Interactive Brain Visualizations

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Learning Objectives

01

Make compelling, interactive visualizations of brain data in Python

02

Know quick wins that work in Google Colab

03

Leave with a template notebook you can adapt to your own data

Agenda

- Setup & data
- Interactive cortical surface (Plotly)
- Slice viewer (nilearn.view_img)
- Tiny 3D connectome (Plotly)
- Volume rendering (Plotly)
- Upload your own NIfTI

Setup (Colab-friendly)

01

PIP INSTALL: NILEARN, NIBABEL, PLOTLY

02

USE NILEARN DATASETS TO FETCH FSAVERAGE SURFACES & SAMPLE STATS

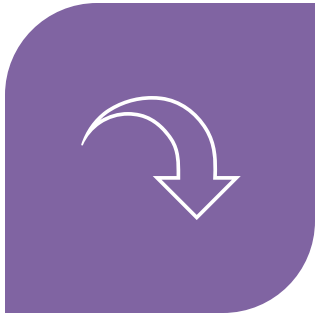
03

PRO TIP: RESTART RUNTIME AFTER INSTALLS IF WIDGETS MISBEHAVE

Demo A: 3D Cortical Surface

PROJECT VOLUME → SURFACE WITH NILEARN.SURFACE.VOL_TO_SURF

PLOT TRIANGULAR MESH WITH PLOTLY MESH3D



COLOR BY STATS; ROTATE, ZOOM, SAVE AS HTML

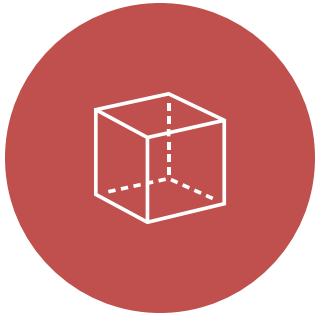
Demo B: Interactive Slice Viewer

NILEARN.PLOTTING.VIEW_IMG(STAT_IMG, THRESHOLD='95%')

BUILT-IN CONTROLS FOR THRESHOLD, COLORMAP, OPACITY

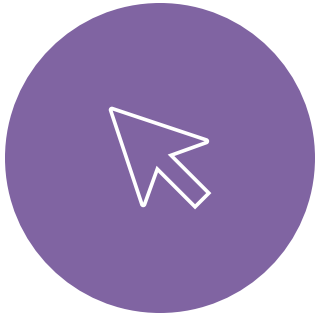
GREAT FOR QUICK EXPLORATION & TEACHING

Demo C: Tiny 3D Connectome



CREATE TOY NODES & EDGES IN 3D

PLOT WITH PLOTLY SCATTER3D (LINES + MARKERS)



ADD HOVER TEXT, WEIGHTS, AND SELECTIONS

Demo D: 3D Volume Rendering

DOWNSAMPLE TO KEEP IT FAST (E.G., 4 MM)

GO.VOLUME WITH OPACITY/SURFACE_COUNT CONTROLS

USE SPARINGLY FOR BIG DATASETS

Best Practices & Pitfalls

Keep	Keep assets small; fetch data programmatically (document paths)
Prefer	Prefer interactive HTML exports for sharing rather than PNG (static)
Document	Document parameters (thresholds, spaces) for reproducibility
Mind	Mind coordinate spaces (MNI, native, fsaverage), mesh/image resolution

Additional Resources

Nilearn docs & examples

https://nilearn.github.io/stable/index.html

NeuroVault (public statistical maps)

https://neurovault.org/

Plotly Python docs

https://plotly.com/python/

Companion Colab notebook)

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.