Interactive Scatter Plots with Bokeh

ESMRMB October 11th, 2025

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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.