

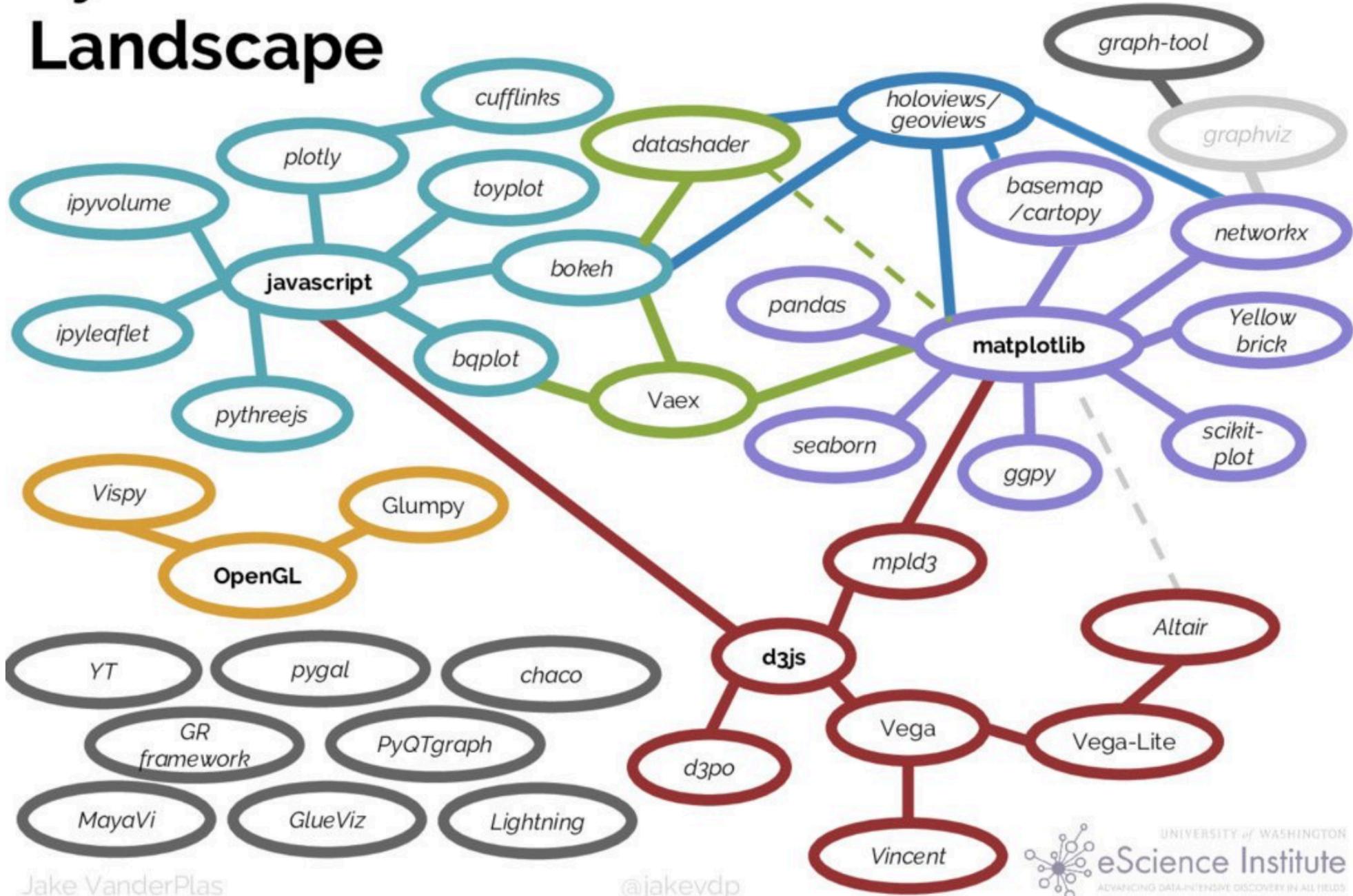
Holoviz Tools (Dynamic plotting in Python)

Javier Gonzalez-Castillo
Coder's Forum, NIH, March 6th 2020



High-level tools to simplify visualization in Python.

Python's Visualization Landscape



INTRODUCTION

- With Python, initial exploration is typically in a [Jupyter](#) notebook, using tools like Matplotlib and Bokeh.
- These tools support a simple syntax for making certain kinds of plots, but:
 - Showing more complex relationships in data can quickly turn into major software development.
 - Hard to move from the notebook to a standalone server context
- Bokeh and Matplotlib both also have limitations on how much data they can handle.
- To address these issues, [holoviz](#) provides a set of open-source Python packages to streamline the process of working with small and large datasets (from a few datapoints to billions or more) in a web browser.



Panel



hvPlot



HoloViews



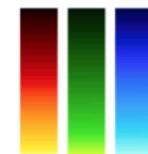
GeoViews



Databricks



Param



Colorcet

MINIMUM SETUP

- Create an environment
 \$> conda create -n holoviz python=3.7
- Activate the environment
 \$> conda activate holoviz
- Install the holoviz libraries
 \$> conda install -c pyviz holoviz
- Install the examples (to follow tutorial)
 \$> holoviz examples
- In addition, for jupyter-lab integration:
 \$> conda install jupyterlab nodejs
 \$> jupyter labextension install @pyviz/jupyterlab_pyviz

Then of course you may want to add some additional pydata packages

Detailed Instructions: <http://holoviz.org/installation.html>

INTRODUCTION: Libraries of interest



Interactive plotting in web browsers, running JavaScript but controlled by Python.



Declarative objects for instantly visualizable data, building Bokeh plots from convenient high-level specifications.



Quickly return interactive Bokeh-based HoloViews objects from Pandas, Xarray, or other data structures.



Assemble objects from different libraries into a layout or app that can be accessed in a Jupyter notebook or in a standalone servable dashboard.



Databricks

Efficiently render large datasets



Colorcet

Collection of perceptually accurate 256-color colormaps

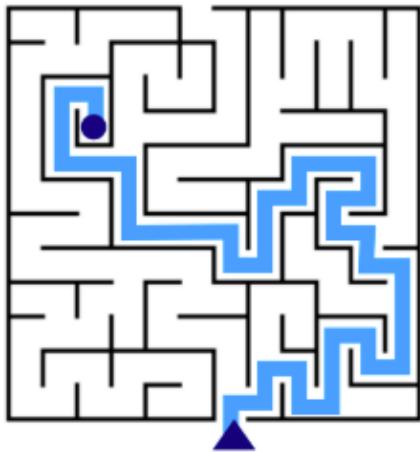


Param

Python attributes extended to have features such as type and range checking

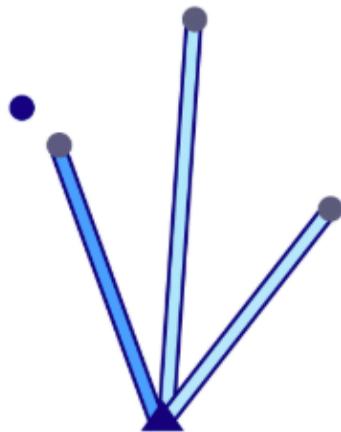
INTRODUCTION: Why the different libraries

Low level



- ✓ Can precisely choose where to go
- Requires expertise to make decisions all along the way

High level



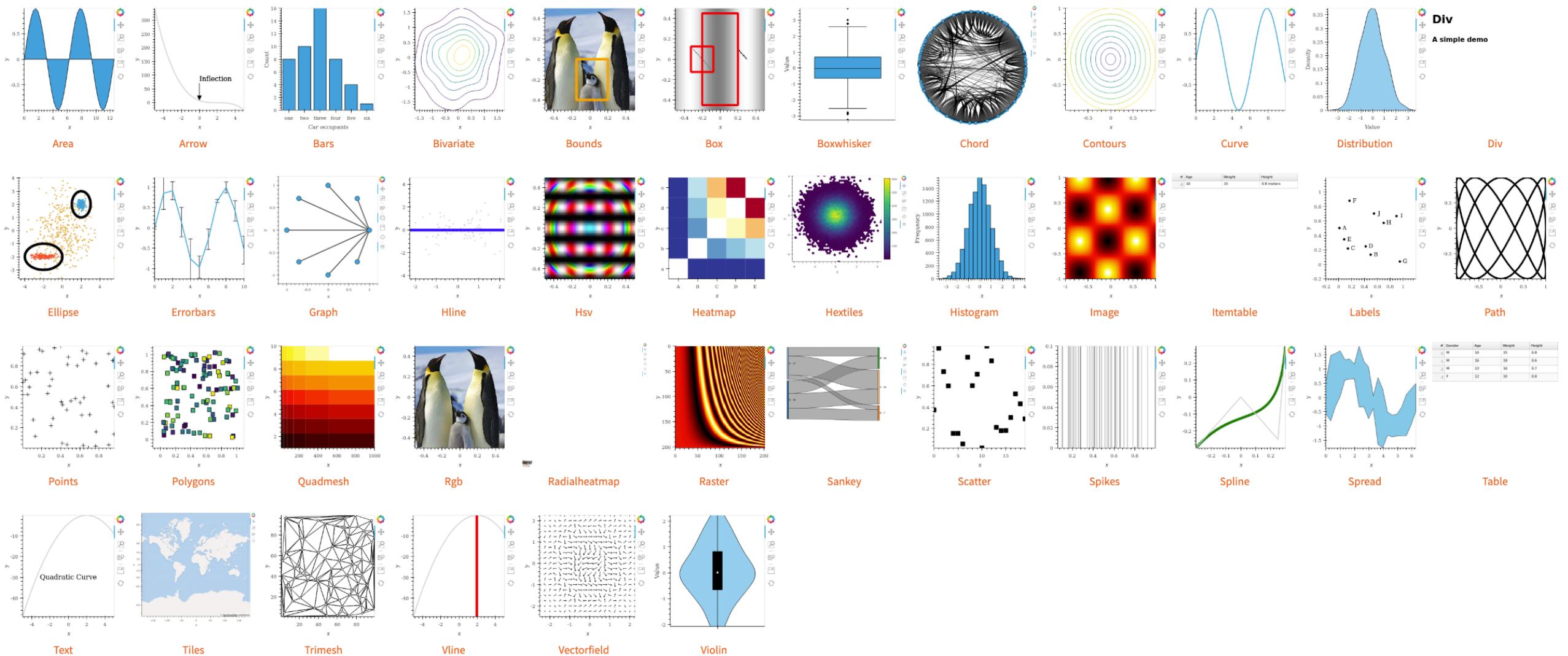
- ✓ Can quickly go far
- ✓ Only requires opinions between options
- Not close enough?
Start over, the hard way

Layered



- ✓ Can quickly go far
- ✓ Can precisely choose where to go
- ✓ Only need to study where shortcut got you

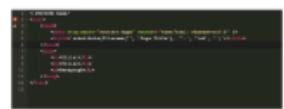
Holoviews Plotting Elements



Notebook: Talk_Part02_HVElements

Panel Dashboarding Elements

Panes



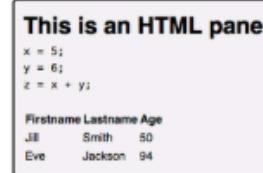
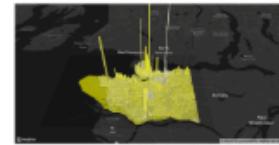
Holoviz Tools (Dynamic plotting in Python)

Ace

Audio

Bokeh

	A	B	C	D
0	0.0	0.0	foo1	2009-01-01
1	1.0	1.0	foo2	2009-01-02
2	2.0	0.0	foo3	2009-01-05
3	3.0	1.0	foo4	2009-01-06
4	4.0	0.0	foo5	2009-01-07

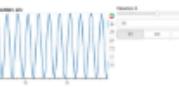
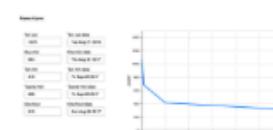
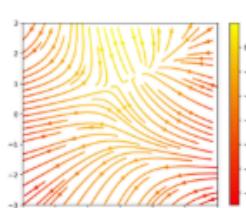


```
▼ Object
  boolean: false
  ▶ dict: Object
  int: 1
  float: 3.1
  ▼ list: Array[3]
    0: 1
    1: 2
    2: 3
  null: null
  string: "A string"
```

$$\nabla \times \vec{B} - \frac{1}{c} \frac{\partial \vec{E}}{\partial t} = \frac{4\pi}{c} \vec{j}$$
$$\nabla \cdot \vec{E} = 4\pi\rho$$
$$\nabla \times \vec{E} + \frac{1}{c} \frac{\partial \vec{B}}{\partial t} = \vec{0}$$
$$\nabla \cdot \vec{B} = 0$$

Emphasis
Emphasis, aka italics, with asterisks or underscores.
Strong emphasis, aka bold, with asterisks or underscores.
Combined emphasis with asterisks and underscores.
Strikethrough uses two tildes. ~~Scratch this.~~

- Task list**
- [x] Write the press release
 - [] Update the website
 - [] Contact the media



Jpg

Json

Latex

Markdown

Matplotlib

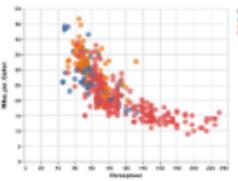
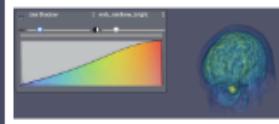
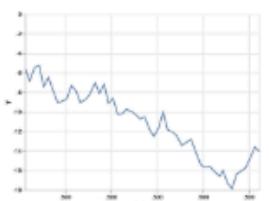
Png

Param

Plotly



This is a raw string which will not be formatted in any way except for the applied style.



Svg

Str

Streamz

Vtk

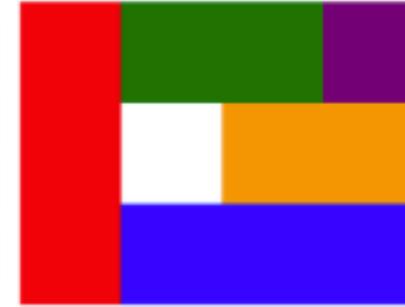
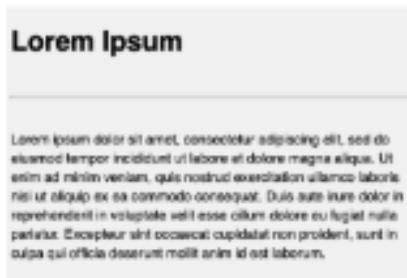
Vtkvolume

Vega

Video

Panel Dashboarding Elements

Layouts

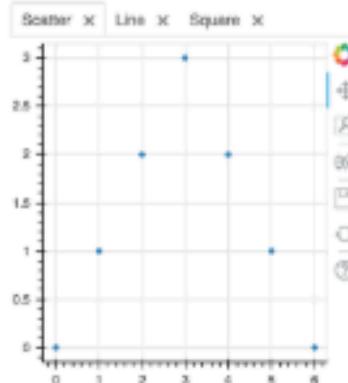


Column
⋮

Divider
⋮

Gridbox
⋮

Gridspec
⋮



A "WidgetBox" containing a text input field labeled "Text:", a horizontal slider labeled "Slider: 0", and a dropdown menu labeled "A".

Row
⋮

Tabs
⋮

Widgetbox
⋮

Panel Dashboarding Elements

Widgets

The image displays a collection of 40 different dashboarding elements, each with a small preview and a descriptive label below it. The elements are arranged in a grid:

- Ace**: A code editor component.
- Audio**: Two audio player components showing playback controls.
- Autocompleteinput**: An input field with a dropdown menu showing 'Biology'.
- Button**: A button labeled 'default' with four color variants: primary (blue), success (green), warning (orange), and danger (red).
- Checkboxgroup**: A group of checkboxes with various states: checked, unchecked, and disabled.
- Checkbuttongroup**: A group of checkboxes with various states: checked, unchecked, and disabled.
- Checkbox**: A single checkbox labeled 'Checked'.
- Colorpicker**: A color picker interface.
- Crossselector**: A multi-select dropdown component.
- Dataframe**: A data frame visualization.
- Datepicker**: A date picker interface.
- Daterangeslider**: A range slider for dates.
- Dateslider**: A slider for dates.
- Datetimeinput**: A datetime input field.
- Discreteplayer**: A component with three discrete slider controls.
- Discreteslider**: Three discrete slider controls.
- Fileinput**: A file input field.
- Fileselector**: A file selector interface.
- Floatslider**: Three float slider controls.
- Intrangeslider**: Three integer range slider controls.
- Intslider**: Three integer slider controls.
- Literalinput**: A text input field.
- Multiselect**: A multi-select dropdown menu.
- Passwordinput**: A password input field.
- Player**: A video player component.
- Progress**: A progress bar component.
- Radioboxgroup**: A radio button group.
- Radiobuttongroup**: A radio button group.
- Rangeslider**: Three range slider controls.
- Select**: A select dropdown menu.
- Spinner**: A spinner input field.
- Statictext**: Two static text labels: 'Static Text: A string' and 'Static Text: Another string'.
- Textareainput**: A text area input field.
- TextInput**: Three text input fields.
- Toggle**: A toggle switch component.
- Videostream**: A video stream component.

Panel Easy Transition from notebook to independent app

Additional Resources

The screenshot shows the Bokeh Discourse forum homepage. At the top, there are links for "Sign Up" and "Log In". Below that, there are buttons for "all categories", "Categories", "Latest", and "Top". The main content area is organized by category: Announcements, Showcase, Community Support, Development, Meta, and Governance. Each category has a count of topics per month and a list of recent posts with user profiles and timestamps.

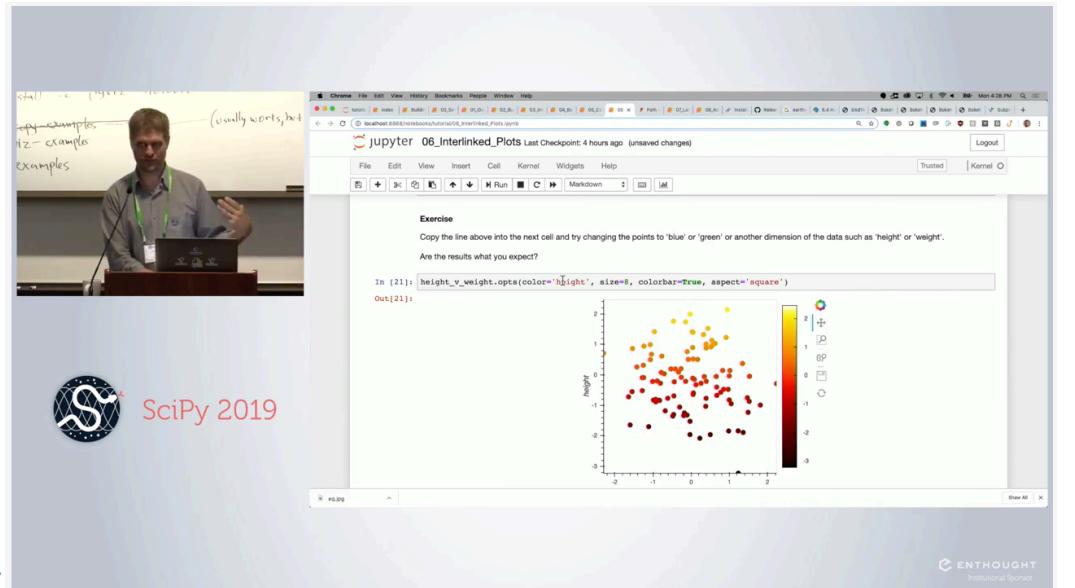
Category	Topics	Latest
Announcements	5	1 May '19 Welcome to the Bokeh Discourse
Showcase	6 / month	1 Circle glyphs move below lines when not selected: how to prevent this? 1h
Community Support	58 / month	0 Trying to use the 'Export CSV' Bokeh Demo 1h
Development	13 / month	7 Bokeh custom tool with Bokeh.embed 2h
Meta	1 / month	3 Adding style to select dropdown options 6h
Governance	0	1 Using colorcet colorpalette hot 7h
		4 parallel coordinates plot 13h
		1 Example on embedding Bokeh Server 13h

<https://discourse.bokeh.org/>

The screenshot shows the HoloViz Discourse forum homepage. At the top, there are links for "Sign Up" and "Log In". Below that, there are buttons for "all categories", "Categories", "Latest", and "Top". The main content area is organized by category: Announcements, Panel, HoloViews, Datasader, GeoViews, hvPlot, and Param. Each category has a count of topics per month and a list of recent posts with user profiles and timestamps.

Category	Topics
Announcements	2
Panel	23 / month
HoloViews	18 / month
Datasader	5 / month
GeoViews	4 / month
hvPlot	3 / month
Param	0

<https://discourse.holoviz.org/>



<https://www.youtube.com/watch?v=7deGS4IPAQ0&t=7422s>