Interactive Scatter Plots with Bokeh

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



https://www.github.com/ saigerutherford/esmrmb _data_viz/

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 Glossary



ColumnDataSource: stores your data table



Figure: creates the plotting canvas



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



Tools: e.g., HoverTool, BoxZoom, Pan, Save



Widgets: e.g., 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 Errors

Confusing CustomJS vs. Bokeh Server callbacks

Missing data / non-numeric fields

Palette too short for all categories

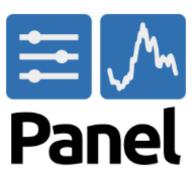
Plot not updating after widget user input

In Colab, connection errors, restart required

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.





