Web Map Visualization: Leaflet

Option GIS-Python

hes·so business.

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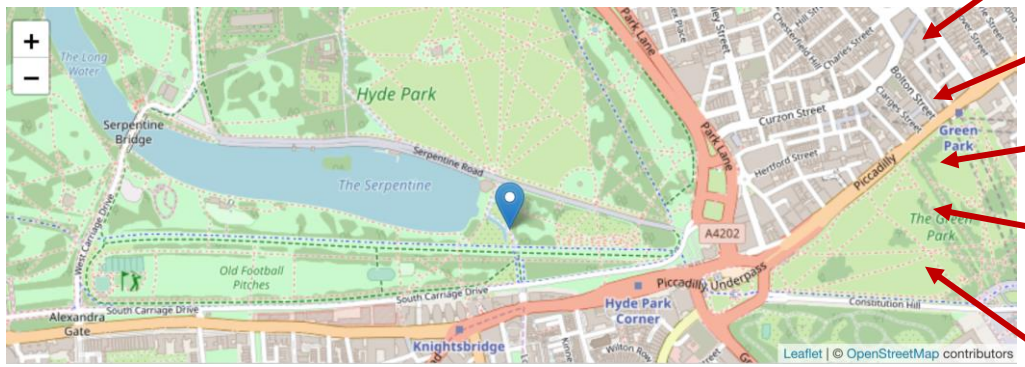
> Leaflet

What is Leaflet?

https://leafletjs.com

- Open-source **JavaScript** library for maps
- **Mobile**-friendly interactive maps.
- Weighing just **38 KB** of JS
- All major **mapping features**
- Simplicity, performance and usability
- All major desktop and mobile platforms,
- Well-documented **API**

> Leaflet



GeoJSON

Layers

Geometries

Events

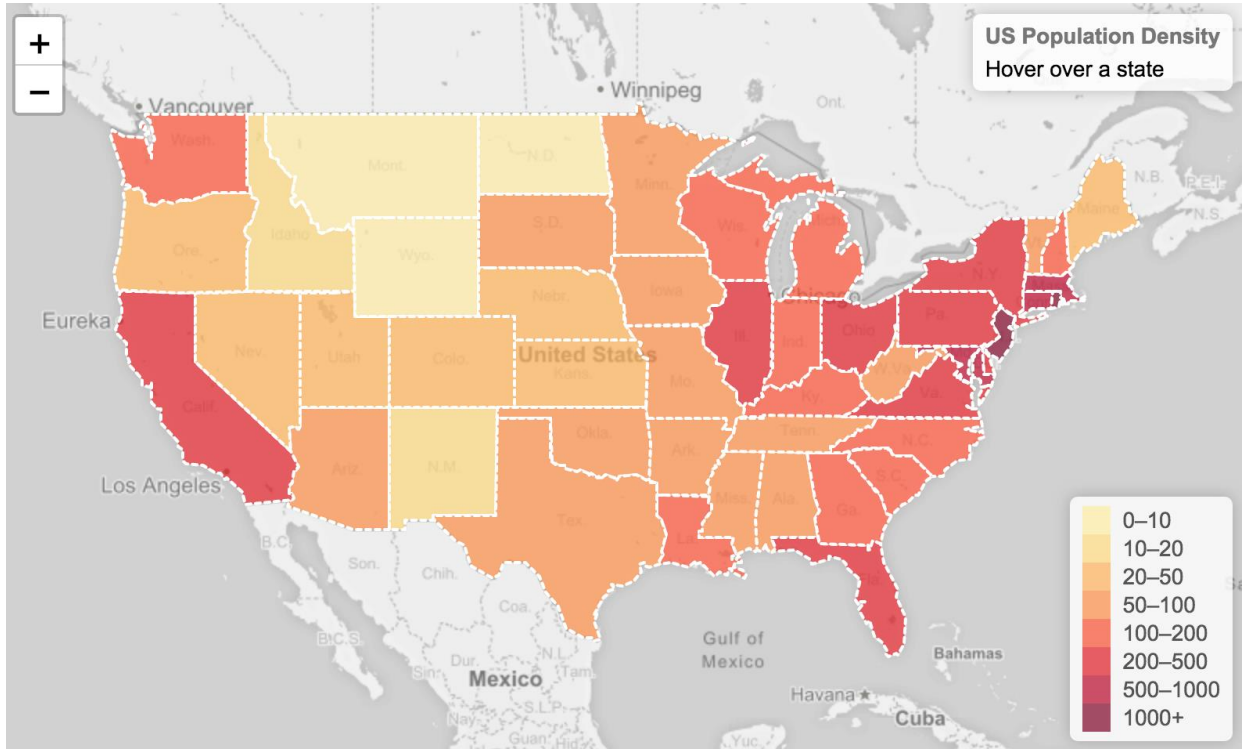
Interactions

Work on your map on the client

You may use any backend you prefer.
or no backend at all…

> Leaflet: features

- **Layers Out of the Box**
  - Tile layers, WMS
  - Markers, Popups
  - Vector layers: polylines, polygons, circles, rectangles
  - Image overlays
  - GeoJSON
- **Interaction Features**
  - Drag panning with inertia
  - Scroll wheel zoom
  - Pinch-zoom on mobile
  - Double click zoom
  - Zoom to area (shift-drag)
  - Keyboard navigation
  - Events: click, mouseover, etc.
  - Marker dragging



- **Map Controls**
  - Zoom buttons
  - Attribution
  - Layer switcher
  - Scale
- **Performance Features**
  - Hardware acceleration on mobile
  - CSS3 features: panning and zooming
  - Smart polyline/polygon
  - Modular build system
  - Tap delay elimination on mobile

> Including Leaflet on HTML

```
<link rel="stylesheet" href="https://unpkg.com/leaflet@1.4.0/dist/leaflet.css"
     integrity="sha512-puBpdR0798OZvTTbP4A8Ix/l+A4dHDD0DGqYW6RQ+9jxkRFclaxxQb/SJAWZfWAkuyeQUytO7+7N4QKrDh+drA=="
     crossorigin=""/>
```

Leaflet css styles

```
<script src="https://unpkg.com/leaflet@1.4.0/dist/leaflet.js"
     integrity="sha512-QVftwZFqvtRNi0ZyCtsznlKSWOStnDORoefr1enyq5mVL4tmKB3S/EnC3rRJcxCPavG10IcrVGSmPh6Qw5lwrg=="
     crossorigin=""></script>
```

Leaflet JS library

```
 <div id="swissmap"></div>
```

id of the map

> Adding a Leaflet map

```
var OpenStreetMap_CH = L.tileLayer('https://tile.osm.ch/switzerland/{z}/{x}/{y}.png',
            { maxZoom: 18,
              attribution: '&copy; <a href="https://www.openstreetmap.org/copyright">OpenStreetMap</a> contributors',
              bounds: [[45, 5], [48, 11]]       });
```

tile layer

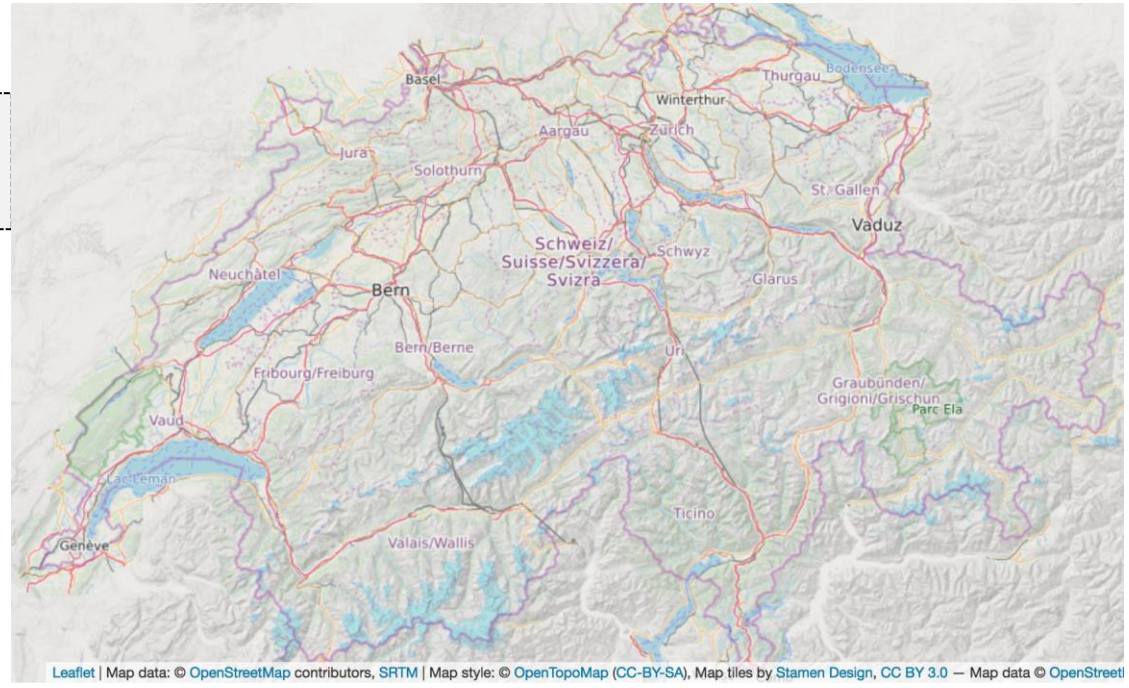
L: leaflet API

div id

```
var themap = L.map('swissmap')
                .setView([46.8,8],8)
```

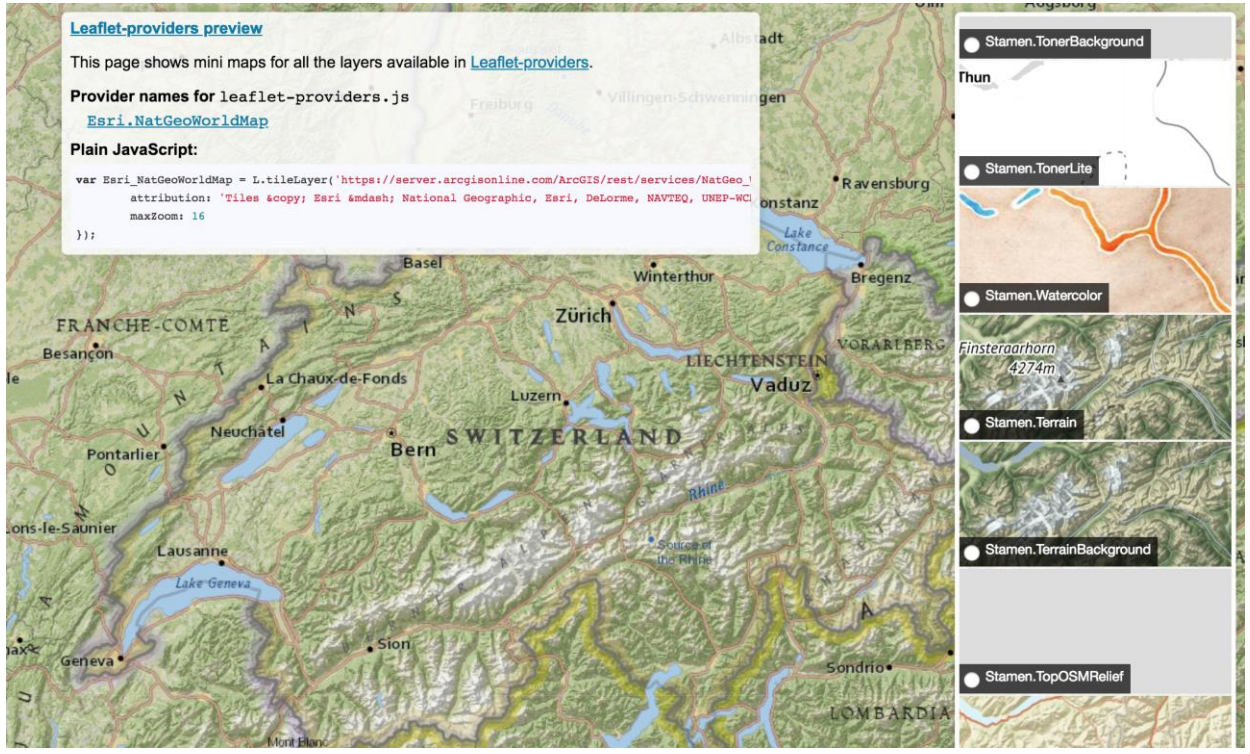
```
OpenStreetMap_CH.addTo(themap);
```

add the tile layer to the map



> Adding layers

https://leaflet-extras.github.io/leaflet-providers/preview/



Many available layers

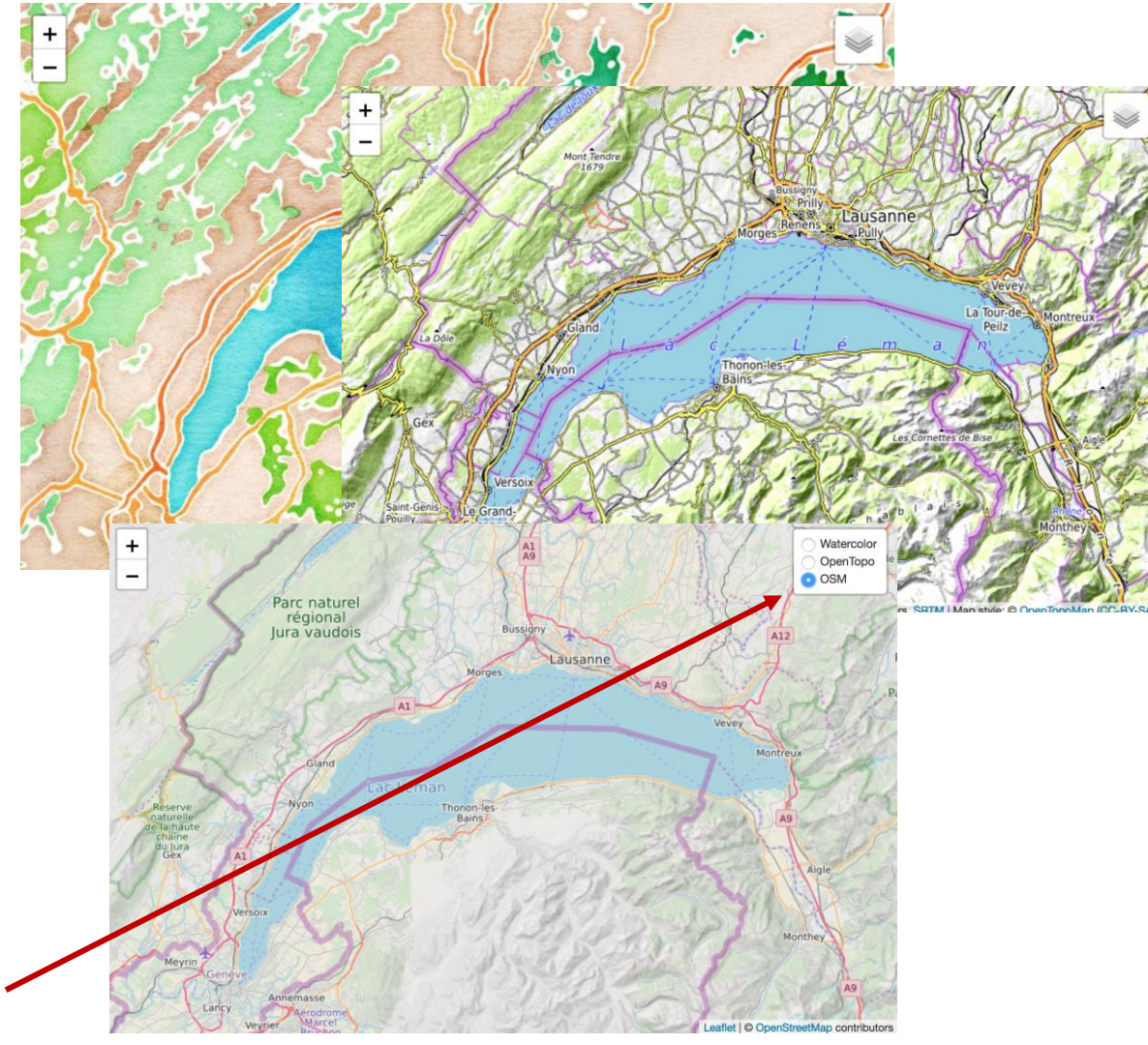
```
var OpenTopoMap        = L.tileLayer('https://{s}.tile.opentopomap.org …);
var OpenStreetMap_CH   = L.tileLayer('https://tile.osm.ch/switzerland…
var Stamen_Watercolor  = L.tileLayer('https://stamen-tiles-{s}….);
```

> Adding layers

```
var baseMaps= {
  "Watercolor":Stamen_Watercolor,
  "OpenTopo"  :OpenTopoMap,
  "OSM"       :OpenStreetMap_CH,};
```

add multiple layers

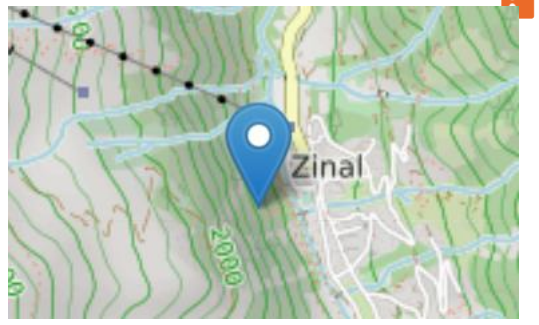
```
 var themap = L.map('swissmap',
    {layers: [OpenTopoMap,
              Stamen_Watercolor,
              OpenStreetMap_CH]})
     .setView([46.8,8],8)

L.control.layers(baseMaps,null)
   .addTo(themap);
```



layer control

> Adding markers, geometries

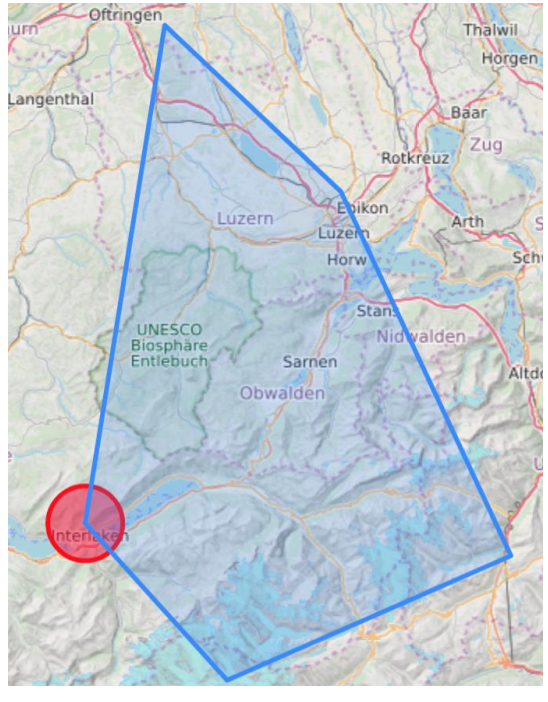
```
var marker = L.marker([46.134666, 7.62216])
              .addTo(themap);
```



marker

```
var circle = L.circle([46.7, 7.85],
      { color: 'red', fillColor: '#f03',
        fillOpacity: 0.5, radius: 5000 })
       .addTo(themap);
```

```
 var polygon = L.polygon([
     [46.7, 7.85], [47.3, 7.99],
     [47.1, 8.3], [46.66,8.6], [46.51, 8.1]] )
     .addTo(themap);
```



circle & polygon

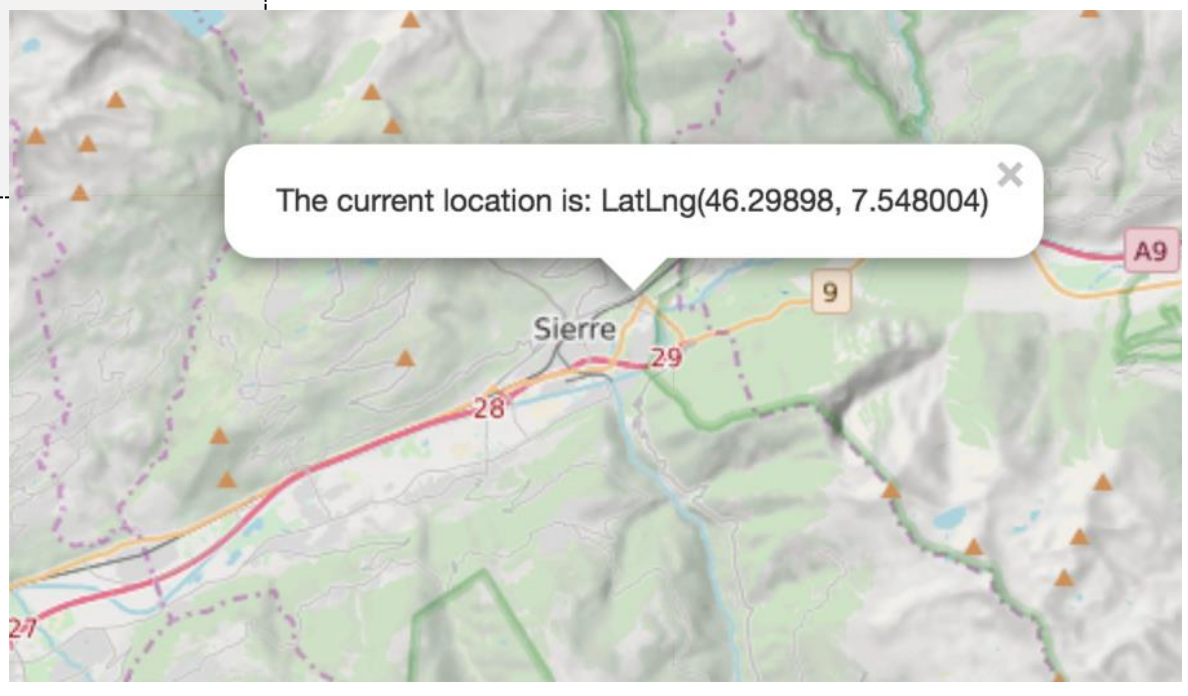
> Events on the map

```
var popup = L.popup();
```

event

lat/long

```
function displayLocation(e) {
    popup.setLatLng(e.latlng)
         .setContent("The current location is: " +
                     e.latlng.toString())
         .openOn(themap);
}
```



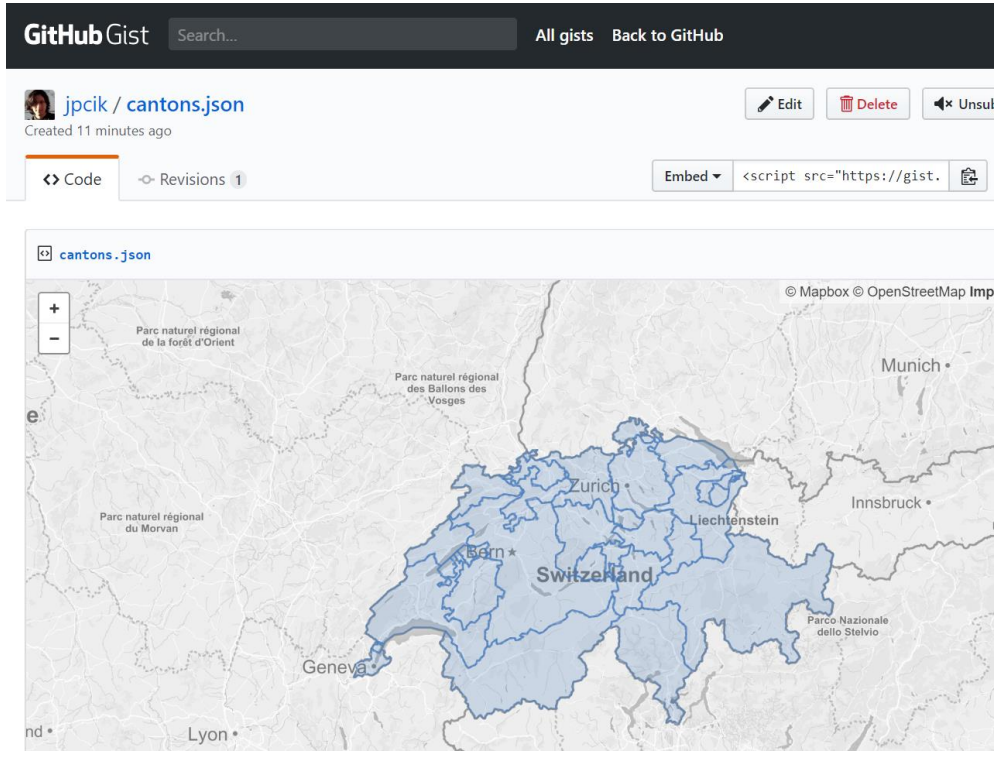
trigger function on click

```
themap.on('click', displayLocation);
```

> Working with GeoJSON

```
....
  "type":"Feature",
  "properties":{
    "abbr":"BE",
    "name":"Bern/Berne",
    "no":2 }
},
{
  "geometry":{
     "type":"Polygon",
     "coordinates":[[[8.049,46.788],
          [8.021,46.789],[7.984,46.775],
          [7.956,46.791],[7.947,46.805]
          ..........
```

Available GeoJSON files on the Web



https://gist.github.com/jpcik/df19846e4958f39d6a6eed26d38af036

Simplified Swiss canton geometries

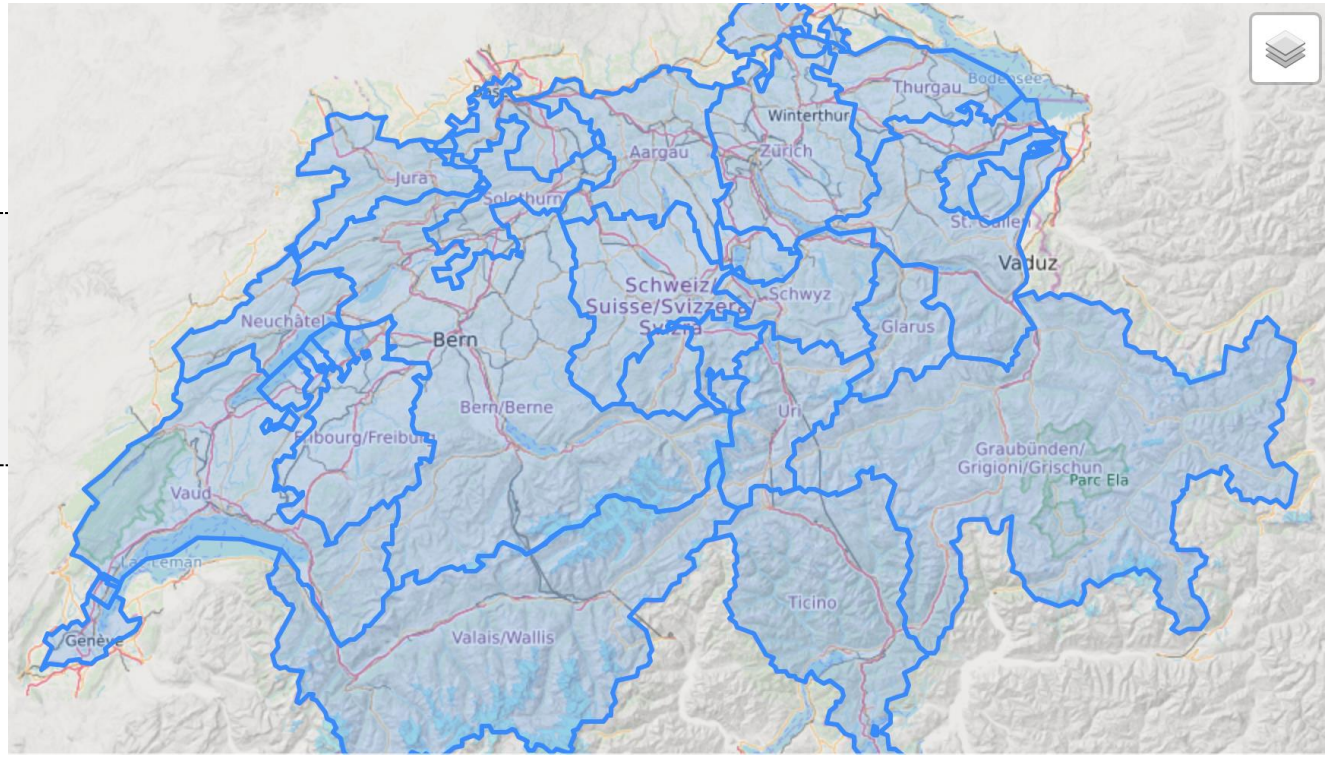
> Working with GeoJSON

```
var dataurl="https://gist.githubusercontent.com/jpcik/df19846e4958f39d6a6eed26d38af036/raw/0e006147240fc411c78f6685d4fc1d85b921ec33/cantons.json";
```

get GeoJSON data form the Web

```
$.getJSON(dataurl, function (data){
    cantondata= L.geoJson(data);
    cantondata.addTo(themap);
});
```

add the data to the map



> More events & styles

```
function highlightFeature(e) {
   var layer = e.target;
   layer.setStyle(
       { weight: 5, color: '#666',
         dashArray: '', fillOpacity: 0.7 });
   layer.bringToFront();
}
```

highlight geometry

```
function highlightEvents(feature, layer) {
   layer.on({ mouseover: highlightFeature,
              mouseout: resetHighlight});
}
```

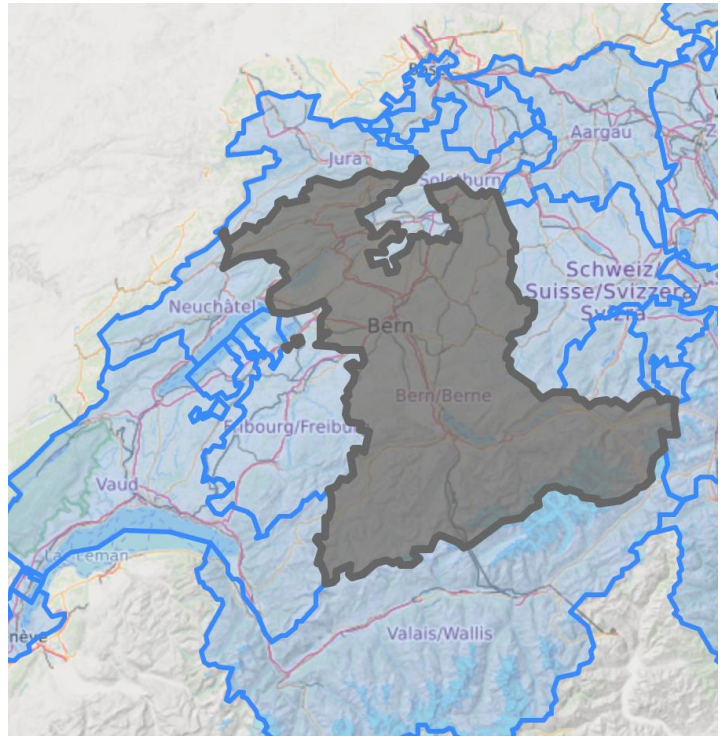
assign to mouse events

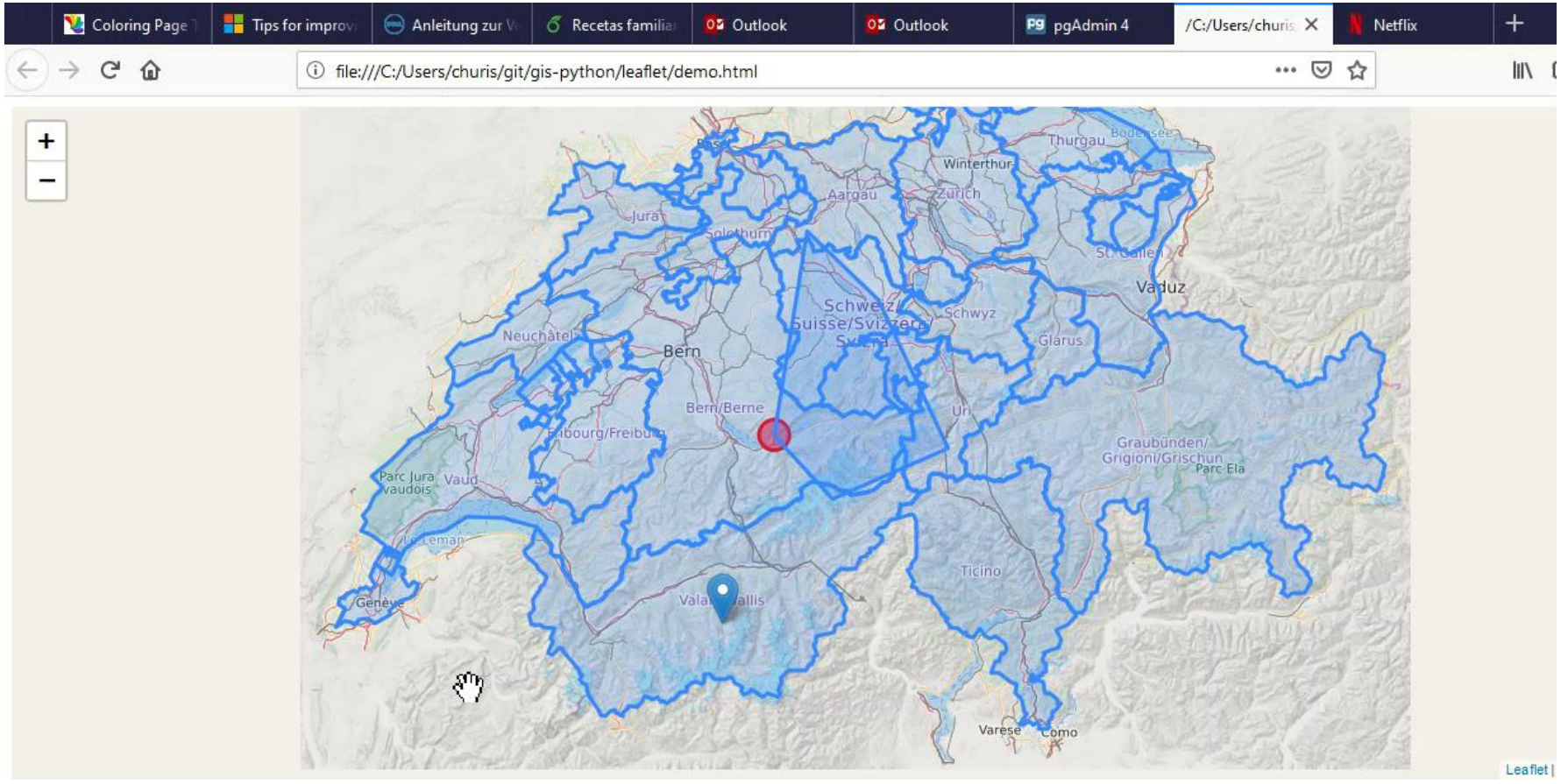
```
 cantondata= L.geoJson(data,
   {onEachFeature:highlightEvents});
```

apply to GeoJSON dataset

```
function resetHighlight(e) {
   cantondata.resetStyle(e.target);
}
```

reset highlight

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Grigioni/Grischun
Parc Ela
Parc Jura
vaudois
Vaud
Ticino
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Como
Leaflet

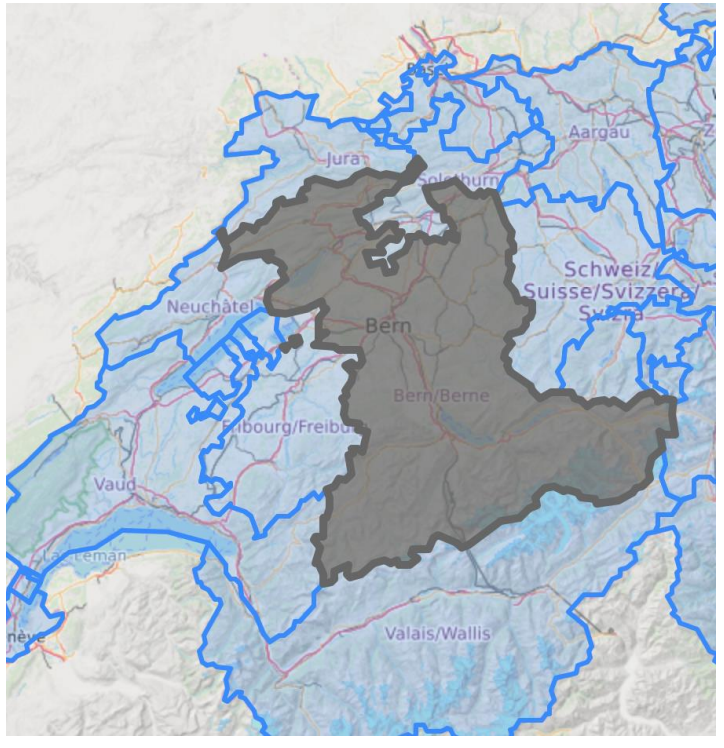
> More events & styles

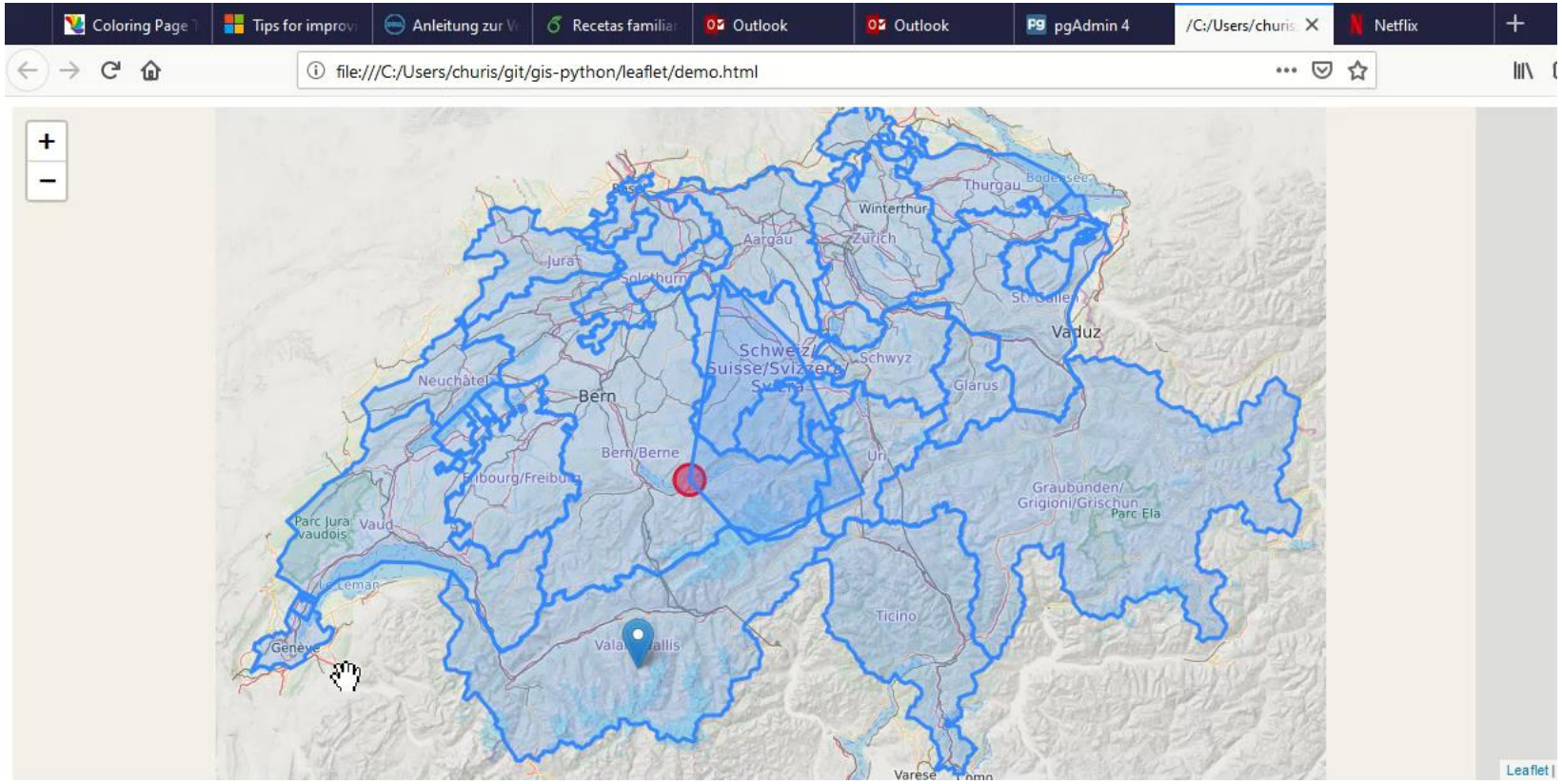
```
function zoomToFeature(e) {
    themap.fitBounds(e.target.getBounds());
}
```

zoom to geometry bounds

```
function onEachFeature(feature, layer) {
    layer.on({ mouseover: highlightFeature,
               mouseout: resetHighlight,
               click: zoomToFeature    });
}
```

add to click event

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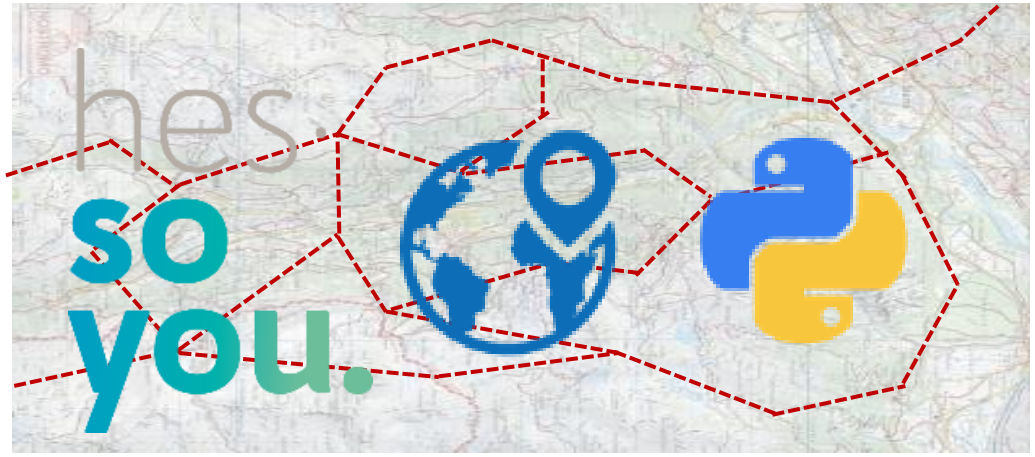

Thank you for your attention.

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