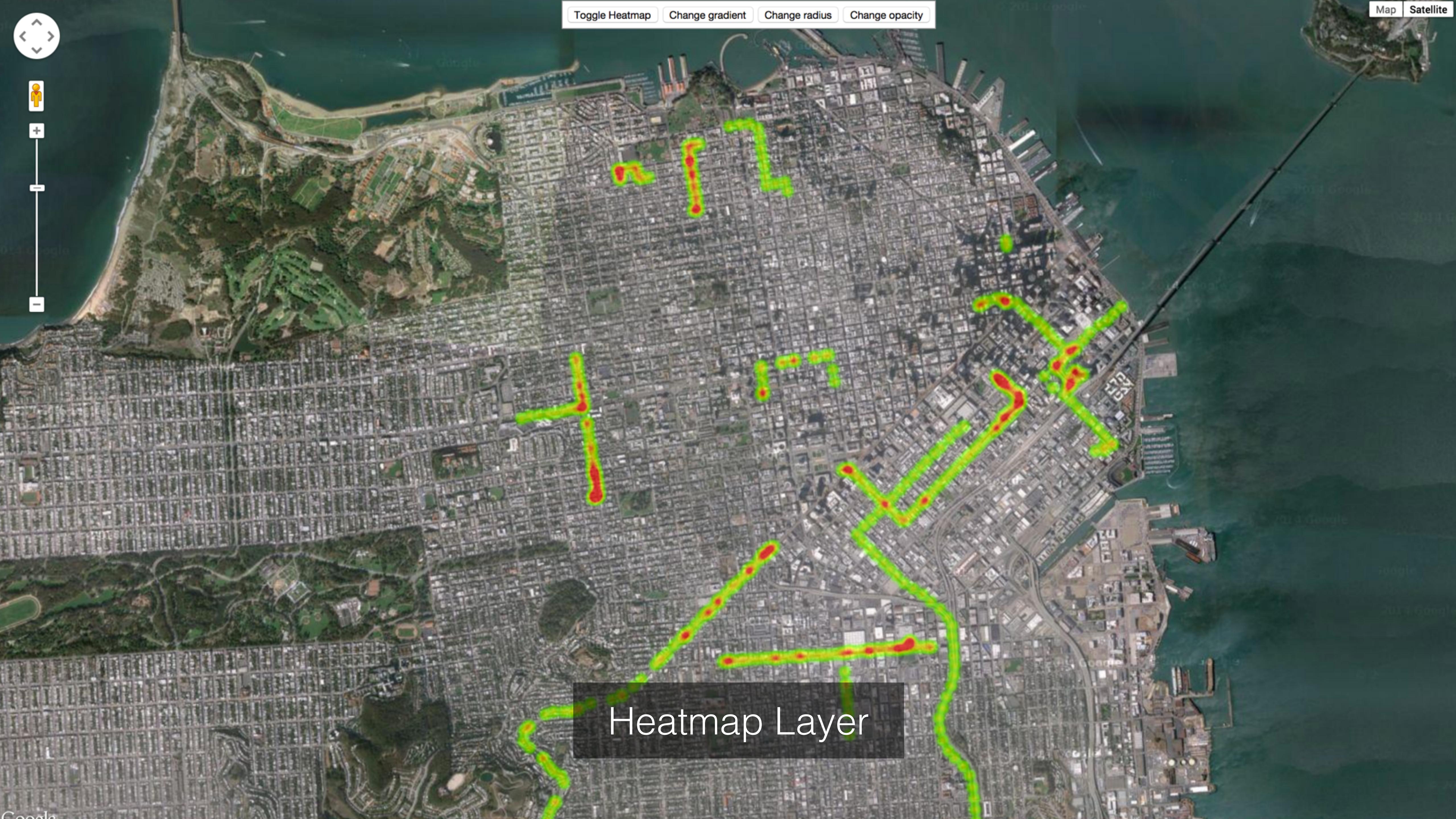
```
// create a map in the "map" div, set the view to a given place and zoom
var map = L.map('map').setView([51.505, -0.09], 13);

// add an OpenStreetMap tile layer
L.tileLayer('http://{s}.tile.osm.org/{z}/{x}/{y}.png', {
    attribution: '&copy; <a href="http://osm.org/copyright">OpenStreetMap</a> contributors'
}).addTo(map);

// add a marker in the given location, attach some popup content to it and open the popup
L.marker([51.5, -0.09]).addTo(map)
    .bindPopup('A pretty CSS3 popup. <br> Easily customizable.')
    .openPopup();
```

Google Maps

What else can it do?



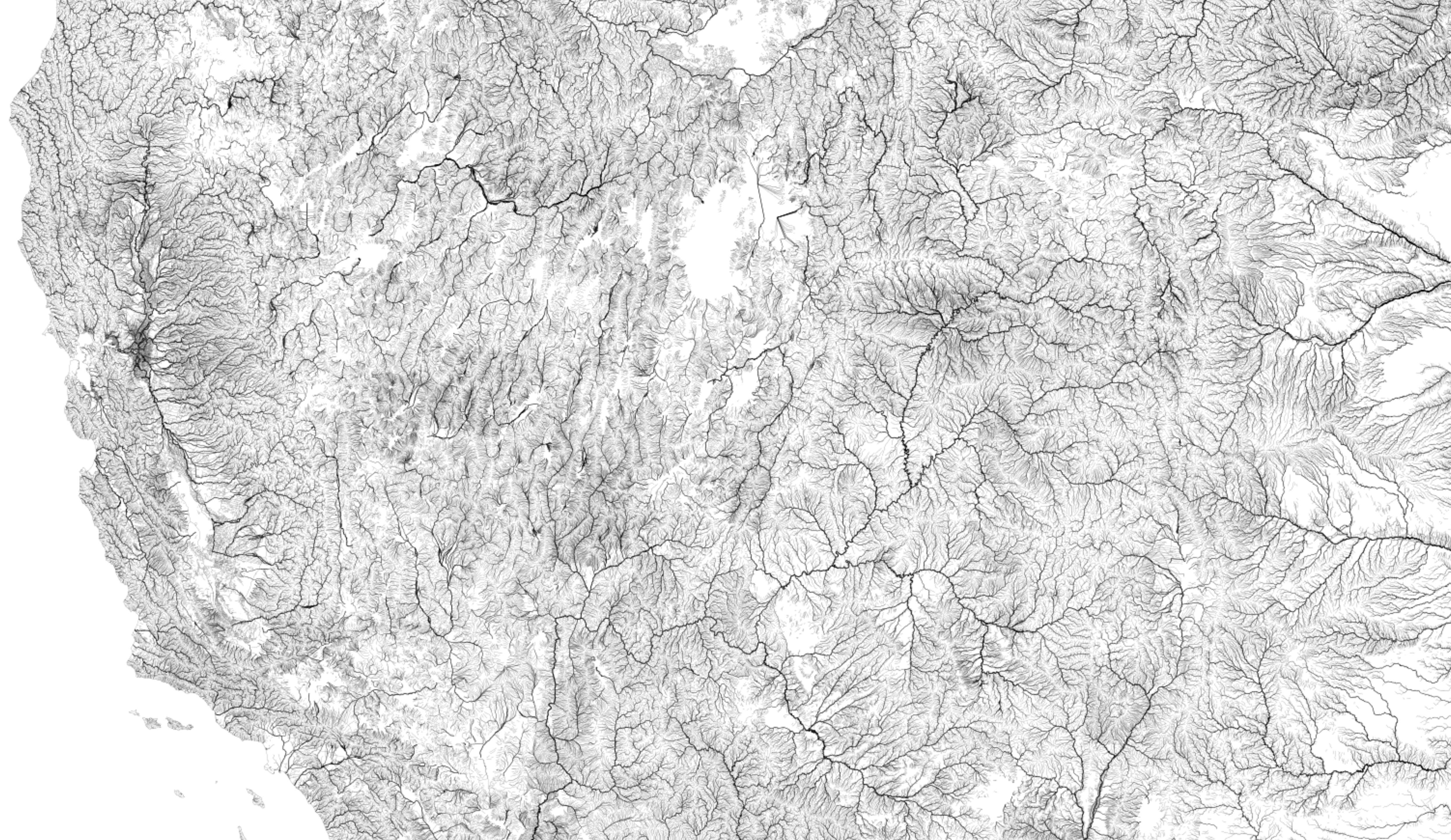
Toggle Heatmap Change gradient Change radius Change opacity

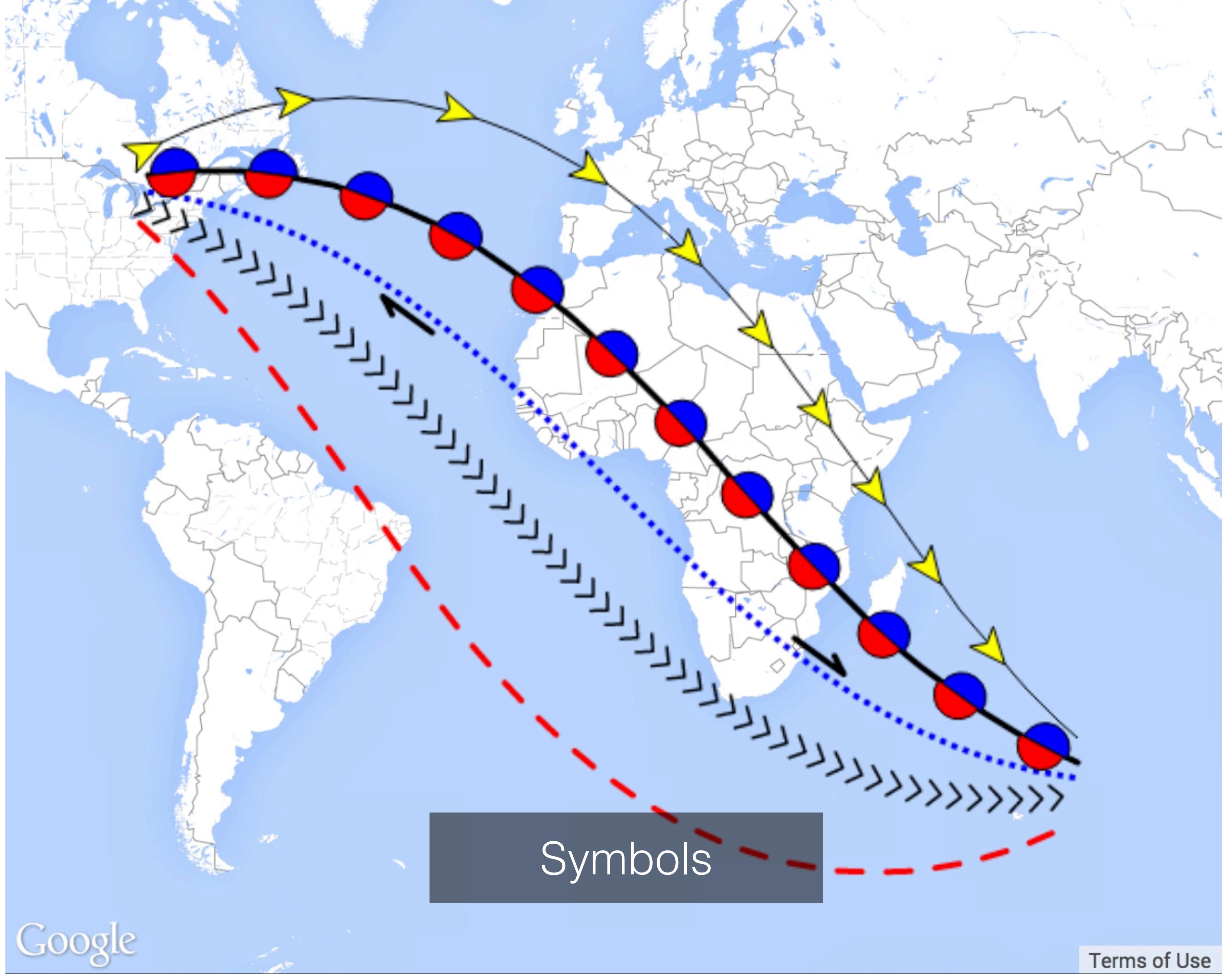
2013 Google

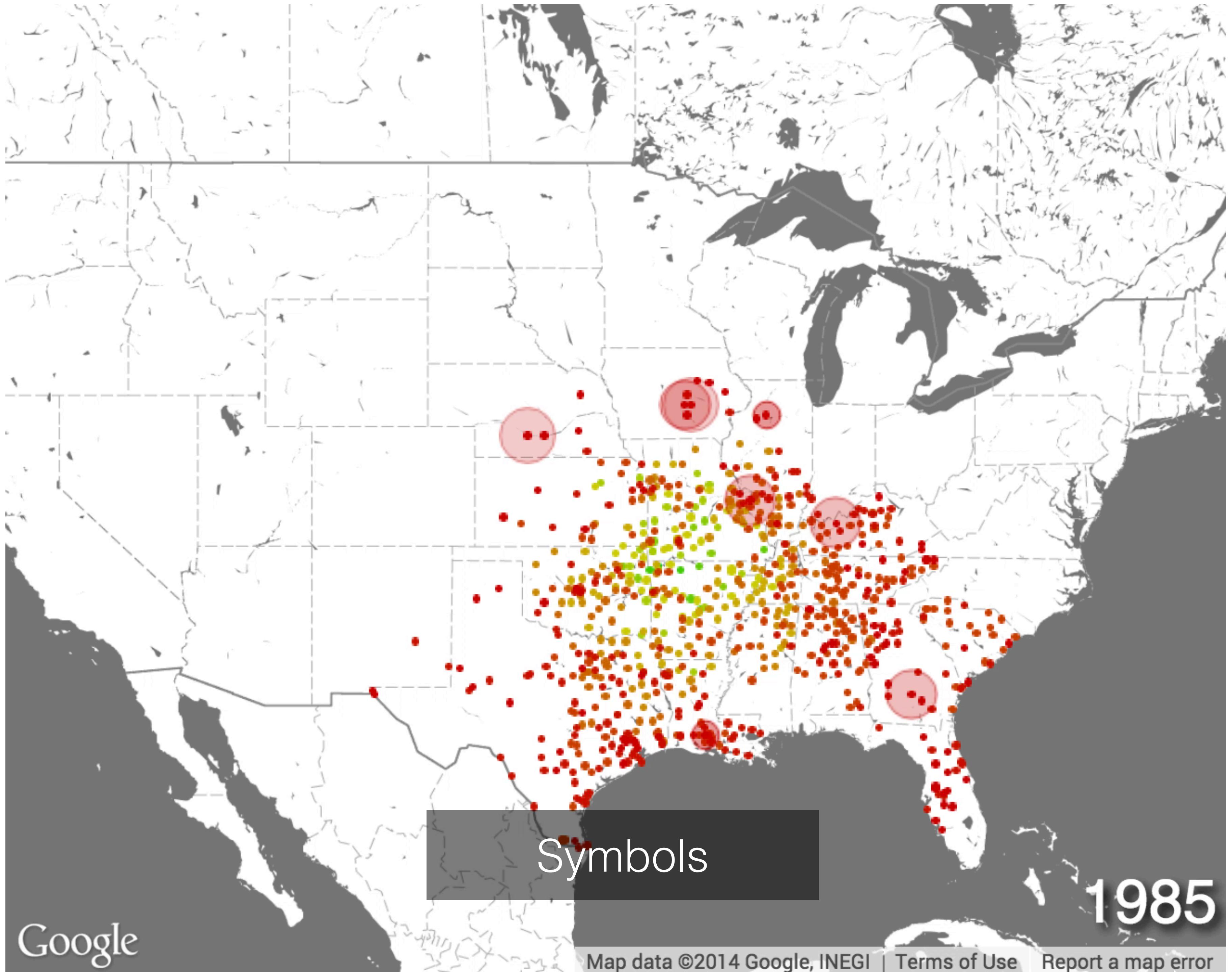
Map Satellite



TopoJSON -> GeoJSON

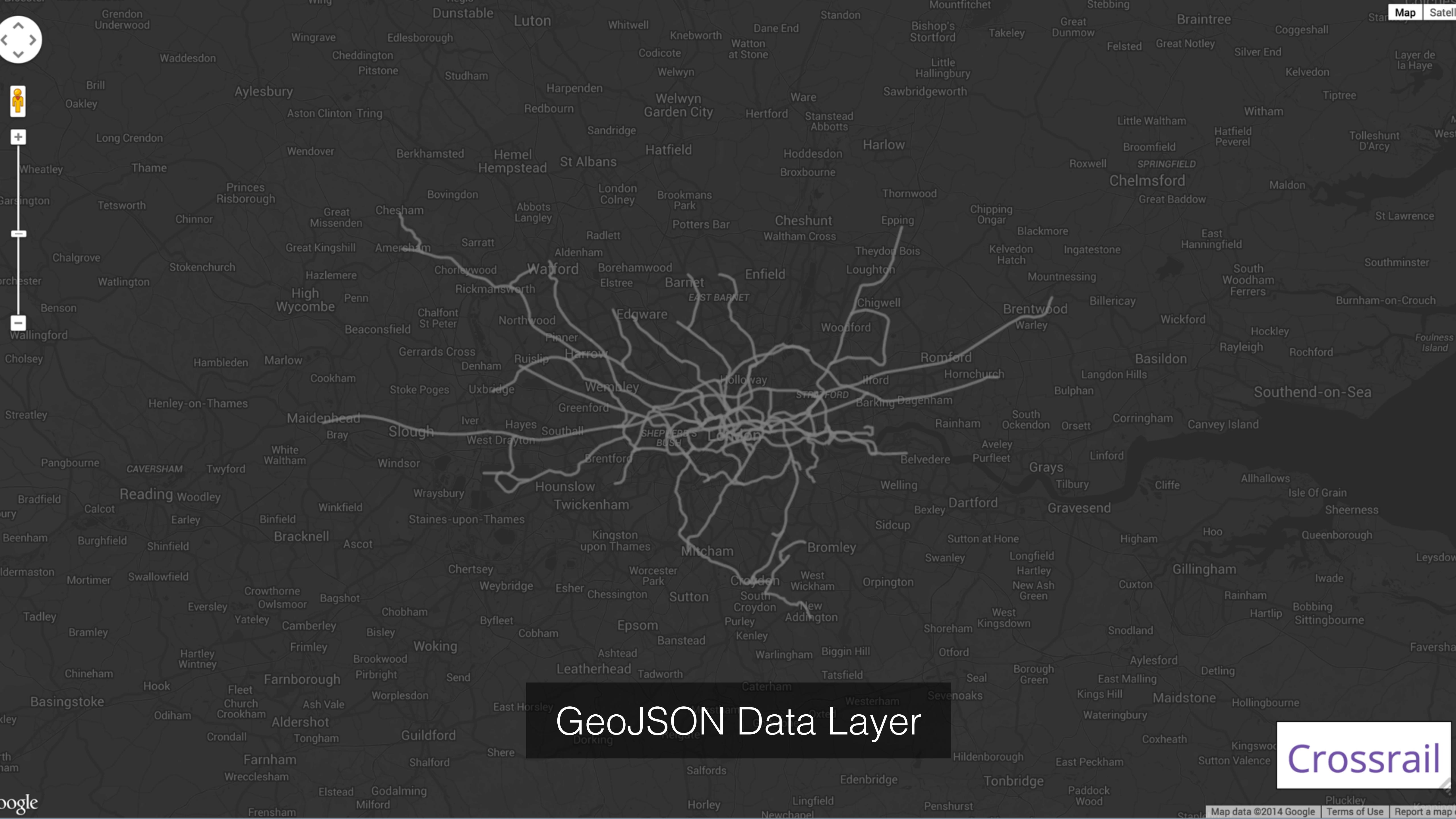






Google

Map data ©2014 Google, INEGI | Terms of Use | Report a map error



Heatmaps

Can you handle the heat?

index.html

```
<head>
<script type="text/javascript"
  src="https://maps.googleapis.com/maps/api/js?sensor=true&key={key}">
</script>
</head>
```

data.js

```
var heatmapData = [
  new google.maps.LatLng(37.782, -122.447),
  new google.maps.LatLng(37.782, -122.445),
  new google.maps.LatLng(37.782, -122.443),
  ...
  new google.maps.LatLng(37.785, -122.437),
  new google.maps.LatLng(37.785, -122.435)
];
```

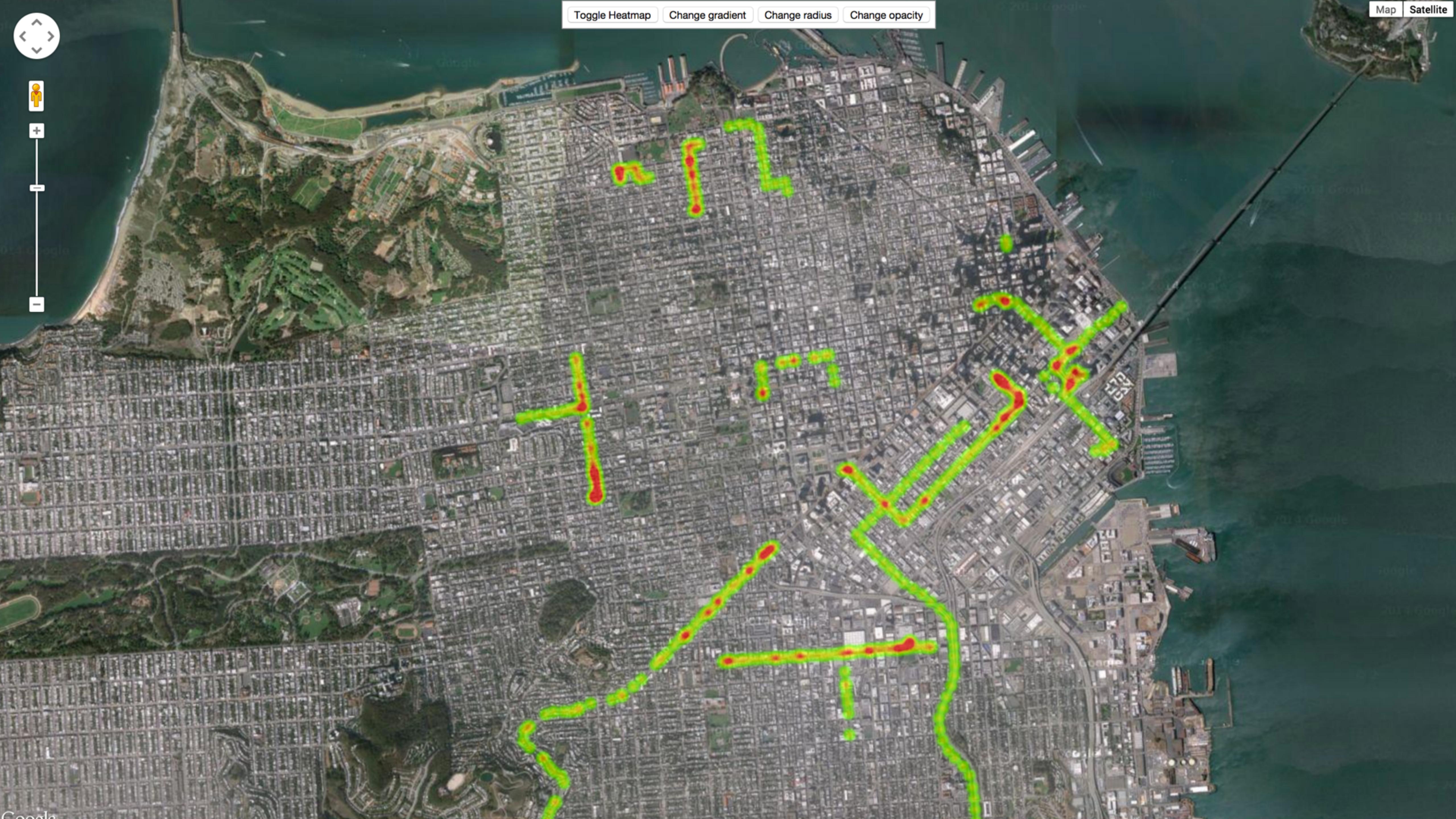
index.html

```
var sanFrancisco = new google.maps.LatLng(37.774546, -122.433523);

map = new google.maps.Map(document.getElementById('map-canvas'), {
  center: sanFrancisco,
  zoom: 13,
  mapTypeId: google.maps.MapTypeId.SATELLITE
});

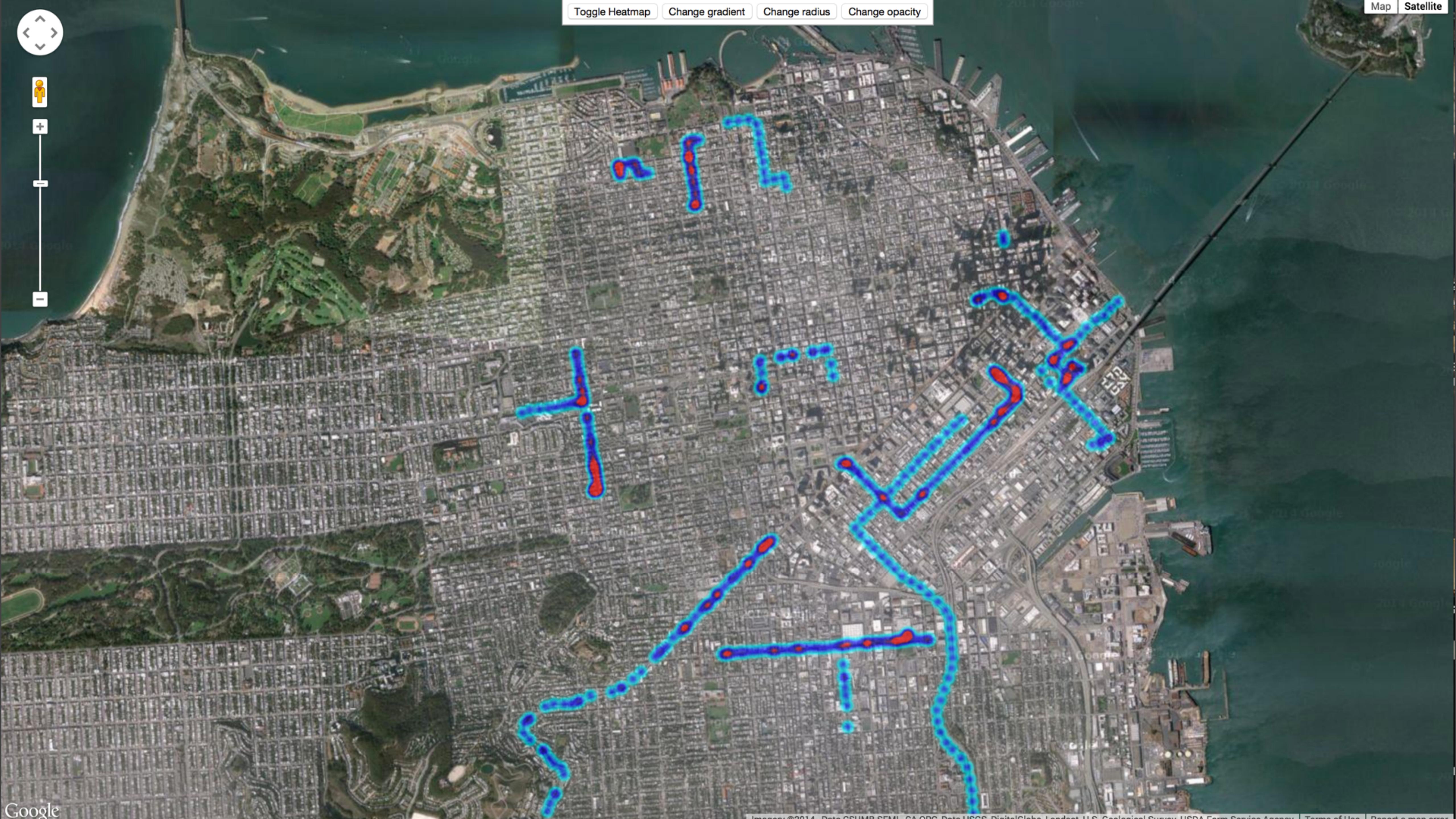
var heatmap = new google.maps.visualization.HeatmapLayer({
  data: heatmapData
});

heatmap.setMap(map);
```



index.html

```
var gradient = [
  'rgba(0, 255, 255, 0)',
  'rgba(0, 255, 255, 1)',
  'rgba(0, 191, 255, 1)',
  'rgba(0, 127, 255, 1)',
  'rgba(0, 63, 255, 1)',
  'rgba(0, 0, 255, 1)',
  'rgba(0, 0, 223, 1)',
  'rgba(0, 0, 191, 1)',
  'rgba(0, 0, 159, 1)',
  'rgba(0, 0, 127, 1)',
  'rgba(63, 0, 91, 1)',
  'rgba(127, 0, 63, 1)',
  'rgba(191, 0, 31, 1)',
  'rgba(255, 0, 0, 1'
]
heatmap.set('gradient', gradient);
```

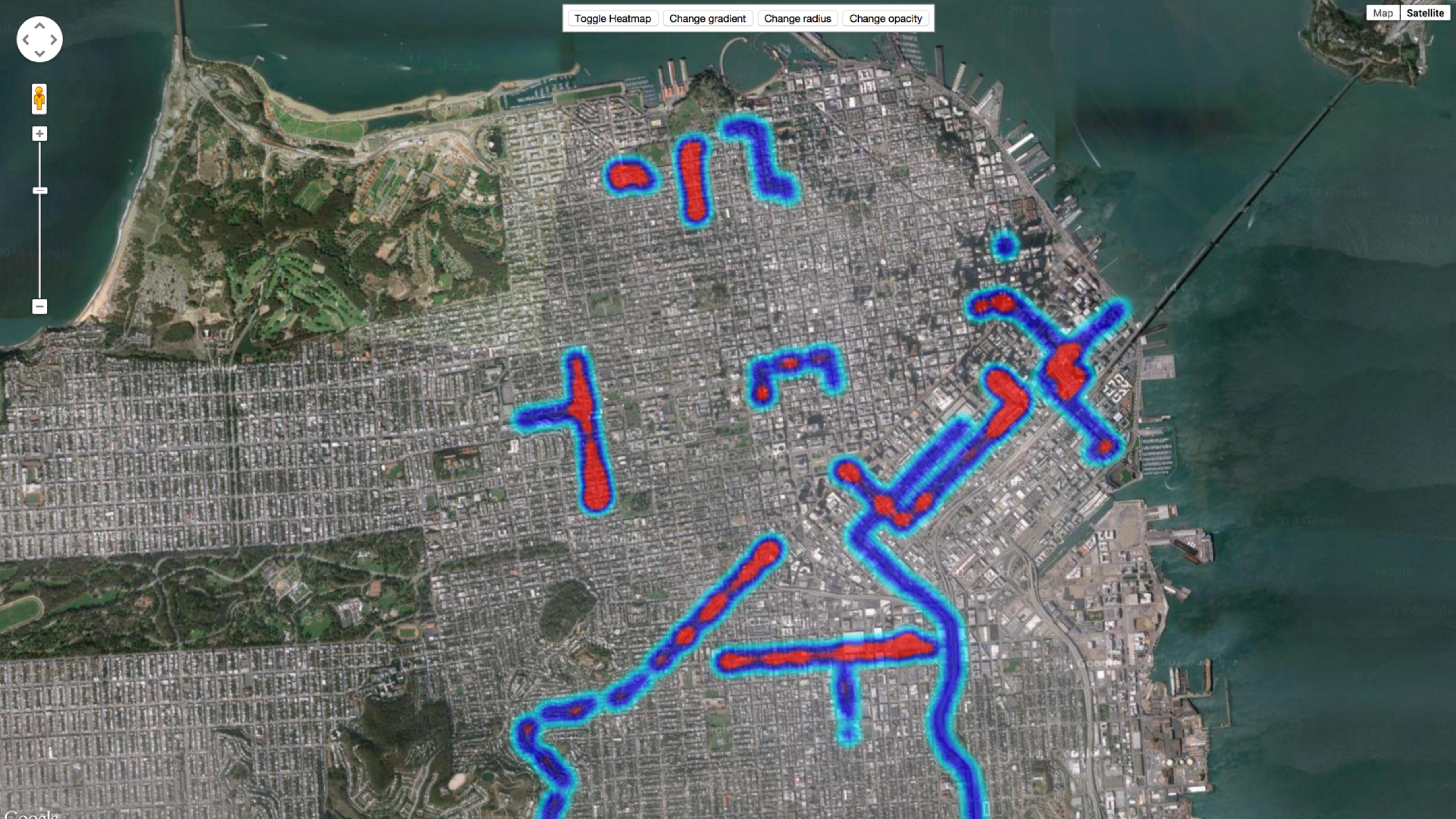


Toggle Heatmap Change gradient Change radius Change opacity

Map Satellite

index.html

```
var  
  data: heatmapData  
});  
  
heatmap.setMap(map);  
  
heatmap.set('radius', 20);
```



GeoJSON

Geometry on maps

tfl_lines.geojson

```
{  
  "type": "FeatureCollection",  
  "crs": { "type": "name", "properties": { "name": "urn:ogc:def:crs:OGC:  
1.3:CRS84" } },  
  
  "features": [  
    { "type": "Feature", "properties": { "id": 1, "lines": [ { "name": "Victoria",  
      "network": "Tube", "colour": "#0098D4" } ], "seg_desc": "Victoria", "geometry": {  
        "type": "LineString", "coordinates": [ [ -0.1148720, 51.4626062 ], [ -0.1154612,  
          51.4627201 ], [ -0.1167776, 51.4629816 ], [ -0.121132, 51.4638465 ], [ -0.1215893,  
          51.463931 ], [ -0.1223392, 51.4641384 ], [ -0.1234773, 51.4645792 ], [ -0.1240446,  
          51.4648628 ], [ -0.1245532, 51.4652346 ], [ -0.1248932, 51.4655457 ], [ -0.1253925,  
          51.4661992 ], [ -0.1256804, 51.4668713 ], [ -0.125783, 064019 ], [ -0.1431186,  
          51.5065574 ], [ -0.1428352, 51.5067094 ], [ -0.1418986, 51.5071603 ], . . .  
      } ] } ] }  
}
```

index.html

```
var mapOptions = {  
  center: {lat: 51.5, lng: 0},  
  zoom: 10,  
  mapTypeId: google.maps.MapTypeId.SATELLITE  
});  
  
var map = new google.maps.Map(document.getElementById("map-canvas"), mapOptions);  
  
map.data.loadGeoJson('./data/tfl_lines.json');
```

index.html

```
map.data.setStyle(function(feature) {  
  var lineColor, strokeOp;  
  
  lineColor = 'gray';  
  strokeOp = 0.5;  
  return {  
    strokeColor: lineColor,  
    strokeOpacity: opacity,  
    strokeWeight: 3  
  };  
});
```



Crossrail

index.html

```
map.data.addListener('mouseover', function(event) {
  map.data.revertStyle();
  var lineColor = event.feature.getProperty('lines')[0].colour;
  map.data.overrideStyle(event.feature, {
    strokeColor: lineColor,
    strokeOpacity: 1.0,
    strokeWeight: 5
});

document.getElementById('data_window').style.display = "initial";
document.getElementById('data_window').innerHTML = "<span style='color: " +lineColor
+ "'>" + event.feature.getProperty('lines')[0].name + "</span>";
});
```



Live Example

Central

Workshop: Week 10

Using 3rd party libraries - Adding Graphs to your websites

- Extend the Interactive Viewer for Flickr Photos from last week
 - Add a sample Highcharts graph to your app
- Experiment with 3rd Party Libraries / jQuery Libraries
 - Try before you use it in your work
 - Talk to us about what you want to do in your visualisation

Time to work on your group work or complete previous workshops

That's all folks!

Questions?

steven.gray@ucl.ac.uk

@frogo

020 3108 3886



casa

Pitches Group Order 2015

Group 1

Group 3

Group 5

Group 7

Group 2

Group 4

Group 6

Starts at 1:30pm - CASA Teaching Room - Friday 27th March
10 mins each - 7 min max + 3 mins for questions