

# GIS with geopandas

## Easiest to install with Conda

- install <https://docs.conda.io/en/latest/miniconda.html>
- put ~/miniconda/bin in front of PATH env variable
- edit ~/.condarc, make sure "anaconda" is first channel:  
channels: [anaconda, conda-forge]
- conda install jupyter pandas geopandas

## GIS (Geographic Information System) Data:

- Shapefile is common format: <https://en.wikipedia.org/wiki/Shapefile>
- **shapely** module (installed by **geopandas**) can parse these
- City data:
  - <http://data-cityofmadison.opendata.arcgis.com/datasets/city-limit>
  - [http://data-cityofmadison.opendata.arcgis.com/datasets/c46082b091a941f8b2ded1dd115a1a05\\_8](http://data-cityofmadison.opendata.arcgis.com/datasets/c46082b091a941f8b2ded1dd115a1a05_8)
  - Unzip above to directories "city" and "lakes"

## imports:

- import pandas as pd
- import geopandas # we'll use this to read shapefiles
- from shapely.geometry import Polygon, Point

## read data:

```
city = geopandas.read_file("city")
city
```

	OBJECTID	SHAPESTAre	SHAPESTLen	geometry
0	1332	5.274004e+05	3.378551e+03	POLYGON ((-89.36924133213829 43.10153277072625...
1	1333	2.675664e+04	7.126214e+02	POLYGON ((-89.28523345356945 43.02112710884431...
2	1334	1.488101e+05	3.297256e+03	POLYGON ((-89.28049139471618 43.11701006709443...
3	1335	2.262220e+09	1.135820e+06	POLYGON ((-89.5331291634087 43.0857426328395, ...

```
type(madison.iloc[3,-1])
```

```
shapely.geometry.polygon.Polygon
```

```
madison.iloc[3,-1]
```



## plotting:

```
# DataFrames with geo data
city = geopandas.read_file("city")
lakes = geopandas.read_file("lakes")
buildings = pd.DataFrame([
    {"name": "cs", "loc": Point(-89.406749, 43.071478)},
    {"name": "capital", "loc": Point(-89.384054, 43.074617)},
])
buildings = geopandas.GeoDataFrame(buildings, geometry="loc")

# create plot from all three
ax = madison.plot(color="lightgray", figsize=(20,20))
lakes.plot(color="darkgray", ax=ax)
buildings.plot(color="black", marker="x", markersize=200, ax=ax)
ax.set_axis_off()

ax.get_figure().savefig("map.eps", bbox_inches="tight")
```

