Interactive Scatter Plots with Bokeh

ESMRMB October 11th, 2025 Saige Rutherford Wolfers, PhD Department of Statistics, Indiana University

Learning Objectives

By the end of this tutorial, you will be able to:

- 1. Load and clean the necessary data
- 2. Create interactive scatter plots
- 3. Map color and size to data features
- 4. Add widgets and CustomJS interactivity in notebooks

What Makes a Plot Interactive?



ZOOM, PAN, AND RESET TOOLS



HOVER TOOLTIPS THAT REVEAL DATA



WIDGETS (DROPDOWNS, SLIDERS) THAT FILTER OR UPDATE PLOTS



REAL-TIME UPDATES USING JAVASCRIPT (CUSTOMJS)

Bokeh Terms



ColumnDataSource – stores your data table



figure() – creates the plotting canvas



Glyphs – e.g. circle(), line(), vbar()



Tools – HoverTool, BoxZoom, Pan, Save



Widgets – Select, RangeSlider, CheckboxGroup



Callbacks – CustomJS for notebooks, or Python callbacks in Bokeh Server

Dataset: Freesurfer recon-all output

Source: simulated dataset of Freesurfer recon-all surface reconstruction from n=20 subjects.

Columns: subject_id, age, sex, ROI_name, cortical_thickness, surface_area, lobe.

Demonstrates numeric and categorical mappings

Clean missing data and convert numeric types

Step-by-Step Build

- 1. Minimal scatter (age vs cortical thickness)
- 2. Add hover tooltips
- 3. Color points by lobe (categorical)
- 4. Size points by surface area (numeric)
- 5. Add widgets (dropdowns, sliders)
- 6. Use CustomJS to link widgets and filters

Common Pitfalls

Confusing CustomJS vs. Bokeh Server callbacks

Missing data / non-numeric fields

Palette too short for all categories

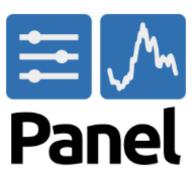
Widget value mismatches (e.g., labels vs. data keys)

In Colab, restart runtime after installing packages

Additional Resources







Bokeh Documentation – https://docs.bokeh.org Gallery – https://docs.bokeh.org/en/latest/docs/gallery.html

Panel (for dashboards) – https://panel.pyviz.org/

Holoviz - High-level tools to simplify visualization in Python https://holoviz.org/

Now, let's code!

Follow along and run the code yourself or watch me run it.



https://www.github.com/saigerutherford/esmrmb_data_viz/

We will use Google Colab, so we don't have to set up Python environments on our personal computers.





