

# Data Visualization

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+ What is visualization?



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# Overview

- Aims:
  - Share visualization tools available to python users
  - Describe some unique functionalities, pros/cons
  - Provide links to documentation/tutorials for each package

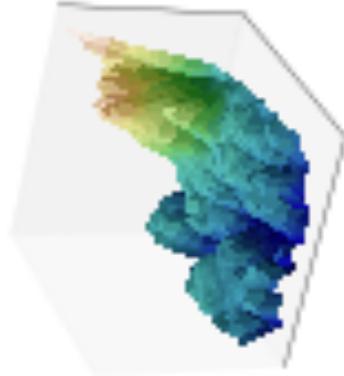
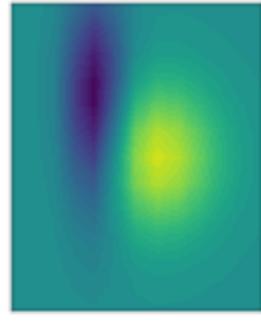
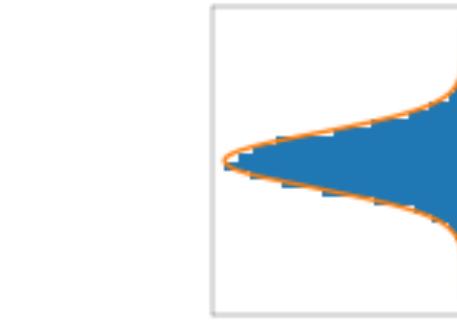
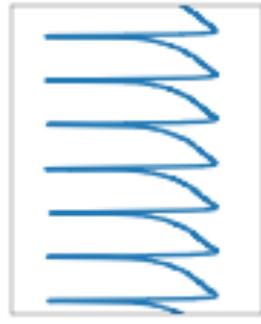
## + General use

- Matplotlib <http://matplotlib.org>
- Seaborn <http://seaborn.pydata.org>
- ggplot <http://ggplot.yhat.com>

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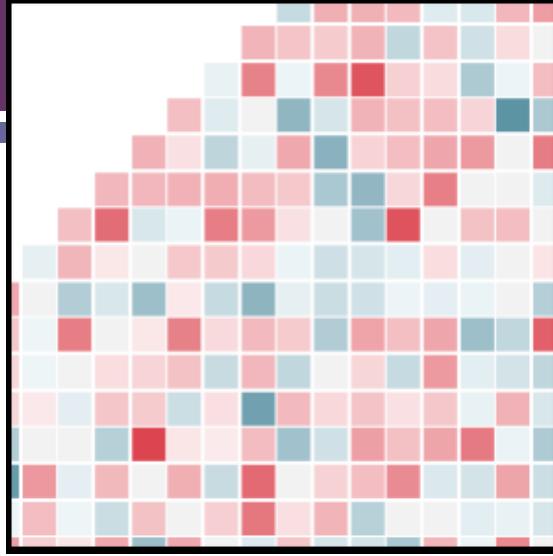
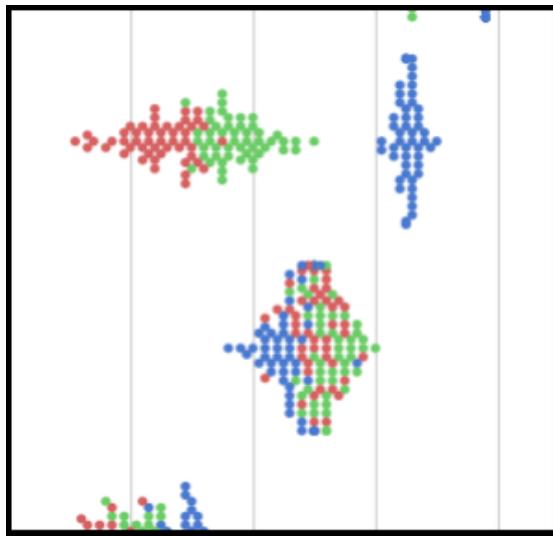
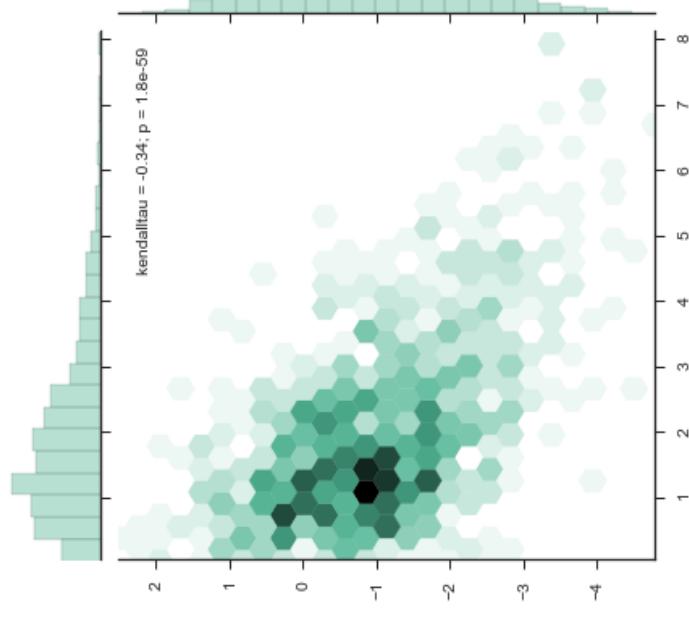
# Matplotlib

- The python ‘got to’ for visualization, inspired by Matlab
- Powerful and versatile tool for visualization
- However, more control means more complexity
- Function over form

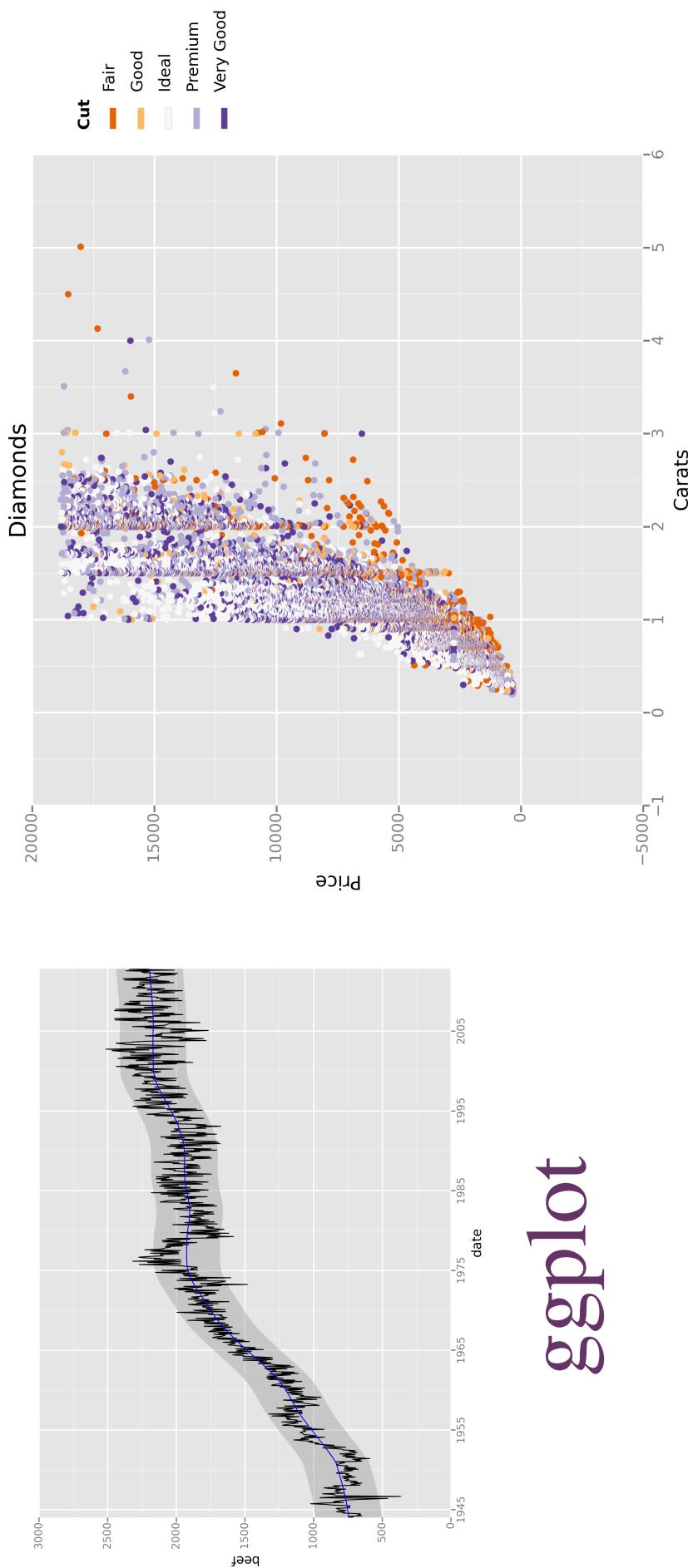


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# Seaborn



- Harnesses Matplotlib's functionality with publication-ready, aesthetically pleasing designs
- It's built on Matplotlib, and again, with functionality comes complexity.



# ggplot

- Based on `ggplot2`, an r-based visualization package
  - Well integrated with Pandas
- Employs a simpler, and arguably more intuitive, ‘layered’ approach to building visualizations
  - Visualizations are build from the bottom up: users build axes, points, lines, etc. on top of one another.
  - With ease of use comes some reduced functionality

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# Mapping

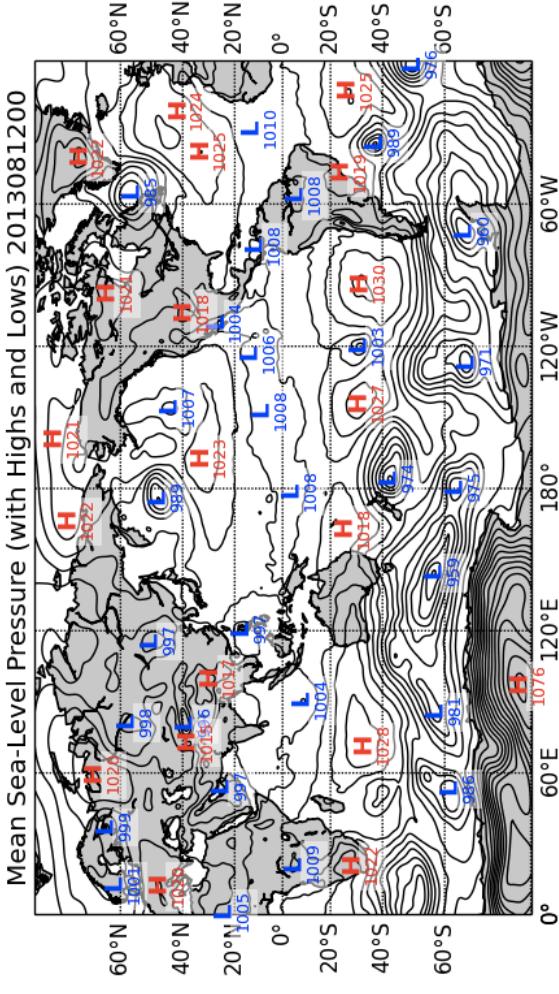
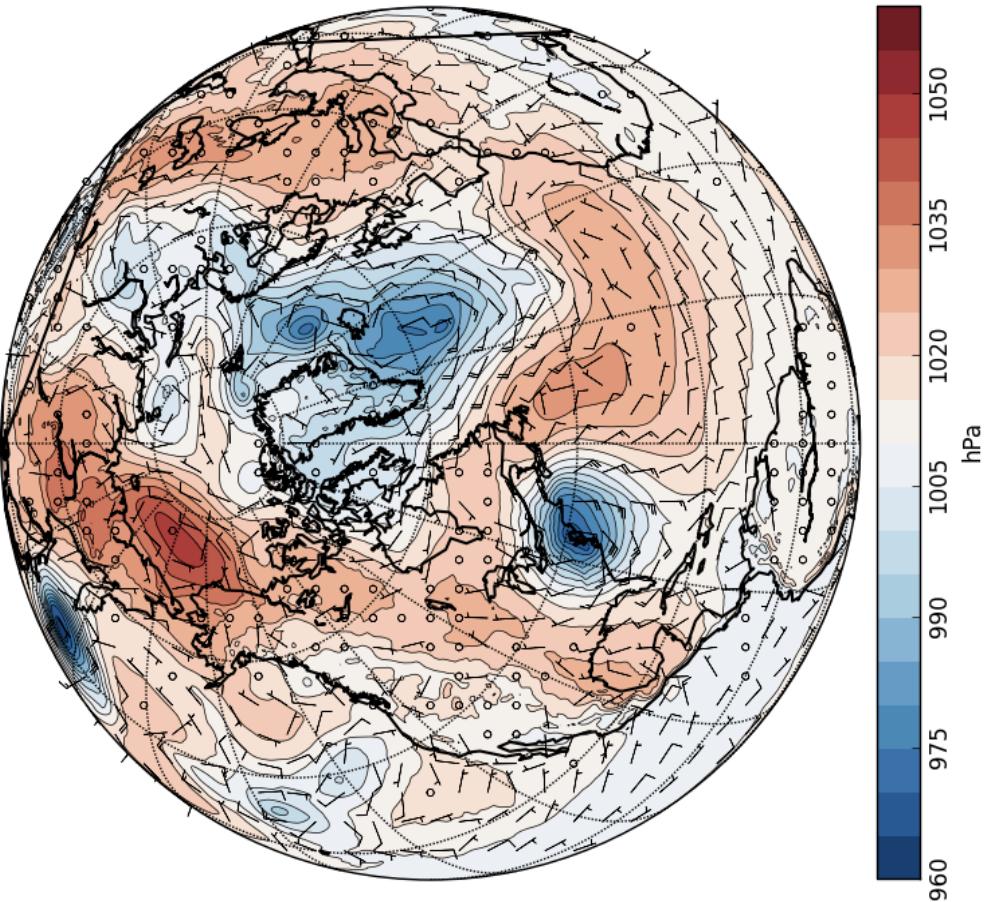
Geoplotlib <https://github.com/andrea-cuttone/geoplotlib>

Basemap <http://matplotlib.org/basemap/>

Folium <https://github.com/python-visualization/folium>

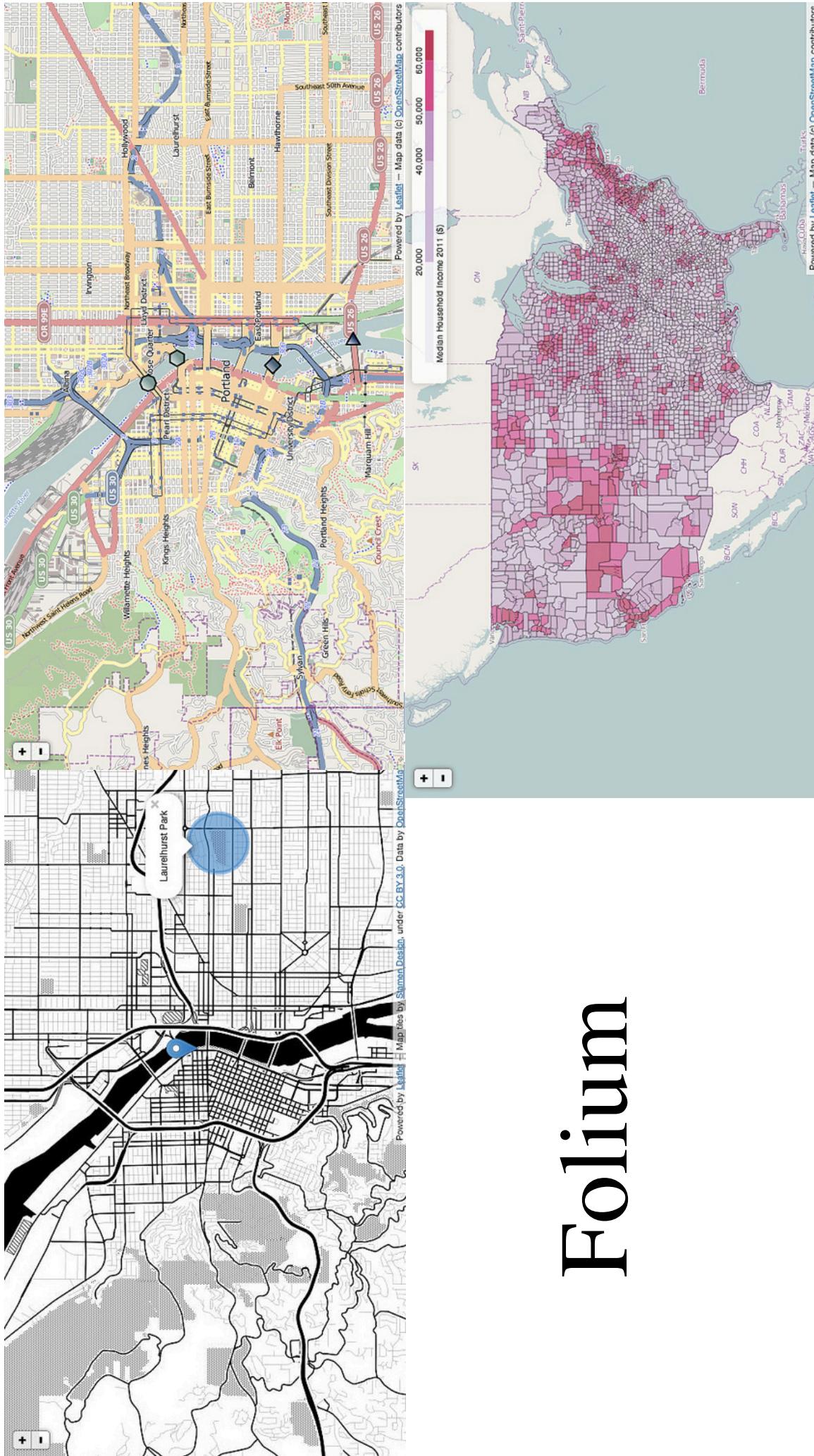
# Basemap

SLP and Wind Barbs 1993-03-14 00:00:00



- Part of the Matplotlib library

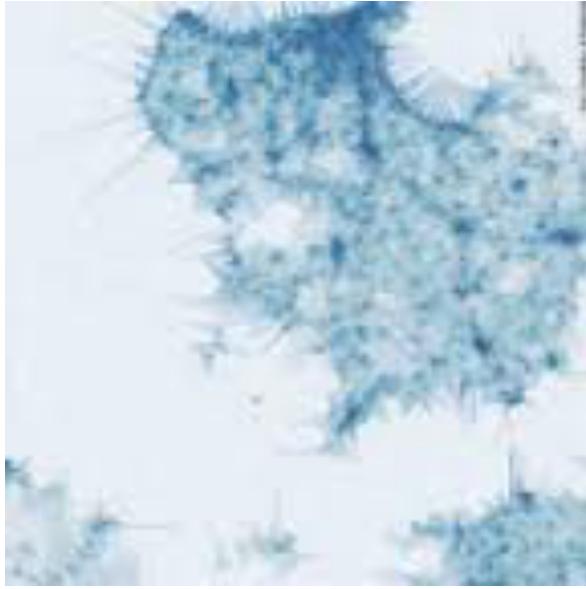
- Offers diverse options for
  - cartographic projections
  - color schemes
  - circumscription of regions
  - measurement of surface distance
  - topography/satellite images



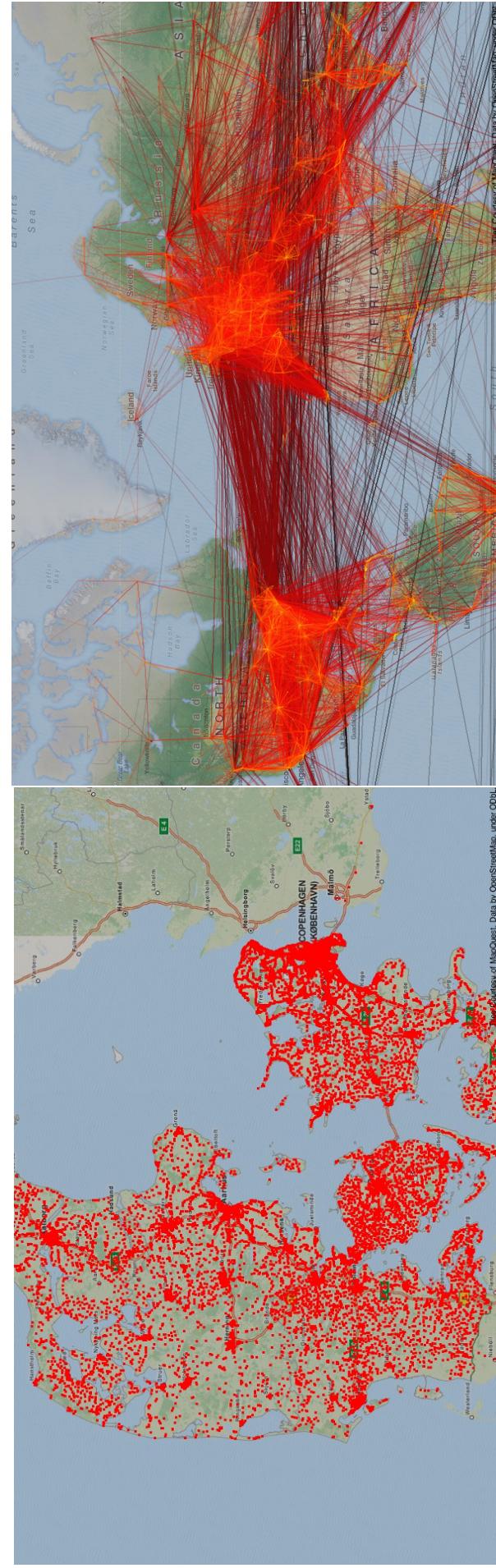
# Folium

- Constructs interactive maps w/zooming & dragging
- Allows embedding of rich information via tagged leaflets
- Example: <http://bl.ocks.org/wrobstory/5609718>

# Geoplotlib



- Built on Matplotlib
- Builds interactive map
- Allows custom layers and spatial animations



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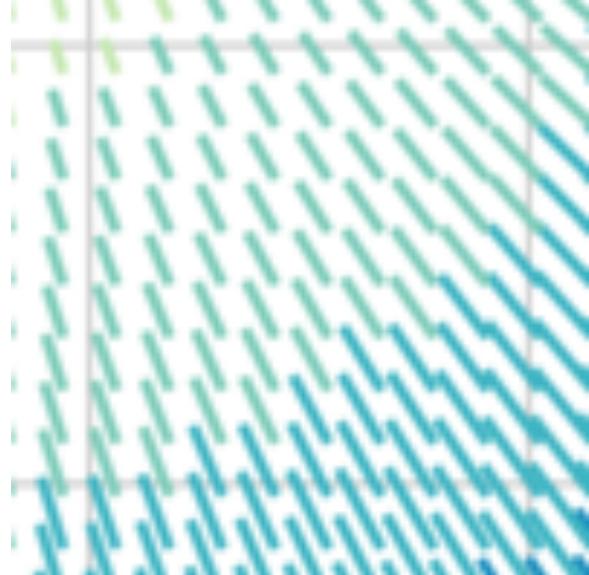
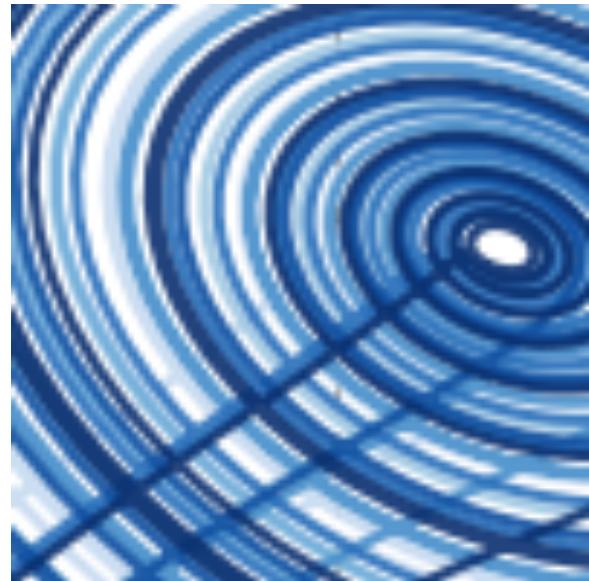
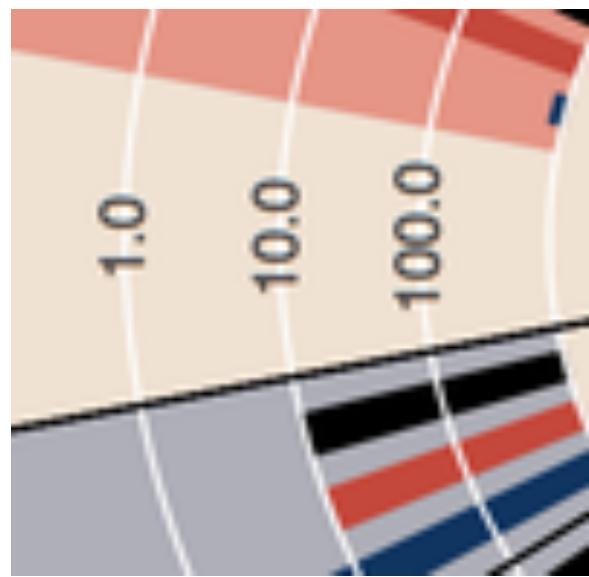
## Interactivity

- Bokeh <http://bokeh.pydata.org/en/latest/>
- Gleam <https://github.com/dgrtwo/gleam>
- Pygal <http://pygal.org/en/stable/>
- Altair <https://github.com/ellisonbg/altair>
- Lightning <http://lightning-viz.org>
- Holoviews <http://holoviews.org>
- Vispy <vispy.org>
- Plotly <https://plot.ly/python/>

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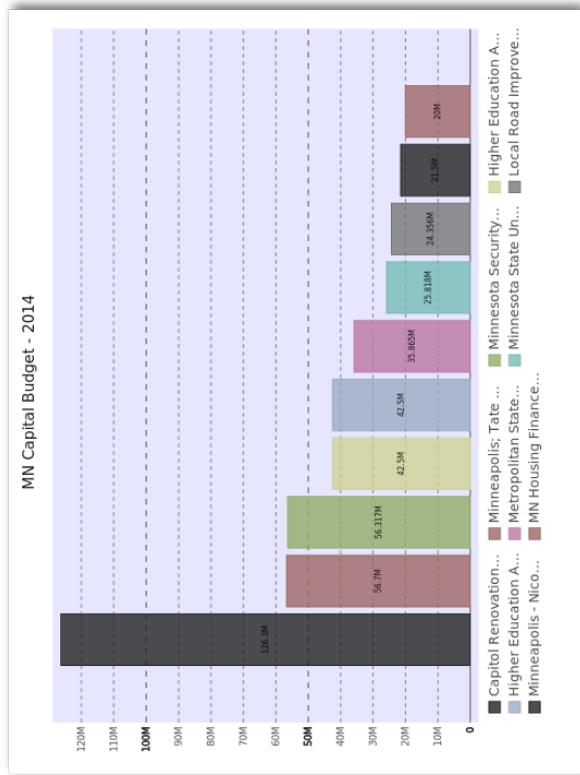
# Bokeh

- Based on the same system as `ggplot` ('bottom up building of visualizations')
- Builds web-ready plots in JSON and HTML
- Allows interactivity and realtime data streaming



# Pygal

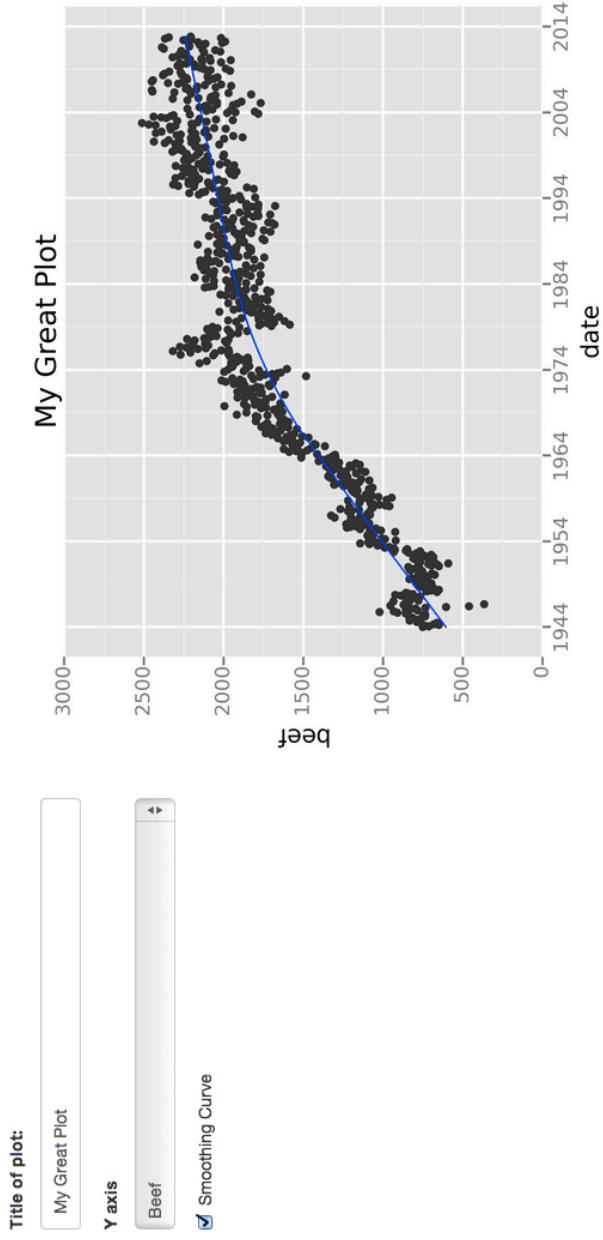
- Similar to Bokeh in terms of plot building technique
- Outputs in SVG format (this can be good for smaller datasets, but is sluggish with larger data sets)
- Well thought out aesthetics



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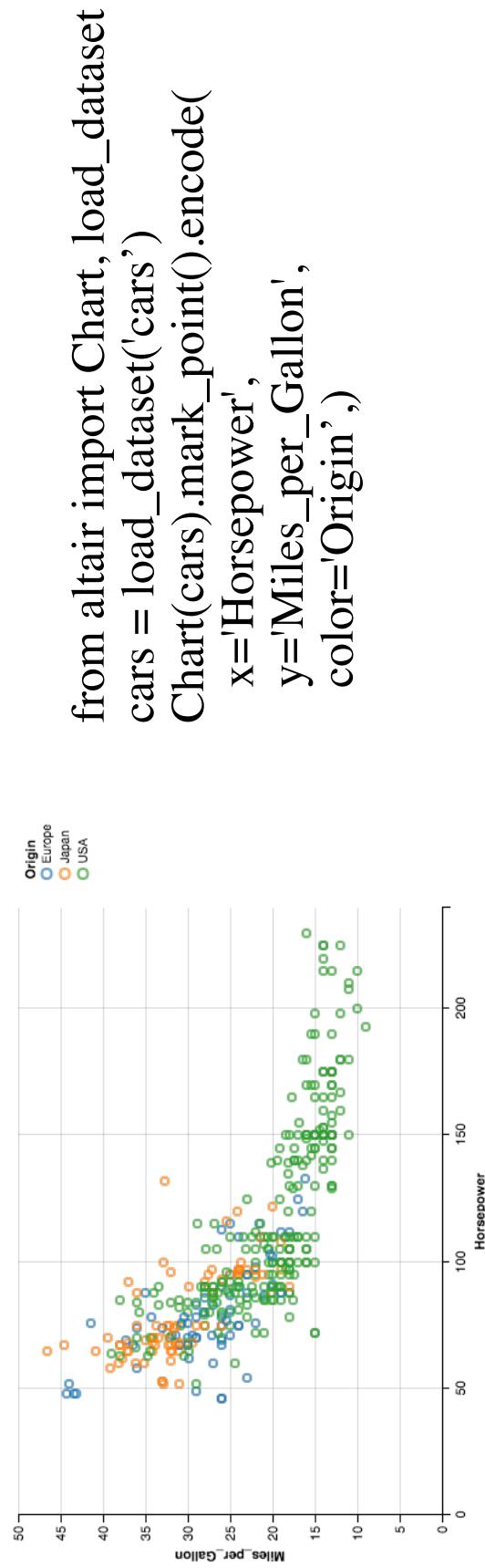
# Gleam

- Gleam works in concert with other, general purpose visualization libraries like Matplotlib
- Creates interactive web apps using only python coding (i.e. avoiding HTML, CSS, etc.)



# Altair

- ‘...declarative statistical visualization library for Python’
- Easy export into JSON, HTML
- Emphasizes simplicity and aesthetics



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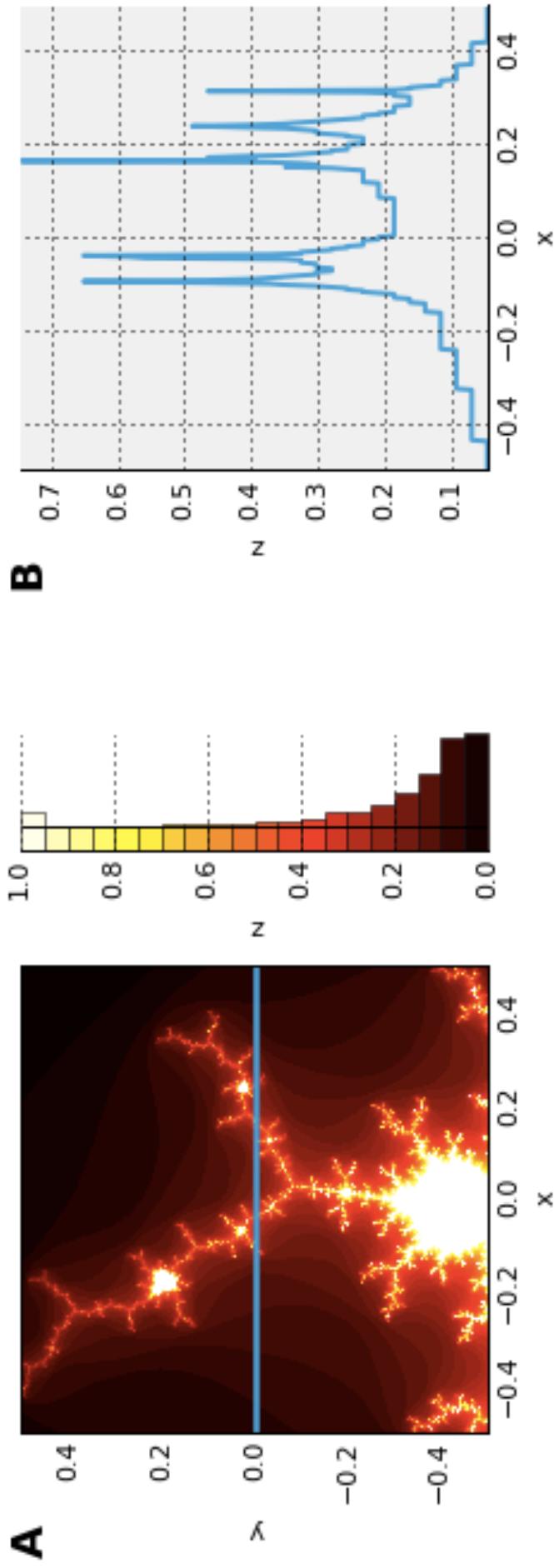
# Lightning

- ‘API-based access to reproducible web visualizations’
- Interfaces with python
- Focuses on high customizability, interactivity and aesthetics
  - Here are some examples

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# Holoviews

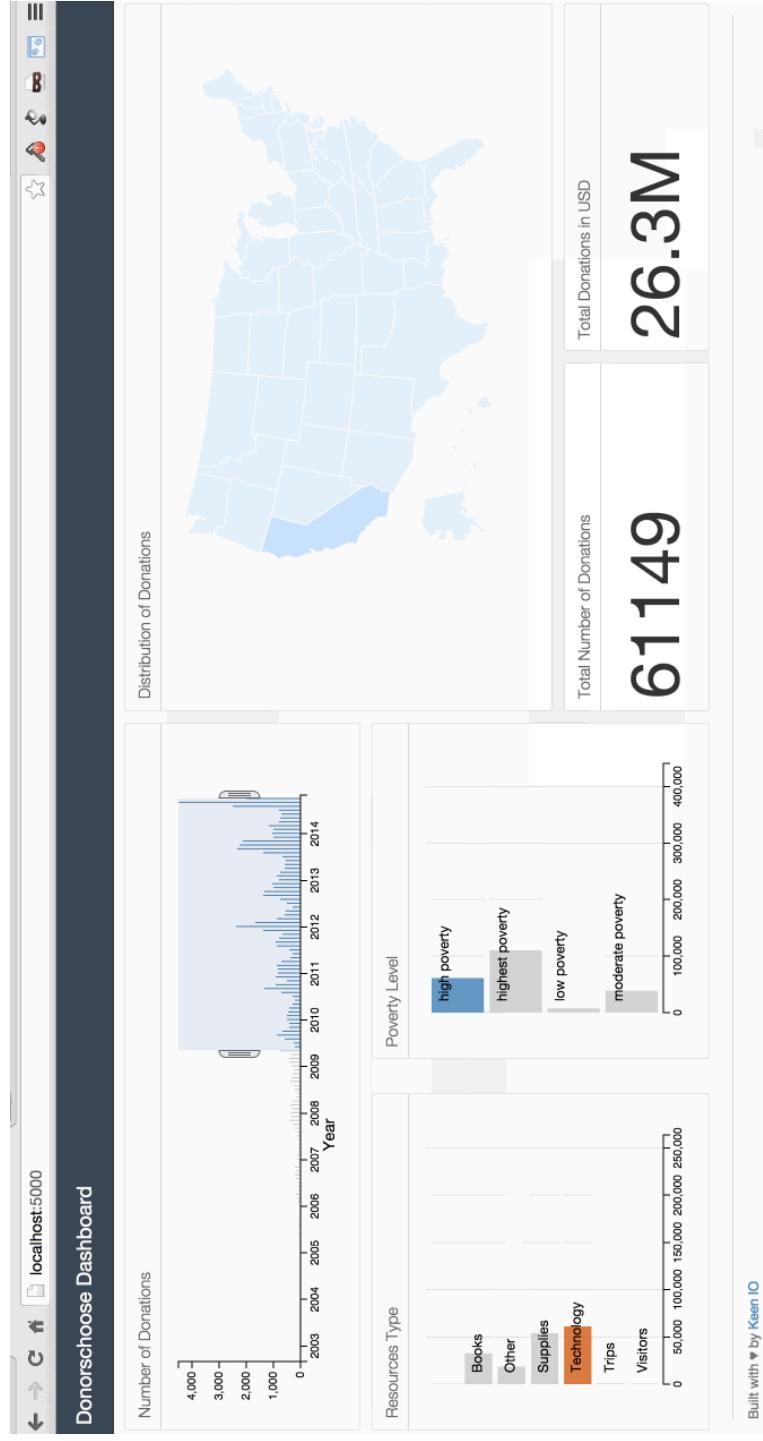
- Focuses on science and engineering visualizations
- Creates a wrapper for a dataset, ‘storing data in an annotated format that is instantly visualizable, with immediate access to both the numeric data *and* its visualization’



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# Web Dashboards

- Tableau: we all know what this is!
- D3: Javascript library for interactive web visualizations and dashboards



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# Data inspection: Missingno

- Simple and quick visualization of missing data
- A quick way to figure out where imputation of null values is needed
- ‘Missingno correlation heatmap lets you measure how strongly the presence of one variable positively or negatively affect the presence of another’

