Plotting with Plotly Express

FinTech

Lesson 6.2

Software Installation for Unit 7 - SQL

Please install the following before our class on July 11

- Installing pgAdmin and Postgres on Windows
- Installing pgAdmin and Postgres on a Mac

Class Objectives

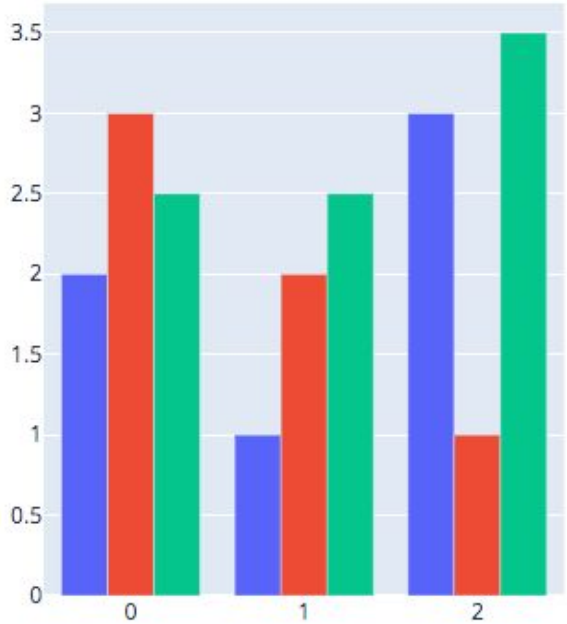
By the end of class, you will be able to:

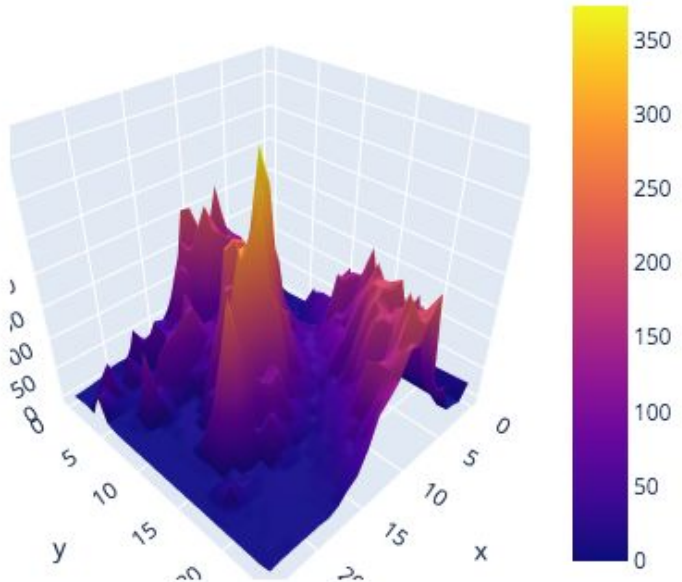
- Define common use cases for Plotly Express
- Set up a Plotly Express environment
- Complete Plotly interactive plots
- Store MapBox API key as an environment variable and authenticate
- Integrate MapBox API with Plotly
- Construct map plot visualizations

plotly

Plotly Express

Plotly Express is a package similar to hvPlot and offers many of the same plots (bar, line, scatter, etc.), as well as parallel coordinates and parallel categories plots.

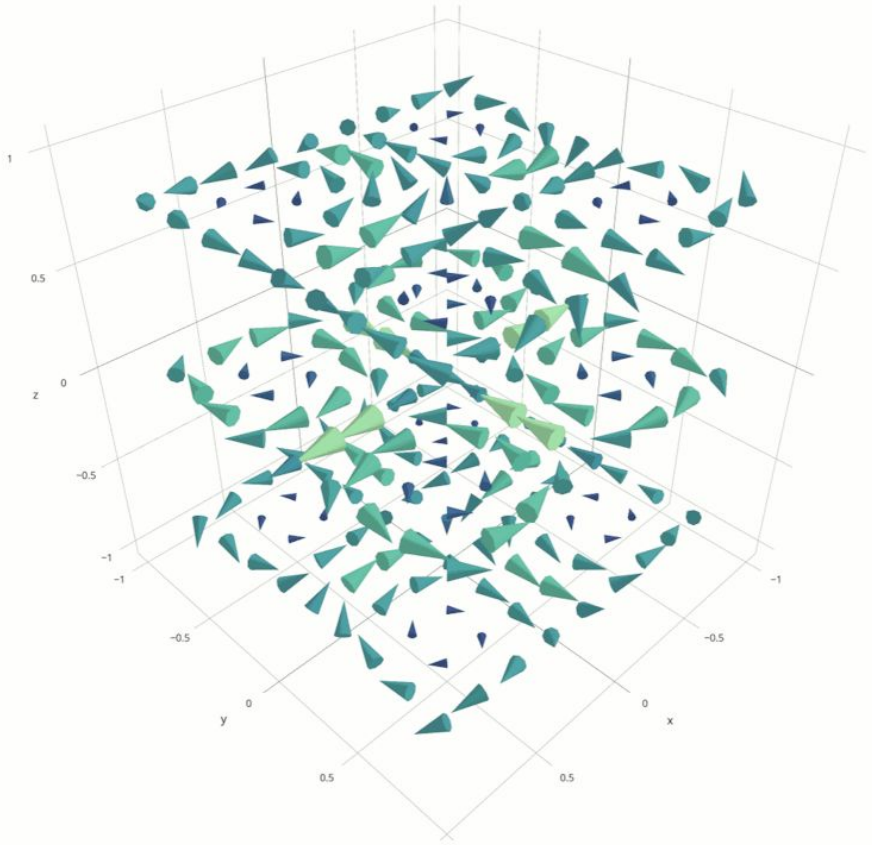




plot.ly/python/v4-migration/

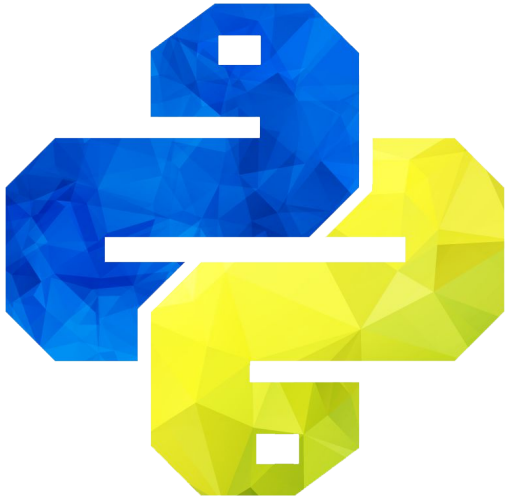
Plotly Express

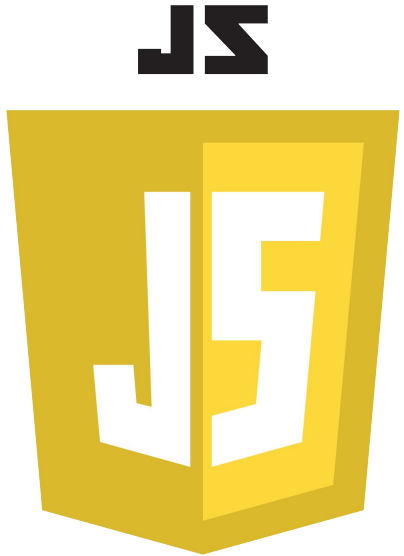
Plotly Express is a favorite among the data science and web-based data visualization communities.



Plotly Express

Plotly Express is a leader in data visualization and supports multiple programming languages, like Python, JavaScript, and R.

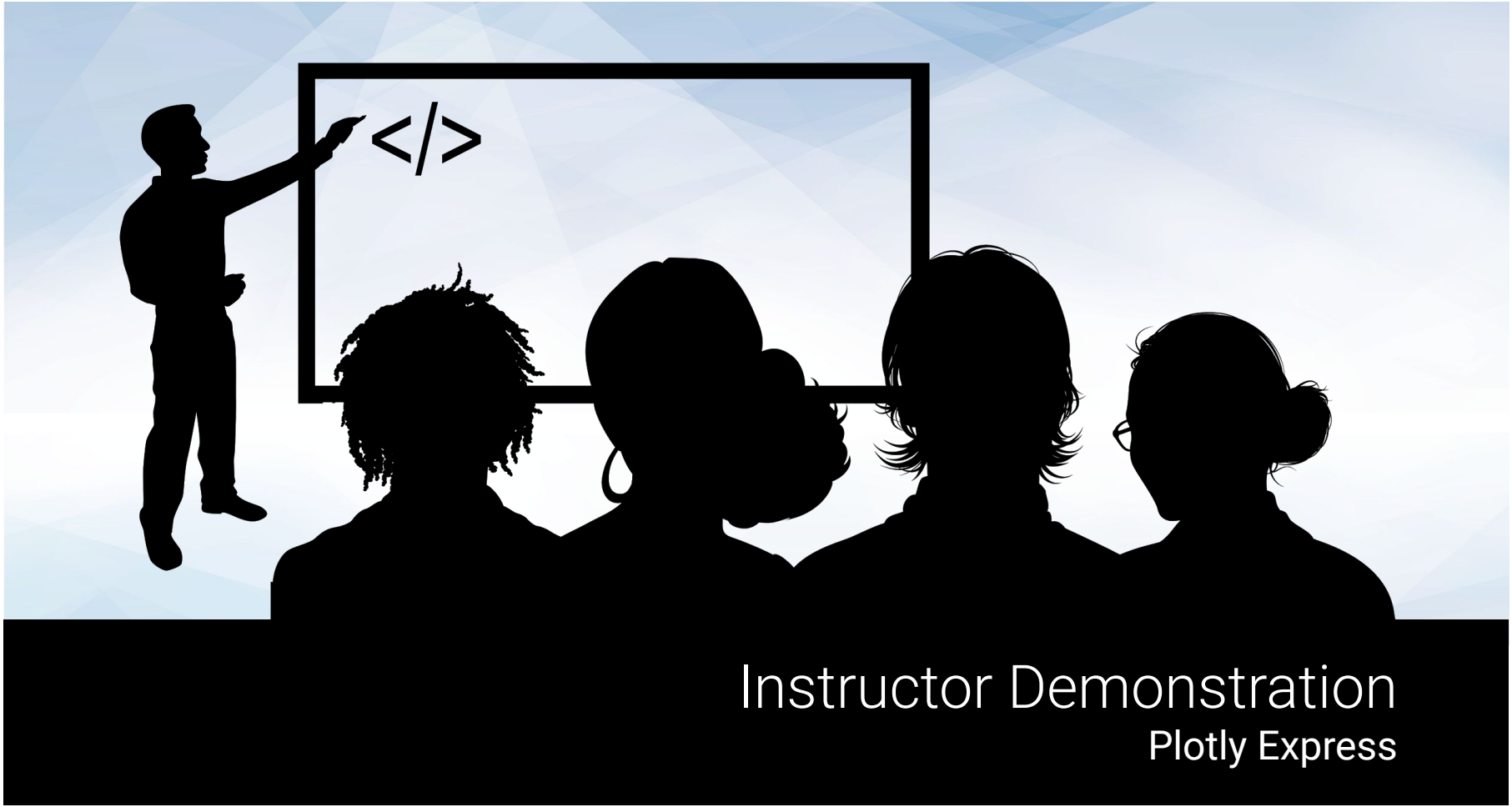




Plotly Express

Plotly Express offers advanced statistical and financial charts that are lacking in technologies like hvPlot, Matplotlib, and Pandas.

plot.ly/python/candlestick-charts/

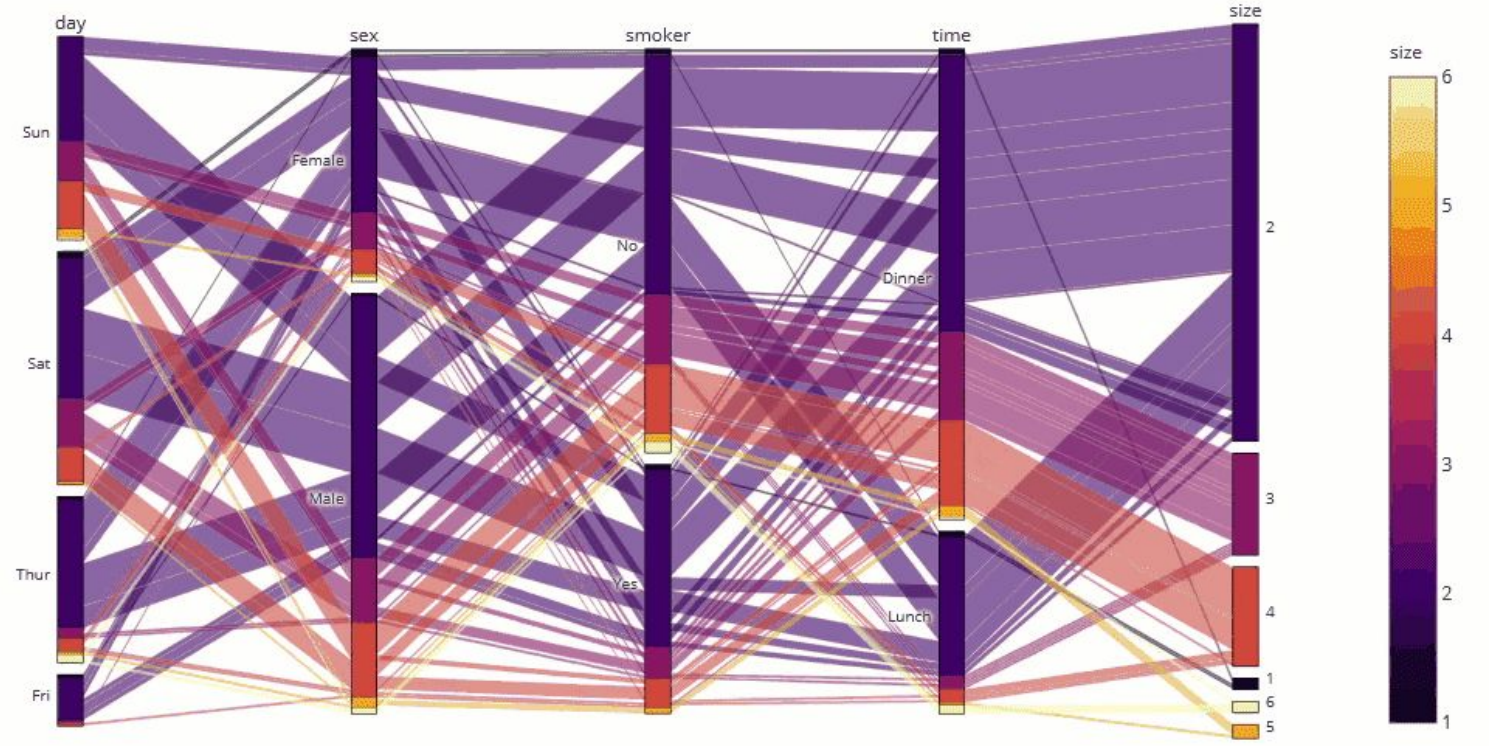


Instructor Demonstration

Plotly Express

Plotly Express

Plotly Express gives users a simple `plot` based interface that allows developers to create and customize interactive visualizations.



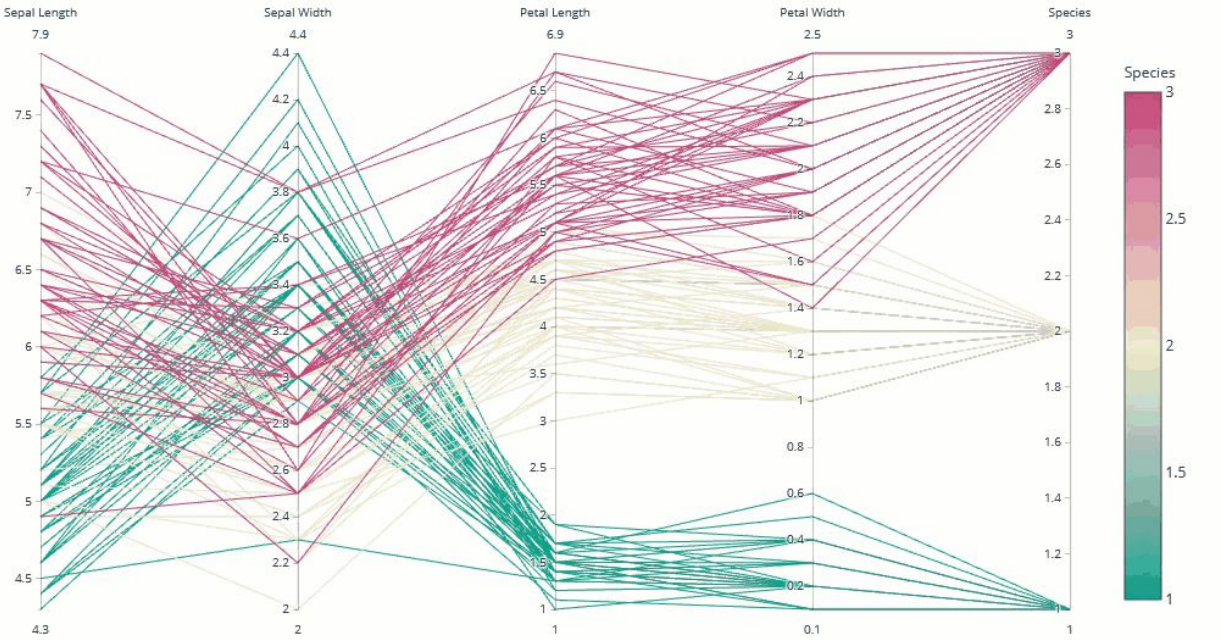
Plotly Express

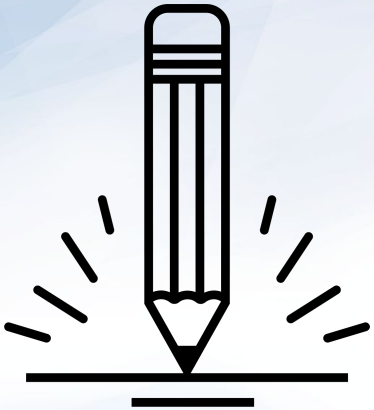
Plotly Express is packaged and powered by the Plotly library, an open source graphing library for Python.

plot.ly/graphing-libraries/

Plotly Express

In addition to the chart types we've seen (scatter, line, and bar), Plotly Express includes charting types like parallel coordinates and parallel categories. These plot types are useful when visualizing correlations and the relationships between data points.





Activity: Plotting with Plotly

In this activity, you will create scatter plots using Plotly Express.

(Instructions sent via Slack.)

Suggested Time:
10 minutes

Time’s Up! Let’s Review.

Parallel Coordinate Plots

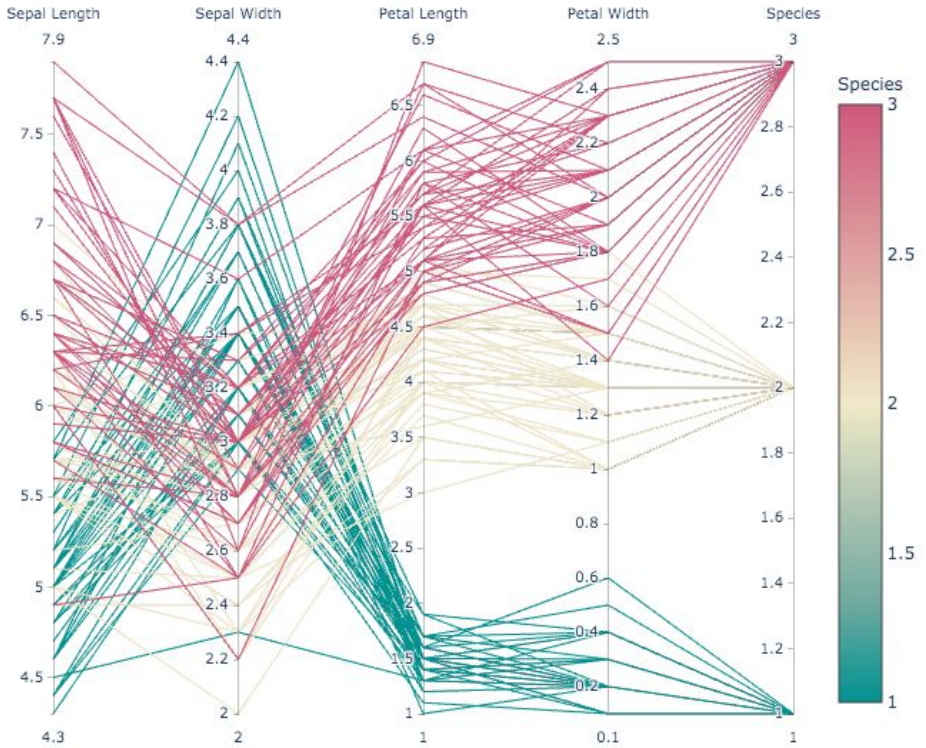
Parallel Coordinate Plots

Parallel coordinate plots allow for multiple variables to be represented in parallel to one another. This is particularly valuable when tracing the relationships between variables, and how each variable relates to/affects the other.

```
import plotly.express as pxiris = px.data.iris()

fig = px.parallel_coordinates(
    iris,
    color="species_id",
    labels={"species_id": "Species",
            "sepal_width": "Sepal Width", "sepal_length": "Sepal Length",
            "petal_width": "Petal Width", "petal_length": "Petal Length", },
    color_continuous_scale=px.colors.diverging.Tealrose,
    color_continuous_midpoint=2)
fig.show()
```

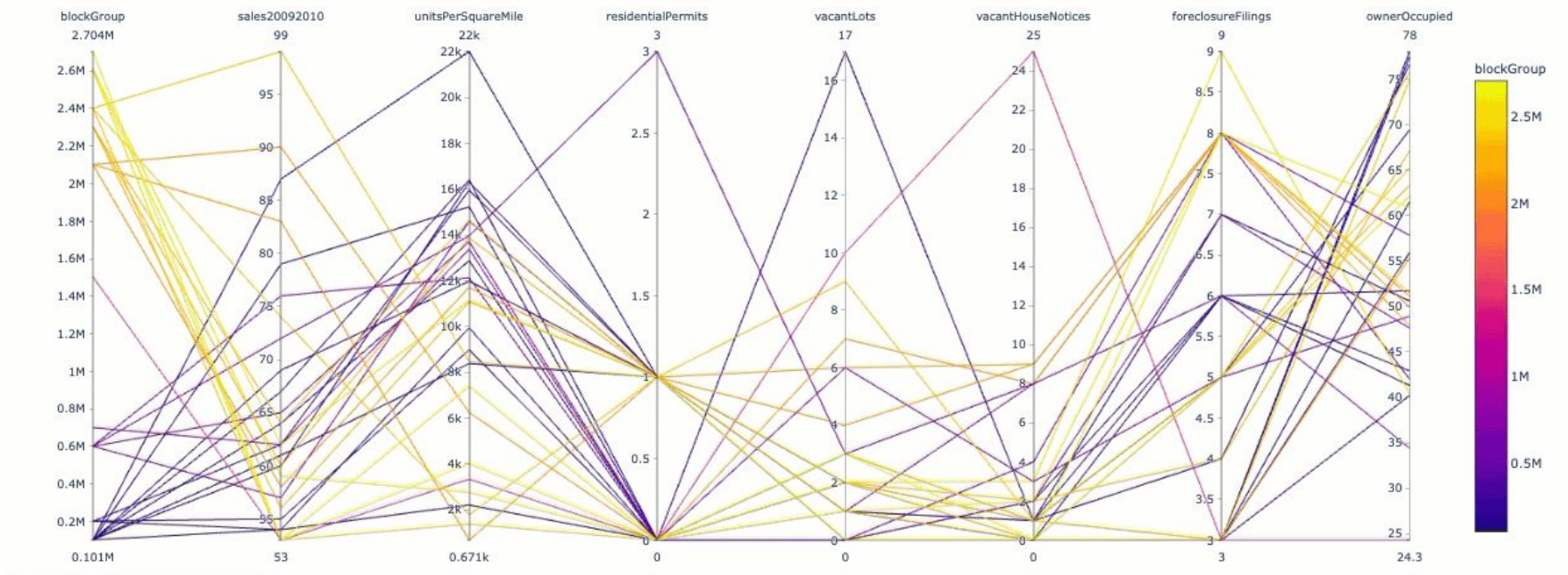
Parallel Coordinate Plots

By sorting the axes and filtering values, analysts can cluster attributes to assess relationships and trends.



Parallel Coordinate Plots

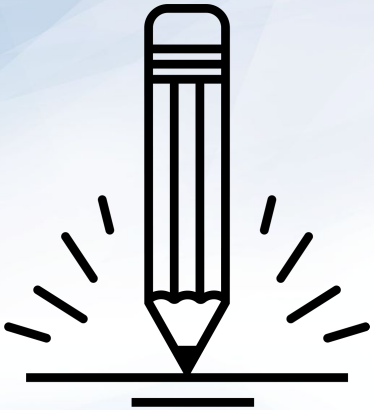
Sorting so that **vacantLots** and **sales20092010** are adjacent lets one see how the number of vacant lots impacts the sales for that block.



Parallel Coordinate Plots

An assessment of **vacantLots**, **unitsPerSquareMile,** and **foreclosures** reveals that if there are more vacant lots on a block, there will be fewer units per square mile, and fewer sales.

```
import plotly.express as px
import pandas as pd
from pathlib import Path

# Read in data
typology =
pd.read_csv(Path('../Resources/housing_market_typology.csv'))[:30].sort_values
('blockGroup')

# Create Parallel Coordinates plot
  px.parallel_coordinates(typology, color='blockGroup')
```



Activity: Plotting in Parallel

In this activity, you will revisit a previously used dataset that was visualized using scatter plots, and visualize the data using a parallel coordinates plot.

(Instructions sent via Slack.)

Suggested Time:
15 minutes

Time’s Up! Let’s Review.

What’s the function used to create a parallel coordinate plot?

```
plotly.express.parallel_coordinates()
```

What’s the difference between a scatter plot and a parallel coordinate plot?

Scatter Plot and Parallel Coordinate Plot

What's the difference between a scatter plot and a parallel coordinate plot?

Scatter Plot

Scatter plots visualize the relationship between two data points as an intersection.

Scatter plots inherently use two axes.

Parallel Coordinate Plot

Parallel coordinate plots visualize the relationship between two data points as parallel axes.

Parallel coordinate are built for multivariate analysis and can have 2+ axes.

Which plot allows you to gain more value from interaction?

Scatter Plot and Parallel Coordinate Plot

Which plot allows you to gain more value from interaction?

Scatter Plot

The parallel coordinate plot offers limited opportunities for interaction, which makes the scatter plot more suitable for interacting with plots.

Parallel Coordinate Plot

Parallel coordinate plots structurally allow for relationships to be traced more effectively and efficiently.

What is the difference between the types of interactions provided by these different plots?

Scatter Plot and Parallel Coordinate Plot

What is the difference between the types of interactions provided by these different plots?

Scatter Plot

Scatter plots can be zoomed, panned, filtered, etc.

Parallel Coordinate Plot

Parallel coordinate plots can only be sorted and filtered/highlighted.

Countdown timer

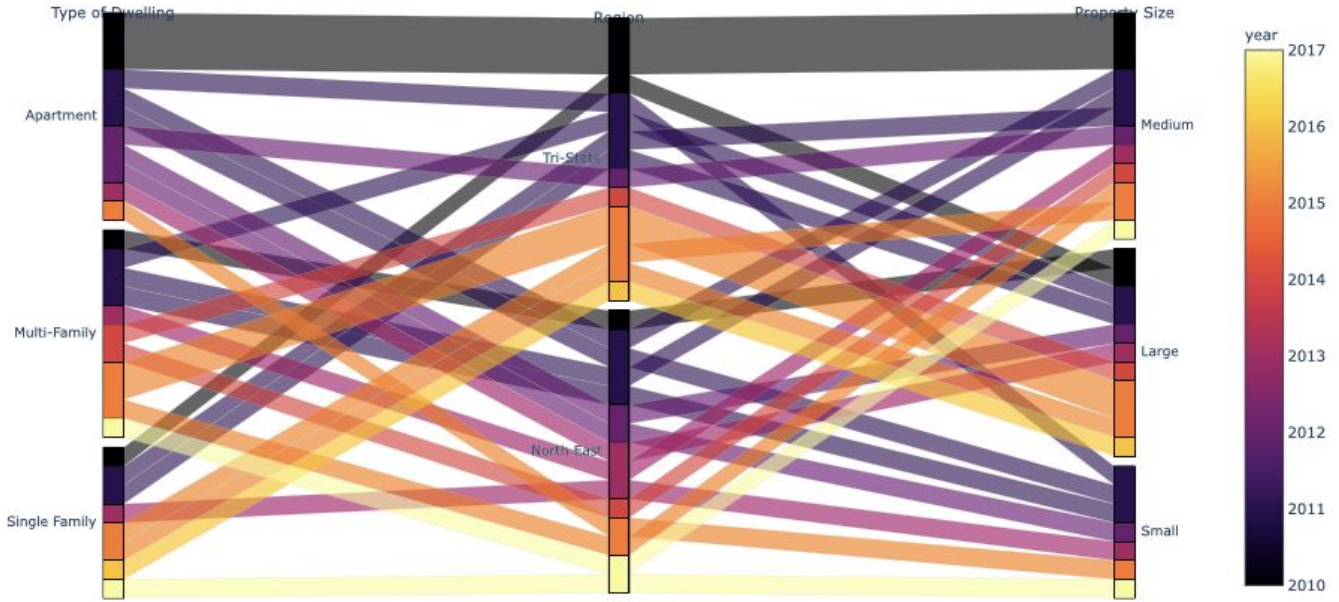
15:00

(with alarm)

Parallel Categories

Parallel Categories

While parallel coordinate plots are used for multivariate analysis and mapping relationships between variables, parallel categories plots are used to perform multidimensional analysis.



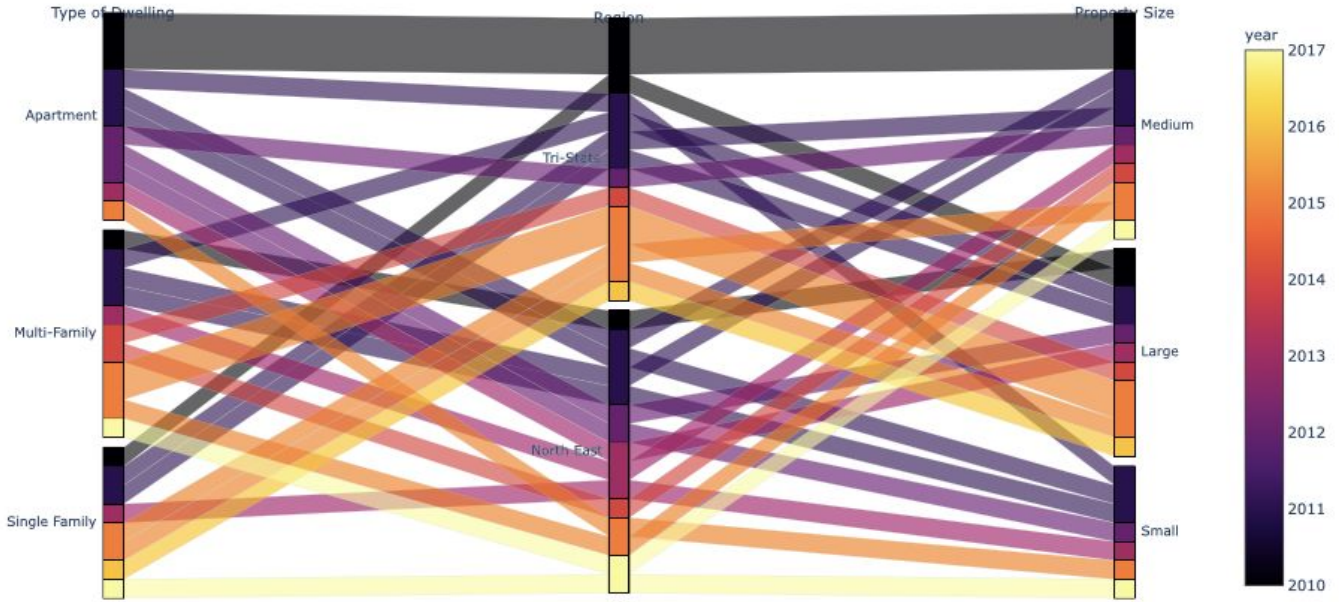
Parallel Categories

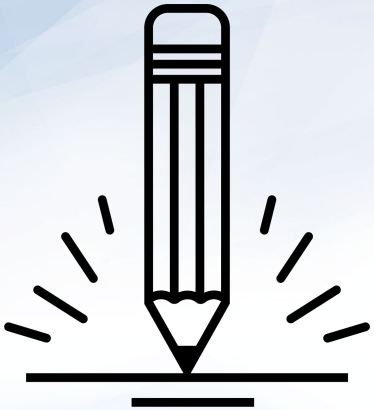
An example of multidimensional analysis is looking at sales and foreclosures data by housing type, region, and number of units. The dimensions would be housing type, region, and number of units.

```
# Prep Data
housing_type= ['Single Family','Multi-Family','Apartment']
region= ['North East','Tri-State']
prop_size= ['Large','Medium','Small']

df = pd.DataFrame({
    "sold": np.random.randint(999, 1002, 30),
    "year": np.random.randint(2010, 2019, 30),
    "type": np.random.choice(housing_type, 30),
    "region": np.random.choice(region, 30),
    "prop_size": np.random.choice(prop_size, 30)}).sort_values(['year',
                                                                'type',
                                                                'region',
                                                                'prop_size'])

df.head()
```

Parallel Categories

Dimensions are considered to be categories. Parallel categories plots focus on connecting the dots between each category, assessing the nuances per category, and the impact of categories on other categories.



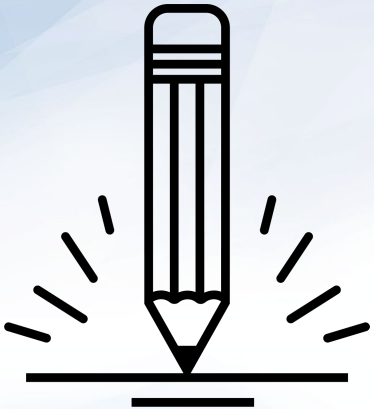


Activity: Categorical Property Evaluation

In this activity, you will code a parallel categories plot and use it to visualize the dimensions and categories evaluated during real estate property assessments.

(Instructions sent via Slack.)

Suggested Time:
15 Minutes



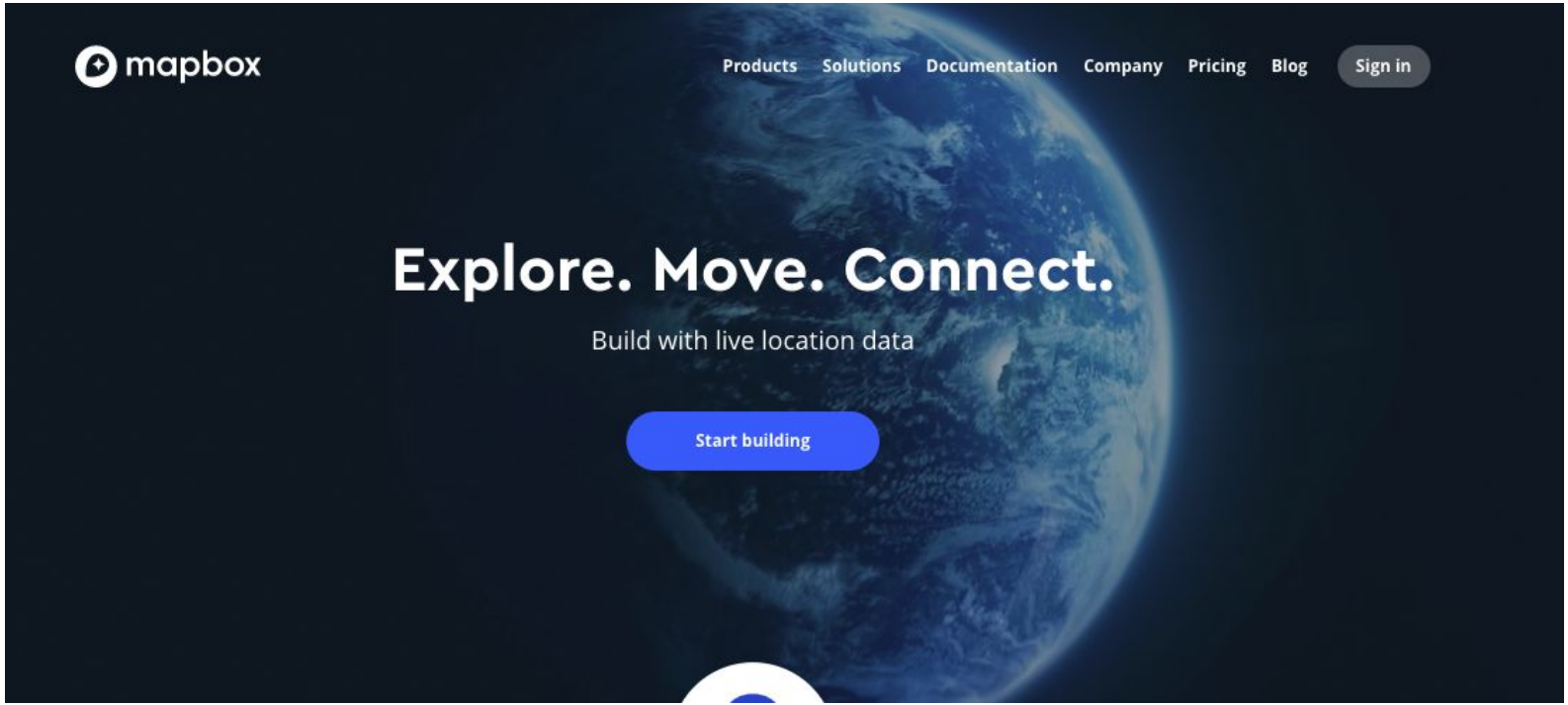
Review Activity: Categorical Property Evaluation Review

Suggested Time:
10 minutes


mapbox

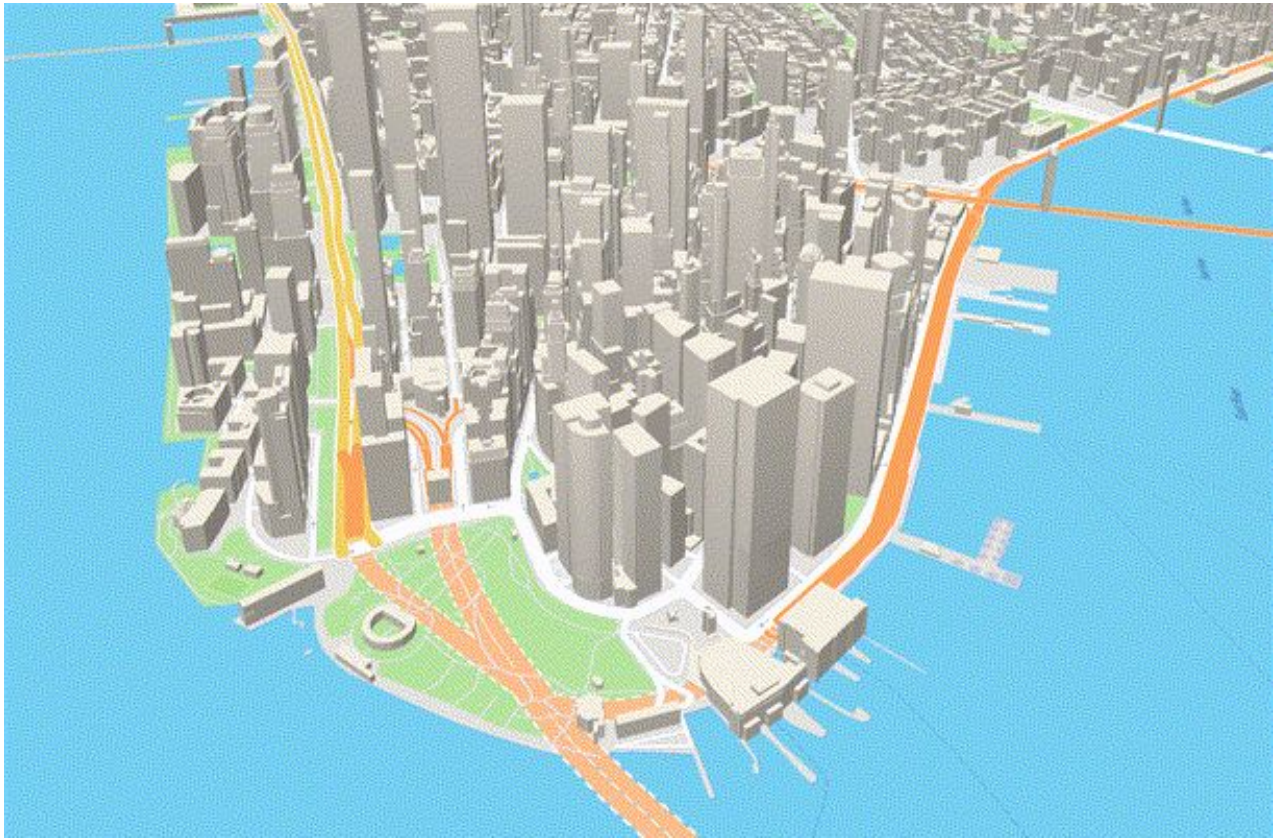
MapBox API

MapBox API is an open source API that gives developers a range of mapping visualizations and functions that enable the creation of interactive map plots.



MapBox API

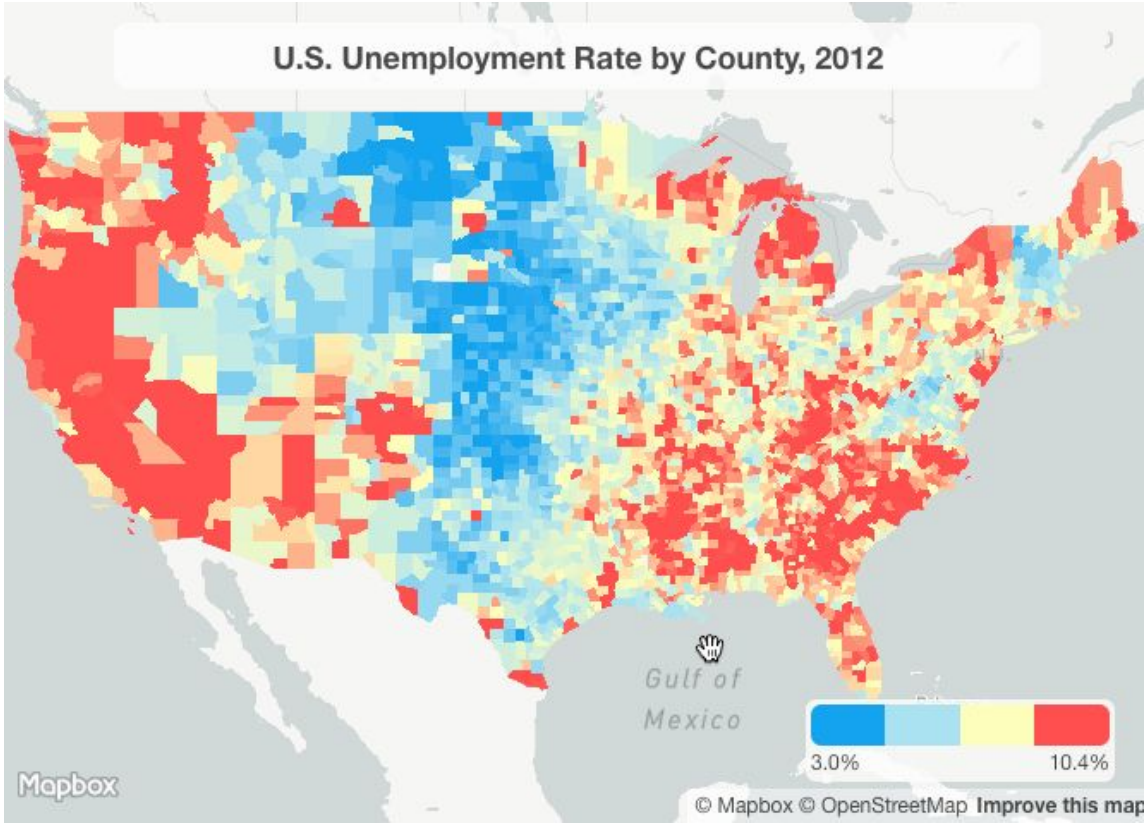
MapBox API is democratizing the map services industry (e.g., navigation and cartography), similar to how Plaid is doing this for FinTech.



MapBox API

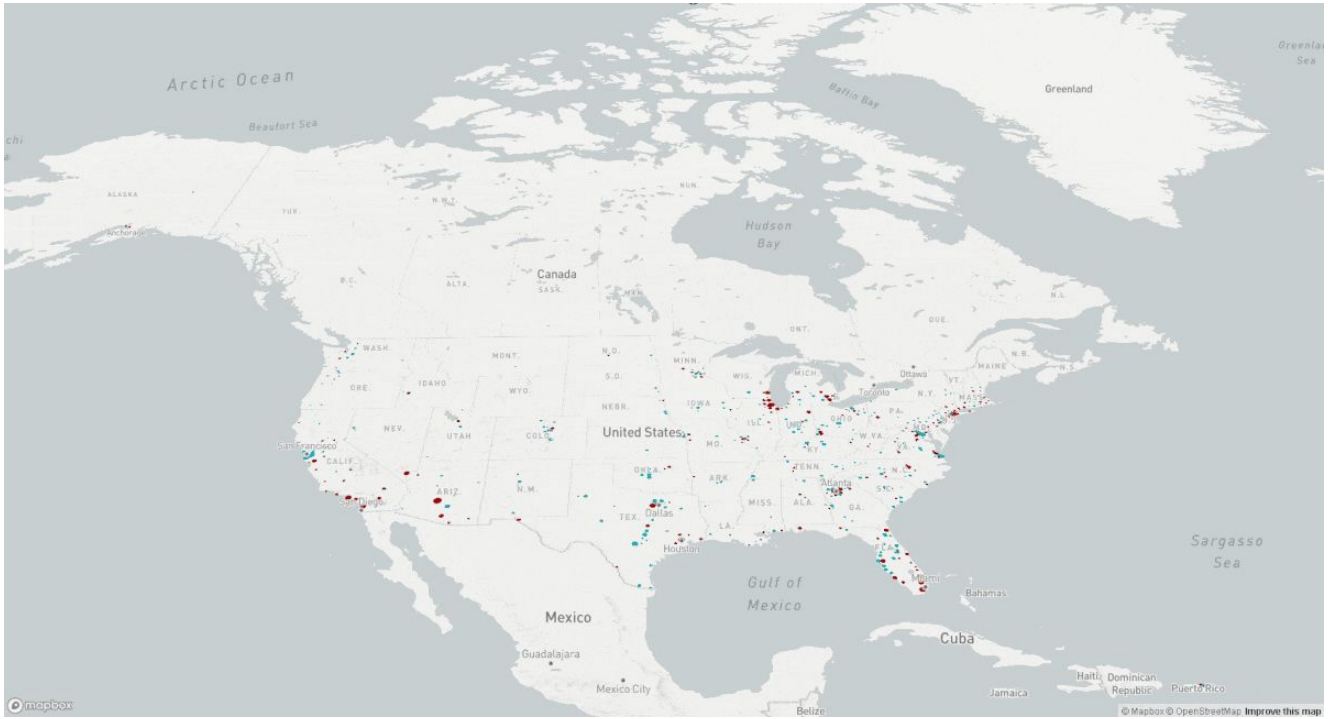
MapBox offers three main services:

- maps
- navigation
- search



MapBox API

These services come with handy tools, like map styles and vectors, map images and data sets, and live location.



MapBox API

Plotly Express has an integration endpoint specific for Mapbox API. This lets Plotly use the Mapbox maps API to create interactive map visualizations.

Plotly Express has functions designed specifically for interacting with MapBox.

```
import plotly.plotly as py
import plotly.graph_objs as go

# mapbox_access_token = 'ADD_YOUR_TOKEN_HERE'

data = [
    go.Scattermapbox(
        lat=['45.5017'],
        lon=['-73.5673'],
        mode='markers',
        marker=go.scattermapbox.Marker(
            size=14
        ),
        text=['Montreal'],
```

MapBox API

Plotly's integration with Mapbox makes it extremely convenient to use; no other imports are required. All that is needed is the Plotly Express library.

MapBox API

The Mapbox API uses API keys to monitor API requests. The Mapbox API key needs to be set up as an environment variable. The ***os.getenv*** function can then be used to retrieve the key within Python code.

```
import plotly.plotly as py
import plotly.graph_objs as go

# mapbox_access_token = 'ADD_YOUR_TOKEN_HERE'

data = [
    go.Scattermapbox(
        lat=['45.5017'],
        lon=['-73.5673'],
        mode='markers',
        marker=go.scattermapbox.Marker(
            size=14
        ),
        text=['Montreal'],
```

MapBox API

After the token is set with the `set_mapbox_access_token`, the Plotly Express mapbox plot functions can be used to create geographic plots.

```
import plotly.plotly as py
import plotly.graph_objs as go

# mapbox_access_token = 'ADD_YOUR_TOKEN_HERE'

data = [
    go.Scattermapbox(
        lat=['45.5017'],
        lon=['-73.5673'],
        mode='markers',
        marker=go.scattermapbox.Marker(
            size=14
        ),
        text=['Montreal'],
```

MapBox API

The ***scatter_mapbox*** function can be used to create a scatter plot that is overlayed on top of a map (provided by Mapbox).

This allows scatter plot data to be analyzed in reference to geographical location.

```
import plotly.plotly as py
import plotly.graph_objs as go

# mapbox_access_token = 'ADD_YOUR_TOKEN_HERE'

data = [
    go.Scattermapbox(
        lat=['45.5017'],
        lon=['-73.5673'],
        mode='markers',
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        ),
        text=['Montreal'],
```

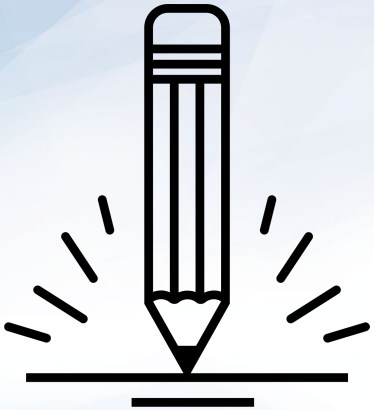

Activity: It’s a Map Plot

In this activity, you will create your own Plotly Mapbox scatter plots and integrate Plotly and Mapbox to create your first geographical visualizations.

(Instructions sent via Slack.)

Suggested Time:
15 minutes

Time’s Up! Let’s Review.

Activity: A Cartographer's Expedition

In this activity, you will work in groups to create map plots for a virtual expedition to New York City.

(Instructions sent via Slack.)

Suggested Time:
20 minutes

Time’s Up! Let’s Review.

Questions?


The End.