Interactive Visualization with Bokeh - Interactive Plots - 1

One should look for what is and not what he thinks should be. (Albert Einstein)

Interactive Plots: Topic introduction

In this part of the course, we will cover the following concepts:

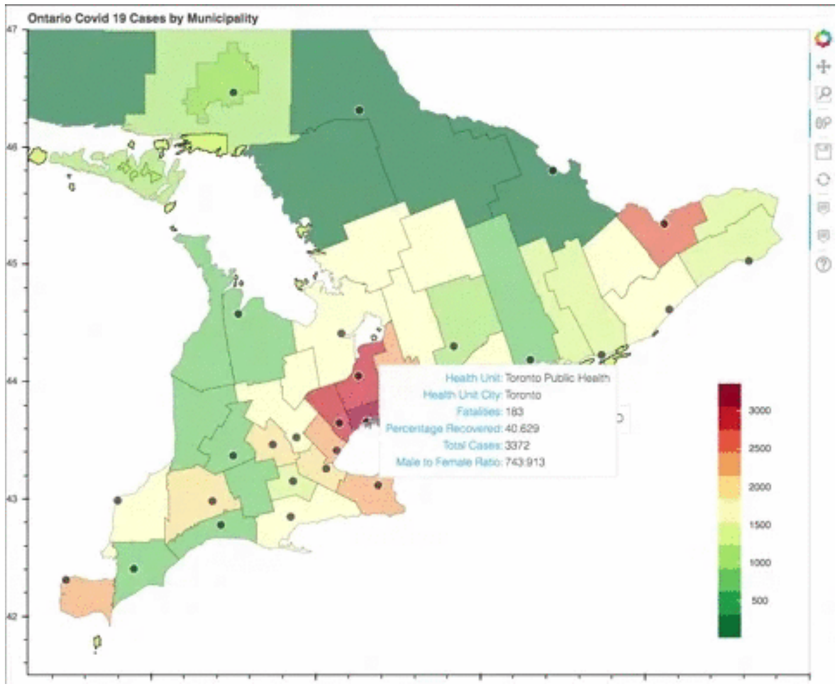
- Introduction to `bokeh` package
- Organize and visualize data with `bokeh`

Module completion checklist

Objective	Complete
Introduce Bokeh package for interactive visualizations	
Generate your first figure using Bokeh and add glyphs to it	

Warm up

- This project uses Bokeh to illustrate the spread of COVID 19 in Ontario:



- For more details on the project, click the ***link***

Visualizing data with Bokeh

- `bokeh` is an interactive visualization library that targets modern web browsers for presentation
- Bokeh offers two interfaces to users:
  - `bokeh.models`: low-level interface with the most flexibility (most users will not use this level of interface to assemble plots directly)
  - `bokeh.plotting`: higher-level interface centered around composing visual glyphs

Visualizing data with Bokeh (cont'd)

- The `bokeh.plotting` interface is handy when we need to customize the output more by adding more data series, glyphs, and so on

Plotting with Bokeh

- The basic steps to creating plots with the `bokeh.plotting` interface are:
- Prepare data:
  - Could be numpy arrays or pandas series
- Tell Bokeh where to generate output:
  - In this case, it's `output_notebook()` for use in Jupyter notebooks
- Call `figure()`
  - This creates a plot with default options and easy customization of title, tools, and axes labels

Plotting with Bokeh (cont'd)

- Add renderers:
  - We use functions specifying visual customizations like colors, legends, and widths
- Ask Bokeh to `show()` or `save()` the results:
  - These functions save the plot to an HTML file and optionally display it in a browser
- The last two steps can be repeated to create more than one plot

Output methods using Bokeh

- Common methods to view Bokeh plots are:
- `output_file()`
  - Generates HTML documents for Bokeh visualizations
- `output_notebook()`
  - Displays inline visualizations in Jupyter notebook

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Load the libraries

- Lets import the libraries we will be using in this module

```
import pandas as pd
import numpy as np
import os
import matplotlib.pyplot as plt

from bokeh.io import output_notebook
from bokeh.plotting import figure, output_file, show, output_notebook, save
from bokeh.transform import factor_cmap, factor_mark
from bokeh.layouts import column, row, gridplot
from bokeh.models import HoverTool, ColumnDataSource, NumeralTickFormatter, GroupFilter, CDSView
import ipywidgets as widgets
from ipywidgets import interact, interact_manual
```

Bokeh: simple plot

- We will create simple plots at first using data points assigned to variables `x_values` and `y_values`

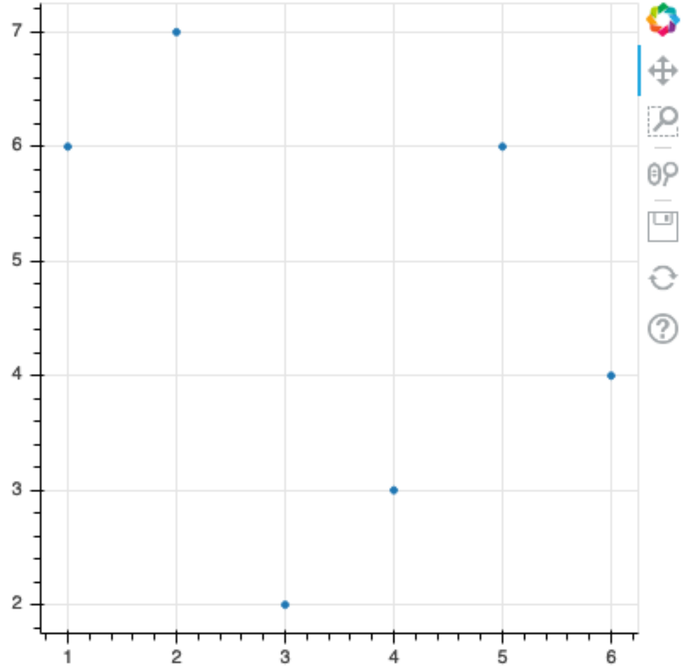
```
# Input the sample data below.
x_values = [1, 2, 3, 4, 5, 6]
y_values = [6, 7, 2, 3, 6, 4]
```

Bokeh: simple plot

- First, we make a plot using the `figure()` method
- Then, we append our glyphs to the plot by calling the appropriate method and passing in data
- Finally, we show our plot

```
# Set the output method
output_notebook()

p = figure()
p.circle(x = x_values, y = y_values)
show(p)
```

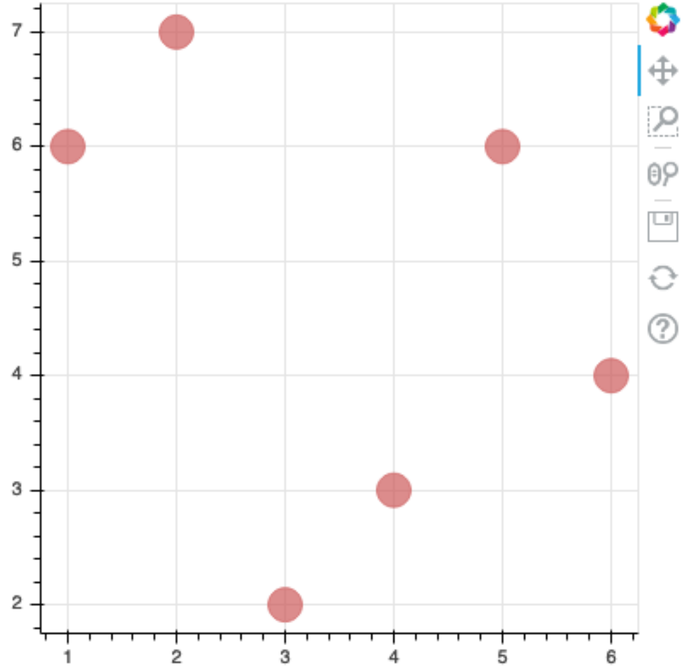


Bokeh: add size, color, and opacity

- We can now create the same circle glyph with a size, color, and alpha

```
# Create the blank plot.
p = figure(plot_width = 400, plot_height = 400)

# Add a circle glyph with a size, color, and
alpha.
p.circle(x_values,
         y_values,
         size = 20,
         color = "indianred",
         alpha = 0.7)
show(p)
```



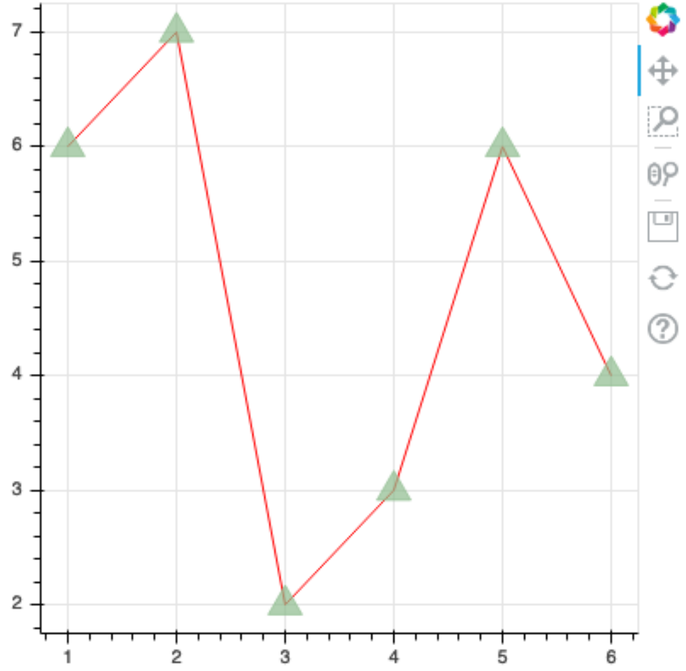
Bokeh: triangle glyph

- This time, two glyphs are added to the graph

```
p = figure(plot_width = 400, plot_height = 400)

p.line(x_values,
       y_values,
       color = 'red')

p.triangle(x_values,
           y_values,
           size = 20,
           color = "darkseagreen",
           alpha = 0.7)
show(p)
```



Bokeh: marker types

- There are a lot more marker types you can try out
- You can see examples of plots with different markers ***here***

- `asterisk()`
- `circle()`
- `circle_cross()`
- `circle_x()`
- `cross()`
- `dash()`
- `diamond()`
- `diamond_cross()`
- `inverted_triangle()`
- `square()`
- `square_cross()`
- `square_x()`
- `triangle()`
- `x()`

Knowledge check

Link: ***Click here to complete the knowledge check***

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This completes our module

You are now ready to try Tasks 1-2 in the Exercise for this topic