

# **GeoPandas**

**Data analysis with GeoPandas**

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```
import geopandas as gpd
import pandas as pd
from shapely.geometry import LineString

# for interactive maps
import folium
from folium import Choropleth, Circle, Marker
from folium.plugins import HeatMap, MarkerCluster
import math
```

## **GeoDataFrame which has all capabilities of Pandas DataFrame**

- Basic information (Gograhical data Frame)

`gdf.info()`

`gdf.columns`

`gdf.shape`

`gdf.dtypes`

- Geospatial-Attributes

`gdf.geometry`

`gdf.crs`

`gdf.geom_type` - provides geometry for each row (ponit, LineString, Polygon, etc.)

- Data Exploration:

```
gdf.head()
```

```
gdf.describe()
```

- Spatial Operation:

```
gdf.area
```

```
gdf.distance
```

```
gdf.buffer
```

- Plotting

```
gdf.plot()
```

```
data = gpd.read_file("C:\\Users\\Khurana_Kunal\\Downloads\\DEC_lands 2\\DEC_lands")
```

```
data.head()
```

	OBJECTID	CATEGORY	UNIT	FACILITY	CLASS
0	1	FOR PRES DET PAR	CFP	HANCOCK FP DETACHED PARCEL	WILD I
1	2	FOR PRES DET PAR	CFP	HANCOCK FP DETACHED PARCEL	WILD I
2	3	FOR PRES DET PAR	CFP	HANCOCK FP DETACHED PARCEL	WILD I
3	4	FOR PRES DET PAR	CFP	GREENE COUNTY FP DETACHED PARCEL	WILD I
4	6	FOREST PRESERVE	AFP	SARANAC LAKES WILD FOREST	WILD I

```
data_selected = data.loc[:, ['CLASS', 'COUNTY', 'geometry']].copy()
```

```
data_selected.CLASS.value_counts()
```

```

CLASS
WILD FOREST          965
INTENSIVE USE        108
PRIMITIVE             60
WILDERNESS           52
ADMINISTRATIVE        17
UNCLASSIFIED          7
HISTORIC              5

```

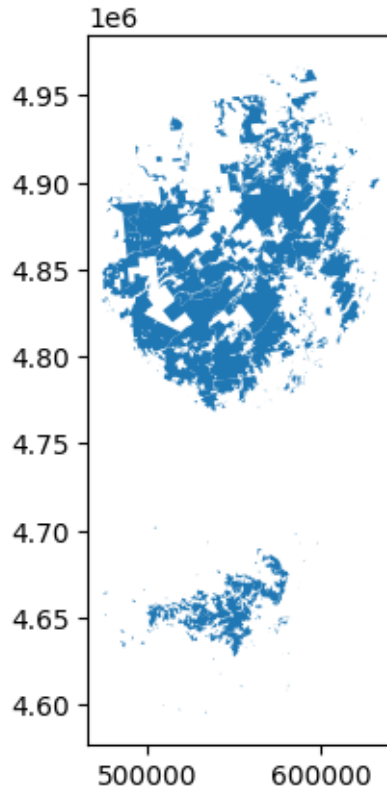
```
PRIMITIVE BICYCLE CORRIDOR    4
CANOE AREA                    1
Name: count, dtype: int64
```

```
# select lands under 'wild forest' or 'wilderness' category
wild_land = data_selected.loc[data_selected.CLASS.isin(['WILD FOREST', 'WILDERNESS'])].copy()
wild_land.head()
```

	CLASS	COUNTY	geometry
0	WILD FOREST	DELAWARE	POLYGON ((486093.245 4635308.586, 486787.235 4...
1	WILD FOREST	DELAWARE	POLYGON ((491931.514 4637416.256, 491305.424 4...
2	WILD FOREST	DELAWARE	POLYGON ((486000.287 4635834.453, 485007.550 4...
3	WILD FOREST	GREENE	POLYGON ((541716.775 4675243.268, 541217.579 4...
4	WILD FOREST	ESSEX	POLYGON ((583896.043 4909643.187, 583891.200 4...

```
wild_land.plot()
```

<Axes: >



```
wild_land.geometry.head()
```

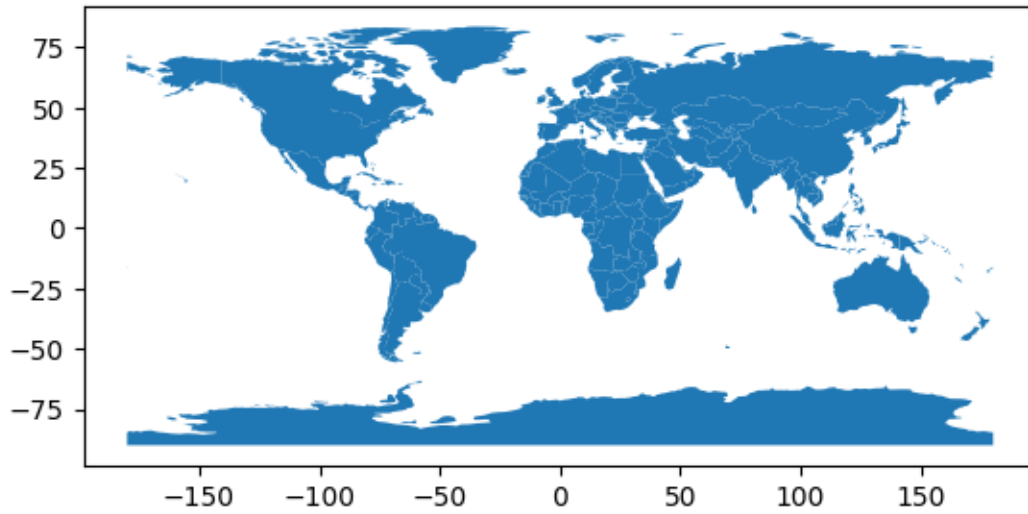
```
0    POLYGON ((486093.245 4635308.586, 486787.235 4...
1    POLYGON ((491931.514 4637416.256, 491305.424 4...
2    POLYGON ((486000.287 4635834.453, 485007.550 4...
3    POLYGON ((541716.775 4675243.268, 541217.579 4...
4    POLYGON ((583896.043 4909643.187, 583891.200 4...
Name: geometry, dtype: geometry
```

```
world_filepath = 'geopandas\\ne_110m_admin_0_countries\\ne_110m_admin_0_countries.shx'
world = gpd.read_file(world_filepath)
world.head()
```

	featurecla	scalerank	LABELRANK	SOVEREIGNT	SOV_A3	ADM0_DIF	I
0	Admin-0 country	1	6	Fiji	FJI	0	2

	featurecla	scalerank	LABELRANK	SOVEREIGNT	SOV_A3	ADM0_DIF	I
1	Admin-0 country	1	3	United Republic of Tanzania	TZA	0	2
2	Admin-0 country	1	7	Western Sahara	SAH	0	2
3	Admin-0 country	1	2	Canada	CAN	0	2
4	Admin-0 country	1	2	United States of America	US1	1	2

```
ax = world.plot()
```



```
#plotting a map with coordinates
ax = world.plot(figsize=(20,20), color='whitesmoke', linestyle=':', edgecolor='black')
```



```
PHL_loans = data.loc[data.COUNTY=="Philippines"].copy()
```

```
print(world.columns)
```

```
Index(['featurecla', 'scalerank', 'LABELRANK', 'SOVEREIGNT', 'SOV_A3',
      'ADMO_DIF', 'LEVEL', 'TYPE', 'TLC', 'ADMIN',
      ...,
      'FCLASS_TR', 'FCLASS_ID', 'FCLASS_PL', 'FCLASS_GR', 'FCLASS_IT',
      'FCLASS_NL', 'FCLASS_SE', 'FCLASS_BD', 'FCLASS_UA', 'geometry'],
      dtype='object', length=169)
```

```
world.info()
```

```
<class 'geopandas.geodataframe.GeoDataFrame'>
RangeIndex: 177 entries, 0 to 176
Columns: 169 entries, featurecla to geometry
dtypes: float64(6), geometry(1), int64(25), object(137)
memory usage: 233.8+ KB
```

```
world.head()
```

	featurecla	scalerank	LABELRANK	SOVEREIGNT	SOV_A3	ADM0_DIF	
0	Admin-0 country	1	6	Fiji	FJI	0	2
1	Admin-0 country	1	3	United Republic of Tanzania	TZA	0	2
2	Admin-0 country	1	7	Western Sahara	SAH	0	2
3	Admin-0 country	1	2	Canada	CAN	0	2
4	Admin-0 country	1	2	United States of America	US1	1	2

## Coordinate Reference Systems

- shape file imports CRS automatically
- settings (DataFrame uses **EPSG 32630**; csv file uses **EPSG 4326**)

```

facilities_df = pd.read_csv('geopandas\health_facilities.csv')

# convert to GeoDataFrame
facilities = gpd.GeoDataFrame(facilities_df, geometry = gpd.points_from_xy
                              (facilities_df.Longitude, facilities_df.Latitude))

# set CRS
facilities.crs = ('epsg:4326')

#view first 5 rows
facilities.head()

```

	Region	District	FacilityName	Type	Town	Ownership
0	Ashanti	Offinso North	A.M.E Zion Clinic	Clinic	Afrancho	CHAG
1	Ashanti	Bekwai Municipal	Abenkyiman Clinic	Clinic	Anwiankwanta	Private
2	Ashanti	Adansi North	Aboabo Health Centre	Health Centre	Aboabo No 2	Government
3	Ashanti	Afigya-Kwabre	Aboabogya Health Centre	Health Centre	Aboabogya	Government
4	Ashanti	Kwabre	Aboaso Health Centre	Health Centre	Aboaso	Government

```

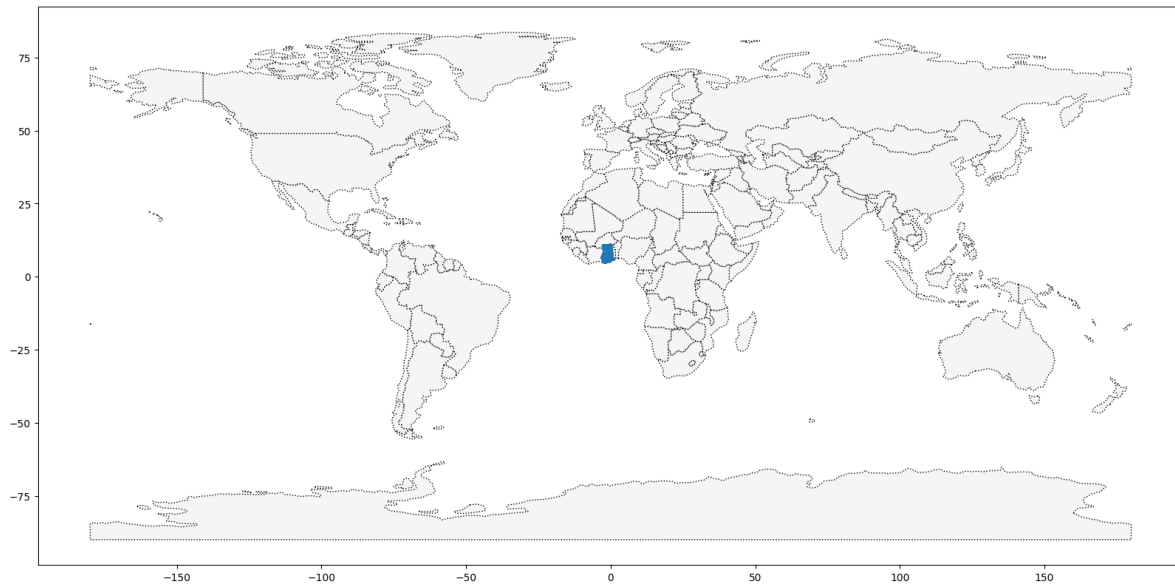
# plotting facilities of Ghana on world map
ax = world.plot(figsize=(20,20), color='whitesmoke', linestyle=':', edgecolor='black')
facilities.to_crs(epsg=4326).plot(markersize=.25, ax=ax)

```

C:\Users\Khurana\_Kunal\anaconda3\Lib\site-packages\shapely\measurement.py:103: RuntimeWarning:  
return lib.bounds(geometry\_arr, out=out, \*\*kwargs)



<Axes: >



```
#get the x coordinates of each point
facilities.geometry.head().x
```

```
0    -1.96317
1    -1.58592
2    -1.34982
3    -1.61098
4    -1.61098
dtype: float64
```

```
birds_df = pd.read_csv("data_for_all_courses\purple_martin.csv")
birds_df.head()
```

	timestamp	location-long	location-lat	tag-local-identifier
0	2014-08-15 05:56:00	-88.146014	17.513049	30448
1	2014-09-01 05:59:00	-85.243501	13.095782	30448
2	2014-10-30 23:58:00	-62.906089	-7.852436	30448
3	2014-11-15 04:59:00	-61.776826	-11.723898	30448
4	2014-11-30 09:59:00	-61.241538	-11.612237	30448

```
print(f"There are {birds_df['tag-local-identifier'].nunique()} different birds in the data
```

There are 11 different birds in the dataset.

```
birds = gpd.GeoDataFrame(birds_df,
                        geometry = gpd.points_from_xy(birds_df["location-long"],
                                                    birds_df['location-lat']))
birds.head()
```

	timestamp	location-long	location-lat	tag-local-identifier	geometry
0	2014-08-15 05:56:00	-88.146014	17.513049	30448	POINT (-88.14601 17.51305)
1	2014-09-01 05:59:00	-85.243501	13.095782	30448	POINT (-85.24350 13.09578)
2	2014-10-30 23:58:00	-62.906089	-7.852436	30448	POINT (-62.90609 -7.85244)
3	2014-11-15 04:59:00	-61.776826	-11.723898	30448	POINT (-61.77683 -11.72390)
4	2014-11-30 09:59:00	-61.241538	-11.612237	30448	POINT (-61.24154 -11.61224)

```
# set the CRS
```

```
birds.crs = ('epsg:4326')
```

```
# plot the data
```

```
americas = world.loc[world['CONTINENT'].isin(['North America', 'South America',])]
americas.head()
```

	featurecla	scalerank	LABELRANK	SOVEREIGNT	SOV_A3	ADM0_DIF	LE
3	Admin-0 country	1	2	Canada	CAN	0	2
4	Admin-0 country	1	2	United States of America	US1	1	2
9	Admin-0 country	1	2	Argentina	ARG	0	2
10	Admin-0 country	1	2	Chile	CHL	0	2
16	Admin-0 country	1	5	Haiti	HTI	0	2

```
world.head()
```

	featurecla	scalerank	LABELRANK	SOVEREIGNT	SOV_A3	ADM0_DIF	I
0	Admin-0 country	1	6	Fiji	FJI	0	2

	featurecla	scalerank	LABELRANK	SOVEREIGNT	SOV_A3	ADMO_DIF	
1	Admin-0 country	1	3	United Republic of Tanzania	TZA	0	2
2	Admin-0 country	1	7	Western Sahara	SAH	0	2
3	Admin-0 country	1	2	Canada	CAN	0	2
4	Admin-0 country	1	2	United States of America	US1	1	2

```
# checking for all the columns in a data frame with for loop
for column in world.columns:
    print(column)
```

```
featurecla
scalerank
LABELRANK
SOVEREIGNT
SOV_A3
ADMO_DIF
LEVEL
TYPE
TLC
ADMIN
ADMO_A3
GEOU_DIF
GEOUNIT
GU_A3
SU_DIF
SUBUNIT
SU_A3
BRK_DIFF
NAME
NAME_LONG
BRK_A3
BRK_NAME
BRK_GROUP
ABBREV
POSTAL
FORMAL_EN
FORMAL_FR
NAME_CIAWF
NOTE_ADMO
NOTE_BRK
```

NAME\_SORT  
NAME\_ALT  
MAPCOLOR7  
MAPCOLOR8  
MAPCOLOR9  
MAPCOLOR13  
POP\_EST  
POP\_RANK  
POP\_YEAR  
GDP\_MD  
GDP\_YEAR  
ECONOMY  
INCOME\_GRP  
FIPS\_10  
ISO\_A2  
ISO\_A2\_EH  
ISO\_A3  
ISO\_A3\_EH  
ISO\_N3  
ISO\_N3\_EH  
UN\_A3  
WB\_A2  
WB\_A3  
WOE\_ID  
WOE\_ID\_EH  
WOE\_NOTE  
ADMO\_ISO  
ADMO\_DIFF  
ADMO\_TLC  
ADMO\_A3\_US  
ADMO\_A3\_FR  
ADMO\_A3\_RU  
ADMO\_A3\_ES  
ADMO\_A3\_CN  
ADMO\_A3\_TW  
ADMO\_A3\_IN  
ADMO\_A3\_NP  
ADMO\_A3\_PK  
ADMO\_A3\_DE  
ADMO\_A3\_GB  
ADMO\_A3\_BR  
ADMO\_A3\_IL  
ADMO\_A3\_PS

ADMO\_A3\_SA  
ADMO\_A3\_EG  
ADMO\_A3\_MA  
ADMO\_A3\_PT  
ADMO\_A3\_AR  
ADMO\_A3\_JP  
ADMO\_A3\_KO  
ADMO\_A3\_VN  
ADMO\_A3\_TR  
ADMO\_A3\_ID  
ADMO\_A3\_PL  
ADMO\_A3\_GR  
ADMO\_A3\_IT  
ADMO\_A3\_NL  
ADMO\_A3\_SE  
ADMO\_A3\_BD  
ADMO\_A3\_UA  
ADMO\_A3\_UN  
ADMO\_A3\_WB  
CONTINENT  
REGION\_UN  
SUBREGION  
REGION\_WB  
NAME\_LEN  
LONG\_LEN  
ABBREV\_LEN  
TINY  
HOMEPART  
MIN\_ZOOM  
MIN\_LABEL  
MAX\_LABEL  
LABEL\_X  
LABEL\_Y  
NE\_ID  
WIKIDATAID  
NAME\_AR  
NAME\_BN  
NAME\_DE  
NAME\_EN  
NAME\_ES  
NAME\_FA  
NAME\_FR  
NAME\_EL

NAME\_HE  
NAME\_HI  
NAME\_HU  
NAME\_ID  
NAME\_IT  
NAME\_JA  
NAME\_KO  
NAME\_NL  
NAME\_PL  
NAME\_PT  
NAME\_RU  
NAME\_SV  
NAME\_TR  
NAME\_UK  
NAME\_UR  
NAME\_VI  
NAME\_ZH  
NAME\_ZHT  
FCLASS\_ISO  
TLC\_DIFF  
FCLASS\_TLC  
FCLASS\_US  
FCLASS\_FR  
FCLASS\_RU  
FCLASS\_ES  
FCLASS\_CN  
FCLASS\_TW  
FCLASS\_IN  
FCLASS\_NP  
FCLASS\_PK  
FCLASS\_DE  
FCLASS\_GB  
FCLASS\_BR  
FCLASS\_IL  
FCLASS\_PS  
FCLASS\_SA  
FCLASS\_EG  
FCLASS\_MA  
FCLASS\_PT  
FCLASS\_AR  
FCLASS\_JP  
FCLASS\_KO  
FCLASS\_VN

```
FCLASS_TR  
FCLASS_ID  
FCLASS_PL  
FCLASS_GR  
FCLASS_IT  
FCLASS_NL  
FCLASS_SE  
FCLASS_BD  
FCLASS_UA  
geometry
```

```
# plot americas  
ax_americas = americas.plot(figsize=(10,10), color='whitesmoke', linestyle=':', edgecolor=
```



## Starting and end journey of birds

```
# GeoDataFrame showing path for each bird
path_df = birds.groupby("tag-local-identifier")['geometry'].apply(list).apply(lambda x: Li
path_gdf = gpd.GeoDataFrame(path_df, geometry = path_df.geometry)
path_gdf.crs = ('epsg:4326')

# GeoDataFrame showing starting point for each bird
start_df = birds.groupby("tag-local-identifier")['geometry'].apply(list).apply(lambda x: x
start_gdf = gpd.GeoDataFrame(start_df, geometry = start_df.geometry)
```



```
start_gdf.crs = ('epsg:4326')
```

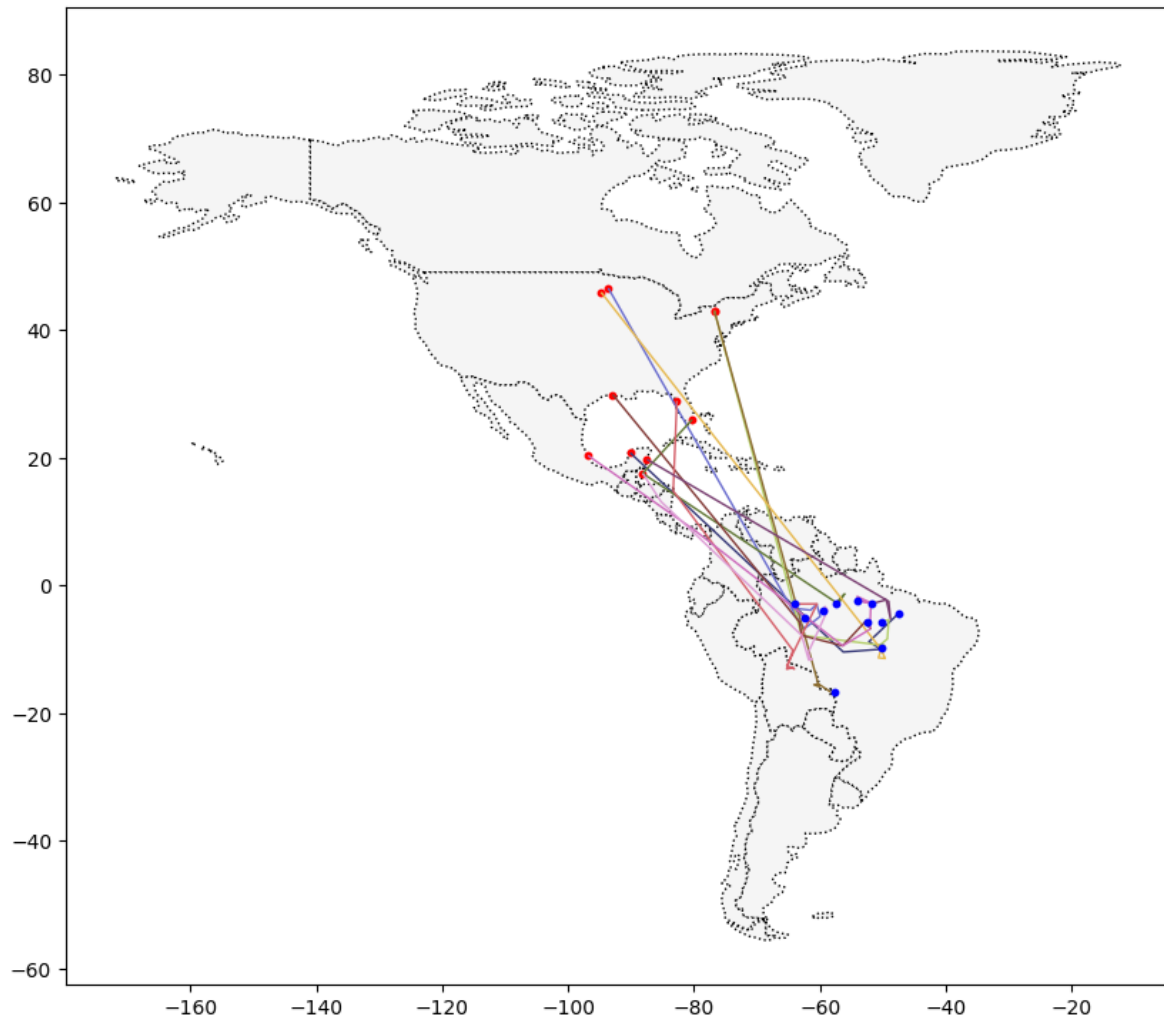
```
# Show first five rows of GeoDataFrame  
start_gdf.head()
```

	tag-local-identifier	geometry
0	30048	POINT (-90.12992 20.73242)
1	30054	POINT (-93.60861 46.50563)
2	30198	POINT (-80.31036 25.92545)
3	30263	POINT (-76.78146 42.99209)
4	30275	POINT (-76.78213 42.99207)

```
# end point of each bird  
end_df = birds.groupby("tag-local-identifier")['geometry'].apply(list).apply(lambda x: x[-1])  
end_gdf = gpd.GeoDataFrame(end_df, geometry = end_df.geometry)  
end_gdf.crs = ('epsg:4326')
```

```
# plot americas  
ax_americas = americas.plot(figsize=(10,10), color='whitesmoke', linestyle=':', edgecolor='black')  
  
start_gdf.plot(ax = ax_americas, color = 'red', markersize = 10)  
path_gdf.plot(ax = ax_americas, cmap = 'tab20b', linestyle = '-', linewidth = 1, zorder = 1)  
end_gdf.plot(ax = ax_americas, color = 'blue', markersize = 10)
```

<Axes: >



```
# no file found; gives 'Driver Error' - à voir plustard
protected_filepath = 'data_for_all_courses/add_0.shp'
protected_area = gpd.read_file(protected_filepath)
```

## Interactive maps

```
# Create a map
montréal_1 = folium.Map(location=[45.50, -73.56], tiles='openstreetmap', zoom_start=10)

# Display the map
montréal_1
```

<folium.folium.Map at 0x1dc44f1ac10>

```
# crimes

crimes = pd.read_csv("data_for_all_courses\crime.csv", encoding = 'latin-1')
crimes.describe()
```

	OFFENSE_CODE	YEAR	MONTH	HOURL	Lat	Long
count	319073.000000	319073.000000	319073.000000	319073.000000	299074.000000	299074.000000
mean	2317.546956	2016.560586	6.609719	13.118205	42.214381	-70.908272
std	1185.285543	0.996344	3.273691	6.294205	2.159766	3.493618
min	111.000000	2015.000000	1.000000	0.000000	-1.000000	-71.178674
25%	1001.000000	2016.000000	4.000000	9.000000	42.297442	-71.097135
50%	2907.000000	2017.000000	7.000000	14.000000	42.325538	-71.077524
75%	3201.000000	2017.000000	9.000000	18.000000	42.348624	-71.062467
max	3831.000000	2018.000000	12.000000	23.000000	42.395042	-1.000000

```
crimes.head()
```

	INCIDENT_NUMBER	OFFENSE_CODE	OFFENSE_CODE_GROUP	OFFENSE_DESCRIPTION
0	I182070945	619	Larceny	LARCENY ALL OTHERS
1	I182070943	1402	Vandalism	VANDALISM
2	I182070941	3410	Towed	TOWED MOTOR VEHIC
3	I182070940	3114	Investigate Property	INVESTIGATE PROPER
4	I182070938	3114	Investigate Property	INVESTIGATE PROPER

```

# drop missing locations
crimes.dropna(subset= ['Lat', 'Long', 'DISTRICT'], inplace = True)

# focus on major crimes
crimes = crimes[crimes.OFFENSE_CODE_GROUP.isin([
    'Larceny', 'Auto Theft', 'Robbery', 'Larceny From Motor Vehicle', 'Residential Burglary',
    'Simple Assault', 'Harassment', 'Ballistics', 'Aggravated Assault', 'Other Burglary',
    'Arson', 'Commercial Burglary'
])]

crimes = crimes[crimes.YEAR>=2018]

crimes.head()

```

	INCIDENT_NUMBER	OFFENSE_CODE	OFFENSE_CODE_GROUP	OFFENSE_DESCRIPTION
0	I182070945	619	Larceny	LARCENY ALL OTHER
6	I182070933	724	Auto Theft	AUTO THEFT
8	I182070931	301	Robbery	ROBBERY - STREET
19	I182070915	614	Larceny From Motor Vehicle	LARCENY THEFT FRO
24	I182070908	522	Residential Burglary	BURGLARY - RESIDEN

```

# crimes between 9 to 18

daytime_robberies = crimes[((crimes.OFFENSE_CODE_GROUP == 'Robbery') &
                             crimes.HOUR.isin(range(9,18)))]

# create a map

map2 = folium.Map(location=[42.32,-71.0589], tiles='openstreetmap', zoom_start=13)

# add points
for idx, row in daytime_robberies.iterrows():
    Marker([row['Lat'], row['Long']]).add_to(map2)

# display
map2

```

<folium.folium.Map at 0x1dc4a4b6210>

## folium.plugin.MarkerCluster

```
# plotting points
m_3 = folium.Map(location= [42.32,-71.0589], tiles='cartodbpositron', zoom_start=13)

# add points
mc = MarkerCluster()
for idx, row in daytime_robberies.iterrows():
    if not math.isnan(row['Long']) and not math.isnan(row['Lat']):
        mc.add_child(Marker([row['Lat'], row['Long']]))
m_3.add_child(mc)
```

<folium.folium.Map at 0x1dc4b900ad0>

## Bubble maps

```
# create a base map

m_4 = folium.Map(location=[42.32,-71.0589], tiles='cartodbpositron', zoom_start=11)

def color_producer(val):
    if val >=12:
        return 'forestgreen'
    else:
        return 'darkred'

# add bubble map to the base map
for i in range(0, len(daytime_robberies)):
    Circle(
        location = [daytime_robberies.iloc[i]['Lat'],
                    daytime_robberies.iloc[i]['Long']],
        radius = 20,
        color = color_producer(daytime_robberies.iloc[i]['HOURLY']))
m_4.add_child(circle)

# display
m_4
```

<folium.folium.Map at 0x1dc4739cc10>

## Heatmaps

```
# basemaps
m_5 = folium.Map(location=[42.32,-71.0589], tiles='cartodbpositron', zoom_start=11)

# add heatmaps to the base map
HeatMap(data= crimes[['Lat', 'Long']], radius = 10).add_to(m_5)

# display
m_5
```

<folium.folium.Map at 0x1dc4a314590>

## Choropleth maps

```
help(folium.Choropleth)
```

Help on class Choropleth in module folium.features:

```
class Choropleth(folium.map.FeatureGroup)
|   Choropleth(geo_data: Any, data: Optional[Any] = None, columns: Optional[Sequence[Any]] =
|   |
|   |   Apply a GeoJSON overlay to the map.
|   |
|   |   Plot a GeoJSON overlay on the base map. There is no requirement
|   |   to bind data (passing just a GeoJSON plots a single-color overlay),
|   |   but there is a data binding option to map your columnar data to
|   |   different feature objects with a color scale.
|   |
|   |   If data is passed as a Pandas DataFrame, the "columns" and "key-on"
|   |   keywords must be included, the first to indicate which DataFrame
|   |   columns to use, the second to indicate the layer in the GeoJSON
|   |   on which to key the data. The 'columns' keyword does not need to be
|   |   passed for a Pandas series.
|   |
|   |   Colors are generated from color brewer (https://colorbrewer2.org/)
|   |   sequential palettes. By default, linear binning is used between
|   |   the min and the max of the values. Custom binning can be achieved
|   |   with the `bins` parameter.
```

```

|
| TopoJSONs can be passed as "geo_data", but the "topojson" keyword must
| also be passed with the reference to the topojson objects to convert.
| See the topojson.feature method in the TopoJSON API reference:
| https://github.com/topojson/topojson/wiki/API-Reference
|
|
| Parameters
| -----
| geo_data: string/object
|     URL, file path, or data (json, dict, geopandas, etc) to your GeoJSON
|     geometries
| data: Pandas DataFrame or Series, default None
|     Data to bind to the GeoJSON.
| columns: tuple with two values, default None
|     If the data is a Pandas DataFrame, the columns of data to be bound.
|     Must pass column 1 as the key, and column 2 the values.
| key_on: string, default None
|     Variable in the `geo_data` GeoJSON file to bind the data to. Must
|     start with 'feature' and be in JavaScript objection notation.
|     Ex: 'feature.id' or 'feature.properties.statename'.
| bins: int or sequence of scalars or str, default 6
|     If `bins` is an int, it defines the number of equal-width
|     bins between the min and the max of the values.
|     If `bins` is a sequence, it directly defines the bin edges.
|     For more information on this parameter, have a look at
|     numpy.histogram function.
| fill_color: string, optional
|     Area fill color, defaults to blue. Can pass a hex code, color name,
|     or if you are binding data, one of the following color brewer palettes:
|     'BuGn', 'BuPu', 'GnBu', 'OrRd', 'PuBu', 'PuBuGn', 'PuRd', 'RdPu',
|     'YlGn', 'YlGnBu', 'YlOrBr', and 'YlOrRd'.
| nan_fill_color: string, default 'black'
|     Area fill color for nan or missing values.
|     Can pass a hex code, color name.
| fill_opacity: float, default 0.6
|     Area fill opacity, range 0-1.
| nan_fill_opacity: float, default fill_opacity
|     Area fill opacity for nan or missing values, range 0-1.
| line_color: string, default 'black'
|     GeoJSON geopath line color.
| line_weight: int, default 1
|     GeoJSON geopath line weight.

```

```

| line_opacity: float, default 1
|     GeoJSON geopath line opacity, range 0-1.
| legend_name: string, default empty string
|     Title for data legend.
| topojson: string, default None
|     If using a TopoJSON, passing "objects.yourfeature" to the topojson
|     keyword argument will enable conversion to GeoJSON.
| smooth_factor: float, default None
|     How much to simplify the polyline on each zoom level. More means
|     better performance and smoother look, and less means more accurate
|     representation. Leaflet defaults to 1.0.
| highlight: boolean, default False
|     Enable highlight functionality when hovering over a GeoJSON area.
| use_jenks: bool, default False
|     Use jenkspy to calculate bins using "natural breaks"
|     (Fisher-Jenks algorithm). This is useful when your data is unevenly
|     distributed.
| name : string, optional
|     The name of the layer, as it will appear in LayerControls
| overlay : bool, default True
|     Adds the layer as an optional overlay (True) or the base layer (False).
| control : bool, default True
|     Whether the Layer will be included in LayerControls.
| show: bool, default True
|     Whether the layer will be shown on opening.
|
| Returns
| -----
| GeoJSON data layer in obj.template_vars
|
| Examples
| -----
| >>> Choropleth(geo_data="us-states.json", line_color="blue", line_weight=3)
| >>> Choropleth(
| ...     geo_data="geo.json",
| ...     data=df,
| ...     columns=["Data 1", "Data 2"],
| ...     key_on="feature.properties.myvalue",
| ...     fill_color="PuBu",
| ...     bins=[0, 20, 30, 40, 50, 60],
| ... )
| >>> Choropleth(geo_data="countries.json", topojson="objects.countries")
| >>> Choropleth(

```



```

|     ...     geo_data="geo.json",
|     ...     data=df,
|     ...     columns=["Data 1", "Data 2"],
|     ...     key_on="feature.properties.myvalue",
|     ...     fill_color="PuBu",
|     ...     bins=[0, 20, 30, 40, 50, 60],
|     ...     highlight=True,
|     ... )
|
| Method resolution order:
|     Choropleth
|     folium.map.FeatureGroup
|     folium.map.Layer
|     branca.element.MacroElement
|     branca.element.Element
|     builtins.object
|
| Methods defined here:
|
|     __init__(self, geo_data: Any, data: Optional[Any] = None, columns: Optional[Sequence[Any]] = None)
|         Initialize self. See help(type(self)) for accurate signature.
|
|     render(self, **kwargs) -> None
|         Render the GeoJson/TopoJson and color scale objects.
|
| -----
| Methods inherited from branca.element.Element:
|
|     __getstate__(self)
|         Modify object state when pickling the object.
|         jinja2 Environment cannot be pickled, so set
|         the ._env attribute to None. This will be added back
|         when unpickling (see __setstate__)
|
|     __setstate__(self, state: dict)
|         Re-add ._env attribute when unpickling
|
|     add_child(self, child, name=None, index=None)
|         Add a child.
|
|     add_children(self, child, name=None, index=None)
|         Add a child.
|

```

```

| add_to(self, parent, name=None, index=None)
|     Add element to a parent.
|
| get_bounds(self)
|     Computes the bounds of the object and all it's children
|     in the form [[lat_min, lon_min], [lat_max, lon_max]].
|
| get_name(self)
|     Returns a string representation of the object.
|     This string has to be unique and to be a python and
|     javascript-compatible
|     variable name.
|
| get_root(self)
|     Returns the root of the elements tree.
|
| save(self, outfile, close_file=True, **kwargs)
|     Saves an Element into a file.
|
|     Parameters
|     -----
|     outfile : str or file object
|         The file (or filename) where you want to output the html.
|     close_file : bool, default True
|         Whether the file has to be closed after write.
|
| to_dict(self, depth=-1, ordered=True, **kwargs)
|     Returns a dict representation of the object.
|
| to_json(self, depth=-1, **kwargs)
|     Returns a JSON representation of the object.
|
| -----
| Data descriptors inherited from branca.element.Element:
|
| __dict__
|     dictionary for instance variables (if defined)
|
| __weakref__
|     list of weak references to the object (if defined)

```