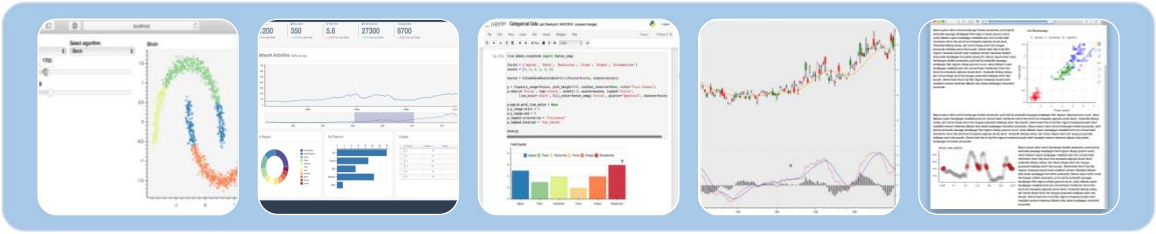
bokeh

- Generate visualizations that are friendly on the web interface and browsers
- Affords high-performance interactivity over large or streaming datasets
- Supports unique visualizations like Geospatial plots, Network graphs, etc.
- If displaying these visualizations in a browser,
  - there are options available to export them
  - can also be used through **JavaScript**
- Important links:
  - Bokeh official documentation https://docs.bokeh.org/en/latest/index.html
  - Example --- Texas Unemployment 2009 map https://docs.bokeh.org/en/latest/docs/gallery/texas.html

How Can Bokeh Be Used?



DATA APPLICATIONS

- Bokeh server can be connected with python analytic tools (numpy, pandas, sci-kit etc) to create rich, interactive visualizations in the browser

PUBLISH SOPHISTICATED DASHBOARDS

- Offers its own basic grid and row/column layouts to get started
- Also possible to embed plots and widgets into templates

INTERACTIVELT EXPLORE DATA IN NOTEBOOKS

Interactive viz can be made alongside notebook data analysis by using **output_notebook** that includes full embedded Bokeh server applications

VISUALIZE STREAMING DATA

Interactive viz can be made with streaming data from financial markets, IOT telemetry, or physical sensors by just passing new data values to a stream method

ADD CONTENT TO WEBPAGES

offers a variety of methods to embed its content in web pages

Basics of Bokeh

- For simplicity and the powerful and flexible features needed for advanced customizations, Bokeh exposes two interface levels to users:
- bokeh.models
  - low-level interface that provides the most flexibility to application developers
- bokeh.plotting
  - higher-level interface centered around composing visual glyphs
  - quite handy if we need to customize the output a bit more by adding more data series, glyphs, logarithmic axis, and so on
  - easier to combine multiple glyphs together on one plot
- https://docs.bokeh.org/en/latest/docs/reference/colors.html

Basic Steps to Create Plots With bokeh.plotting Interface

Prepare Some Data

- Python lists, NumPy arrays or Pandas series etc

Where To Generate Output

- Using output_file(), with the filename OR output_notebook() for use in Jupyter notebooks

Call --- figure()

- This creates a plot with typical default options and easy customization of title, tools, and axes labels

Add Renderers

- Use line() , specifying visual customizations like colors, legends and widths

show() OR save() The Results

- These functions save the plot to an HTML file and optionally display it in a browser

Core Concepts of Bokeh

Glyphs

- Basic visual building blocks of Bokeh plots
- Visual properties of shapes
- Includes the following types and attributes of shapes:
  - Visual Shapes -- Circles, triangles, squares, Rectangle lines, wedges
  - Properties attached to shapes
    - Coordinates(x,y)
    - Size, Color, Transparency (alpha)

Types of Glyphs

AnnularWedge	Annulus	ImageRGBA
Quad	Arc	ImageURL
Quadratic	Bezier	Line
HBar	Ellipse	MultiLine
HexTile	HArea	MultiPolygons
Image	Patch	Oval
Wedge	Patches	Segment
circle	Step	Ray
VArea	Text	Rect
VBar		

References

- For different plotting libraries in python
  - https://www.analyticsvidhya.com/blog/2020/03/6-data-visualization-python-libraries/
- Matplotlib documentation
- Seaborn documentation
- Bokeh documentation
- Google images