Scatter Plots on Maps in Python

How to make scatter plots on maps in Python. Scatter plots on maps highlight geographic areas and can be colored by value.

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Base Map Configuration

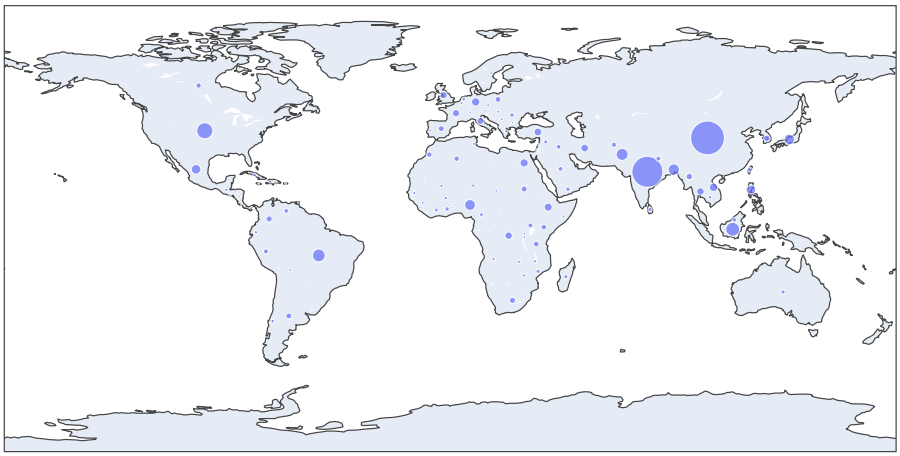
Plotly figures made with Plotly Express (/python/plotly-express/) px.scatter_geo, px.line_geo or px.choropleth functions or containing go.Choropleth or go.Scattergeo graph objects (/python/graph-objects/) have a go.layout.Geo object which can be used to control the appearance of the base map (/python/map-configuration/) onto which data is plotted.

Geographical Scatter Plot with px.scatter_geo

Here we show the Plotly Express (/python/plotly-express/) function px.scatter_geo for a geographical scatter plot. The size argument is used to set the size of markers from a given column of the DataFrame.

Plotly Express (/python/plotly-express/) is the easy-to-use, high-level interface to Plotly, which operates on a variety of types of data (/python/px-arguments/) and produces easy-to-style figures (/python/styling-plotly-express/).

```
import plotly.express as px
df = px.data.gapminder().query("year == 2007")
fig = px.scatter_geo(df, locations="iso_alpha",
                     size="pop", # size of markers, "pop" is one of the columns of gapminder
                     )
fig.show()
```



Geographical scatter plot

```
import plotly.express as px
df = px.data.gapminder().query("year == 2007")
fig = px.scatter_geo(df, locations="iso_alpha",
                     color="continent", # which column to use to set the color of markers
                     hover_name="country", # column added to hover information
                     size="pop", # size of markers
                     projection="natural earth")
fig.show()
```

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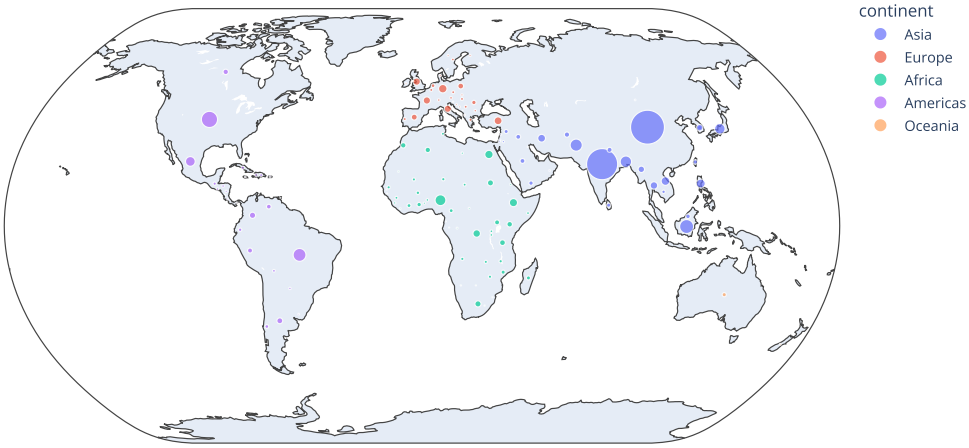

Basic Example with GeoPandas

px.scatter_geo can work well with GeoPandas (https://geopandas.org/) dataframes whose geometry is of type Point.

```
import plotly.express as px
import geopandas as gpd

geo_df = gpd.read_file(gpd.datasets.get_path('naturalearth_cities'))

px.set_mapbox_access_token(open(".mapbox_token").read())
fig = px.scatter_geo(geo_df,
                     lat=geo_df.geometry.y,
                     lon=geo_df.geometry.x,
                     hover_name="name")
fig.show()
```

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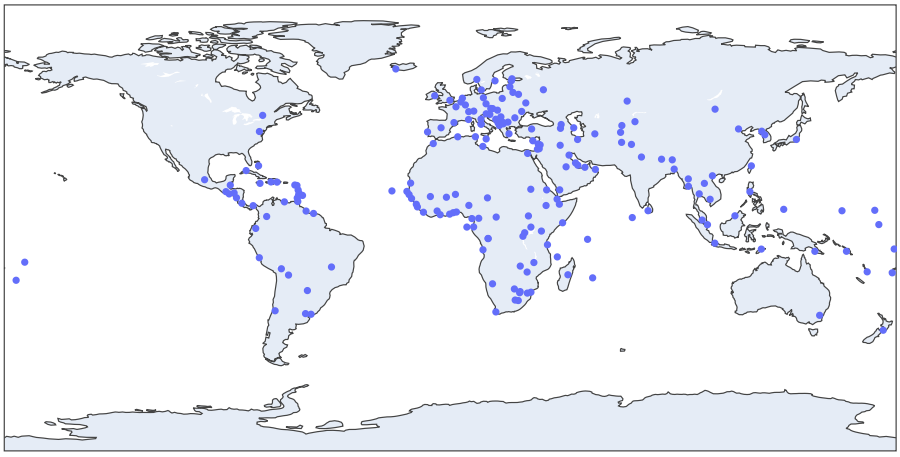

U.S. Airports Map

Here we show how to use `go.Scattergeo` from `plotly.graph_objects`.

Simple U.S. Airports Map

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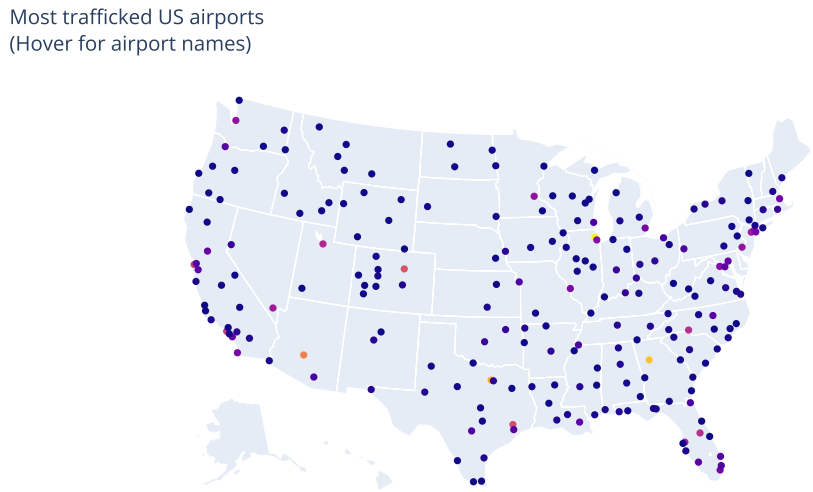
```
import plotly.graph_objects as go

import pandas as pd

df = pd.read_csv('https://raw.githubusercontent.com/plotly/datasets/master/2011_february_us_airport_traffic.csv')
df['text'] = df['airport'] + '' + df['city'] + ', ' + df['state'] + '' + 'Arrivals: ' + df['cnt'].astype(str)

fig = go.Figure(data=go.Scattergeo(
        lon = df['long'],
        lat = df['lat'],
        text = df['text'],
        mode = 'markers',
        marker_color = df['cnt'],
        ))

fig.update_layout(
        title = 'Most trafficked US airports<br>(Hover for airport names)',
        geo_scope='usa',
    )
fig.show()
```



Styled U.S. Airports Map

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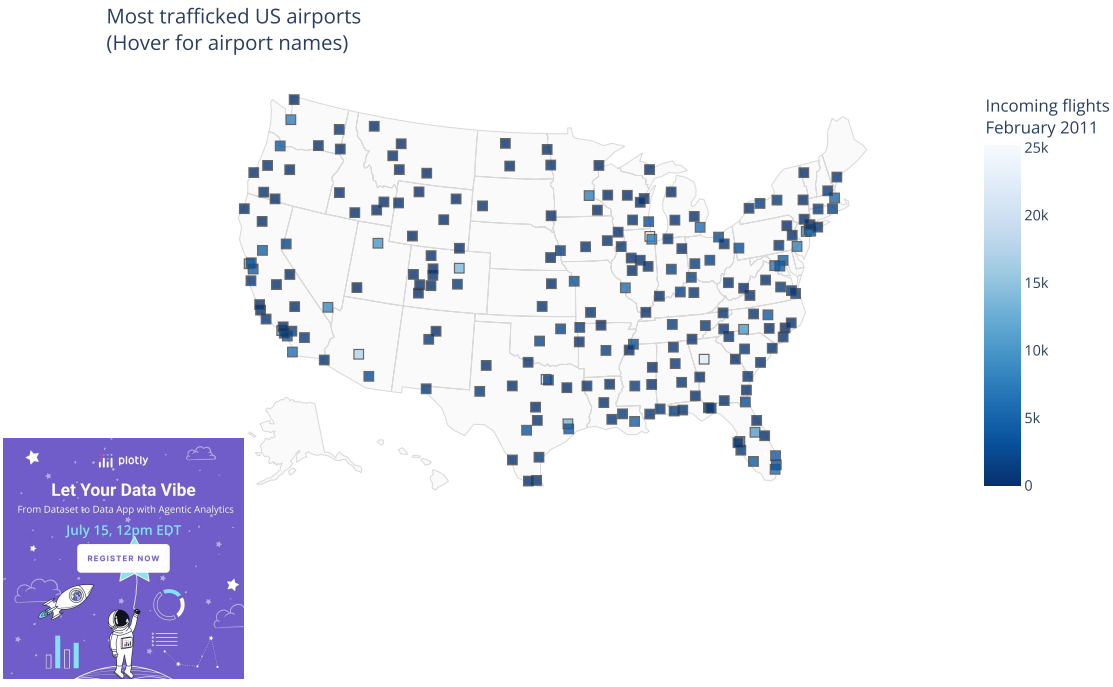
```
import plotly.graph_objects as go

import pandas as pd

df = pd.read_csv('https://raw.githubusercontent.com/plotly/datasets/master/2011_february_us_airport_traffic.csv')
df['text'] = df['airport'] + '' + df['city'] + ', ' + df['state'] + '' + 'Arrivals: ' + df['cnt'].astype(str)


fig = go.Figure(data=go.Scattergeo(
        locationmode = 'USA-states',
        lon = df['long'],
        lat = df['lat'],
        text = df['text'],
        mode = 'markers',
        marker = dict(
            size = 8,
            opacity = 0.8,
            reversescale = True,
            autocolorscale = False,
            symbol = 'square',
            line = dict(
                width=1,
                color='rgba(102, 102, 102)'
            ),
            colorscale = 'Blues',
            cmin = 0,
            color = df['cnt'],
            cmax = df['cnt'].max(),
            colorbar=dict(
                title=dict(
                    text="Incoming flights<br>February 2011"
                )
            )
        )))

fig.update_layout(
        title = 'Most trafficked US airports<br>(Hover for airport names)',
        geo = dict(
            scope='usa',
            projection_type='albers usa',
            showland = True,
            landcolor = "rgb(250, 250, 250)",
            subunitcolor = "rgb(217, 217, 217)",
            countrycolor = "rgb(217, 217, 217)",
            countrywidth = 0.5,
            subunitwidth = 0.5
        ),
    )
fig.show()
```



North American Precipitation Map

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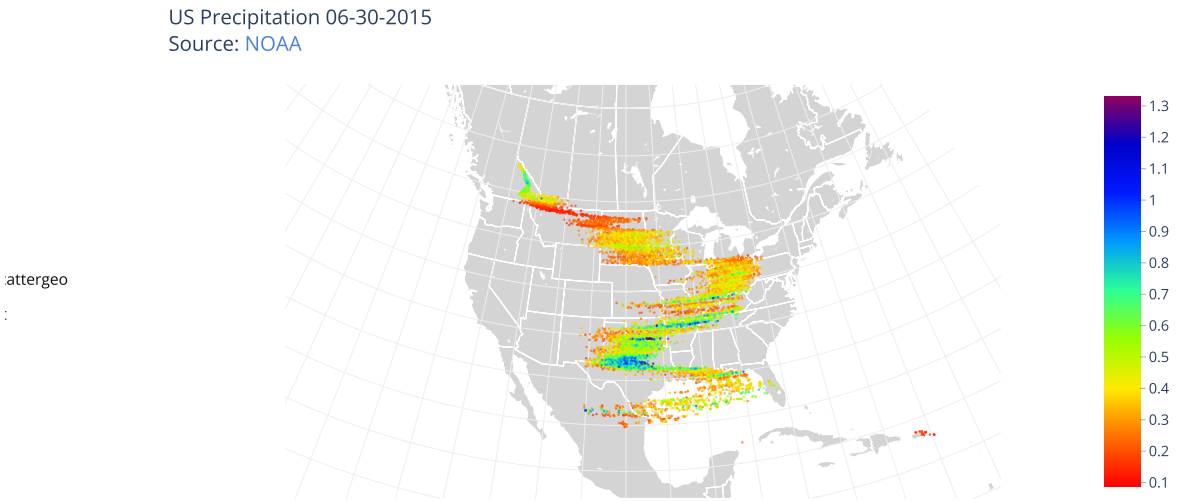
```
import plotly.graph_objects as go

import pandas as pd

df = pd.read_csv('https://raw.githubusercontent.com/plotly/datasets/master/2015_06_30_precipitation.csv')

scl = [0,"rgb(150,0,90)"],[0.125,"rgb(0, 0, 200)"],[0.25,"rgb(0, 25, 255)"],\
[0.375,"rgb(0, 152, 255)"],[0.5,"rgb(44, 255, 150)"],[0.625,"rgb(151, 255, 0)"],\
[0.75,"rgb(255, 234, 0)"],[0.875,"rgb(255, 111, 0)"],[1,"rgb(255, 0, 0)"]

fig = go.Figure(data=go.Scattergeo(
    lat = df['Lat'],
    lon = df['Lon'],
    text = df['Globvalue'].astype(str) + ' inches',
    marker = dict(
        color = df['Globvalue'],
        colorscale = scl,
        reversescale = True,
        opacity = 0.7,
        size = 2,
        colorbar = dict(
            title = dict(
                side="right"
            ),
            outlinecolor = "rgba(68, 68, 68, 0)",
            ticks = "outside",
            showticksuffix = "last",
            dtick = 0.1
        )
    )
))

fig.update_layout(
    geo = dict(
        scope = 'north america',
        showland = True,
        landcolor = "rgb(212, 212, 212)",
        subunitcolor = "rgb(255, 255, 255)",
        countrycolor = "rgb(255, 255, 255)",
        showlakes = True,
        lakecolor = "rgb(255, 255, 255)",
        showsubunits = True,
        showcountries = True,
        resolution = 50,
        projection = dict(
            type = 'conic conformal',
            rotation_lon = -100
        ),
        lonaxis = dict(
            showgrid = True,
            gridwidth = 0.5,
            range= [ -140.0, -55.0 ],
            dtick = 5
        ),
        lataxis = dict (
            showgrid = True,
            gridwidth = 0.5,
            range= [ 20.0, 60.0 ],
            dtick = 5
        )
    ),
    title=dict(text='US Precipitation 06-30-2015<br>Source: <a href="http://water.weather.gov/precip/">NOAA</a>'),
)
fig.show()
```



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Reference

See function reference for px.(scatter_geo) (https://plotly.com/python-api-reference/generated/plotly.express.scatter_geo) or https://plotly.com/python/reference/scattergeo/ (https://plotly.com/python/reference/scattergeo/) and https://plotly.com/python/reference/layout/geo/ (https://plotly.com/python/reference/layout/geo/) for more information and chart attribute options!

What About Dash?

Dash (https://dash.plot.ly/) is an open-source framework for building analytical applications, with no Javascript required, and it is tightly integrated with the Plotly graphing library.

Learn about how to install Dash at https://dash.plot.ly/installation (https://dash.plot.ly/installation).

Everywhere in this page that you see fig.show(), you can display the same figure in a Dash application by passing it to the figure argument of the Graph component (https://dash.plot.ly/dash-core-components/graph) from the built-in dash_core_components package like this:

```
import plotly.graph_objects as go # or plotly.express as px
fig = go.Figure() # or any Plotly Express function e.g. px.bar(...)
# fig.add_trace( ... )
# fig.update_layout( ... )

from dash import Dash, dcc, html

app = Dash()
app.layout = html.Div([
    dcc.Graph(figure=fig)
])

app.run(debug=True, use_reloader=False)  # Turn off reloader if inside Jupyter
```

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