Lecture 22:
Animated and Interactive Visuals

Dynamic and Interactive Visualization

- Last week we learned about static graphs
- Dynamic/Interactive graphs change based on time or user input
- Often used to demonstrate a relationship in the data over time
- Examples
    - Business Insider, Spread of 5 Major Religions Map
      https://www.youtube.com/watch?v=AvFl6UBZLv4
    - NYTimes, Renting vs buying calculator
      https://www.nytimes.com/interactive/2014/upshot/buy-rent-calculator.html

Python and Dynamic Visualization

- Plotly can do this for us!
- Upgrade plotly:

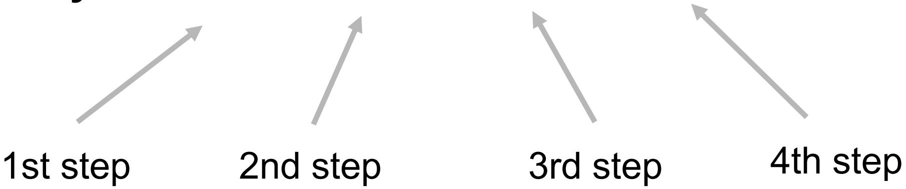
```
pip install plotly --upgrade
```

- Dynamic visualizations add a new field to the figure: **Frames**!

Frames

- Frames represent the data at each step in the animation
- Frames are a list of data points, so we need a list of lists for x-values and y-values.

```
x = [[1, -1], [1, -1], [-1, 1], [-1, 1]]
y = [[1, -1], [-1, 1], [-1, 1], [1, -1]]
```



1st step 2nd step 3rd step 4th step

Creating data points

We will use plotly’s Scatter class to plot the data points.

```
go.Scatter(
        x=x_value,
        y=y_value,
        mode = ‘markers’,
        marker = {‘color’ : ’Blue’, ‘size’:10})
```

X_value and y_value are two lists.
Each value in x_value has a corresponding value in y_value.
These two points are the x and y coordinates for each point.
If we pass in:

```
x_value=[2,-1]
y_value=[3,-2]
```

The two points we plot will be:
(2,3) and (-1,-2).

Creating data points

We will use plotly’s Scatter class to plot the data points.

```
go.Scatter(
        x=x_value,
        y=y_value,
        mode = ‘markers’,
        marker = {‘color’ : ’Blue’, ‘size’:10})
```

Here we can pass in “lines”, “markers”, “text”, or a combination of these.

This determines how each point is represented on the graph.

“Marker” will be a point.

Creating data points

We will use plotly’s Scatter class to plot the data points.

```
go.Scatter(
        x=x_value,
        y=y_value,
        mode = ‘markers’,
        marker = {‘color’ : ’Blue’, ‘size’:10})
```

Here we can edit the marker’s color and size.

Creating data points

For each frame we want to create a new scatterplot.

```
def create_data(x_values, y_values):

    data = [go.Scatter( x = x_values, y = y_values, mode = ‘markers’, marker = 
    {‘color’ : ’Blue’, ‘size’:10})]

        return data
```

Creating frames

- We want to create a list of dictionaries called frames to pass into the plotly Figure object.

```
frames = [
                {‘data’: create_data(x[0], y[0]},
                {‘data’: create_data(x[1], y[1])},
                {‘data’: create_data(x[2], y[2])},
                {‘data’: create_data(x[3], y[3])}
            ]
```

```
go.Scatter(
        x=x[0],
        y=y[0],
        mode=”markers”,
        marker={‘color’:’Blue’,
                    ‘Size’:10}
        )
```

Where create_data is a function that returns a go.Scatter object.

Creating layout

- Our layout for dynamic visualizations are more complicated because we want users to be able to interact with them
- In this example, we are creating a button to dynamically show all the frames

```
go.Layout(updatemenus=
                [ {‘buttons’: [{‘label’: ‘Animate’,
                               ‘method’: ‘animate’,
                               ‘args’: [None]}],
                   ‘showactive’: False,
                   ‘type’: ‘buttons’}
                ])
```

Putting it all together

- Finally, we want to create the figure by passing in all the data, frames, and layout

```
figure = go.Figure(data=data,
                   layout=layout,
                   frames=frames)
```

Lab Time