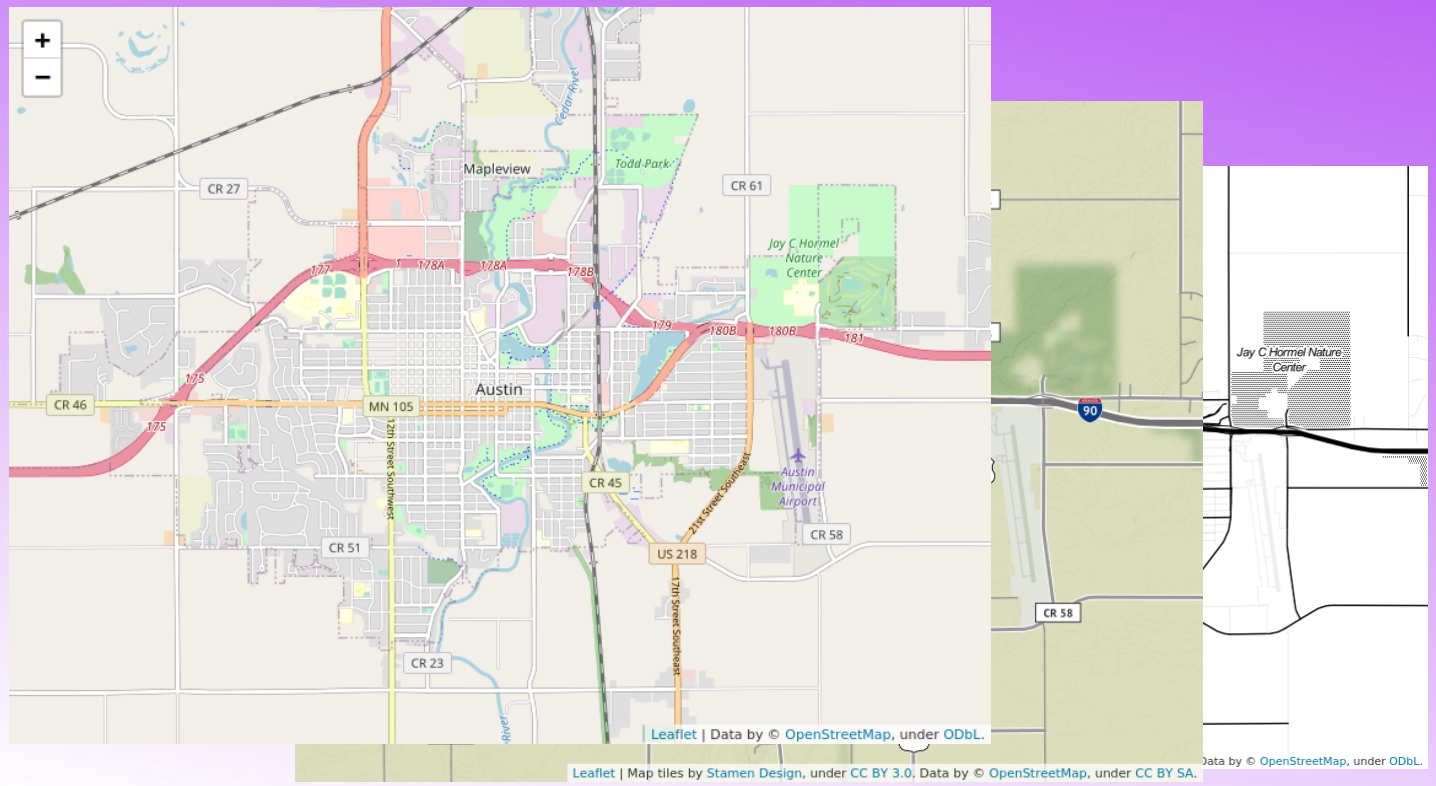
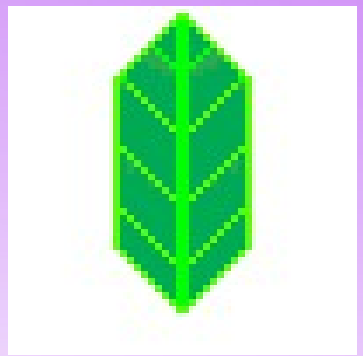
Geospatial Visualization with Folium

- https://python-visualization.github.io/folium/





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What is Folium?

- Folium is a Python library used for visualizing geospatial data. It is easy to use and yet a powerful library. Folium is a Python wrapper for Leaflet. js which is a leading open-source JavaScript library for plotting interactive maps
- Auto-generated HTML w/API calls for interactive maps

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Folium + Browser

- Auto generate HTML files
- Browser builds maps by retrieving contents via API calls

```
43          var map_dc65904c688c47eaafd0719c694ad999 = L.map(
44              "map_dc65904c688c47eaafd0719c694ad999",
45              {
46                  center: [43.669428, -92.974317],
47                  crs: L.CRS.EPSG3857,
48                  zoom: 20,
49                  zoomControl: true,
50                  preferCanvas: false,
51              }
52          );
53
54
55
56
57
58          var tile_layer_3cf95aa29f4f4a5a995c7fc6c4ed2f9a = L.tileLayer(
59              "https://{s}.tile.openstreetmap.org/{z}/{x}/{y}.png",
60              {"attribution": "Data by \u0026copy; \u003ca href=\"http://openstreetmap.org\"\u003eOpenStreetMap\u003c/a\u003e,
under \u003ca href=\"http://www.openstreetmap.org/copyright\"\u003eODbL\u003c/a\u003e.", "detectRetina": false, "maxNativeZoom":
18, "maxZoom": 18, "minZoom": 0, "noWrap": false, "opacity": 1, "subdomains": "abc", "tms": false}
61          ).addTo(map_dc65904c688c47eaafd0719c694ad999);
```

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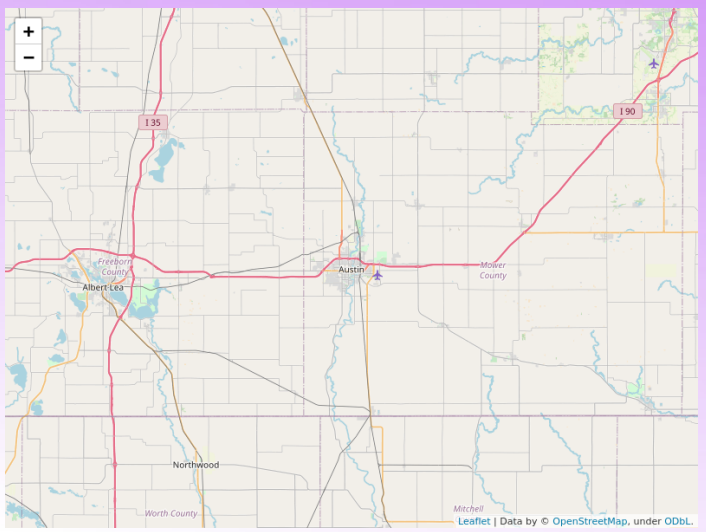
Simple Example

- Create Map w/Center
- Save to HTML File
- Open File w/Browser




```
import folium
import webbrowser

tempFile='./index.html'
latLong=(43.669428, -92.974317)
map = folium.Map(location=latLong)
map.save(tempFile)
webbrowser.open(tempFile, new=2)
```

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Map Tiles

- Built-In Tiles:
  - OpenStreetMap (default)
  - Stamen Terrain
  - Stamen Toner
  - Mapbox Bright
  - Mapbox Control Room
  - many others
    - folium.Map(location=[45.5236, -122.6750],
    - tiles='https://…..',
    - API_key='your.API.key')

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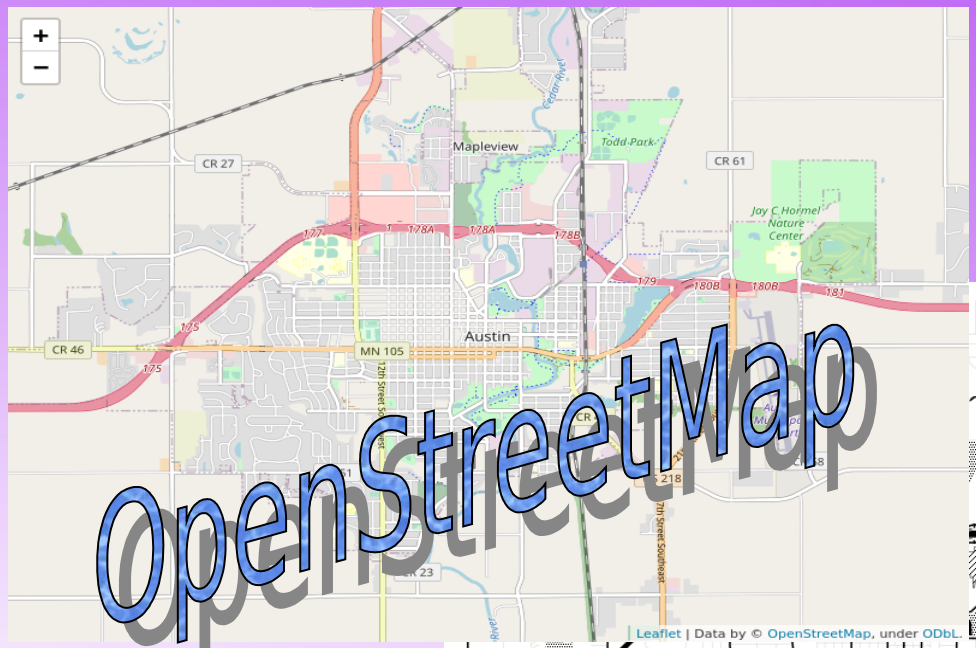
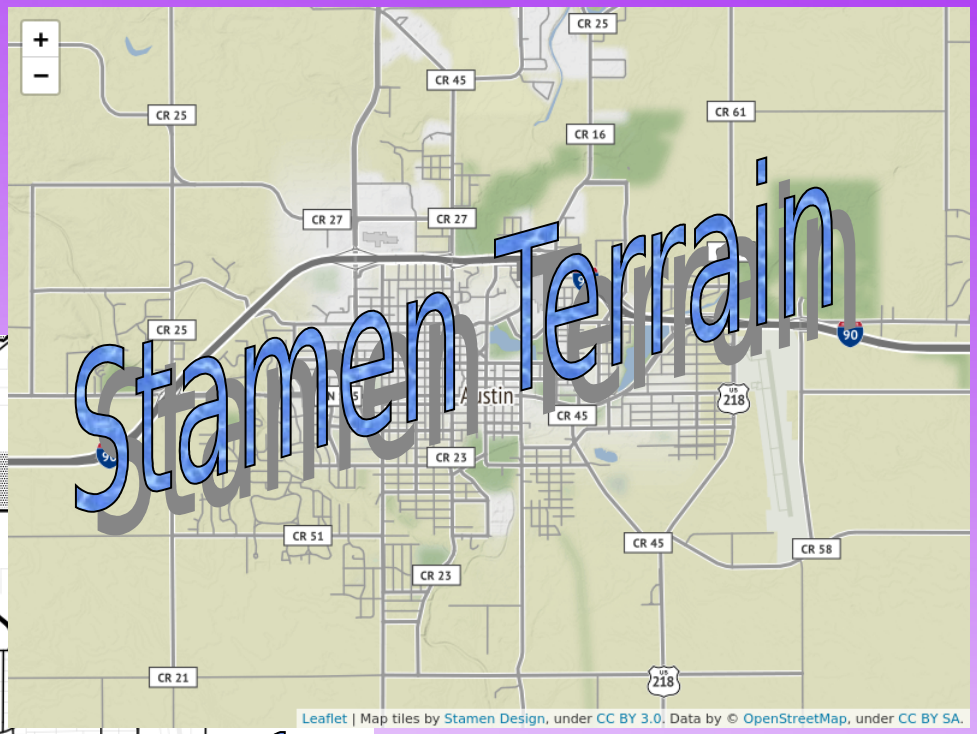
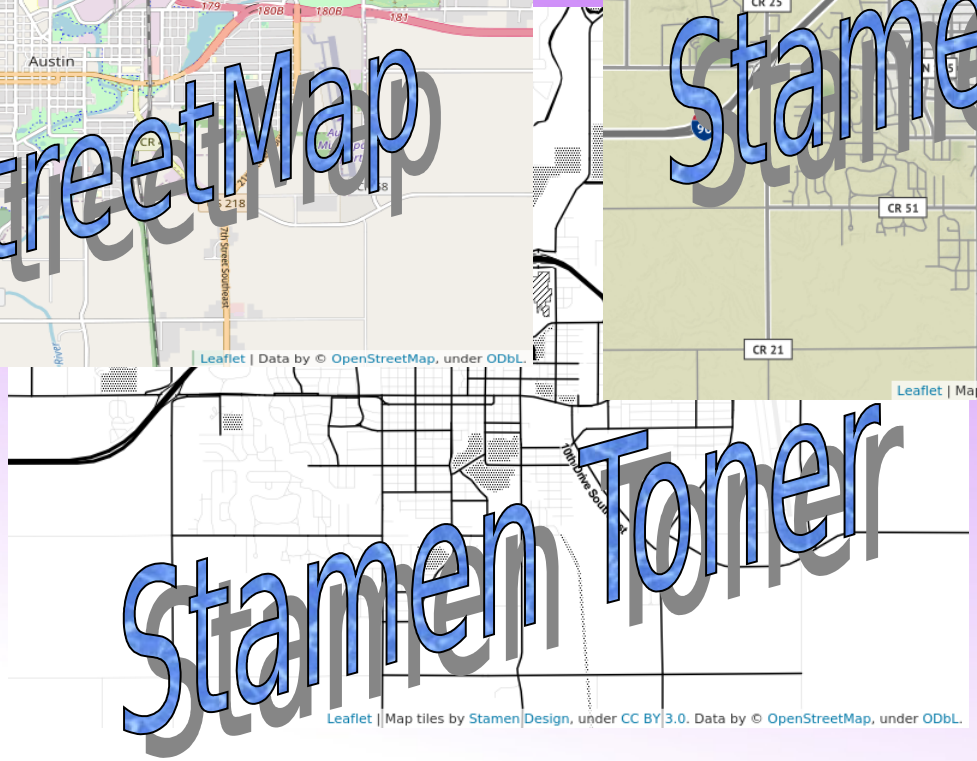
Specify Tile & Zoom

map = folium.Map(location=[39.809, -98.559], **zoom_start=13, tiles='Stamen Terrain')**







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US Windmill Locations

- https://openei.org/datasets/dataset/5fb0a6e2-a02b-4776-a5de-08a47828943f/resource/df55e4c8-258a-4845-a145-df00bd7d79aa/download/millerkeith2018data2.csv
-

USWTDB_ID	Longitude	Latitude	Plant_Code
Cimarron I	-100.2578900000	37.86479600000	57762
...	...	...	...

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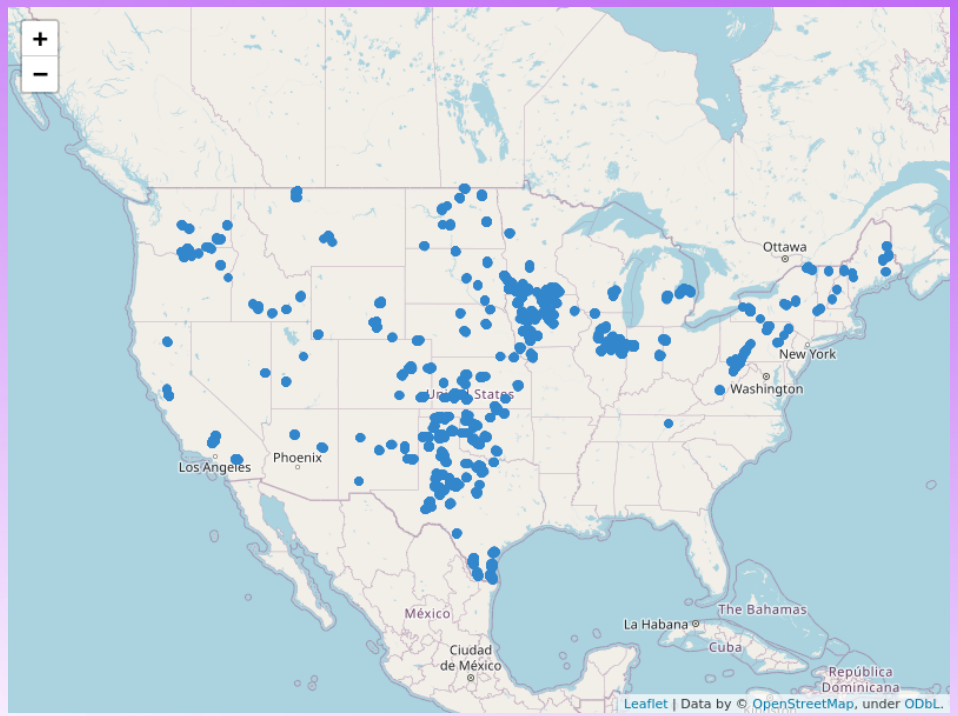
Windpower Example

```
 1  #!/usr/bin/python3
 2
 3 import folium
 4 import csv
 5 import webbrowser
 6 import os
 7 import sys
 8
 9 def convertToPng(htmlFileName, pngFileName, pageLoadDelayMs=5000):
10   os.system("cutycapt --delay=%d --url=file://%s --out=%s 2>/dev/null"%(pageLoadDelayMs, os.path.realpath(htmlFileName),pngFileName))
11
12 def processFile(fileName):
13   fileName=sys.argv[1]
14   tempFile='./index.html'
15   latLong=(39.809830, -98.559149)
16   map = folium.Map(location=latLong, zoom_start=4)
17   with open(fileName, 'r') as csvfile:
18    reader = csv.DictReader(csvfile, delimiter=',', quotechar='"')
19    for row in reader:
20      folium.CircleMarker(
21          location=[float(row['Latitude']),float(row['Longitude'])],
22          radius=2,
23          popup="",
24          color="#3186cc",
25          fill=True,
26          fill_color="#3186cc",
27      ).add_to(map)
28   map.save(tempFile)
29   webbrowser.open(tempFile)
30   convertToPng(tempFile, './map.png')
31
32 #---main---
33 fileName=sys.argv[1]
34 processFile(fileName)
```



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Choropleth Map

- Regions colored/patterned with respect to statistics
- What you need:
  - Region boundaries
    - e.g. boundary of country/states/regions
    - https://raw.githubusercontent.com/python-visualization/folium/master/examples/data/us-states.json
  - Single-dimension statistic for each region
    - e.g. Mn, 1048
    - https://raw.githubusercontent.com/python-visualization/folium/master/examples/data/US_Unemployment_Oct2012.csv
  - Means to map files to one another
    - e.g. Abbreviation to Name

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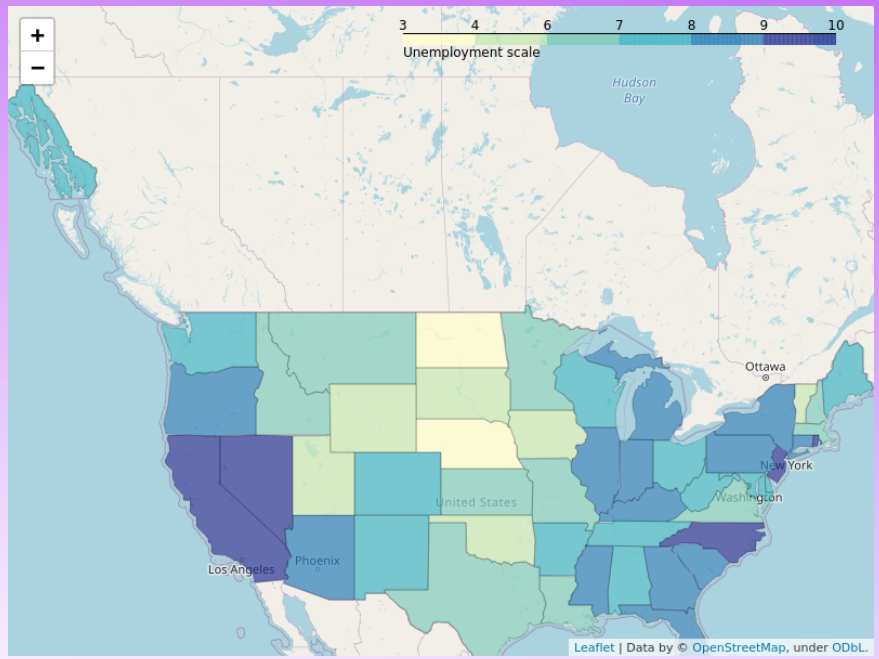
State Unemployment Example

- state_unemp = pd.read_csv("state_unemployment.csv")
- url = 'https://raw.githubusercontent.com/python-visualization/folium/master/examples/data'
- state_geo = f'{url}/us-states.json' #for state level data
- map = folium.Map(location=[48, -102], zoom_start=4)
- folium.Choropleth(
- geo_data = state_geo, #json
- name ='choropleth',
- data = state_unemp,
- columns = ['State', 'Unemployment'], #columns to work on
- key_on ='feature.id',
- fill_color ='YlGnBu', #I passed colors Yellow,Green,Blue
- fill_opacity = 0.7,
- line_opacity = 0.2,
- legend_name = "Unemployment scale"
-).add_to(map)
- tempFile='./index.html'
- map.save(tempFile)
- openInBrowser(tempFile)
- convertToPng(tempFile, './foo.png')
-



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Contact Info

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